9.3 PISGAH

9.3.1 Background and Summary of Impacts

9.3.1.1 General Information

The proposed Pisgah SEZ has a total area of 23,950 acres (97 km^2) and is located in San Bernardino County in southeastern California, about 100 mi (160 km) northeast of Los Angeles (Figure 9.3.1.1-1). In 2008, the county population was 2,086,465. The nearest population center to the SEZ is the City of Barstow, which is located about 25 mi (40 km) to the west of the SEZ and had a 2008 population of 24,596. Interstate 40 (I-40) runs east–west through the proposed Pisgah SEZ, bisecting it into a northern portion that contains about two-thirds of the SEZ acreage and a southern portion with the remainder of the acreage. Access to the SEZ from I-40 is available from exits at Fort Cady Road (to the west of the SEZ), Hector Road (midway through the SEZ), and Pisgah Crater Road (at the eastern end of the SEZ). Hector Road runs north–south through the middle of the SEZ, and a number of other local dirt roads cross the SEZ. The National Trails Highway (historic U.S. 66) also passes through the SEZ as it runs south of and parallel to I-40. The BNSF Railroad serves the area and traverses the SEZ from the northwest to the southeast, running approximately parallel to and about 0.8 mi (1.3 km) north of I-40. Three small public airports are within about 62 mi (100 km) of the SEZ.

Four existing high-capacity transmission lines run from the southwest to the northeast through the eastern portion of the SEZ. It is assumed that these transmission lines could potentially provide access from the SEZ to the transmission grid (see Section 9.3.1.2). There are also other lower-capacity lines running through portions of the SEZ.

As of February 2010, there were two solar development applications with boundaries wholly or partially within the Pisgah SEZ. One of these, covering approximately 8,600 acres (35 km^2) of the SEZ, is a BLM fast-track project for which environmental reviews have begun.

The proposed Pisgah SEZ lies within the western Mojave Desert region of the Basin and Range physiographic province in southern California. The site is in a northwest–southeast trending valley that lies to the southeast of the Mojave Valley, between the Cady Mountains to the northeast and the Rodman and Lava Bed Mountains to the southwest. The SEZ has surface elevations ranging between 1,800 and 2,300 ft (549 and 701 m), with a general drainage pattern from east to west along the SEZ. The area is in the western portion of the Mojave Desert, which has an extremely arid climate marked by mild winters and hot summers and large daily temperature swings, with annual precipitation averaging about 3.8 in. (9.7 cm). Sediments of Troy Dry Lake make up about 8% of the west central portion of the SEZ.

The proposed Pisgah SEZ and other relevant information are shown in Figure 9.3.1.1-1. The criteria used to identify the SEZ as an appropriate location for solar development included proximity to existing transmission lines or designated corridors, proximity to existing roads, a

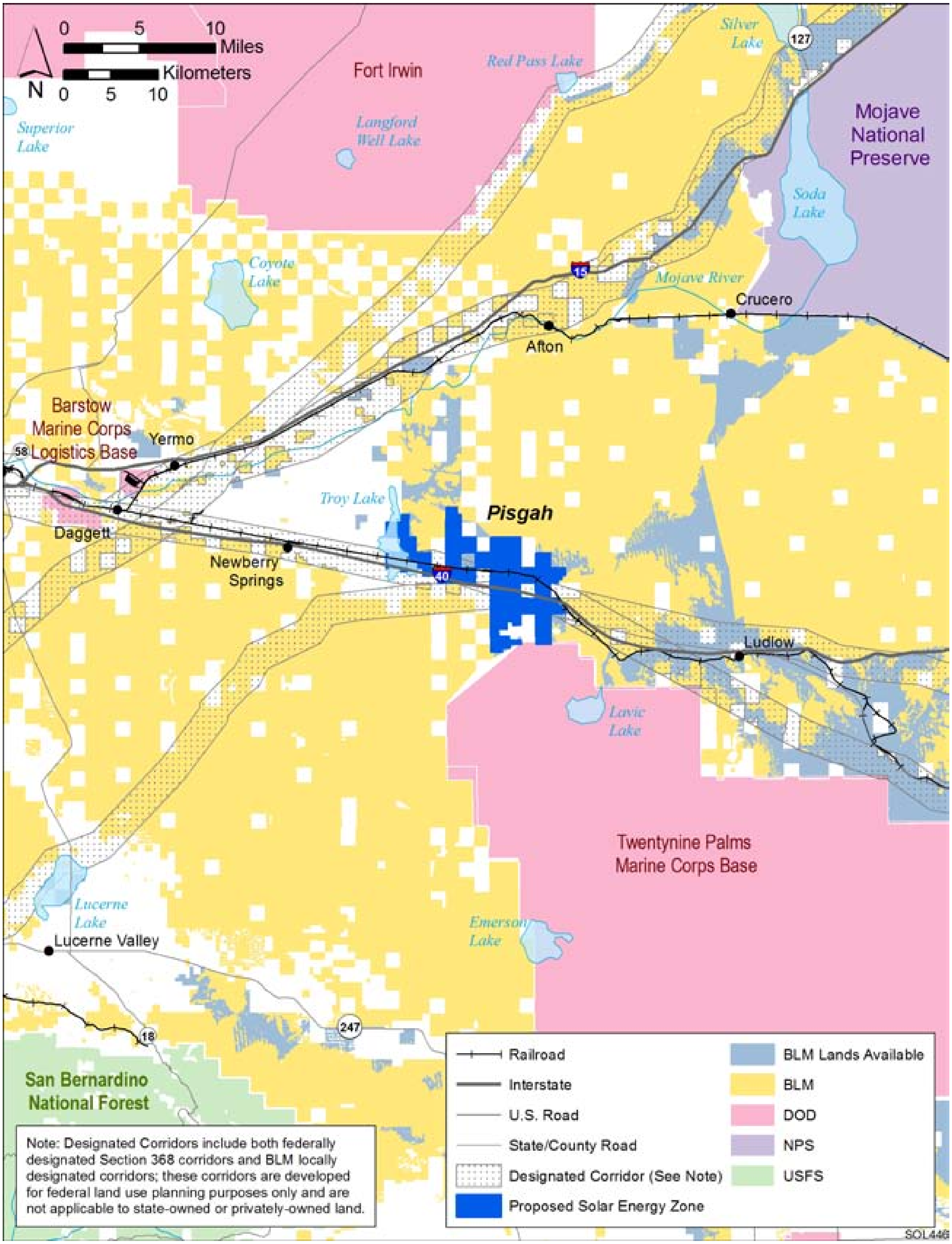

FIGURE 9.3.1.1-1 Proposed Pisgah SEZ

slope of generally less than 2%, and an area of more than 2,500 acres (10 km^2). In addition, the area was identified as being relatively free of other types of conflicts, such as USFWS-designated critical habitat for threatened and endangered species, ACECs, SRMAs, and NLCS lands (see Section 2.2.2.2 for the complete list of exclusions). Although these classes of restricted lands were excluded from the proposed Pisgah SEZ, other restrictions might be appropriate. The analyses in the following sections evaluate the affected environment and potential impacts associated with utility-scale solar energy development in the proposed SEZ for important environmental, cultural, and socioeconomic resources.

As initially announced in the *Federal Register* on June 30, 2009, the proposed Pisgah SEZ encompassed 26,282 acres (106 km^2). Subsequent to the study area scoping period, the Pisgah SEZ boundaries were altered somewhat for several reasons. Border areas with irregularly shaped boundaries were moved to match the section boundaries of the PLSS (BLM and USFS 2010a) to facilitate the BLM's administration of the SEZ area. Some small higher slope areas were also added to the borders of the SEZ acreage; although these higher slope areas would not be amenable to solar facilities, inclusion in the SEZ would facilitate BLM administration of the area. In addition, some lands near the Pisgah SEZ donated to the BLM for conservation purposes but inadvertently included in the published Pisgah study area were excluded from the boundaries of the SEZ. The revised SEZ is approximately 2,300 acres (9 km^2) smaller than the original SEZ as published in June 2009.

9.3.1.2 Development Assumptions for the Impact Analysis

Maximum development of the proposed Pisgah SEZ was assumed to be 80% of the total SEZ area over a period of 20 years, a maximum of 19,160 acres (78 km^2). These values are shown in Table 9.3.1.2-1, along with other development assumptions. Full development of the Pisgah SEZ would allow development of facilities with an estimated total of 2,129 MW of electrical power capacity if power tower, dish engine, or PV technologies were used, assuming 9 acres/MW (0.04 km^2/MW) of land required, and an estimated 3,832 MW of power if solar trough technologies were used, assuming 5 acres/MW (0.02 km^2/MW) of land required.

Availability of transmission from SEZs to load centers will be an important consideration for future development in SEZs. The nearest existing transmission lines are 230-kV and 250-kV lines that run through the SEZ. It is possible that these existing lines could be used to provide access from the SEZ to the transmission grid, but the 230- to 250-kV capacity of those lines would be inadequate for 2,129 to 3,832 MW of new capacity (a 500-kV line can accommodate approximately the load of one 700-MW facility). At full build-out capacity, it is clear that substantial new transmission and/or upgrades of existing transmission lines would be required to bring electricity from the proposed Pisgah SEZ to load centers; however, at this time the location and size of such new transmission facilities are unknown. Generic impacts of transmission and associated infrastructure construction and of line upgrades for various resources are discussed in Chapter 5. Project-specific analyses would need to identify the specific impacts of new transmission construction and line upgrades for any projects proposed within the SEZ.

TABLE 9.3.1.2-1 Proposed Pisgah SEZ Development Acreages, Maximum Solar MW Output, Access Roads, and Transmission Line ROWs

Total Acreage and Assumed Developed Acreage (80% of Total)	Assumed Maximum SEZ Output for Various Solar Technologies	Distance to Nearest State, U.S. or Interstate Highway	Distance and Capacity of Nearest Existing Transmission Line	Assumed Area of Transmission Line ROW and Road ROW	Distance to Nearest Designated Transmission Corridor[d]
23,950 acres and 19,160 acres[a]	2,129 MW[b] 3,832 MW[c]	Adjacent (I-40)	Within SEZ, 230 and 500 kV	0 acres and 0 acres	Within SEZ[e]

[a] To convert acres to km^2, multiply by 0.004047.

[b] Maximum power output if the SEZ were fully developed using power tower, dish engine, or PV technologies, assuming 9 acres/MW (0.04 km^2/MW) of land required.

[c] Maximum power output if the SEZ were fully developed using solar trough technologies, assuming 5 acres/MW (0.02 km^2/MW) of land required.

[d] BLM-designated corridors are developed for federal land use planning purposes only and are not applicable to state-owned or privately owned land.

[e] A Section 368 federally designated energy corridor crosses through the SEZ along I-40.

For the purposes of analysis in this PEIS, it was assumed that the four existing high-capacity transmission lines (230 and 500 kV) that run through the proposed Pisgah SEZ could provide access to the transmission grid, and thus no additional acreage disturbance for transmission line access was assessed. Access to the existing transmission lines was assumed, without additional information on whether these lines would be available to for connection of future solar facilities. If a connecting transmission line were constructed in the future to connect facilities within the SEZ to a different off-site grid location from the one assumed here, site developers would need to determine the impacts from the construction and operation of that line. In addition, developers would need to determine the impacts of line upgrades if they were needed.

Existing road access to the proposed Pisgah SEZ should be adequate to support construction and operation of solar facilities, because I-40 runs from east to west through the SEZ. Thus, no additional road construction outside of the SEZ is assumed to be required to support solar development of the SEZ.

9.3.1.3 Summary of Major Impacts and SEZ-Specific Design Features

In this section, the impacts and SEZ-specific design features assessed in Sections 9.3.2 through 9.3.21 for the proposed Pisgah SEZ are summarized in tabular form. The impacts identified in Table 9.3.1.3-1 are a comprehensive list of those discussed in these sections; the reader may reference the applicable sections for detailed support of the impact assessment.

TABLE 9.3.1.3-1 Summary of Impacts of Solar Energy Development within the Proposed Pisgah SEZ and SEZ-Specific Design Features[a]

Resource Area	Environmental Impacts—Proposed Pisgah SEZ	SEZ-Specific Design Features
Lands and Realty	Full development of the SEZ for utility-scale solar energy production (80% of the total area) could disturb up to 19,160 acres (77.5 km^2) and would establish a large industrial area that would exclude many existing and potential uses of the land, perhaps in perpetuity. Utility-scale solar energy development would introduce a new and discordant land use to the area.	None.
	Private lands and the state land parcel located on the boundaries of the SEZ also could be developed in the same or a complementary manner as the public lands if landowners agree and the lands are suitable for solar energy development.	None.
	The Section 368 energy corridor running through the SEZ could constrain solar development. Alternatively, the transmission corridor capacity could be substantially reduced if the SEZ were developed for utility-scale solar energy production.	None.
Specially Designated Areas and Lands with Wilderness Characteristics	Wilderness characteristics in 20% of the Cady Mountain WSA and 27% of the Rodman Mountain WA would be adversely affected. The Ord-Rodman DWMA and Pisgah ACECs abut portions of the Pisgah SEZ and are vulnerable to increased human traffic induced by the presence of the SEZ. The Rodman Mountains Cultural area would also be vulnerable to increased traffic.	Application of SEZ-specific design features for visual resource impacts may reduce the visual impact on wilderness characteristics. Once construction of solar energy facilities begins, the BLM would monitor to determine whether increases in traffic to the Ord-Rodman DWMA, Rodman Mountains Cultural Area, and Pisgah ACECs occur and whether additional management measures are required to protect the resources in these areas.

TABLE 9.3.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Pisgah SEZ	SEZ-Specific Design Features
Rangeland Resources: Livestock Grazing	None.	None.
Rangeland Resources: Wild Horses and Burros	None.	None.
Recreation	Recreation use would be excluded from developed portions of the SEZ but it is anticipated the loss of recreation use within the SEZ would be small. The presence of solar development in the SEZ also likely would adversely affect recreational use of the Cady Mountains WSA and Rodman Mountains WA. Opportunities for primitive recreation surrounding the SEZ would be reduced.	None.
Military and Civilian Aviation	The development of any solar energy or transmission facilities that encroach into the airspace of an MTR could interfere with military training activities and could create a safety concern.	None.
	The Barstow-Dagett public airport is located about 12 mi (19 km) west of the SEZ, but no impacts on operations at that airport are expected.	None.
Geologic Setting and Soil Resources	Impacts on soil resources would occur mainly as a result of ground-disturbing activities (e.g., grading, excavating, and drilling) during the construction phase. Impacts include soil compaction, soil horizon mixing, soil erosion and deposition by wind, soil erosion by water and surface runoff, sedimentation, and soil contamination. These impacts may be impacting factors for other resources (e.g., air quality, water quality, and vegetation). The Pisgah lava field may not be a suitable location for construction.	None. The feasibility of constructing solar facilities in the lava field area of the SEZ will need to be addressed by facility developers.

TABLE 9.3.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Pisgah SEZ	SEZ-Specific Design Features
Minerals (fluids, solids, and geothermal resources)	Currently there are 103 mining claims within the SEZ, most of these are in the area south of I-40, where there has been a mining operation for many years. These mining claims represent a prior existing right that, if valid, likely would preclude solar energy development as long as they are in place.	Consideration should be given to altering the boundaries of the SEZ to remove the areas with mining claims.
Water Resources	Ground-disturbance activities (affecting 17 to 25% of the total area in the peak construction year) could affect surface water quality due to surface runoff, sediment erosion, and contaminant spills. Construction activities may require up to 2,620 ac-ft (3.2 million m^3) of water during peak construction year. Construction activities would generate as much as 148 ac-ft 182,600 m^3) of sanitary wastewater. Assuming full development of the SEZ, normal operations would use the following amounts of water (Analysis Areas 1 and 2 combined): • For parabolic trough facilities (3,832-MW capacity), 2,736 to 5,802 ac-ft/yr (3.4 million to 7.2 million m^3/yr) for dry-cooled systems, and 19,214 to 57,534 ac-ft/yr (23.7 million to 71.0 million m^3/yr) for wet-cooled systems; • For power tower facilities (2,129-MW capacity), 1,514 to 3,217 ac-ft/yr (1.9 million to 4.0 million m^3/yr) for dry-cooled systems, and 10,668 to 31,957 ac-ft/yr (13.1 million to 39.4 million m^3/yr) for wet-cooled systems; • For dish engine facilities (2,129-MW capacity), 1,088 ac-ft/yr (1.3 million m^3/yr);	Water resource analysis indicates that wet-cooling options would not be feasible. Other technologies should incorporate water conservation measures. Land disturbance activities should avoid impacts to the extent possible in the vicinity of Troy Lake and ephemeral washes onsite. During site characterization, hydrologic investigations would need to identify 100-year floodplains and potential jurisdictional water bodies subject to Clean Water Act Section 404 permitting. Siting of solar facilities and construction activities should avoid areas identified as being within a 100-year floodplain. During site characterization, coordination and permitting with CDFG regarding California's Lake and Streambed Alteration Program would be required for any proposed alterations to surface water features (both perennial and ephemeral). Groundwater should be used in accordance with rules and regulations set forth by the MWA regarding the Mojave River adjudicated groundwater basin for the portions of the SEZ located in Analysis Area 1.

TABLE 9.3.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Pisgah SEZ	SEZ-Specific Design Features
Water Resources *(Cont.)*	• For PV facilities (2,129-MW capacity), 109 ac-ft/yr (134,400 m^3/yr). Assuming full development of the SEZ, normal operations would generate up to 54 ac-ft/yr (66,600 m^3/yr) of sanitary wastewater and up to 1,089 ac-ft/yr (1.3 million m^3/yr) of blowdown water. Approximately 20% of the SEZ is located within the Mojave River adjudicated groundwater basin, which is managed by the MWA: • Basin is fully allocated, and water-rights or water transfers would need to be negotiated with existing water rights holders and the MWA; • No exports of groundwater outside the MWA boundary is permitted.	The groundwater-permitting process should be in compliance with the San Bernardino County groundwater ordinance. Groundwater monitoring and production wells should be constructed in accordance with standards set forth by the State of California and San Bernardino County. Stormwater management best management practices should be implemented according to the California Stormwater Quality Association. Water for potable uses would have to meet or be treated to meet water quality standards in the California Safe Drinking Water Act.
Vegetation[b]	Approximately 80% of the SEZ (19,160 acres [77.5 km^2]) would be cleared with full development of the SEZ. The plant communities affected would depend on facility locations and could include any of the plant communities occurring on the SEZ. Therefore, for the purposes of this analysis, all of the area of each cover type within the SEZ is considered to be directly affected by removal with full development of the SEZ. Sand dune, playa, desert chenopod scrub, and dry wash communities are important sensitive habitats within the SEZ that could be affected. Indirect effects (caused, for example, by surface runoff or dust from the SEZ) outside the SEZ boundaries would have the potential to degrade	An Integrated Vegetation Management Plan, addressing invasive species control, and an Ecological Resources Mitigation and Monitoring Plan, addressing habitat restoration should be approved and implemented to increase the potential for successful restoration of creosotebush–white bursage desertscrub communities and other affected habitats and to minimize the potential for the spread of tamarisk, Sahara mustard, schismus, or other invasive species. Invasive species control should focus on biological and mechanical methods to reduce the use of herbicides.

TABLE 9.3.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Pisgah SEZ	SEZ-Specific Design Features
Vegetation[b] *(Cont.)*	affected plant communities and reduce biodiversity by promoting the decline or elimination of species sensitive to disturbance. Indirect effects could also cause an increase in disturbance-tolerant species or invasive species. Noxious weeds could become established in disturbed areas and colonize adjacent undisturbed habitats, thus causing reduced restoration success and possible widespread habitat degradation. Groundwater withdrawals could affect riparian areas or groundwater-dependent communities, such as mesquite bosque.	All playa, chenopod scrub, sand dune and sand transport areas, and desert dry wash habitats, shall be avoided to the extent practicable, and any impacts minimized and mitigated. A buffer area shall be maintained around riparian areas, playas, and dry washes to reduce the potential for impacts on these habitats on or near the SEZ. Appropriate engineering controls shall be used to minimize impacts on these areas resulting from surface water runoff, erosion, sedimentation, altered hydrology, accidental spills, or fugitive dust deposition to these habitats. Appropriate buffers and engineering controls would be determined through agency consultation. Groundwater withdrawals should be prohibited to avoid the potential for indirect impacts on riparian habitat along the Mojave River or groundwater-dependent communities, such as mesquite bosque.
Wildlife: Amphibians and Reptiles[b]	The red-spotted toad (*Bufo punctatus* would be expected to occur within the Pisgah SEZ. However, as it prefers dry, rocky areas near temporary sources of standing water, its occurrence within the SEZ would be spatially limited. It would most likely occur in the far western portion of the SEZ that overlaps portions of Troy Lake. Thirty-one reptile species (the desert tortoise, which is a federally and state-listed species; 13 lizards; and 16 snakes) could occur within the SEZ.	Implement design features to reduce the potential for effects on amphibians and reptiles, especially for those species that depend on habitat types that can be avoided (e.g., Troy Lake, which could provide habitat for the red-spotted toad).

TABLE 9.3.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Pisgah SEZ	SEZ-Specific Design Features
Wildlife: Amphibians and Reptiles[b] *(Cont.)*	Direct impacts on amphibian and reptile species from SEZ development would be small (0.2 to 0.6% of potentially suitable habitats identified for the species in the SEZ region would be lost). With implementation of proposed design features, indirect impacts would be expected to be negligible.	
Wildlife: Birds[b]	Almost 100 species of birds have a range that encompasses the Pisgah SEZ region. However, habitats for more than 35 of these species either do not occur on or are limited within the SEZ (e.g., habitat for waterfowl and wading birds). Direct impacts on bird species would be small for most bird species (0.6% or less of habitats potentially suitable for most representative bird species would be lost), although a moderate impact is indicated for the killdeer (1.7% of its potentially suitable habitat would be lost). Other impacts on birds could result from collision with vehicles and facility structures, surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, noise, lighting, spread of invasive species, accidental spills, and harassment. Indirect impacts on areas outside the SEZ (for example, impacts caused by dust generation, erosion, and sedimentation) are expected to be negligible with implementation of proposed design features.	Pre-disturbance surveys should be conducted within the SEZ for desert bird focal species and bird species listed under the Migratory Bird Treaty Act. Impacts on potential nesting habitat for these species should be avoided during the nesting season. Plant species that positively influence the presence and abundance of the desert bird focal species should be avoided to the extent practicable. These species include Goodding's willow, yucca, Joshua tree, mesquite, honey mesquite, screwbean, desert mistletoe, big saltbush, smoketree, and catclaw acacia. Take of golden eagles and other raptors should be avoided. Development within the area of Troy Lake should be avoided.

TABLE 9.3.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Pisgah SEZ	SEZ-Specific Design Features
Wildlife: Mammals[b]	Direct impacts on small game, furbearers, and small mammals on the SEZ from habitat disturbance and long-term habitat reduction/fragmentation would be small (0.6% or less of potentially suitable habitats for the species in the SEZ region would be lost). Other impacts on mammals could result from collision with vehicles and fences, surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, noise, lighting, spread of invasive species, accidental spills, and harassment. Indirect impacts on areas outside the SEZ (e.g., impacts caused by dust generation, erosion, and sedimentation) are expected to be negligible with implementation of proposed design features.	Development within the ephemeral drainages should be avoided in order to reduce impacts on species such as the round-tailed ground squirrel, white-tailed antelope squirrel, little pocket mouse, long-tailed pocket mouse, and any other mammal species that inhabit wash habitats.
Aquatic Biota[b]	No permanent water bodies, perennial streams, or wetlands are present within the boundaries of the Pisgah SEZ or within the 5-mi (8-km) area considered potentially susceptible to indirect impacts. Consequently, no direct or indirect impacts on aquatic habitats are expected to occur from construction and operation of utility-scale solar energy facilities at the Pisgah SEZ. However, more site specific data would be necessary to evaluate whether aquatic biota is present in ephemeral surface water features. Water quantity in surrounding aquatic habitats could be affected if significant amounts of surface water or groundwater were utilized for solar development needs.	None.

TABLE 9.3.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Pisgah SEZ	SEZ-Specific Design Features
Special Status Species[b]	Potentially suitable habitat for 54 special status species occurs in the affected area of the Pisgah SEZ. For most of these special status species, less than 1% of the potentially suitable habitat in the region occurs in the area of direct effects; for all special status species, less than 3% of the potentially suitable habitat in the region occurs in the area of direct effects. There are three groundwater dependent species that occur outside of the areas of direct and indirect effects. Potential impacts on these species could range from small to large depending on the solar energy technology deployed, the scale of development within the SEZ, and the cumulative rate of groundwater withdrawals.	Pre-disturbance surveys should be conducted within the SEZ to determine the presence and abundance of special status species. Disturbance to occupied habitats for these species should be avoided or minimized to the extent practicable. If avoiding or minimizing impacts to occupied habitats is not possible for some species, translocation of individuals from areas of direct effect; or compensatory mitigation of direct effects on occupied habitats could reduce impacts. A comprehensive mitigation strategy for special status species that used one or more of these options to offset the impacts of development should be developed in coordination with the appropriate federal and state agencies. Disturbance of desert playa and wash habitats within the SEZ should be avoided or minimized to the extent practicable. In particular, development should be avoided in and near Troy Lake in the western portion of the SEZ. Avoiding or minimizing disturbance of these habitats could reduce impacts on 11 special status species. Avoiding or minimizing disturbance of sand dunes and sand transport systems, rocky cliffs, and outcrops on the SEZ could reduce impacts on 11 special status species. Avoiding or minimizing groundwater withdrawals from the SEZ would reduce or prevent impacts on 3 special status species that may occur in aquatic habitats outside of the affected area.

TABLE 9.3.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Pisgah SEZ	SEZ-Specific Design Features
Special Status Species[b] *(Cont.)*		As a California fully protected species, direct and indirect impacts on the Mohave tui chub should be completely avoided. This includes the avoidance of groundwater withdrawals from the SEZ that may affect habitats at Camp Cady and in the Mojave River. Coordination with the CDFG should be conducted for the Mohave tui chub to address the potential for impact when project-related groundwater demands are better identified. Consultations with the USFWS and the CDFG should be conducted to address the potential for impacts on the Mohave tui chub and desert tortoise species listed as endangered and threatened, respectively, under the ESA and CESA. Consultation would identify an appropriate survey protocol, avoidance measures, and, if appropriate, reasonable and prudent alternatives, reasonable and prudent measures, and terms and conditions for incidental take statements. Harassment or disturbance of special status species and their habitats in the affected area should be mitigated. This can be accomplished by identifying any additional sensitive areas and implementing necessary protection measures based upon consultation with the USFWS and CDFG.

TABLE 9.3.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Pisgah SEZ	SEZ-Specific Design Features
Air Quality and Climate	*Construction*: Temporary exceedances of AAQS for PM_{10} and $PM_{2.5}$ at the SEZ boundaries during construction; higher concentrations would be limited to the immediate area surrounding the SEZ boundary and would decrease quickly with distance. Modeling indicates that emissions from construction activities are not expected to exceed Class I PSD PM_{10} increments at the nearest Federal Class I area (Joshua Tree NP). Construction emissions from the engine exhaust from heavy equipment and vehicles could cause some impacts on AQRVs (e.g., visibility and acid deposition) at the nearest federal Class I area. *Operations:* Positive impact due to avoided emission of air pollutants from combustion-related power generation: 3.5 to 6.3% of total SO_2, NO_x, Hg, and CO_2 emissions from electric power systems in the state of California avoided (up to 858 tons/yr SO_2, 1,410 tons/yr NO_x, 0.012 tons/yr Hg, and 3,336,000 tons/yr CO_2).	None.
Visual Resources	Large visual impacts on the SEZ and surrounding lands within the SEZ viewshed due to major modification of the character of the existing landscape; potential additional impacts from construction and operation of transmission lines and access roads within the SEZ. The SEZ is located within the CDCA. While renewable energy development is allowable within the SEZ under the CDCA management plan, substantial, non-mitigable visual impacts would occur within the CDCA in the SEZ and surrounding lands. The SEZ is located 6.0 mi (9.7 km) from the Newberry Mountains WA. Because of the open views of the SEZ and elevated viewpoints, weak to moderate visual contrasts could be observed by WA visitors.	Within the SEZ, in areas visible from and within 1 mi (1.6 km) of the Cady Mountains WSA, visual impacts associated with solar energy project operation should be consistent with VRM Class II management objectives, as experienced from KOPs (to be determined by the BLM) within the WSA, and in areas visible from between 1 and 3 mi (1.6 and 4.8 km); visual impacts should be consistent with VRM Class III management objectives. Within the SEZ, in areas located south of I-40 and visible from and between 1 and 3 mi (1.6 and 4.7 km) of the Rodman Mountains WA, visual impacts associated with solar energy project operation should be consistent with VRM Class III management objectives, as experienced from KOPs determined by the BLM within the WA.

TABLE 9.3.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Pisgah SEZ	SEZ-Specific Design Features
Visual Resources *(Cont.)*	The SEZ is located 1.2 mi (1.9 km) from the Rodman Mountains WA. Because of the short distance and elevated viewpoints, moderate to strong visual contrasts could be observed by WA visitors. The SEZ is adjacent to the Cady Mountains WSA. Because of the short distance and elevated viewpoints, moderate to strong visual contrasts could be observed by WSA visitors. Approximately 48 mi (77 km) of I-40 and Historic Route 66 are within the SEZ viewshed. Eight mi (13 km) of I-40 and 5 mi (8 km) of Historic Route 66 are within the SEZ. Strong visual contrasts could be observed within the SEZ by travelers on both roads. Amtrak passenger rail line serves Barstow and travels through the SEZ on BNSF tracks for approximately 9 mi (15 km). Approximately 55 mi (88 km) of the passenger service line are within the SEZ viewshed. Strong visual contrasts could be observed within the SEZ by train passengers. The communities of Barstow, Daggett, Yermo, Newberry Springs, and Ludlow are located within the viewshed of the SEZ, although slight variations in topography and vegetation provide some screening. Moderate visual contrasts may be observed within Newberry Springs. Residents, workers, and visitors to the area may experience visual impacts from solar energy facilities located within the SEZ (as well as any associated access roads and transmission lines) as they travel area roads, including I-15. Nearby residents could be subjected to large visual impacts from solar energy development within the SEZ.	

TABLE 9.3.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Pisgah SEZ	SEZ-Specific Design Features
Acoustic Environment	*Construction*. Estimated noise levels at the nearest residence located next to the northwestern corner of the SEZ would be about 74 dBA, which is much higher than a typical daytime mean rural background level of 40 dBA and the San Bernardino County regulation of 55 dBA daytime L_{eq} For 10-hr daytime work schedule, about 70 dBA L_{dn} would be above the EPA guideline of 55 dBA L_{dn} for residential areas. *Operations*. Noise levels at the nearest residence from a CSP solar facility would be about 51 dBA, which is higher than typical daytime mean rural background level of 40 dBA but lower than the San Bernardino County regulation of 55 dBA daytime L_{eq}. For 12-hour daytime operation, the estimated 49 dBA L_{dn} falls below the EPA guideline of 55 dBA L_{dn} for residential areas. However, in the case of 6-hour TES, the estimated nighttime noise level at the nearest residence would be 61 dBA, which is higher than typical nighttime mean background level of 30 dBA and San Bernardino County regulation of 45 dBA nighttime L_{eq}. The day–night average noise level is estimated to be about 63 dBA L_{dn}, which is higher than the EPA guideline of 55 dBA L_{dn}, for residential areas. If 80% of the SEZ were developed with dish engine facilities, the estimated noise level of 56 dBA at the nearest residence would be higher than a typical daytime mean rural background level of 40 dBA and slightly higher than the San Bernardino County regulation of 55 dBA daytime L_{eq}. For 12-hour daytime operations, the estimated 54 dBA L_{dn} would be just below the EPA guideline of 55 dBA L_{dn} for residential areas. About 3-dBA higher noise levels than those at the nearest residence were predicted at the next nearest residence (about 500 ft [150 m] south of the SEZ near I-40), but these noise levels are considerably masked by heavy road traffic noise from I-40.	Noise levels from cooling systems equipped with TES should be managed so that levels at the nearby residences to the northwest and to the south of the SEZ are kept within applicable guidelines. This could be accomplished in several ways, for example, through placing the power block approximately 1 to 2 mi (1.6 to 3 km) or more from residences, limiting operations to a few hours after sunset, and/or installing fan silencers. Dish engine facilities within the Pisgah SEZ should be located more than 1 to 2 mi (1.6 to 3 km) from the nearest residences to the northwest and the south of the SEZ (i.e., the facilities should be located in other portions of the proposed SEZ). Direct noise control measures applied to individual dish engine systems could also be used to reduce noise impacts at the nearest residences.

TABLE 9.3.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Pisgah SEZ	SEZ-Specific Design Features
Paleontological Resources	The potential for impacts on significant paleontological resources at the SEZ is relatively unknown, but could be high in some areas. A more detailed investigation of the local geological deposits of the SEZ and their potential depth is needed; a paleontological survey would likely be required prior to project approval.	The need for and the nature of any SEZ-specific design features would depend on findings of paleontological surveys.
Cultural Resources	Direct impacts on significant cultural resources could occur in the proposed Pisgah SEZ; however, a cultural resource survey of the entire area of potential effect of a proposed project would first need to be conducted to identify archaeological sites, historic structures and features, and traditional cultural properties, and an evaluation would then be needed to determine whether any are eligible for listing in the NRHP. Numerous prehistoric and Native American sites and trails are potentially located within the SEZ and could be impacted by solar energy development.	Significant historic and prehistoric sites in the vicinity of Troy Lake should be avoided. Areas of significant prehistoric remains within the SEZ that are identified through the Calico Solar Power Project (to date an area including a 400 ft [122 m] buffer and in some instances fencing [BLM and CA SHPO 2010]) should be avoided. Other possible design features specific to the SEZ would be determined through consultation with the California SHPO and affected Tribes.
Native American Concerns	Development of utility-scale solar energy projects in the SEZ could have direct impacts on resources important to Native Americans. The proposed Pisgah SEZ is located close to the Mohave Trail and may be visible from it. The SEZ includes plant species important to Native American, but not in abundance. There is also some potential for game animals important to Native Americans, including bighorn sheep crossing from surrounding mountains, and smaller game such as black-tailed jackrabbits. Ground-disturbing activities have the potential for adversely affecting these resources along with archaeological resources and burials important to Native Americans. As consultations continue, it is possible that other Native American concerns, regarding solar energy development within the SEZ will emerge.	The need for and nature of SEZ-specific design features would be determined during government-to-government consultation with the affected Tribes.

TABLE 9.3.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Pisgah SEZ	SEZ-Specific Design Features
Socioeconomics	*Construction:* 806 to 10,667 total jobs; \$66 million to \$871 million income in ROI. *Operations:* 58 to 1,385 annual total jobs; \$2.4 million to \$61 million annual income in the ROI.	None.
Environmental Justice	There are both minority populations and low-income populations, as defined by CEQ guidelines, within the 50-mi (80-km) radius around the boundary of the SEZ, meaning that any adverse impacts of solar projects could disproportionately affect minority and low-income populations.	None.
Transportation	The primary transportation impacts are anticipated to be from commuting worker traffic. I-40 and the National Trails Highway provide a regional traffic corridor that would experience small impacts for single projects that may have up to 1,000 daily workers, with an additional 2,000 vehicle trips per day (maximum). Such an increase is approximately 15% of the current traffic on I-40. The exits on I-40 might experience moderate impacts with some congestion.	None.

Abbreviations: AAQS = ambient air quality standards; ACEC = Area of Critical Environmental Concern; AQRV = air quality-related value; BLM = Bureau of Land Management; BMP = best management practice; BNSF = Burlington Northern Santa Fe; CDCA = California Desert Conservation Area; CDFG = California Department of Fish and Game; CEQ = Council on Environmental Quality; CESA= California Endangered Species Act; CNDDB = California Natural Diversity Database; CO_2 = carbon dioxide; CRA = Colorado River Aqueduct; CSP = concentrating solar power; DWMA = Desert Wildlife Management Area; EPA = U.S. Environmental Protection Agency; ESA = Endangered Species Act; Hg = mercury; KOP = key observation point; MTR = military training route; MWA = Mojave Water Agency; NO_x = nitrogen oxides; NRHP = *National Register of Historic Places*; $PM_{2.5}$ = particulate matter with an aerodynamic diameter of 2.5 µm or less; PM_{10} = particulate matter with an aerodynamic diameter of 10 µm or less; PSD = prevention of significant deterioration; PV= photovoltaic; ROI = region of influence; SEZ = solar energy zone; SHPO = State Historic Preservation Office; SO_2 = sulfur dioxide; TES = thermal energy storage; USFWS = U.S. Fish and Wildlife Service; VOC = volatile organic compound; VRM = visual resource management; WA = Wilderness Area; WSA = Wilderness Study Area.

[a] The detailed programmatic design features for each resource area to be required under BLM's Solar Energy Program are presented in Appendix A, Section A.2.2. These programmatic design features would be required for development in the proposed Pisgah SEZ.

[b] The scientific names of all plants, wildlife, aquatic biota, and special status species are provided in Sections 9.3.10 through 9.3.12.

Section 9.3.22 discusses potential cumulative impacts from solar development in the proposed SEZ.

Only those design features specific to the Pisgah SEZ are included in Sections 9.3.2 through 9.3.21 and in the summary table. The detailed programmatic design features for each resource area to be required under BLM's Solar Energy Program are presented in Appendix A, Section A.2.2. These programmatic design features would also be required for development in this and other SEZs.

This page intentionally left blank.

9.3.2 Lands and Realty

9.3.2.1 Affected Environment

The 23,950 acres (97 km^2) of the proposed Pisgah SEZ stretch for about 12 mi (19 km) along I-40, which splits the SEZ into northern and southern portions. Although the SEZ consists only of BLM-administered public lands, the combination of the public land ownership pattern and the topography of the area creates a large interface between public and private lands. There are also about 380 acres (1.5 km^2) of state land bordering the SEZ. There is a large block of private land to the west and northwest of the area. The area is rural in character.

There are numerous existing ROW authorizations in the SEZ (BLM and USFS 2010b), including authorizations for I-40 and the National Trails Highway (old U.S. 66), a railroad line, a fiber optic line, four large transmission lines, an electrical substation, four pipelines, and a county road that provides access to a mine surrounded by the SEZ. There are also additional lower capacity power lines located in portions of the SEZ. A 2-mi (3-km) wide Section 368 designated energy corridor that follows the route of I-40 passes through portions of the SEZ. This corridor was recently established as an outcome of the West-wide Corridor PEIS (DOE and DOI 2008) (see also Section 3.2.5).

As of February 2010, there were two solar development applications wholly or partially within the SEZ boundaries. One of these, covering approximately 8,600 acres (35 km^2) of the SEZ, is a BLM fast-track project for which environmental reviews have begun.

9.3.2.2 Impacts

9.3.2.2.1 Construction and Operations

Development of the proposed Pisgah SEZ for utility-scale solar energy production would establish a very large industrial area that would exclude many existing and potential uses of the land, perhaps in perpetuity. Since the SEZ is relatively undeveloped and rural, utility-scale solar energy development would be a new and discordant land use in the area. It is also possible that the numerous private lands and the state land parcel located on the boundaries of the SEZ could be developed in the same or a complementary manner as the public lands if the landowners are willing and if these lands are suitable for solar energy development.

Existing ROW authorizations on the SEZ would not be affected by solar energy development since they are prior rights. The existing pipeline, electrical transmission line, and highway ROWs do remove some land from potential solar development within the SEZ. Should the proposed SEZ be identified as an SEZ in the ROD for this PEIS, the BLM would still have discretion to authorize additional ROWs in the area until solar energy development was authorized, and then future ROWs would be subject to the rights granted for solar energy development.

The designated Section 368 transmission corridor along I-40 running through portions of the SEZ could limit solar development of the SEZ, because in order to avoid technical or operational interference between transmission and solar energy facilities, solar energy facilities cannot be constructed under transmission lines or over pipelines. Alternatively, because of the existing constraints from designated WAs, one WSA, the Twentynine Palms Marine Base, and topographic constraints, the transmission corridor capacity could be substantially reduced if the SEZ were fully developed for utility-scale solar energy production. Transmission capacity is becoming a more critical factor and reducing corridor capacity in this SEZ may have future, but currently unknown, consequences. This is an administrative conflict that can be addressed by the BLM, but there would be implications either for the amount of potential solar energy development or for the amount of transmission capacity that can be accommodated.

The current public land ownership pattern, along with terrain features in the SEZ, could lead to the creation of isolated parcels of BLM-administered land scattered among solar energy facilities that would be both inaccessible to the public and difficult to manage.

9.3.2.2.2 Transmission Facilities and Other Off-Site Infrastructure

An existing 230-kV transmission line runs north–south through the eastern portion of the SEZ; this line might be available to transport the power produced in this SEZ. Establishing a connection to the existing line would not involve the construction of a new transmission line outside of the SEZ. If a connecting transmission line were constructed in a different location outside of the SEZ in the future, site developers would need to determine the impacts from construction and operation of that line. In addition, developers would need to determine the impacts of line upgrades, if they were needed.

Road access to the SEZ is readily available, so it is anticipated there would be no additional land disturbance outside the SEZ associated with road construction to provide access to the SEZ. Both internal electric transmission lines and roads would be required to support development of solar energy facilities. See Section 9.3.1.2 for the analysis assumptions for the SEZ.

9.3.2.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features were identified. Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program would provide adequate mitigation for some identified impacts. The exceptions may be impacts that are related to the exclusion of many existing and potential uses of the public land, perhaps in perpetuity; the visual impact of an industrialized-looking solar facility within an otherwise rural area; and induced land use changes on state and private lands.

9.3.3 Specially Designated Areas and Lands with Wilderness Characteristics

9.3.3.1 Affected Environment

The SEZ is located in the California Desert Conservation Area (CDCA) which is a 26-million-acre (105,000-km^2) area in southern California designated by Congress in 1976 in the FLPMA. About 10.7 million acres (43,300 km^2) of the CDCA are administered by the BLM. The proposed Pisgah SEZ is located within the CDCA and is surrounded by specially designated areas, including four designated WAs, one WSA, and numerous ACECs (Figure 9.3.3.1-1). None of the ACECs within the viewshed of the SEZ were designated because they possess scenic values; they were identified for the protection of plant and animal species or cultural resources. No lands with wilderness characteristics outside of designated WAs or WSAs have been identified within 25 mi (40 km) of the SEZ.

As part of the planning process for the BLM-administered lands in the CDCA, all public lands except for about 300,000 acres (1,214 km^2) of scattered parcels were designated geographically into one of four multiple-use classes. The classification was based on the sensitivity of resources and kinds of uses for each geographic area. The four multiple-use classes are (BLM 1999):

- Class C is for lands either designated as wilderness or for wilderness study areas. These lands are managed to protect their wilderness characteristics.

- Class L (Limited Use) protects sensitive, natural, scenic, ecological, and cultural resource values. Public lands designated as Class L are managed to provide for generally lower intensity, carefully controlled multiple use of resources, while ensuring that sensitive values are not significantly diminished.

- Class M (Moderate Use) is based upon a controlled balance between higher intensity use and protection of public lands. This class provides for a wide variety of present and future uses such as mining, livestock grazing, recreation, energy, and utility development. Class M management is also designed to conserve desert resources and to mitigate damage to those resources caused by permitted uses.

- Class I (Intensive use) is to provide for concentrated use of lands and resources to meet human needs. Reasonable protection will be provided for sensitive natural and cultural values. Mitigation of impacts on resources and rehabilitation of affected areas will occur insofar as possible.

Land within the SEZ south of I-40 is predominantly Class L (27%), and the rest of the area is Class M (73%). The Multiple Use Class Guidelines contained in the CDCA Plan indicate that wind, solar, or geothermal electrical generation facilities could be allowed in both of these classes.

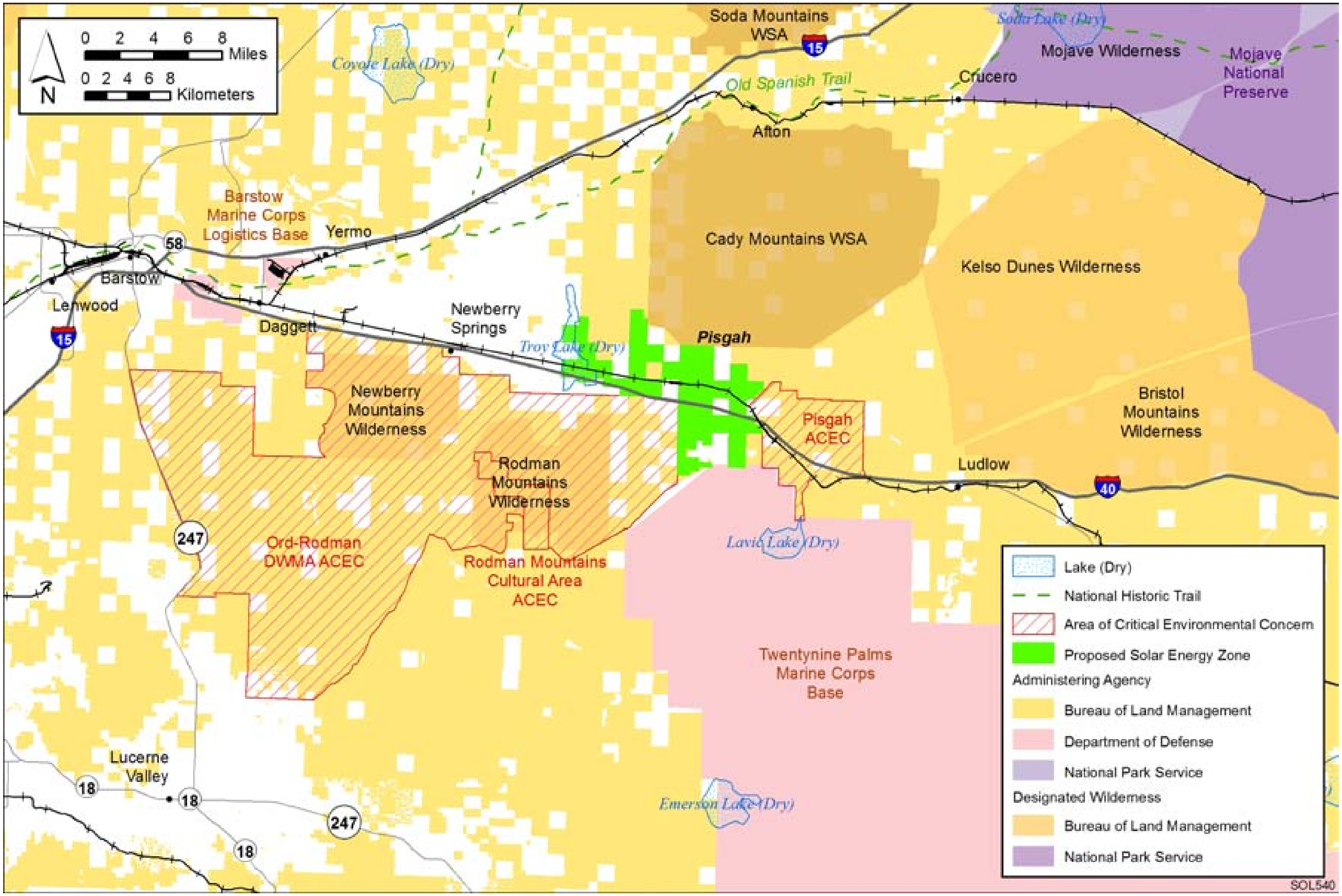

FIGURE 9.3.3.1-1 Specially Designated Areas in the Vicinity of the Proposed Pisgah SEZ

9.3.3.2 Impacts

9.3.3.2.1 Construction and Operations

The potential impact on specially designated areas from solar development within the proposed Pisgah SEZ is difficult to quantify and would vary by solar technology employed, the specific area being affected, and the perception of individuals viewing the development. Development of the SEZ, especially full development, would be a dominating factor in the viewshed from large portions of some of these specially designated areas, as summarized in Table 9.3.3.2-1. The data provided in Table 9.3.3.2-1 assume the use of the power tower solar energy technology, which because of the potential height of these facilities could be visible from the largest amount of land for the technologies being considered in this PEIS. The potential visual impacts of solar energy projects in terms of the amount of acreage within specially designated areas within the viewshed of the SEZ could be less for shorter solar energy facilities; however, assessment of the visual impact of solar development on specially designated areas must be conducted on a site-specific and technology-specific basis to accurately identify impacts. See Section 9.3.14 for a more complete review of the visual impacts for the Pisgah SEZ. The nine ACECs presented in Table 9.3.3.2-1, with the exception of the Ord-Rodman DWMA, Rodman Mountains Cultural Area, and Pisgah, are presented for information only and are not analyzed further. They were not analyzed because they do not have a scenic component for their designation and they are far enough removed from the SEZ that they would not reasonably be expected to have an increase in human use and traffic because of construction and operation of solar energy facilities in the SEZ.

In general, the closer a viewer is to solar development, the greater the potential impact is on an individual's perception of impact on the values within the area from which the individual is viewing the SEZ. The viewing height above a solar energy development area, the size of the development area, and the purpose for which a person is visiting an area are also important. Individuals seeking a wilderness experience within these areas could be expected to be more adversely affected than those traveling along the highway with another destination in mind. In the case of the Pisgah SEZ, the low-lying location of the SEZ in relation to surrounding specially designated areas would tend to highlight the industrial-like development in the SEZ. Because the SEZ currently has numerous man-made features present, the impact on wilderness characteristics and scenic values may be less significant than in areas that are more pristine.

The occurrence of glint and glare at solar facilities could potentially cause large, but temporary, increases in brightness and visibility of the facilities. The visual contrast levels that were assumed to assess potential impacts on specially designated areas (see Section 9.3.14) do not account for potential glint and glare effects; however, these effects would be incorporated into a future site- and project-specific assessment that would be conducted for specific proposed utility-scale solar energy projects.

TABLE 9.3.3.2-1 Specially Designated Areas Potentially within the Viewshed of Solar Facilities within the Proposed Pisgah SEZ[a]

Name	Total Acres	Acres within 5-mi (8-km) Viewshed	Percent within 5-mi (8-km) Viewshed	Acres within 15-mi (24-km) Viewshed	Percent within 15-mi (24-km) Viewshed	Acres within 25-mi (40-km) Viewshed	Percent within 25-mi (40-km) Viewshed
California Desert Conservation Area	25,919,319	178,231	7	406,533	1.6	552,338	2.1
Calico Early Man Site ACEC[b]	899			684	76.1	684	76.1
Manix ACEC[b]	2,259			894	39.6	894	39.6
Mojave Fringe-toed Lizard ACEC[b]	24,695			2,728	11.0	3,411	13.8
Mojave Monkeyflower ACEC[b]	46,488			263	0.6	9,988	21.5
Ord-Rodman DWMA ACEC	224,622	35,353	15.7	63,990	28.5	65,372	29.1
Parish's Phacelia ACEC[b]	899			873	97.2	873	97.2
Pisgah ACEC	19,755	14,792	74.9	16,429	83.2	16,429	83.2
Rodman Mountains Cultural Area ACEC	6,208			1,944	31.3	1,944	31.3
Superior-Cronese ACEC[b]	542,739			58,114	10.7	135,987	25.1
Old Spanish National Historic Trail	17,362			161	0.9	190	1.1
Bristol Mountains WA	77,026			1,776	2.3	8,353	10.8
Kelso Dunes WA	154,335			694	0.4	4,383	2.8
Newberry Mountains WA	27,768			6,498	23.4	6,498	23.4
Rodman Mountains WA	34,341	9,120	26.6	19,900	57.9	19,900	57.9
Cady Mountains WSA	120,197	20,677	17.2	23,952	19.9	23,952	19.9
Soda Mountains	121,680					3,005	2.5

[a] Identified assuming a power tower facility of 650 ft (198.1 m).

[b] Denotes area not further discussed in the text.

Cady Mountains WSA and Rodman Mountains and Newberry Mountains Wilderness

- The southwestern side of the Cady Mountains WSA[1] abuts the SEZ and rises quickly above it, providing a dominating view of the SEZ. Visitors in about 24,000 acres (97 km^2), or 20% of the WSA, would have a clear view of the development in the SEZ. It is likely that much of the wilderness value of this portion of the WSA would be adversely affected by development within the SEZ. The viewshed of the WSA includes I-40 and the railroad, which are within 3 to 4 mi (5 to 6 km) of the WSA boundary; therefore the impact of SEZ development on the wilderness characteristics of the WSA may be less significant than in the case of a pristine viewshed.

- A total of about 58% of the designated Rodman Mountains Wilderness would have a full view of solar development in the SEZ. Within 5 mi (8 km) of the SEZ, because of the strong contrast between solar development and the surrounding area, wilderness characteristics would be adversely affected in areas in view of the SEZ. This area includes 9,000 acres (36 km^2), or about 27% of the WA. Beyond 5 mi (8 km), while the SEZ would still be very visible, visual impacts would begin to diminish because of increasing distance and the smaller percentage of the overall viewshed covered by the SEZ. Views from within the WA currently include I-40, old U.S. 66, and four electrical transmission lines on the southeastern side of the SEZ. Because of the presence of these features, the impact of development within the SEZ on wilderness characteristics may be less significant than in the case of a pristine viewshed.

- The Newberry Mountains Wilderness is farther away from the SEZ than the two areas discussed above, and portions of the area are partially screened from it. Although solar development would be visible in about 23% of the area within 15 mi (24 km) of the SEZ, none of the solar facilities would be visible within the most visually sensitive zone, the area within 5 mi (8 km) of the SEZ. Because of this distance and the existence of visual impacts associated with man-made disturbances between the WA and the SEZ, impacts on the wilderness characteristics of the WA from development in the SEZ are expected to be minor.

---

[1] The congressionally directed inventory and study of BLM's roadless areas received extensive public input and participation. By November 1980, the BLM had completed field inventories and designated about 25 million acres (101,000 km^2) of WSAs. Since 1980, Congress has reviewed some of these areas and has designated some as wilderness and released others for non-wilderness uses. Until Congress makes a final determination on a WSA, the BLM is required by FLPMA to manage these areas in a manner so as not to impair their suitability for preservation as wilderness.

Kelso Dunes and Bristol Mountains Wilderness

- The boundaries of these two WAs range from about 11 to 14 mi (18 to 23 km) from the eastern border of the SEZ. The Kelso Dunes Wilderness is completely screened within 5 mi (8 km) of the SEZ, and only a very small percentage of the area is visible out to 25 mi (40 km). No impact on wilderness characteristics in the Kelso Dunes wilderness is expected from development of the SEZ. The Bristol Mountains Wilderness is also completely screened from view of the SEZ within 5 mi (8 km), and although screened somewhat less than Kelso Dunes, again only a very small portion of the area is visible from the SEZ out to 25 mi (40 km). There is also expected to be no impact on wilderness characteristics within the Bristol Mountains Wilderness.

Ord-Rodman DWMA, Rodman Mountains Cultural Area, and Pisgah ACECs

- The Ord-Rodman DWMA and Pisgah ACECs abut portions of the Pisgah SEZ and are vulnerable to increased human traffic induced by the presence of the SEZ. While neither of these ACECs have a visual component in their reason for designation, they provide habitat for sensitive species. Any increase in human use and traffic in these areas represents some level of increased risk to the resources the areas were created to protect. The level of that risk and the susceptibility to resource damage cannot be assessed at this time, but it is possible that additional management efforts would be needed from the BLM to maintain the current level of protection. The Rodman Mountains Cultural Area also does not have a scenic resource component to its designation and is more remote from the SEZ than the other two ACECs; however, the resources it was established to protect are more susceptible to damage and loss. An increase in human use and traffic in the area would be assumed to increase the level of risk to these resources. As is the case for the other ACECs, it is likely the BLM would have to increase its management efforts to protect these resources if additional traffic is introduced to the area.

California Desert Conservation Area

- The viewshed within 25 mi (40 km) of the Pisgah SEZ includes about 552,000 acres (2,234 km^2), or about 2% of the CDCA (Table 9.3.3.2-1), and may be visible up to about 40 mi (64 km). Installation of renewable energy facilities is consistent with the CDCA Plan, and although full development of the SEZ would adversely affect wilderness characteristics in 29,717 acres (120 km^2) in one designated WA and one WSA and may have a small effect wilderness recreation and on primitive recreation use in the immediate area of the SEZ, impacts on the CDCA appear to be small.

Old Spanish National Historic Trail

- Two segments of the Old Spanish National Historic Trail are within 8 to 19 mi (13 to 31 km) of the SEZ and, depending on the solar technology employed, may have some view of the solar facilities in the SEZ. Because of the distance to the trail segments it is likely there would be no impact from development of the SEZ on potential management of the trail. See Section 9.3.17 for a more thorough discussion of the Old Spanish National Historic Trail.

9.3.3.2.2 Transmission Facilities and Other Off-Site Infrastructure

Because of the availability of an existing transmission line and access to I-40, no additional construction of transmission or road facilities was assessed. Should additional transmission lines be required outside of the SEZ, there may be additional impacts on specially designated areas. See Section 9.3.1.2 for the development assumptions underlying this analysis.

9.3.3.3 SEZ-Specific Design Features and Design Feature Effectiveness

Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program, would provide adequate mitigation for some identified impacts. The exception would be adverse impacts on wilderness characteristics in the Cady Mountains WSA and Rodman Mountains Wilderness that would not be fully mitigable and are related to the exclusion of many existing and potential uses of the public land, perhaps in perpetuity; the visual impact of an industrialized-looking solar facility within an otherwise rural area; and induced land use changes on state and private lands.

Proposed design features specific to the proposed SEZ include the following:

- Application of SEZ-specific design features for visual resource impacts (Section 9.3.14) may reduce the visual impact on wilderness characteristics.

- Once construction of solar energy facilities begins, the BLM would monitor whether there are increases in traffic to the Ord-Rodman DWMA, Rodman Mountains Cultural Area, and Pisgah ACECs and determine whether additional mitigation measures are required to continue to protect the resources in these areas.

This page intentionally left blank.

9.3.4 Rangeland Resources

Rangeland resources include livestock grazing and wild horses and burros, all of which are managed by the BLM. These resources and possible impacts on them from solar development within the proposed Pisgah SEZ are discussed in Sections 9.3.4.1 and 9.3.4.2.

9.3.4.1 Livestock Grazing

9.3.4.1.1 Affected Environment

Only the portion of the Pisgah SEZ north of I-40 is currently included within the Cady Mountain grazing allotment (BLM 2009d); the acreage within the SEZ is about 5% of the total allotment. The allotment is in non-use and has been identified by the allotment operator for voluntary relinquishment. Once the request for relinquishment has been processed by the BLM, the allotment will no longer be available for livestock grazing (Chavez 2010).

9.3.4.1.2 Impacts

Since the current allotment is being relinquished, there would be no effect on livestock grazing.

9.3.4.1.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features would be necessary to protect or minimize impacts on livestock grazing.

9.3.4.2 Wild Horses and Burros

9.3.4.2.1 Affected Environment

Section 4.4.2 discusses wild horses (*Equus caballus*) and burros (*E. asinus*) that occur within the six-state study area. Twenty-two BLM wild horse and burro HMAs occur within California. In addition, several HMAs in Arizona are located near the Arizona–California border. None of these HMAs occur within a 50-mi (80-km) radius of the proposed Pisgah SEZ (Figure 9.3.4.2-1). The closest HMAs to the SEZ are the Chicago Valley HMA, located more than 70 mi (112 km) north of the SEZ, and Palm Canyon HMA, located more than 65 mi (104 km) south of the SEZ.

In addition to the HMAs managed by the BLM, the USFS has 51 established wild horse and burro territories in Arizona, California, Nevada, New Mexico, and Utah; it is the lead

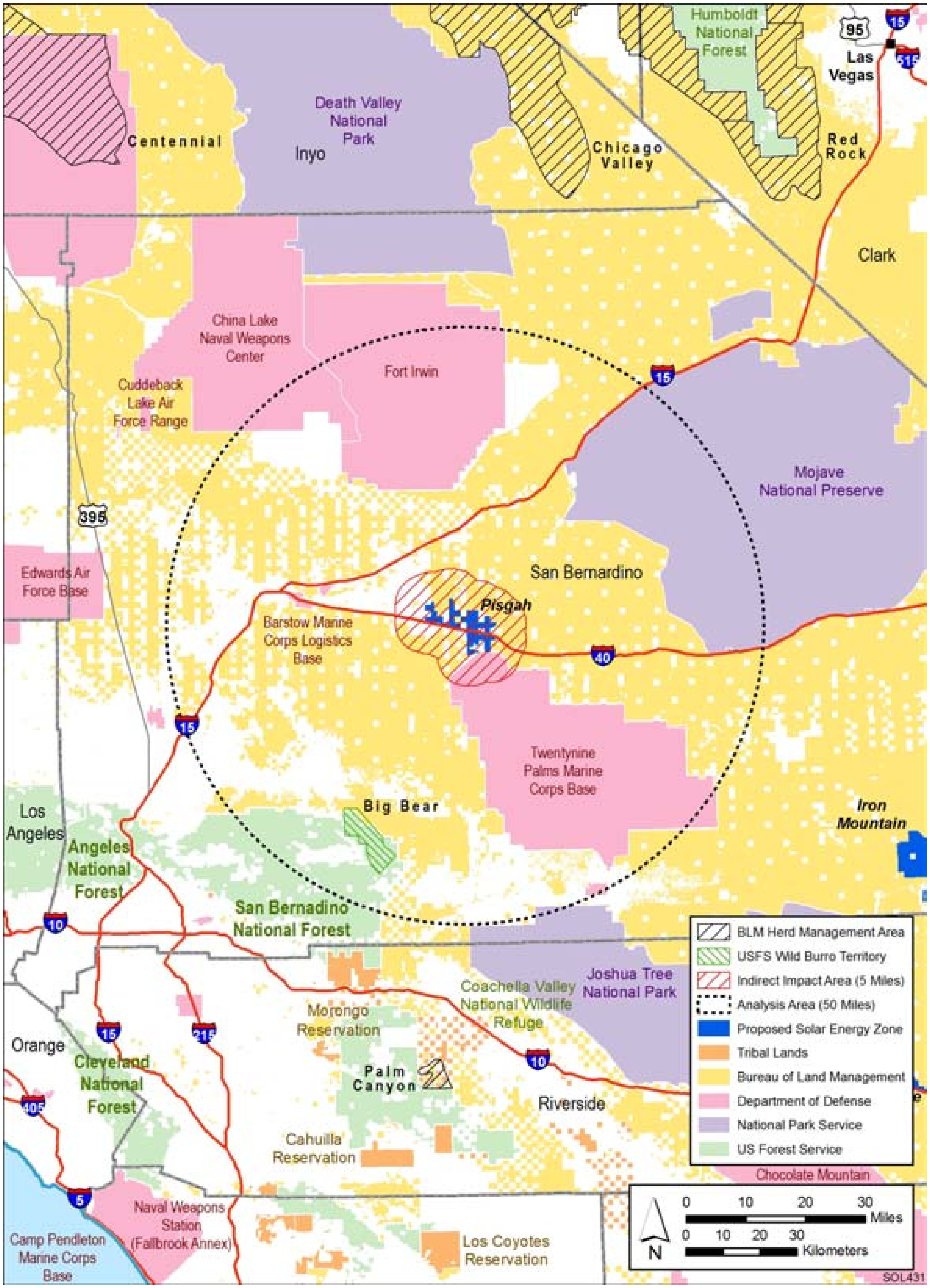

FIGURE 9.3.4.2-1 BLM Wild Horse and Burro HMAs and USFS Wild Horse and Burro Territories Located near the Proposed Pisgah SEZ Region (Sources: BLM 2009a,b; USFS 2007)

management agency that administers 37 of these territories (Giffen 2009; USFS 2007). The closest territory to the proposed Pisgah SEZ is the Big Bear Territory within the San Bernardino National Forest. It is located about 32 mi (51 km) south of the SEZ (Figure 9.3.4.2-1). This territory is managed for a population of 60 wild burros (USFS 2007).

9.3.4.2.2 Impacts

Because the proposed Pisgah SEZ is 65 mi (104 km) or more from any wild horse and burro HMA managed by the BLM and about 32 mi (51 km) from any wild horse and burro territory administered by the USFS, solar energy development within the SEZ would not affect wild horses and burros managed by these agencies.

9.3.4.2.3 SEZ-Design Features and Design Feature Effectiveness

The implementation of required programmatic design features described in Appendix A, Section A.2.2, would reduce the potential for effects on wild horses and burros. No proposed Pisgah SEZ-specific design features would be necessary to protect or minimize impacts on wild horses and burros.

This page intentionally left blank.

9.3.5 Recreation

9.3.5.1 Affected Environment

The proposed Pisgah SEZ is very flat, largely dominated by creosote shrublands, and during the summer months does not provide an environment conducive to non-motorized recreation. Although there are several roads, including a county road, that provide easy access to most of the area, recreational use is likely limited. The CDCA, like many remote areas of the public lands, attracts individuals and families that are seeking undeveloped recreation opportunities. Opportunities to explore old town sites, mining operations, and old roads, as well as opportunities for hunting and backcountry camping, hiking, and wildlife and wildflower viewing are important attractions throughout the CDCA. There are areas both in and adjacent to the Pisgah SEZ that provide these kinds of attractions.

The area is included in the West Mojave Desert Off-Road Vehicle Designation Project (BLM 2003), which provides direction for designation of roads and trails as closed, limited, or open for vehicular use. There are several segments of roads in the SEZ that are designated for limited use (Blaine 2010). These OHV routes designated as open within the Pisgah SEZ are discussed in Section 9.3.21 and shown in Figure 9.3.21-1.

9.3.5.2 Impacts

9.3.5.2.1 Construction and Operations

Recreational users would lose the use of any portions of the SEZ developed for solar energy production. Because of the impact of a large and highly visible industrial type development in the SEZ, opportunities for an undeveloped and primitive recreation experience around the SEZ also would be lost or reduced. Access through areas developed for solar power production could be closed or rerouted, making it more difficult or impossible to access current destinations although existing county roads would continue to provide general access. While there are no recreational use statistics for the area of the SEZ and surrounding lands, it is anticipated that the loss of recreational use caused by development of the Pisgah SEZ would be small.

Open OHV routes crossing areas granted ROWs for solar facilities would be re-designated as closed. However, a programmatic design feature addressing recreational impacts would require consideration of the development of alternative routes that would retain a similar level of access across and to public lands as a part of the project proposal (see Section 5.5.1 for more details on how routes coinciding with proposed solar facilities would be treated).

On the basis of the viewshed analysis (see Table 9.3.3.2-1), the Pisgah SEZ would be highly visible from the Rodman Mountain WA and the Cady Mountain WSA. The presence of solar development in the SEZ would be likely to adversely affect recreational use of these areas, since large portions of the areas are within the most sensitive visual zone surrounding the proposed SEZ.

9.3.5.2.2 Transmission Facilities and Other Off-Site Infrastructure

Because of the availability of an existing transmission line and access to I-40, no additional construction of transmission or road facilities was assessed. Should additional transmission lines be required outside of the SEZ, there may be additional impacts on specially designated areas. See Section 9.3.1.2 for the development assumptions underlying this analysis.

9.3.5.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features were identified for addressing impacts on recreation use at the proposed Pisgah SEZ. Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program would provide some mitigation for some identified impacts. The exceptions would be the loss of recreation use within the SEZ and loss of opportunities for undeveloped and primitive recreation around the SEZ; wilderness recreation use in the Cady Mountains WSA and the Rodman Mountains WA would also be adversely affected.

9.3.6 Military and Civilian Aviation

9.3.6.1 Affected Environment

The proposed Pisgah SEZ is completely blanketed under eight MTRs that include a mixture of visual and instrument routes, with the lowest floor elevation at 200 ft (61 m) AGL. The BLM has identified this as an area where advance consultation with the DoD is required prior to approval of activities that could adversely affect the use of the MTRs.

The Barstow-Dagett public airport is located about 12 mi (19 km) west of the SEZ.

9.3.6.2 Impacts

The development of any solar energy or transmission facilities that encroach into the airspace of an MTR could interfere with military training activities and could create a safety concern. While the military has indicated that solar development on portions of the Pisgah SEZ is compatible with its existing uses, it has also commented that other portions should have height limits for facilities, and some areas may be incompatible with existing military use.

The system of military airspace in the Southwest overlaps much of the area of highest interest for solar development and there is potential for solar development to result in cumulative effects on the system of MTRs that stretch beyond just one SEZ or solar project.

No impacts are expected on the Barstow-Daggett Airport.

9.3.6.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features were identified for addressing impacts on military and civilian aviation at the proposed Pisgah SEZ. Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program would provide adequate mitigation for identified impacts.

This page intentionally left blank.

9.3.7 Geologic Setting and Soil Resources

9.3.7.1 Affected Environment

9.3.7.1.1 Geologic Setting

Regional Geology

The proposed Pisgah SEZ lies within the western Mojave Desert region of the Basin and Range physiographic province in southern California. The site is in a northwest-trending alluvial valley southeast of the Mojave River Valley, between the Cady Mountains to the northeast and the Newberry, Rodman, and Lava Bed Mountains to the southwest (Figure 9.3.7.1-1).

Exposed sediments in the Pisgah region consist mainly of modern alluvial fan and playa lake deposits (Figure 9.3.7.1-2). The Pisgah lava field is a prominent feature, covering an area of about 19,770 acres (80 km^2) southeast of the Pisgah SEZ. The lava field is made of a series of Quaternary basalt flows (predominantly pahoehoe) erupted from the Pisgah Crater over alluvial fan and lacustrine sediments. Drainage in the valley is internal, flowing to either Troy Dry Lake (to the northwest of the SEZ) or Lavic Lake (to the southeast). The two dry lakes may have been connected during the Pleistocene before damming by the Pisgah basalt flows and later development of the playas. Lake sediments are at least 160 ft (50 m) thick above the lava flows, especially in the northeast part of Lavic Lake. Portions of the Pisgah SEZ are covered by Troy Dry Lake sediments and Pisgah basalt lava flows. The surrounding mountains are composed of various sedimentary and volcanic rocks of Tertiary and pre-Tertiary age (Bassett and Kupfer 1964; Gawarecki 1968; Wood and Keinle 1993).

Topography

The proposed Pisgah SEZ is located in an alluvial valley between the Cady Mountains (to the northeast) and the Rodman and Lava Bed Mountains (to the southwest), about 7 mi (11 km) southeast of the Mojave River. Elevations range from about 2,355 ft (718 m) at the northeastern corner of the SEZ to less than 1,805 ft (550 m) in the center of the site (Figure 9.3.7.1-3).

Geologic Hazards

The types of geologic hazards that could potentially affect solar project sites and their mitigation are discussed in Sections 5.7.3 and 5.7.4. The following sections provide a preliminary assessment of these hazards at the proposed Pisgah SEZ. Solar project developers may need to conduct a geotechnical investigation to assess geologic hazards locally to better identify facility design criteria and site-specific design features to minimize their risk.

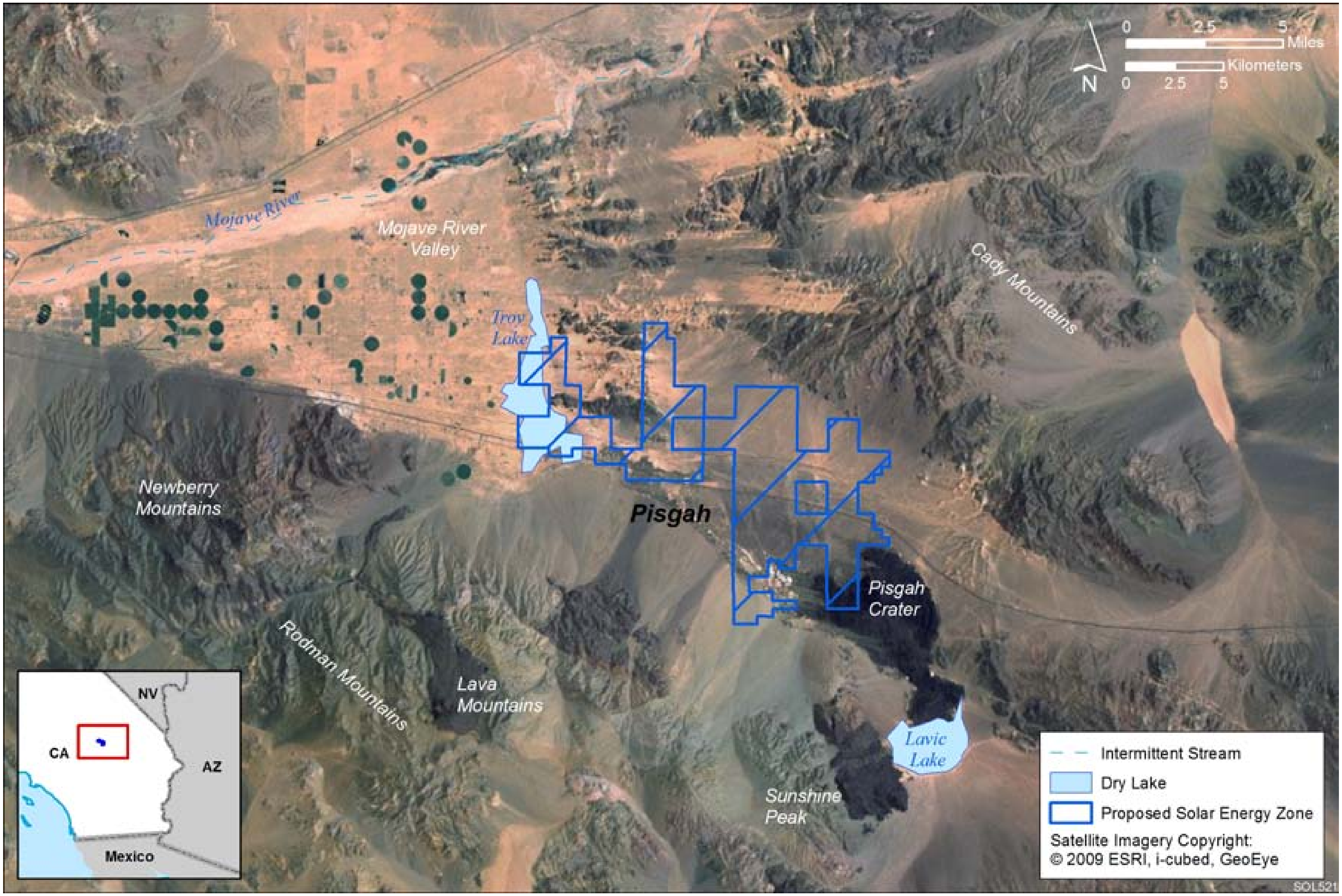

FIGURE 9.3.7.1-1 Physiographic Features in the Mojave River Valley Region

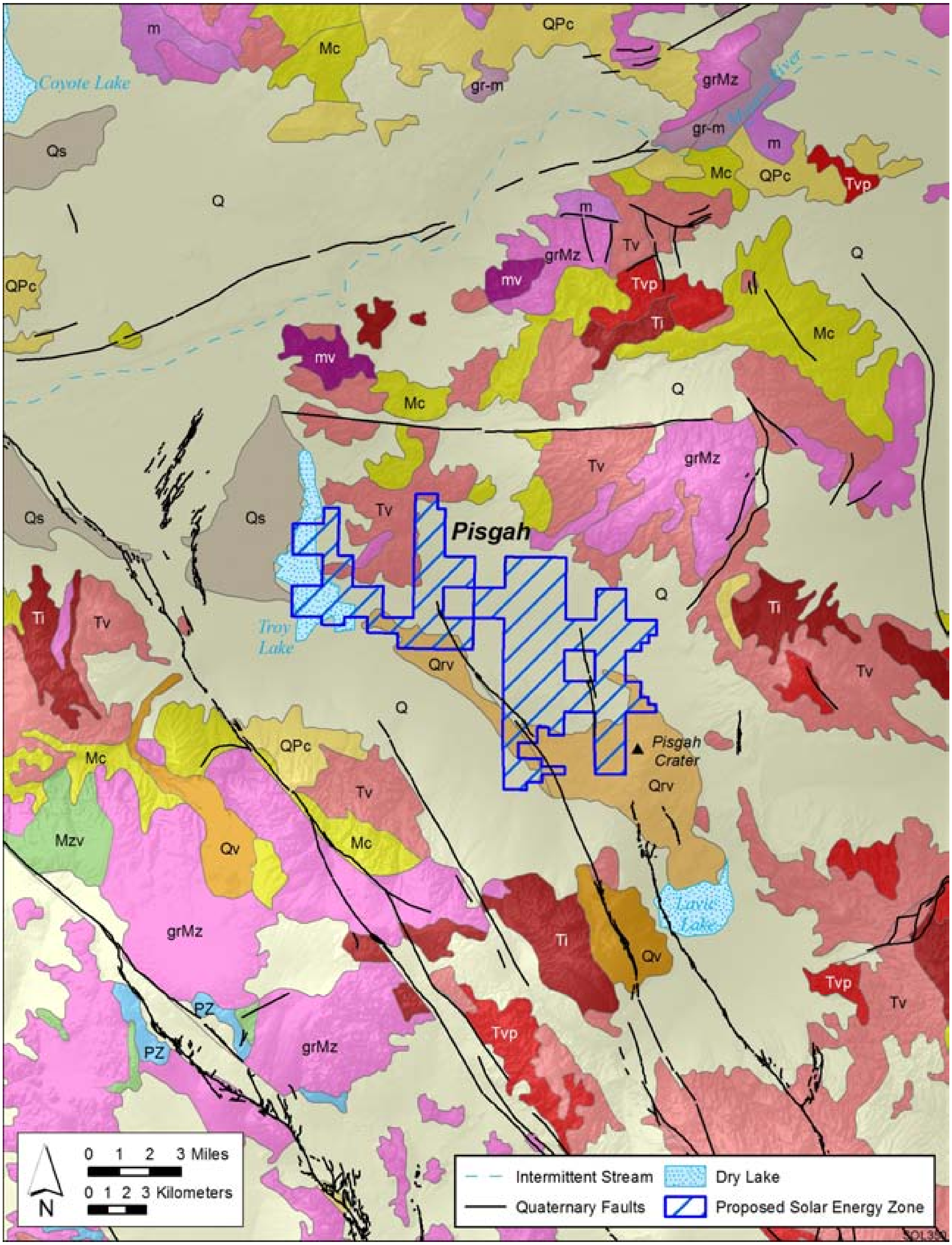

FIGURE 9.3.7.1-2 Geologic Map of the Mojave River Valley Region (adapted from Lundington et al. 2007 and Gutierrez et al. 2010)

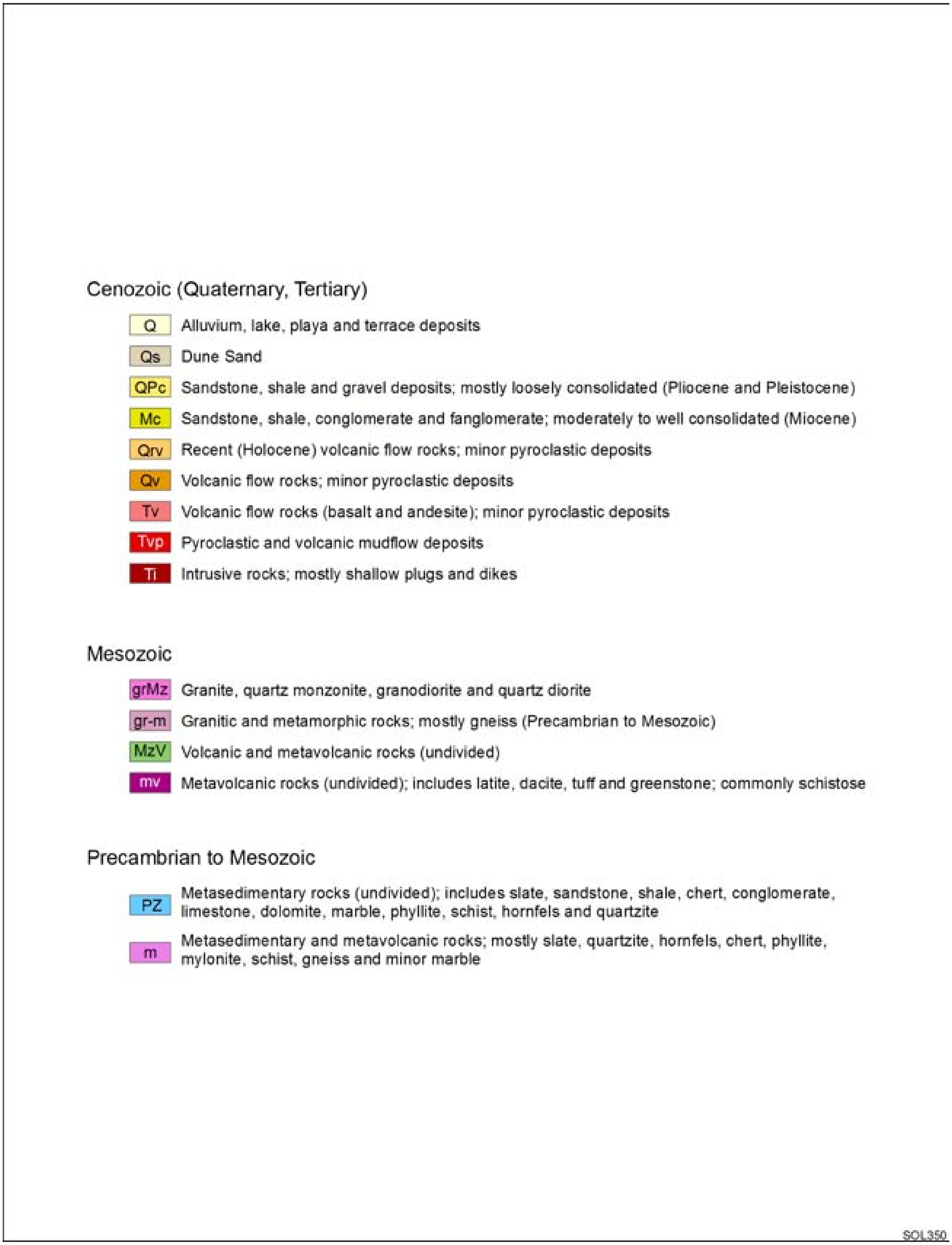

FIGURE 9.3.7.1-2 (Cont.)

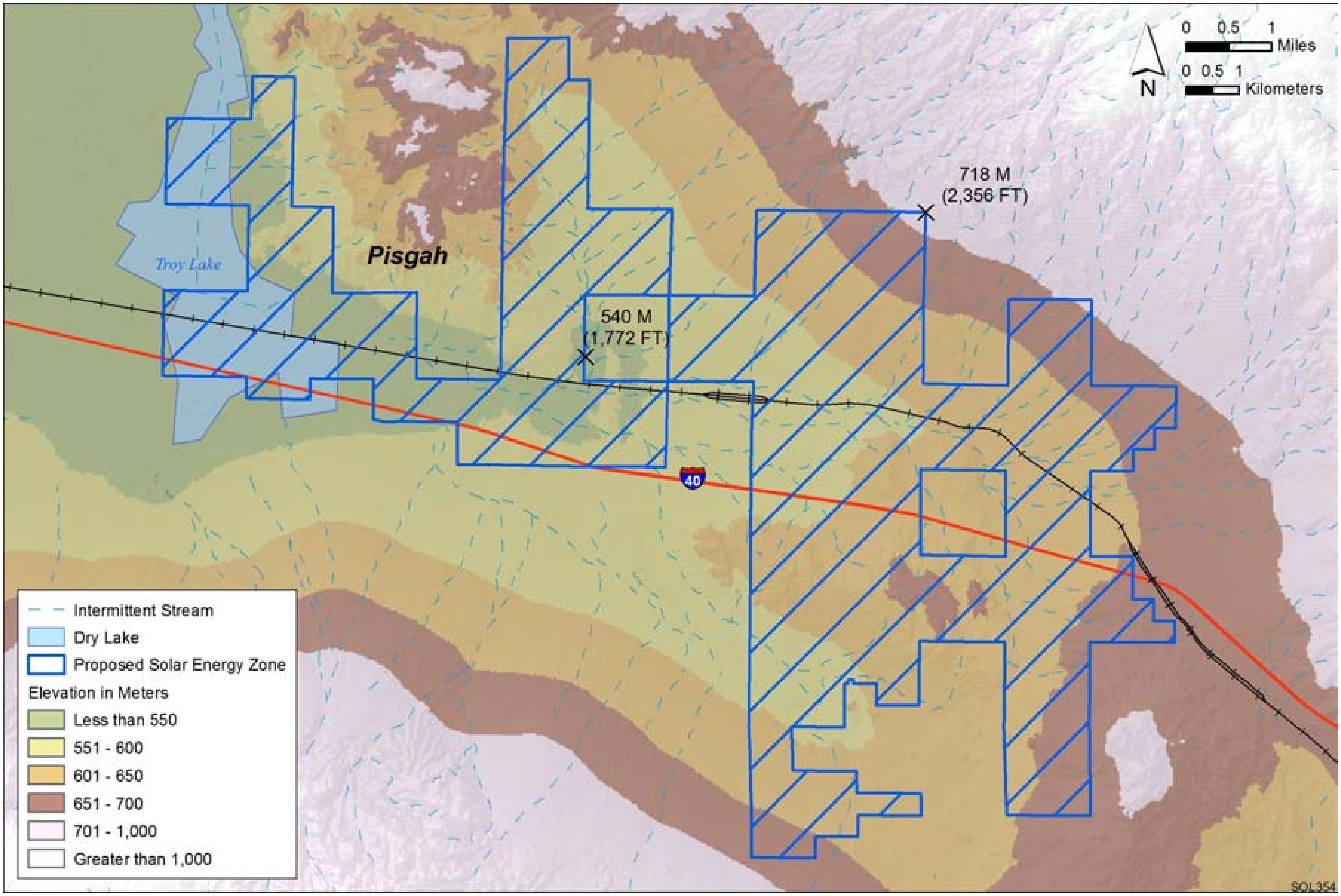

FIGURE 9.3.7.1-3 General Terrain of the Proposed Pisgah SEZ

Seismicity. The proposed Pisgah SEZ is located on the Mojave structural block at the eastern margin of the Eastern California Shear Zone, a seismically active region dominated by northwest-trending right-lateral strike-slip faulting and categorized as “potentially active” (i.e., having surface displacement within the last 11,000 years [Holocene]) under the Alquist-Priolo Earthquake Fault Zoning Act (Figure 9.3.7.1-4). The term “potentially active” generally denotes that a fault has shown evidence of surface displacement during Quaternary time (the last 1.6 million years). However, because there are numerous such faults in California, the State Geologist has introduced new, more discriminating criteria for zoning faults under the Alquist-Priolo Act. Currently, zoned faults include those that are “sufficiently active,” showing evidence of surface displacement within the past 11,000 years along one or more of its segments or branches, and “well-defined,” having a clearly detectable trace at or just below the ground surface (Bryant and Hart 2007).

The proposed Pisgah SEZ is intersected by the Pisgah section of the Pisgah-Bullion Fault Zone and the Lavic Lake Fault Zone (Figure 9.3.7.1-5). The Calico section of the Calico-Hidalgo Fault Zone and the Rodman Fault lie about 8 mi (13 km) and 5 mi (8 km) to the southwest, respectively. These faults are major strands of a complex fault system of right-lateral strike-slip faults within the Mojave structural block. Offsets of volcanic rocks of Pleistocene age (basalt flows from the Pisgah and Sunshine Craters) and younger alluvial fan deposits along the Pisgah section place the most recent activity at less than 15,000 years ago and the most recent event within the past 3,000 years. Slip rates along the Pisgah section have been estimated at 0.6 mm/yr (Dokka 1983; Treiman 2003a; Bryant and Hart 2007).

The Lavic Lake Fault is a northwest-striking fault on the same trend (and possibly related to) the Pisgah-Bullion Fault Zone. It was the causative fault in the 1999 Hector Mine earthquake (with a magnitude of 7.1), which resulted in an average right-lateral displacement of about 8.2 ft (2.5 m) and a maximum displacement of about 18 ft (5.5 m). Estimated slip rates for the fault range from about 0.2 to 1 mm/yr (Treiman 2003b).

Since 1973, more than 3,400 earthquakes have been recorded within a 61-mi (100-km) radius of the Pisgah SEZ. Five of these earthquakes registered moment magnitudes[2] greater than 6.0: July 8, 1986 (Mw 6.5); April 23, 1992 (Mw 6.1); June 28, 1992 (Landers, Mw 6.5 and Mw 7.3); and October 16, 1999 (Hector Mine, Mw 7.1) (USGS 2010c). The 1992 Landers earthquake ruptured five separate faults within the Pisgah-Bullion Fault Zone (SCEDC 2010a) and was centered about 35 mi (60 km) south of the Pisgah SEZ; the 1999 Hector Mine earthquake ruptured the Lavic Lake and Bullion faults (SCEDC 2010b) and was centered about 12 mi (20 km) to the south–southeast.

Liquefaction. The proposed Pisgah SEZ lies within an area where the peak horizontal acceleration with a 10% probability of exceedance in 50 years is between 0.30 and 0.50 g.

[2] Moment magnitude (Mw) is used for earthquakes with magnitudes greater than 3.5 and is based on the moment of the earthquake, equal to the rigidity of the earth times the average amount of slip on the fault times the amount of fault area that slipped (USGS 2010d).

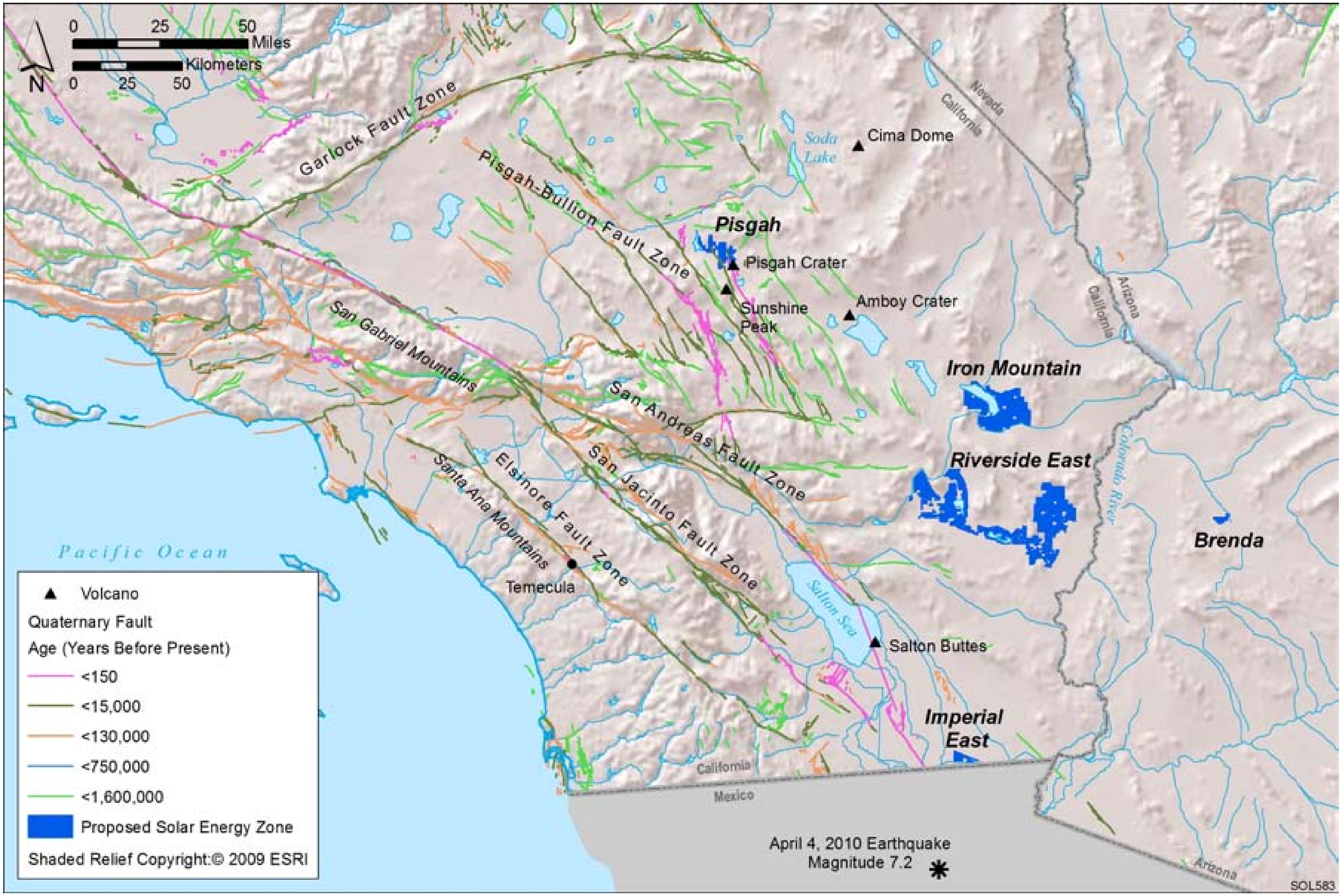

FIGURE 9.3.7.1-4 Quaternary Faults and Volcanoes in Southern California (Sources: USGS and CGS 2010; USGS 2010c)

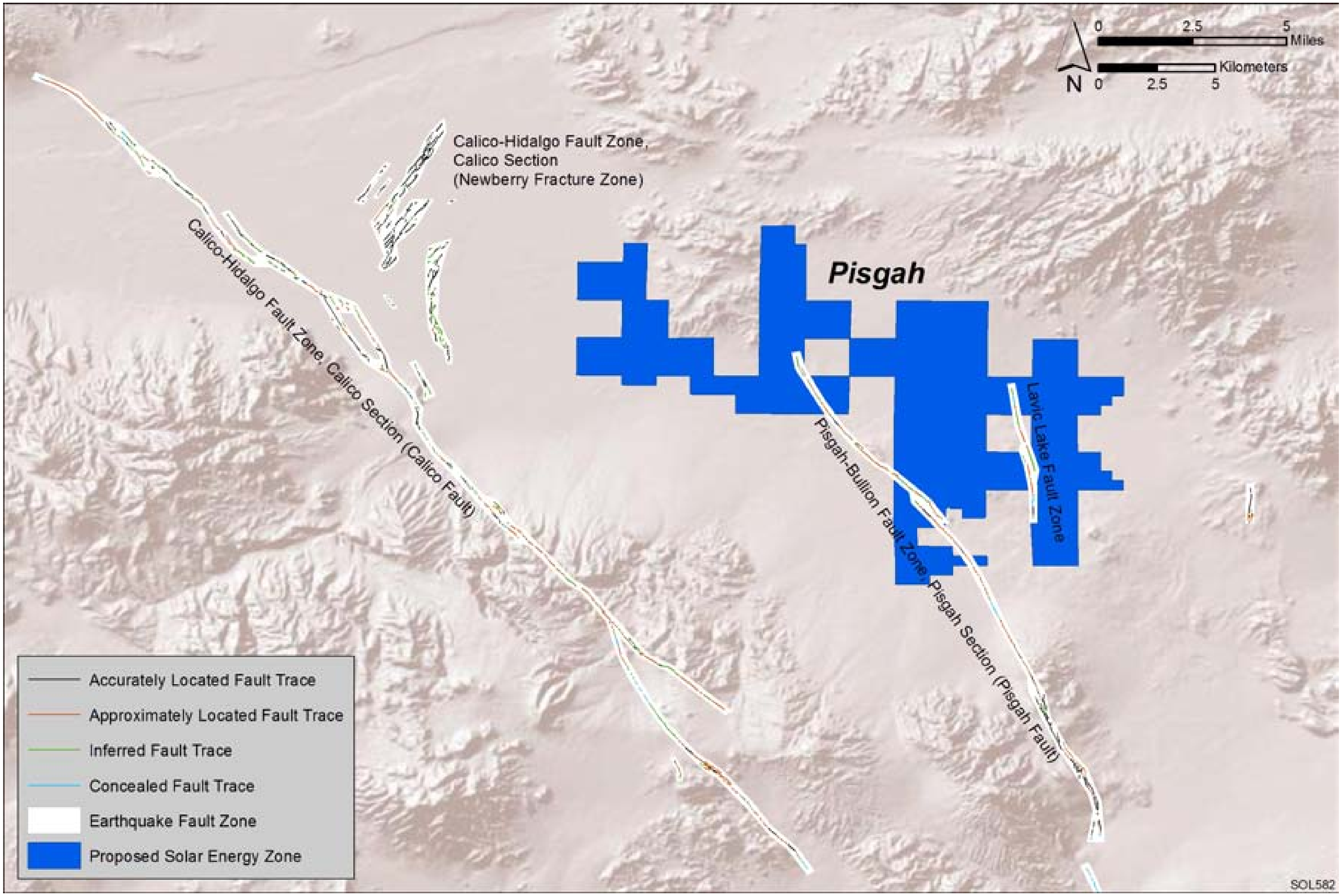

FIGURE 9.3.7.1-5 Delineated Earthquake Fault Zones near the Proposed Pisgah SEZ (CGS 2010)

Shaking associated with this level of acceleration is generally perceived as very strong to severe; the potential damage to structures is moderate to heavy (USGS 2008).

A regional evaluation for liquefaction hazards was completed for the San Bernardino Valley and vicinity in western San Bernardino County by Matti and Carson (1991); the study did not include the eastern part of San Bernardino County where the Pisgah SEZ is located. San Bernardino Valley is located between the San Andreas and San Jacinto Fault Zones, where the peak horizontal acceleration with a 10% probability of exceedance in 50 years is much higher (between 0.88 and 1.62 g) than that for the Pisgah region; therefore, only general conclusions from the study are presented here.

The evaluation considered three aspects of liquefaction: susceptibility, opportunity, and potential. Susceptibility identifies sedimentary materials likely to liquefy during a seismic event on the basis of their physical properties, depth to groundwater, expected earthquake magnitude, and strength of ground shaking. Opportunity considers the recurrence intervals for earthquake shaking strong enough to cause liquefaction in susceptible materials. The potential for ground failure due to liquefaction evaluation then combines the results of the susceptibility and opportunity evaluations and identifies the areas most and least likely to experience liquefaction (Matti and Carson 1991).

Investigators found that the level of liquefaction susceptibility was most dependent on two factors: (1) depth to the groundwater table and (2) the intensity and duration of ground shaking as determined by an earthquake's magnitude and the distance from the causative fault. These factors in combination with penetration-resistance data from various locations within the San Bernardino Valley allowed them to conclude that liquefaction susceptibility gradually decreases with increasing depth to groundwater, increasing distance away from the causative fault, and increasing geologic age (and induration) of sedimentary materials. Studies of the effects of ground shaking after the 1999 Hector Mine earthquake (centered near the Pisgah SEZ) found little damage to bridges and highways, especially along I-40. Since there were no strong-motion stations near the epicenter at the time, horizontal acceleration was estimated based on the displacement of rocks near the fault zone. These estimates indicated a slightly lower-than-expected shaking during the earthquake (Rymer et al. 2002). For the Pisgah SEZ, the opportunity for liquefaction is considered high, because it sits within a seismically active area and intersects the causative fault for the 1999 Hector Mine earthquake. However, the lack of evidence for liquefaction in the area as a result of the 1999 earthquake and the depth of groundwater below the site (greater than 60 ft [18 m]; Section 9.3.9.1.2) suggest that the sediments in the area may have a low liquefaction susceptibility. These factors combined would indicate preliminarily that the liquefaction potential for the Pisgah SEZ is low.

Volcanic Hazards. The nearest volcano is the Pisgah Crater, located within the Pisgah lava field (part of the Lavic Lake volcanic field) immediately adjacent to the southeast corner of the proposed Pisgah SEZ (Figure 9.3.7.1-4). The 328-ft (100-m) high cinder cone is the youngest vent in the basalt field. Lava flows issuing from vents within the basalt field sit above alluvial fan and playa lake deposits. A similar, lesser known cinder cone and lava field also is present in the Sunshine Peak area, about 6 mi (10 km) to the south. Researchers date the most recent activity associated with the Pisgah volcano to about 25,000 years ago (Smithsonian 2010; Bassett and Kupfer 1964). Hazards resulting from these kinds of eruptions would likely be less severe than those from more silicic sources (although given the volcano's close proximity to the Pisgah SEZ, could be more severe); they include the formation of cinder cones, small volumes of tephra, and lava flows (Miller 1989).

The Amboy Crater and lava field (also part of the Lavic Lake volcanic field) are about 40 mi (64 km) southeast of the Pisgah SEZ and immediately northwest of Bristol Dry Lake (Figure 9.3.7.1-4). Amboy Crater is a 250-ft (76-m) high complex basaltic cinder cone surrounded by about 24 mi^2 (62 km^2) of mafic lava flows. The basalt fields erupted from several vents about 10,000 years ago (Parker 1963; Bassett and Kupfer 1964). Because of the basaltic composition of the Amboy Crater lava, hazards likely would be similar to those described for the Pisgah Crater but would depend on factors such as location, size, and timing (season).

The Cima dome and volcanic field east of Soda Lake is about 32 mi (51 km) to the northeast of the Pisgah SEZ (Figure 9.3.7.1-4). The volcanic field consists of about 40 basaltic cones and more than 60 associated mafic lava flows covering an area of about 58 mi^2 (150 km^2). It has had three periods of activity from the late Miocene through the late Pleistocene, the most recent having occurred about 15,000 years ago (Dohrenwend et al. 1984). Because of its basaltic nature, hazards associated with the Cima volcanic field would like be similar to those described for the Lavic Lake volcanic field, but would depend on factors such as location, size, and timing (season).

The nearest active volcano is Mount St. Helens in the Cascade Range (Washington), about 840 mi (1,350 km) to the north-northwest of the Pisgah SEZ, which has shown some activity as recently as 2008. The nearest volcano that meets the criterion for an unrest episode is the Long Valley Caldera in east-central California, about 240 mi (380 km) to the northwest, which has experienced recurrent earthquake swarms, changes in thermal springs and gas emissions, and uplift since 1980 (Diefenbach et al. 2009). The Long Valley Caldera is part of the Mono-Inyo Craters volcanic chain that extends from Mammoth Mountain (on the caldera rim) northward about 25 mi (40 km) to Mono Lake. Small to moderate eruptions have occurred at various sites along the volcanic chain in the past 5,000 years at intervals ranging from 250 to 700 years. Windblown ash from some of these eruptions is known to have drifted as far east as Nebraska. While the probability of an eruption within the volcanic chain in any given year is small (less than 1%), serious hazards could result from a future eruption. Depending on the location, size, timing (season), and type of eruption, hazards could include mudflows and flooding, pyroclastic flows, small to moderate volumes of tephra, and falling ash (Hill et al. 1998, 2000; Miller 1989).

Earthquake swarms also occurred at Medicine Lake Volcano in northern California (Cascade Range) for a few months in 1988. Medicine Lake is about 550 mi (885 km) northwest of the Pisgah SEZ (Diefenbach et al. 2009). The most recent eruption at Medicine Lake was rhyolitic in composition and occurred about 900 years ago (USGS 2010e). Nearby Lassen Peak last erupted between 1914 and 1917; at least two blasts during this period produced mudflows that inundated the valley floors of Hut and Lost Creeks to the east. Tephra from the most violent eruption, occurring on May 22, 1915, was carried by prevailing winds and deposited as far as 310 mi (500 km) to the east (Miller 1989).

Slope Stability and Land Subsidence. The incidence of rock falls and slope failures can be moderate to high along mountain fronts and can present a hazard to developments on the relatively flat terrain of valley floors, such as the valley in which the Pisgah SEZ is located if they are located at the base of steep slopes. The risk of rock falls and slope failures decreases toward the flat valley center.

Numerous lava tube features have been documented in the Pisgah lava field by Harter (1992). These include more than 300 small surface tube caves and semitrenches. Lava tubes are sites of potential collapse if they are subjected to increased loads during construction. The collapse hazard is only of potential concern for the parts of the SEZ that are covered by lava, an area of about 3,479 acres (14 km^2) or about 15% of the proposed Pisgah SEZ.

There has been no land subsidence monitoring within the valley to date; however, 32- to 64-ft (10- to 20-m) long earth fissures and 3-ft (1-m) wide sinkholes associated with subsidence have been documented in the Temecula area of southwestern Riverside County, about 100 mi (160 km) south-southwest of the proposed Pisgah SEZ (Figure 9.3.7.1-4). The subsidence is the result of groundwater overdrafts in the Temecula-Wolf Valley that have caused differential compaction in the sediments of the underlying aquifer. Land failure caused by sinkholes and fissures have been significant enough to damage buildings, roads, potable water and sewer lines, and other infrastructure (Corwin et al. 1991; Shlemon 1995). Land subsidence has also been documented as far back as the 1970s in southern California's San Joaquin Valley, where the maximum subsidence due to extensive groundwater withdrawals for irrigation is greater than 28 ft (9 m) (Galloway et al. 1999), and in the Wilmington Oil Field as a result of oil extraction from the Los Angeles basin in southern Los Angeles County (Kovach 1974).

Other Hazards. Other potential hazards at the Pisgah SEZ include those associated with soil compaction (restricted infiltration and increased runoff), expanding clay soils (destabilization of structures), and hydro-compactable or collapsible soil (settlement). Disturbance of soil crusts and desert varnish on soil surfaces may also increase the likelihood of soil erosion by wind.

Alluvial fan surfaces, such as those in the Pisgah SEZ valley, can be the sites of damaging high-velocity flash floods and debris flows during periods of intense and prolonged rainfall. The nature of the flooding and sedimentation processes (e.g., streamflow versus debris flow) will depend on specific morphology of the fan (National Research Council 1996).

9.3.7.1.2 Soil Resources

Because soil mapping is not complete for the Mojave Desert area, the map unit composition within the proposed Pisgah SEZ has not been delineated. Therefore, only soil series are mapped in Figure 9.3.7.1-6 and described in Table 9.3.7.1-1. Soils within the SEZ are

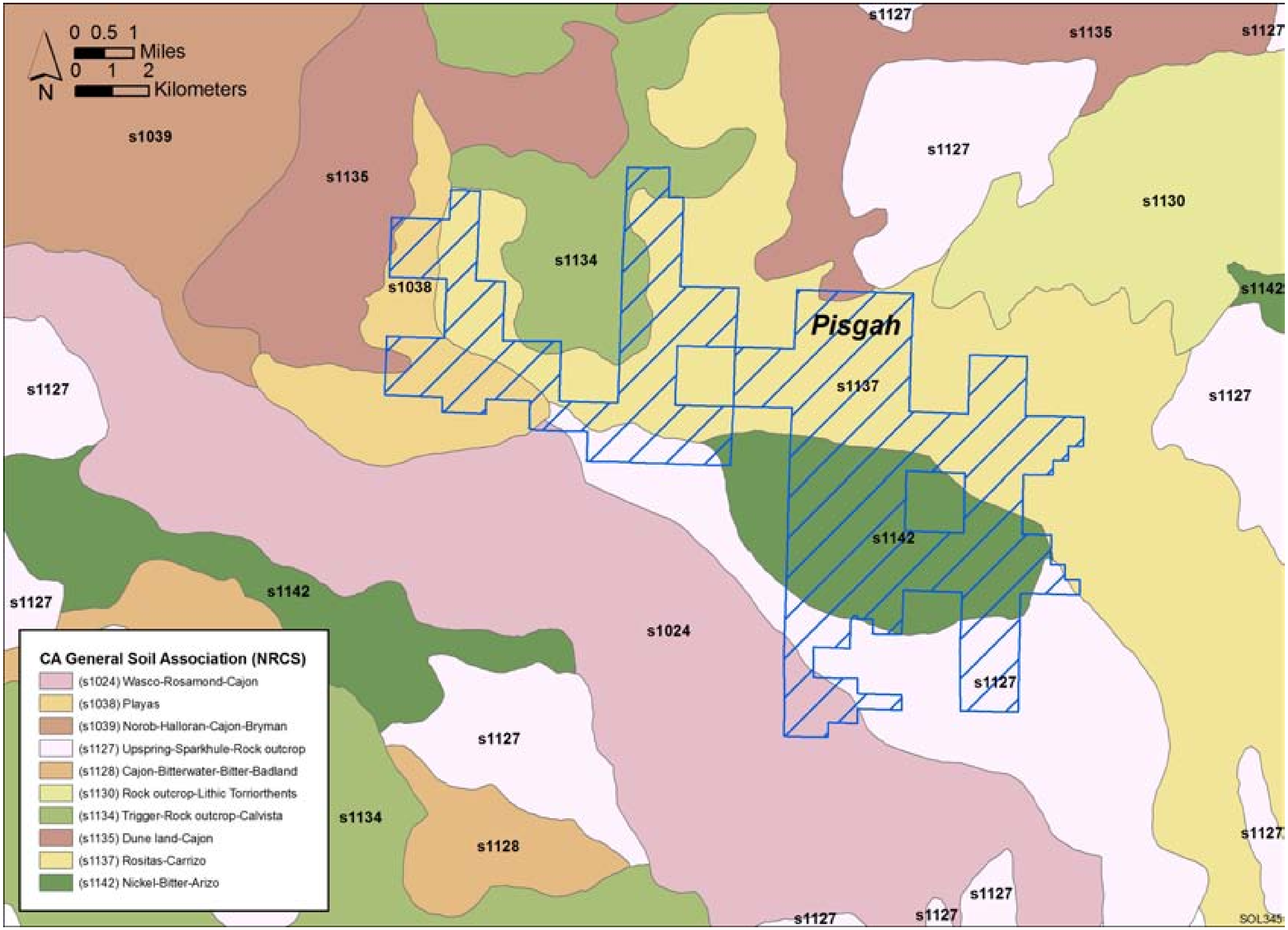

FIGURE 9.3.7.1-6 Soil Map for the Proposed Pisgah SEZ (NRCS 2008)

TABLE 9.3.7.1-1 Summary of Soil Series within the Proposed Pisgah SEZ

Map Unit Symbol	Map Unit Name	Water Erosion Potential[a]	Wind Erosion Potential	Description	Area in Acres[a] (% of SEZ)
s1137	Rositas-Carrizo	–[b]	–[b]	*Rositas series* are gently sloping soils on dunes and sand sheets (gradients of 0 to 30%). Very deep and somewhat excessively drained with low surface runoff potential (high infiltration rate) and rapid permeability. Typically fine sand. *Carrizo series* are gently sloping soils on floodplains, alluvial fans, fan piedmonts, and bolson floors (gradients of 0 to 15%). Parent material consists of alluvium from mixed sources. Very deep and excessively drained with negligible to very low surface runoff potential and rapid to very rapid permeability. Typically extremely gravelly sand. Aridic soil moisture regime. Used mainly as rangeland and wildlife habitat.	11,390 (48)
s1142	Nickel-Bitter-Arizo	–	–	*Nickel series* are gently sloping soils on alluvial fan remnants. Parent material consists of alluvium from mixed sources. Very deep and well-drained with low to medium surface runoff potential and moderate permeability. Typically a gravelly, very fine sandy loam. *Bitter series* are gently sloping soils on dissected fan terraces. Parent material weathered from all types of rocks. Deep and well-drained with medium surface runoff potential and moderately slow permeability. Typically an extremely gravelly sandy loam. *Arizo series* are gently sloping soils on recent alluvial fans, fan aprons, fan skirts, stream terraces, and floodplains. Parent material consists of alluvium from mixed sources. Very deep and excessively drained with negligible to medium surface runoff potential and rapid to very rapid permeability. Typically a very gravelly fine sand. All series used as rangeland and desert wildlife habitat.	5,972 (25)

TABLE 9.3.7.1-1 (Cont.)

Map Unit Symbol	Map Unit Name	Water Erosion Potential[a]	Wind Erosion Potential	Description	Area in Acres[a] (% of SEZ)
s1127	Upspring-Sparkhule-Rock outcrop	–	–	*Upspring series* are gently to greatly sloping soils on hills, mountains, and plateaus. Parent material derived from basic igneous rocks and pyroclastics. Very shallow and shallow and somewhat excessively drained with high to very high surface runoff potential and moderately rapid permeability over impermeable bedrock. Typically a very stony loam. Used for watershed, wildlife habitat, and recreation. *Sparkhule series* are gently sloping to sloping soils on rock pediments and hills. Parent material consists of residuum from igneous rocks. Shallow to rock and well-drained soils with high to very high surface runoff potential and moderately slow permeability. Typically a gravelly sandy loam. Used for wildlife habitat, military operations, and recreation.	2,752 (11)
s1038	Playas	–	–	Very poorly drained soils formed in flats and closed basins; moderately to strongly saline. Medium surface runoff potential and low permeability.	1,919 (8)
s1134	Trigger-Rock outcrop-Calvista	–	–	*Trigger series* are gently sloping to sloping soils on uplands. Parent material weathered from hard sedimentary rocks. Shallow and well-drained with medium to rapid surface runoff and moderately rapid permeability. Typically a gravelly sandy loam. Used for wildlife habitat, limited grazing, and recreation. *Calvista series* are gently sloping soils on mountain ridges. Parent material consists of residuum from granite. Shallow and well-drained with medium to rapid surface runoff and moderately rapid permeability. Typically a sandy loam. Used for desert range; small areas for home sites.	916 (4)

TABLE 9.3.7.1-1 (Cont.)

Map Unit Symbol	Map Unit Name	Water Erosion Potential[a]	Wind Erosion Potential	Description	Area in Acres[a] (% of SEZ)
s1024	Wasco-Rosamond-Cajon	–	–	*Wasco series* are nearly level soils on recent alluvial fans and floodplains. Parent material consists of alluvium from mixed sources. Very deep and well-drained with negligible or very low surface runoff potential and moderately rapid permeability. Typically a sandy loam. Used for growing field, forage, and row crops. *Rosamond series* soils are nearly level soils on the lower margin of alluvial fans between sloping fans and playas. Parent material derived from granitic alluvium. Deep and well-drained with medium surface runoff potential and moderate to moderately slow permeability. Typically a fine sandy loam. Used for desert range. *Cajon series* described above.	804 (3)
s1135	Dune land-Cajon	–	–	*Dune land* soils are constantly shifting, medium-grained sand deposited by wind blowing across the valley. *Cajon series* soils are gently sloping soils on alluvial fans, fan aprons, fan skirts, and river terraces. Parent material consists of sandy alluvium from granitic rocks. Very deep and somewhat excessively drained with negligible to low surface runoff potential and rapid permeability. Typically sand; used for rangeland, watershed, and recreation.	197 (<1)

a To convert acres to km^2, multiply by 0.004047.

b A dash indicates water and wind erosion potential not rated at the Soil Series taxonomic level.

Source: NRCS (2006).

predominantly gravelly alluvial sands and fine-grained eolian sands, which together make up about 73% of the site's soil coverage. These soils are characterized as deep and well drained, with low to medium surface runoff potential and moderate to very rapid permeability. The poorly drained soils of Troy Dry Lake (on the west end of the SEZ) make up about 8% of the site's soil coverage. The composition of these soils has not been reported but likely consists of brine-saturated clay and evaporite deposits. The Pisgah lava field covers about 15% of the SEZ. The fine-grained sands are highly susceptible to wind erosion; these sands and the clays within dry lakebeds could generate fugitive dust if disturbed. Biological soil crusts and desert pavement have not been documented in the SEZ but may be present.

9.3.7.2 Impacts

Impacts on soil resources would occur mainly as a result of ground-disturbing activities (e.g., grading, excavating, and drilling), especially during the construction phase of a solar project. These include soil compaction, soil horizon mixing, soil erosion and deposition by wind, soil erosion by water and surface runoff, sedimentation, and soil contamination. Such impacts are common to all utility-scale solar energy developments in varying degrees and are described in more detail for the four phases of development in Section 5.7 .1.

Because impacts on soil resources result from ground-disturbing activities in the project area, soil impacts would be roughly proportional to the size of a given solar facility, with larger areas of disturbed soil having a greater potential for impacts than smaller areas (Section 5.7.2). The magnitude of impacts would also depend on the types of components built for a given facility since some components would involve greater disturbance and would take place over a longer timeframe.

The Pisgah lava field, which covers about 3,479 acres (14 km^2) along the southern portions of the SEZ, may not be a suitable location for construction because of its irregular, hard surface and abundant lava tubes, which occur as open trenches or caves with openings on the ground surface (as described by Harter 1992).

9.3.7.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features were identified for soil resources at the proposed Pisgah SEZ. Implementing the programmatic design features described in Appendix A, Section A.2.2, and the mitigation measures listed in Section 5.7.4 would reduce the potential for soil impacts during all project phases.

The feasibility of constructing solar facilities in the lava field area of the SEZ will need to be addressed by facility developers.

9.3.8 Minerals (Fluids, Solids, and Geothermal Resources)

9.3.8.1 Affected Environment

Public land in the Pisgah SEZ was closed in June 2009 to locatable mineral entry pending the outcome of this solar energy PEIS. Currently, there are 103 mining claims (lode, placer, and millsite) within the SEZ, most of which are located in the southern portion of the SEZ south of I-40, where there has been a mining operation for many years (BLM and USFS 2010a). Most of the land south of I-40 in the SEZ contains mining claims. There are no oil and gas leases within the proposed SEZ, nor are there any geothermal leases (BLM and USFS 2010b). The area is still open for discretionary mineral leasing, including leasing for oil and gas and for other leasable and saleable minerals.

9.3.8.2 Impacts

If the BLM identifies the area as an SEZ to be used for utility-scale solar development, it would continue to be closed to all incompatible forms of mineral development with the exception of the areas with existing mining claims. These mining claims represent prior existing rights that, if valid, would preclude solar energy development as long as they are in place. Development of solar resources on areas with mining claims could only occur if (1) the claims are abandoned, (2) the claims are demonstrated to not be valid and are vacated by the BLM, or (3) the claims are purchased by a solar developer. The latter two of these approaches could require considerable time, negotiation, and money to accomplish and are unlikely to occur. The mining claims represent a serious impediment to moving forward with planning solar development in the areas of the SEZ in which they are located, and are likely to prevent that development in the immediate future.

Elsewhere in the SEZ, where there are no mining claims, it is assumed that if solar development were to proceed, there would be no loss of locatable mineral production in the future. Since there are no oil and gas or geothermal leases in the area, it also is assumed that there would be no significant impacts on these resources if the area was developed for solar energy production.

If the area is identified as a solar energy development zone, some other mineral uses might be allowed on all or portions of the SEZ. For example, oil and gas development that involves the use of directional drilling to access resources under the area (should any be found) might be allowed. Also, the production of common minerals, such as sand, gravel, and mineral materials used for road construction, might take place in areas not directly developed for solar energy production.

9.3.8.3 SEZ-Specific Design Features and Design Feature Effectiveness

Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program would provide adequate mitigation for some identified impacts. The exception may be related to the extensive number of mining claims present in the SEZ south of I-40.

A proposed design feature specific to the proposed SEZ is the following:

- Consideration should be given to altering the boundaries of the SEZ to remove the areas with mining claims.

9.3.9 Water Resources

9.3.9.1 Affected Environment

The proposed Pisgah SEZ is located within the Southern Mojave-Salton Sea subbasin of the California hydrologic region (USGS 2010b) and the Basin and Range physiographic province characterized by intermittent mountain ranges and desert valleys (Planert and Williams 1995). The proposed SEZ has surface elevations ranging between 1,800 and 2,300 ft (549 and 701 m), with a general drainage pattern from east to west along the SEZ toward the southern portion of Troy Lake (Figure 9.3.9.1-1). This region is located within the Mojave Desert, which is characterized by extreme daily temperature ranges with low precipitation and humidity (CDWR 2009). The majority of the precipitation falls during the winter rainy season from November to March, with an annual average rainfall ranging between 4 and 6 in./yr (10 and 15 cm/yr) (MWA 2004; Mathany and Belitz 2008). Evapotranspiration estimates in this region vary between 12 and 24 in./yr (30.5 and 61.0 cm/yr) in the riparian regions of the Mojave River (Lines 1996) and pan evaporation rates are on the order of 74 in./yr (188 cm/yr) (Cowherd et al. 1988; WRCC 2010a).

9.3.9.1.1 Surface Waters (Including Drainages, Floodplains, and Wetlands)

The primary surface water features within the proposed Pisgah SEZ are several ephemeral washes coming off the Cady Mountains and the Lava Bed Mountains that drain east to west toward the Troy Lake area (Figure 9.3.9.1-1). Troy Lake is a dry lake consisting of playa and dune sediments that covers approximately 3,500 acres (14 km^2); approximately 1,550 acres (6 km^2) of this dry lake is within the boundaries of the western portions of the proposed SEZ. Additionally, the Lavic Lake dry lakebed is located 5 mi (8 km) to the southeast.

The Mojave River is an intermittent river that originates from the San Bernardino Mountains and flows north and northeast into the Mojave Desert. Historically, the Mojave River had several reaches with perennial flow, but currently the only reach of the Mojave River with perennial flow is located near the town of Victorville, approximately 50 mi (80 km) southwest of the proposed SEZ. The reach of the Mojave River that is closest to the proposed SEZ is located 7 mi (11 km) to the north and is typically dry at the surface except during large rainfall events (Lines 1996).

Flood hazards have not been identified (Zone D) for the region surrounding the proposed Pisgah SEZ (FEMA 2009). Intermittent flooding may occur along the ephemeral washes and Troy Lake area with temporary ponding and erosion. Portions of the Mojave River channel and riparian areas are located within an identified 100-year floodplain according to FEMA, while reaches further downstream are suspected to be within a 100-year floodplain as characterized by the CDWR awareness floodplain program (CDWR 2010; FEMA 2009). Floodwaters in the Mojave River are typically limited to the channel region (Lines 1996). In addition, no wetlands have been identified within the proposed SEZ according to the NWI (USFWS 2009a).

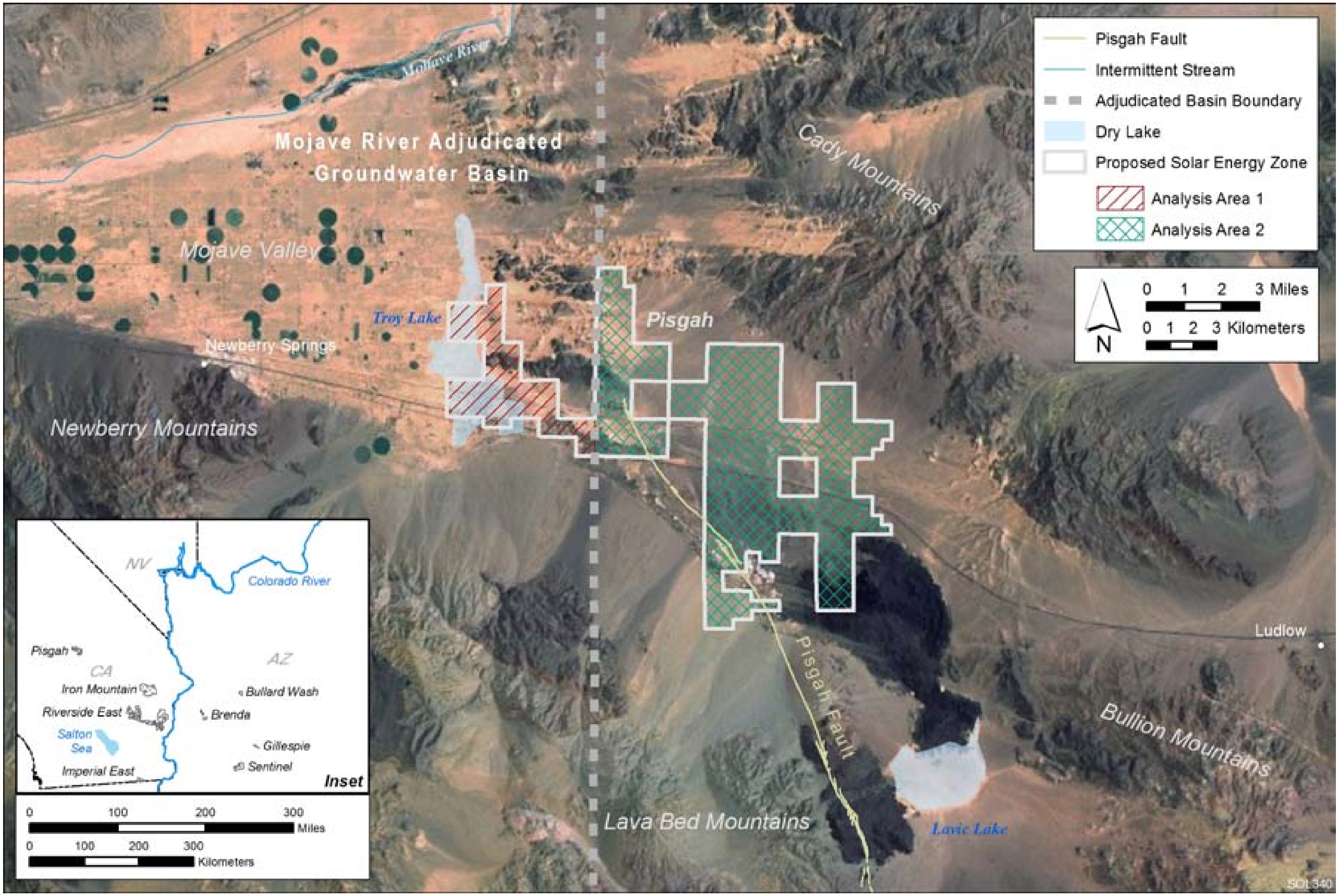

FIGURE 9.3.9.1-1 Surface Water Features near the Proposed Pisgah SEZ

9.3.9.1.2 Groundwater

The proposed Pisgah SEZ is located within two groundwater basins: the Lavic Valley and Lower Mojave River Valley. The Pisgah Fault is suspected to act as a groundwater barrier (CDWR 2003) that separates the two groundwater basins, with 25% of the proposed SEZ's area (western portion) in the Lower Mojave River Valley and 75% of the area (central and eastern portions) located in the Lavic Valley (Figure 9.3.9.1-1). The Lower Mojave Valley groundwater basin consists of alluvial deposits of Quaternary age sediments (CDWR 2003; groundwater basin number 6-40). There are two primary aquifers of the Mojave River: the floodplain and regional aquifers. The floodplain aquifer is typically limited to an area within 1 mi (1.6 km) of the Mojave River channel and consists of highly permeable deposits of sand and gravel on the order of 200 ft (60 m) in thickness. The regional aquifer consists of unconsolidated to partially consolidated sand, silt, and gravel deposits up to 2,000 ft (610 m) in thickness (Stamos et al. 2001; Izbicki 2004). The floodplain aquifer extends from the Mojave River into the proposed SEZ to include Troy Lake. The Lavic Valley groundwater basin consists of alluvial fan and lacustrine deposits of Quaternary age sediments. These deposits consist of unconsolidated sands, pebbles, and boulders with silts and clays in the ephemeral washes above deposits of moderately consolidated gravels, sands, silts, and clays (CDWR 2003; groundwater basin number 7-14). Small regions in the southern portions of the proposed SEZ contain volcanic rocks at the surface originating from the Lavic Lake volcanic field (GVP 2010).

Seepage from the Mojave River is the primary recharge source for the floodplain and regional aquifers of the Lower Mojave groundwater basin. Additional recharge comes from direct precipitation, percolation of runoff from surrounding mountains, irrigation returns, and artificial recharge (CDWR 2003). Estimates of recharge vary depending upon the time frame that was examined, with the average annual recharge to the Lower Mojave Valley groundwater basin estimated to range from 7,400 ac-ft/yr (9 million m^3/yr) to 15,914 ac-ft/yr (19.6 million m^3/yr) for the analysis periods of 1931 to 1990 and 1937 to 1961, respectively (Stamos et al. 2001). The variability in these recharge estimates is caused by the varying groundwater development practices that have occurred in the Mojave River area. Estimates of recharge for the Lavic Valley groundwater basin are not as well quantified because of the lack of development in this region. The natural recharge is estimated to be approximately 300 ac-ft/yr (0.4 million m^3/yr) for the Lavic Valley region (CDWR 2003).

Groundwater withdrawals in the Lower Mojave Valley groundwater basin have been primarily used to support agriculture dating back to the early 1900s. In 1931, groundwater withdrawals were approximately 5,000 ac-ft/yr (6.1 million m^3/yr), quickly rose to around 50,000 ac-ft/yr (61.7 million m^3/yr) in the mid-1960s, and reached a maximum of 60,000 ac-ft/yr (74 million m^3/yr) in the mid-1990s (Stamos et al. 2001). Groundwater withdrawals are currently limited to less than 40,000 ac-ft/yr (49 million m^3/yr), and this limit is decreasing because of groundwater management by adjudication (MWA 2009; see Section 9.3.9.1.3 for further details). Additionally, groundwater discharge by evapotranspiration and underflow are estimated to be approximately 1,000 ac-ft/yr (1.2 million m^3/yr) each for the Lower Mojave Valley groundwater basin based on a groundwater model for 1994 conditions (Stamos et al. 2001). Groundwater discharge processes have not been quantified in the Lavic Valley groundwater basin.

Groundwater well yields range from 80 to 140 gpm (303 to 530 L/min) in the Lavic Valley groundwater basin and from 10 to 2,700 gpm (38 to 10,220 L/min), with an average of 480 gpm (1817 L/min), in the Lower Mojave groundwater basin (CDWR 2003). Transmissivity values in the Lower Mojave groundwater basin were modeled as 1,750 to 7,000 ft^2/day (163 to 650 m^2/day) in the floodplain aquifer and between 250 and 2,500 ft^2/day (23 and 232 m^2/day) in the regional aquifer (Stamos et al. 2001). The general groundwater flow pattern in the Lower Mojave Valley groundwater basin is toward the Mojave River channel (CDWR 2003). In pre-development times, groundwater flowed from the regional aquifer to the floodplain aquifer recharging the Mojave River; however, modeling has shown this flow pattern to have reversed from the 1930s to 1990s because of excessive groundwater withdrawal rates (Stamos et al. 2001). Groundwater in the Lavic Valley groundwater basin typically flows toward Lavic Lake (CDWR 2003).

Evidence of groundwater overdraft[3] with decreasing groundwater elevations has been recognized in the Mojave River region since the mid-1950s (MWA 2004). Groundwater surface elevations have declined at rates ranging from 0.8 to 1.3 ft/yr (0.2 to 0.4 m/yr) over the past decade near Troy Lake and are currently around 60 ft (18 m) below the surface (USGS 2009; well numbers 344956116352901, 345001116381701, 345053116344701, 345104116384002, 345109116332401, and 345142116332601). In other portions of the Lower Mojave Valley groundwater basin, groundwater levels currently range between 120 and 160 ft (37 and 49 m) below the surface (MWA 2009). During the period from 1930 to 1945, groundwater elevations were fairly stable, and steady-state conditions (balance in recharge and discharge processes) were assumed to exist in the Lower Mojave Valley groundwater basin (Stamos et al. 2001). The average of the annual groundwater withdrawals during this period was 5,500 ac-ft/yr (6.8 million m^3/yr) and represents a reasonable estimate of the natural safe yield[4] for the basin.

TDS concentrations in the Lower Mojave Valley groundwater basin range from 300 to 2,000 mg/L. Water quality impairments relating to leaking underground fuel tanks exist near Barstow that introduce chemicals such as benzene, toluene, ethylbenzene, and xylene (BTEX), as well as methyl-tertiary-butyl-ether (MTBE) into the groundwater; there are also elevated concentrations of fluoride, boron, and arsenic found in some wells in the basin (CDWR 2003; Mathany and Belitz 2008). TDS concentrations vary across the Lavic Lake groundwater basin, with values around 280 mg/L in the north and values between 1,680 and 1,720 mg/L in the south and east. Additional impairments to groundwater quality have been detected with regard to sulfate and chloride concentrations that exceed drinking water standards (CDWR 2003). For potable water supplies in California, the TDS must be below 500 mg/L and can be as high as 1,500 mg/L for only short periods of time to meet maximum secondary contaminant levels (*California Code*, Title 22, Article 16, Section 64449).

---

[3] Groundwater overdraft is the condition where water extractions from an aquifer exceed recharge processes in such excess as to cause substantial and sustained decreases in groundwater flows and groundwater elevations.

[4] Safe yield is the amount of groundwater that can be withdrawn from a groundwater basin over a period of time without exceeding the long-term recharge of the basin or unreasonably affecting the basin's physical and chemical integrity.

9.3.9.1.3 Water Use and Water Rights Management

In 2005, water withdrawals from surface waters and groundwater in San Bernardino County were 656,900 ac-ft/yr (860 million m^3/yr), of which 57% came from surface waters and 43% came from groundwater. The largest water use category was municipal and domestic supply, at 427,100 ac-ft/yr (527 million m^3/yr). However, the majority of this water is used in the larger cities located in the southwestern portion of San Bernardino County. Agricultural water uses accounted for 167,000 ac-ft/yr (206 million m^3/yr), while industrial and thermoelectric water uses accounted for 29,150 and 33,630 ac-ft/yr (36 million and 41 million m^3/yr), respectively (Kenny et al. 2009). Consumptive water use in the rural areas near the proposed SEZ totaled 26,400 ac-ft/yr (32.5 million m^3/yr) in 2001 with 58% use by agriculture, 24% industrial, and 9% for municipal and recreational uses each (MWA 2004; Baja region).

California uses a "plural" system to manage water resources that consists of a mixture of riparian and prior appropriation doctrines for surface waters, a separate doctrine for groundwater, and pueblo rights (BLM 2001). Several agencies are involved with the management of California's water resources, including federal, state, local, and water/irrigation districts. For example, water rights and water quality are managed by the State Water Board, while the Department of Water Resources manages water conveyance, infrastructure, and flood management (CDWR 2009). Surface water appropriations for nonriparian rights begin with a permit application to the State Water Board and a review process that examines the application's beneficial use, pollution potential, and water quantity availability; the permitting, review, and licensing procedure should not take more than 6 months to complete unless the application is protested (BLM 2001).

Groundwater management in California is primarily implemented at the local level of government through local agencies or ordinances and can also be subject to court adjudications. State statute provides authority and revenue mechanisms to several types of local agencies to provide water for beneficial uses, as well as manage withdrawals in order to prevent overdraft of the aquifers. Local ordinances (typically at the county level) can also be used to manage groundwater resources and have been adopted in 27 counties in California. Many of these local groundwater ordinances are focused on controlling water exports out of the basin through permitting processes. Court adjudications are the strongest form of groundwater management used in California and often result in the creation of a court-appointed "watermaster" agency to manage withdrawals for all users to ensure that the court-determined safe yield is achieved (CDWR 2003).

Approximately 20% of the proposed Pisgah SEZ is located within the boundaries of the Mojave River adjudicated groundwater basin, which is managed by the Mojave Water Agency (MWA), which serves as the watermaster for the basin. The boundary of the MWA jurisdiction is shown in Figure 9.3.9.1-1, and the western portion of the proposed SEZ located in the adjudicated basin is labeled as Analysis Area 1. This portion of the proposed SEZ is located within the Lower Mojave Valley groundwater basin described previously. The groundwater within the MWA boundaries is completely allocated. Thus new groundwater users need to purchase existing water rights or purchase water as a transfer from current water right holders or the MWA; only minimal users that withdrawal less than 10 ac-ft/yr (12,000 m^3/yr) are exempt from the allocations set by adjudication (MWA 2004). A potential complication for solar energy development on the proposed Pisgah SEZ is that the adjudication of the Mojave River groundwater basin does not permit water exports outside of the MWA boundary (*City of Barstow v. City of Adelanto* 1996).

The MWA establishes groundwater allocations for individual subareas of the adjudicated groundwater basin as a percentage of the base annual production (BAP), which was set using groundwater withdrawal rates from 1986 to 1990. The percentage of the BAP allotted to water users in each subarea is reduced year to year in order to slowly bring withdrawal rates down to the safe yield of the basin over time. The portion of the Mojave River adjudicated basin relevant to the proposed SEZ is known as the Baja subarea, where the *production* safe yield[5] is 20,679 ac-ft/yr (25.5 million m^3/yr) and the BAP is 66,157 ac-ft/yr (81.6 million m^3/yr), of which 70% was available for users during the 2007 to 2008 water year; the available percentage has been set to 65% for the 2009 to 2010 water year (MWA 2009).

The MWA has additional water, which is transported via pipeline from the California Aqueduct near Victorville along the Mojave River, available through the California State Water Project; the nearest discharge point is near the town of Newberry Springs, 6 mi (10 km) west of the proposed SEZ (MWA 2009). While the MWA is allotted 75,800 ac-ft/yr (93.5 million m^3/yr) of State Water Project water, it typically only receives 40% of this amount because of limited supply within the State Water Project (MWA 2004). Persistent drought conditions that have occurred recently in California have reduced the SWP allocations to 15% (CDWR 2010a). The MWA has many uses for SWP water, including supplying replacement water for water rights holders who require more than their allotment and selling to non-water right holders. The cost of replacement water was $337 per ac-ft for the 2007 to 2008 water year (MWA 2009).

The entire proposed Pisgah SEZ falls under the management of the San Bernardino County groundwater ordinance (Groundwater Management Act, *Water Code* §§ 10750 et seq.). Any new groundwater wells that withdraw more than 30 ac-ft/yr (37,000 m^3/yr) are subject to a full review process in accordance with the California Environmental Quality Act. The permitting and review process requires the applicant to provide detailed information regarding the groundwater aquifer, including estimated storage capacity, recharge conditions, water quality, and anticipated safe yield. Conditions of approval for the groundwater withdrawal permit may include mitigation actions, as well as the establishment of a groundwater monitoring plan.

---

5 Production safe yield as defined by *City of Barstow v. City of Adelanto* (1996):

"The highest average annual amount of water that can be produced from a subarea: (1) over a sequence of years that is representative of long-term average natural water supply to the subarea net of long-term average annual natural outflow from the subarea, (2) under given patterns of production, applied water, return flows, and consumptive use, and (3) without resulting in a long-term net reduction of groundwater in storage in the subarea."

9.3.9.2 Impacts

Potential impacts on water resources related to utility-scale solar energy development include direct and indirect impacts on surface waters and groundwater. Direct impacts occur at the place of origin and at the time of the proposed activity, while indirect impacts occur away from the place of origin or later in time. Impacts on water resources considered in this analysis are the result of land disturbance activities (construction, final developed site plan, as well as off-site activities such as road and transmission line construction) and water use requirements for solar energy technologies that take place during the four project phases: site characterization, construction, normal operations, and decommissioning/reclamation. Both land disturbance and consumptive water use activities can affect groundwater and surface water flows, cause drawdown of groundwater surface elevations, modify natural drainage pathways, obstruct natural recharge zones, and alter surface water–wetland–groundwater connectivity. Water quality can also be degraded through the generation of wastewater, chemical spills, increased erosion and sedimentation, and increased salinity (e.g., by excessive withdrawal from aquifers).

9.3.9.2.1 Land Disturbance Impacts on Water Resources

Impacts related to land disturbance activities from the construction of utility-scale solar energy facilities are described in Section 5.9.1 for the four phases of development; these impacts will be minimized through the implementation of programmatic design features described in Appendix A, Section A.2.2. In addition to the hydrologic evaluation (including identifying 100-year floodplains and jurisdictional waters) described in the design features (Appendix A, Section A.2.2), coordination and permitting with the California Department of Fish and Game (CDFG) would be needed for any proposed alterations of surface water features (both perennial and ephemeral) in accordance with the Lake and Streambed Alteration Program (CDFG 2010c). Land disturbance activities in the vicinity of Troy Lake could potentially disrupt natural drainage patterns of the ephemeral washes and lead to erosion, as well as affecting natural groundwater recharge and discharge properties. Additionally, because of the existing surface slopes, there is potential for increased erosion for the northern regions of the proposed SEZ that are located just off the slopes of the Cady Mountains and the Lava Bed Mountains.

9.3.9.2.2 Water Use Requirements for Solar Energy Technologies

Analysis Assumptions

A detailed description of the water use assumptions for the four utility-scale solar energy technologies (parabolic trough, power tower, dish engine, and PV systems) is presented in Appendix M. Assumptions regarding water use calculations specific to the proposed Pisgah SEZ include the following:

- Water use requirements for solar energy technologies were analyzed for two separate areas: Analysis Areas 1 and 2 (Figure 9.3.9.1-1);

- Analysis Area 1 covers 4,417 acres (18 km^2), and Analysis Area 2 covers 19,533 acres (79 km^2);

- Analysis Area 1 is the portion of the proposed SEZ that is within the Mojave River adjudicated groundwater basin described in Section 9.3.9.1.3;

- On the basis of a total area (both Analysis Areas) between 10,000 and 30,000 acres (40 and 121 km^2), it is assumed that two solar projects could be constructed during the peak construction year;

- Water needed for making concrete would come from an off-site source;

- The maximum land area disturbed for an individual solar facility during the peak construction year is assumed to be 3,000 acres (12 km^2);

- Assumptions on individual facility size and land requirements (Appendix M), along with the assumed number of projects and maximum allowable land disturbance, results in the potential to disturb up to 25% of the total SEZ area during the peak construction year; and

- Water use requirements for hybrid cooling systems are assumed to be on the same order of magnitude as those using dry cooling (see Section 5.9.2.1).

Site Characterization

During site characterization, water would be used mainly for controlling fugitive dust and the workforce potable water supply. Impacts on water resources during this phase of development are expected to be negligible since activities would be limited in area, extent, and duration; water needs could be met by trucking water in from an off-site source.

Construction

Water use estimates during the peak construction year for the various solar energy technologies are presented in Table 9.3.9.2-1. These estimates were based on the assumption that two solar projects could be constructed during the peak construction year (based on the large total area of the proposed SEZ). Because the area of Analysis Area 2 is 19,533 acres (79 km^2), up to two solar facilities with a total of up to 6,000 acres (24 km^2) of land disturbance could be constructed in Analysis Area 2 during the peak construction year if there was no construction in Analysis Area 1. Because the area of Analysis Area 1 is 4,417 acres (18 km^2), it was assumed that up to 3,000 acres (12 km^2) of land disturbance could occur in Analysis Area 1 in the peak construction year and an additional 3,000 acres (12 km^2) of land disturbance could occur in Analysis Area 2.

TABLE 9.3.9.2-1 Estimated Water Requirements during the Peak Construction Year for the Proposed Pisgah SEZ

Activity	Parabolic Trough	Power Tower	Dish Engine	PV
Total Water Use Requirements for Construction of Two Solar Facilities during the Peak Construction Year				
Water use requirements[a]				
Fugitive dust control (ac-ft)[b,c]	1,686	2,530	2,530	2,530
Potable supply for workforce (ac-ft)	148	90	37	19
Total water use requirements (ac-ft)	1,834	2,620	2,567	2,549
Wastewater generated				
Sanitary wastewater (ac-ft)	148	90	37	19
Water Use Requirements for Peak Year Construction of One Solar Energy Facility (Analysis Area 1)				
Water use requirements[a]				
Fugitive dust control (ac-ft)[b,c]	845	1,267	1,267	1,267
Potable supply for workforce (ac-ft)	74	45	19	9
Total water use requirements (ac-ft)	919	1,312	1,286	1,276
Wastewater generated				
Sanitary wastewater (ac-ft)	74	45	19	9

[a] Assumptions of water use for fugitive dust control, potable supply for workforce, and wastewater generation are presented in Appendix M.

[b] Fugitive dust control estimation assumes a local pan evaporation rate of 74 in./yr (188 cm/yr) (Cowherd et al. 1988; WRCC 2010a).

[c] To convert ac-ft to m^3, multiply by 1,234.

During construction, water would be used mainly for controlling fugitive dust and the workforce potable water supply. The water requirements for construction activities could be met by either trucking water to the sites or by using on-site groundwater resources, because there are no significant surface water bodies on the proposed Pisgah SEZ. Water requirements for fugitive dust control could be as high as 2,620 ac-ft/yr (3.2 million m^3/yr) and for the potable workforce supply as high as 148 ac-ft/yr (182,600 m^3/yr). Groundwater wells would have to yield an estimated 1,136 to 1,623 gpm (4,300 to 6,144 L/min) to meet the total estimated construction water requirements. These yields are on the order of large municipal and agricultural production wells (Harter 2003) and are larger than average well yields for both groundwater basins, thus multiple wells would likely be needed in order to obtain the water requirements. In addition, the generation of up to 148 ac-ft/yr (182,600 m^3/yr) of sanitary wastewater would need to be treated either on-site or sent to an off-site facility.

Operations

During operations, water would be required for mirror/panel washing, the workforce potable water supply, and cooling (parabolic trough and power tower only) (Table 9.3.9.2-2). Water needs for cooling are a function of the type of cooling used (dry, hybrid, or wet). Further refinements to water requirements for cooling would result from the percentage of time the option was employed (30 to 60% range assumed) and the power of the system. The differences between the water requirements reported in Table 9.3.9.2-2 for the parabolic trough and power tower technologies are attributable to the assumptions of acreage per MW. As a result, the water usage for the more energy-dense parabolic trough technology is estimated to be almost twice as large as that for the power tower technology.

The water use estimates for solar energy technologies presented in Table 9.3.9.2-2 are listed for full build-out capacity for Analysis Areas 1 and 2 separately. For Analysis Area 1, water needs for mirror/panel washing are estimated to range from 20 to 353 ac-ft/yr (25,000 to 435,000 m^3/yr) and for the workforce potable water supply up to 10 ac-ft/yr (12,000 m^3/yr). Technologies using wet cooling have a total water requirement of up to 10,610 ac-ft/yr (13.1 million m^3/yr), whereas technologies using dry cooling require up to 1,070 ac-ft/yr (1.3 million m^3/yr), approximately a factor of 10 times less than wet cooling. Non-cooled technologies require substantially less water at full build-out capacity at 200 ac-ft/yr (246,700 m^3/yr) for dish engine and 20 ac-ft/yr (25,000 m^3/yr) for PV. For Analysis Area 2, water needs for mirror/panel washing are estimated to range from 87 to 1,563 ac-ft/yr (107,000 to 1.9 million m^3/yr) and for the workforce potable water supply up to 44 ac-ft/yr (54,300 m^3/yr). Technologies using wet cooling have a total water requirement of up to 46,924 ac-ft/yr (57.9 million m^3/yr), whereas technologies using dry cooling require up to 4,732 ac-ft/yr (5.8 million m^3/yr). Similar to Analysis Area 1, non-cooled technologies require substantially less water at full build-out capacity, at 887 ac-ft/yr (1.1 million m^3/yr) for dish engine and 89 ac-ft/yr (109,800 m^3/yr) for PV.

Operations would produce sanitary wastewater and system blowdown water (wet-cooling technologies only) that would need to be treated either on-site or off-site. In Analysis Area 1, the generation of sanitary wastewater is estimated to be as high as 10 ac-ft/yr (12,000 m^3/yr) and wet-cooling system blowdown water as high as 201 ac-ft/yr (248,000 m^3/yr). In Analysis Area 2, the generation of sanitary wastewater is estimated to be as high as 44 ac-ft/yr (54,300 m^3/yr) and wet-cooling system blowdown water as high as 888 ac-ft/yr (1.1 million m^3/yr). Any on-site treatment of wastewater would have to ensure that treatment ponds are effectively lined in order to prevent any groundwater contamination.

The total water requirements for wet-cooling technologies ranges from 1,967 to 10,610 ac-ft/yr (2.4 million to 13.1 million m^3/yr) in Analysis Area 1 (Table 9.3.9.2-2). These water use estimates for wet cooling are on the same order of magnitude as the estimated safe yield, natural recharge rate, and currently available State Water Project replacement water for the Lower Mojave Valley groundwater basin. Additionally, of the current water right allotments in the Baja subarea of the Mojave adjudicated basin, the maximum groundwater production allotment is less than 5,000 ac-ft/yr (6.2 million m^3/yr), with typical production rates between 100 and 1,500 ac-ft/yr (123,000 to 1.9 million m^3/yr) (MWA 2009). Given that the Lower

TABLE 9.3.9.2-2 Estimated Water Requirements during Normal Operations at Full Build-out Capacity at the Proposed Pisgah SEZ

Activity	Parabolic Trough	Power Tower	Dish Engine	PV
Analysis Area 1 (Mojave River Adjudicated Groundwater Basin)				
Full build-out capacity (MW)[a,b]	707	393	393	393
Water use requirements				
Mirror/panel washing (ac-ft/yr)[c,d]	353	196	196	20
Potable supply for workforce (ac-ft/yr)	10	4	4	<1
Dry cooling (ac-ft/yr)[e]	141–707	79–393	NA[f]	NA
Wet cooling (ac-ft/yr)[e]	3,180–10,247	1,767–5,693	NA	NA
Total water use requirements				
Non-cooled technologies (ac-ft/yr)	NA	NA	200	20
Dry-cooled technologies (ac-ft/yr)	504–1,070	279–593	NA	NA
Wet-cooled technologies (ac-ft/yr)	3,543–10,610	1,967–5,893	NA	NA
Wastewater generated				
Blowdown (ac-ft/yr)[g]	201	112	NA	NA
Sanitary wastewater (ac-ft/yr)	10	4	4	<1
Analysis Area 2 (Areas outside MWA Jurisdiction)				
Full build-out capacity (MW)[a,b]	3,125	1,736	1,736	1,736
Water use requirements				
Mirror/panel washing (ac-ft/yr)[c,d]	1,563	868	868	87
Potable supply for workforce (ac-ft/yr)	44	19	19	2
Dry cooling (ac-ft/yr)[e]	625–3,125	347–1,736	NA	NA
Wet cooling (ac-ft/yr)[e]	14,064–45,317	7,813–25,176	NA	NA
Total water use requirements				
Non-cooled technologies (ac-ft/yr)	NA	NA	887	89
Dry-cooled technologies (ac-ft/yr)	2,232–4,732	1,234–2,623	NA	NA
Wet-cooled technologies (ac-ft/yr)	15,671–46,924	8,700–26,063	NA	NA
Wastewater generated				
Blowdown (ac-ft/yr)[g]	888	493	NA	NA
Sanitary wastewater (ac-ft/yr)	44	19	19	2

[a] Land area for parabolic trough technology was estimated at 5 acres/MW (0.02 km^2/MW); land area for the power tower, dish engine, and PV technologies was estimated at 9 acres/MW (0.04 km^2/MW).

[b] Water needs are linearly related to power. Water usage for any other size project can be estimated by using multipliers provided in Table M.9-2 (Appendix M).

[c] Value assumes a usage rate of 0.5 ac-ft/yr/MW for mirror washing for parabolic trough, power tower, and dish engine technologies and a rate of 0.05 ac-ft/yr/MW for panel washing for PV systems.

[d] To convert ac-ft to m^3, multiply by 1,234.

[e] Dry-cooling value assumes 0.2 to 1.0 ac ft/yr per MW and wet-cooling value assumes 4.5 to 14.5 ac ft/yr per MW (range in these values represents 30 and 60% operating times) (DOE 2009).

[f] NA = not applicable.

[g] Value scaled from 250-MW Beacon Solar project with an annual discharge of 44 gpm (167 L/min) (AECOM 2009). Blowdown estimates are relevant to wet cooling only.

Mojave Valley groundwater basin is already in overdraft and that groundwater allocations will be decreased over time by the MWA, there do not appear to be adequate available water resources to support wet-cooling technologies in Analysis Area 1.

The groundwater resources in Analysis Area 2 have not been fully quantified because of the lack of development in the region historically. However, the estimated recharge for the Lavic Valley groundwater basin is very low at 300 ac-ft/yr (370,000 m^3/yr) and represents only 1 to 3% of the estimated water requirements for wet cooling, which range from 8,700 to 46,924 ac-ft/yr (10.7 million to 57.9 million m^3/yr) (Table 9.3.9.2-2). It is very likely that the required groundwater withdrawal rates needed for wet cooling would generate significant drawdown of the groundwater elevations in the Lavic Valley groundwater basin.

Decommissioning/Reclamation

During decommissioning/reclamation, all surface structures associated with the solar project would be dismantled, and the site reclaimed to its preconstruction state. Activities and water needs during this phase would be similar to those during the construction phase (dust suppression and potable supply for workers) and may also include water to establish vegetation in some areas. However, the total volume of water needed is expected to be less. Because the quantities of water needed during the decommissioning/ reclamation phase would be less than those for construction, impacts on surface and groundwater resources also would be less.

9.3.9.2.3 Off-Site Impacts: Roads and Transmission Lines

Impacts associated with the construction of roads and transmission lines primarily deal with water use demands for construction, water quality concerns relating to potential chemical spills, and land disturbance effects on the natural hydrology. A new access road would not be needed because I-40 runs east–west along the southern edge and then through the Pisgah SEZ, as described in Section 9.3.1.1. It is assumed that existing transmission lines could provide access to the transmission grid, and thus no additional acreage disturbance for transmission line access was assessed.

9.3.9.2.4 Summary of Impacts on Water Resources

The impacts on water resources associated with developing solar energy in the proposed Pisgah SEZ are associated with land disturbance effects on natural hydrology, water quality concerns, and water use requirements for the various solar energy technologies. Land disturbance impacts can cause localized ponding and erosion, especially in the areas near Troy Lake and the northern portions of the proposed SEZ near the base of the Cady and Lava Bed Mountains. Water quality concerns specific to the proposed SEZ deal with contamination of groundwater through surface spills and with potable water supplies meeting California drinking water standards, for which TDS values exceed standards in certain areas of the site.

The groundwater resources available to the proposed Pisgah SEZ are well quantified and strictly managed for the portions of the site within the Mojave River adjudicated groundwater basin (Analysis Area 1; Figure 9.3.9-1), but are not quantified fully for the portions of the site located within the Lavic Valley groundwater basin (Analysis Area 2). Groundwater levels have been decreasing for several decades, and overdraft conditions exist in the aquifers of Analysis Area 1. It is highly likely that any rapid development of groundwater production in Analysis Area 2 would result in declines in groundwater elevations, given the development history and current conditions with respect to groundwater in the adjacent Mojave River adjudicated basin. The consequences of overdraft and decreasing groundwater elevations are of particular concern to minimal groundwater users in the region who typically use groundwater for domestic water supply, as many of these wells are shallow (less than 250 ft [76 m] in depth) (MWA 2008). An additional concern specific to decreasing groundwater elevations is at the Camp Cady Wildlife Area, located 6 mi (10 km) northwest of the proposed SEZ, where groundwater is critical to preserving habitat for the Mohave tui chub fish, a fish species listed as endangered under the Endangered Species Act (see Section 9.3.12.2.1 for further details).

Impacts relating to water use requirements vary depending on the type of solar technology built and, for technologies using cooling systems, the type of cooling (wet, dry, or hybrid). The water use estimates for wet cooling at the proposed Pisgah SEZ are of a magnitude that exceed the physically, and legally, available groundwater resources in Analysis Area 1, and would most likely generate overdraft conditions in Analysis Area 2. Therefore, wet cooling would not be a feasible option for solar energy development at the proposed Pisgah SEZ.

9.3.9.3 SEZ-Specific Design Features and Design Feature Effectiveness

The program for solar energy development on BLM-administered lands will require the programmatic design features given in Appendix A, Section A.2.2, to be implemented, thus mitigating some impacts on water resources. Programmatic design features would focus on coordinating with federal, state, and local agencies that regulate the use of water resources to meet the requirements of permits and approvals needed to obtain water for development, and conducting hydrological studies to characterize the aquifer from which groundwater would be obtained (including drawdown effects, if a new point of diversion is created). The greatest consideration for mitigating water impacts would be in the selection of solar technologies. The mitigation of impacts would be best achieved by selecting technologies with low water demands.

Proposed design features specific to the proposed Pisgah SEZ include the following:

- Water resource analysis indicates that wet-cooling options would not be feasible. Other technologies should incorporate water conservation measures.

- Land disturbance activities should avoid impacts to the extent possible in the vicinity of Troy Lake and ephemeral washes onsite.

- During site characterization, hydrologic investigations would need to identify 100-year floodplains and potential jurisdictional water bodies subject to Clean

Water Act Section 404 permitting. Siting of solar facilities and construction activities should avoid areas identified as within a 100-year floodplain.

- During site characterization, coordination and permitting with CDFG regarding California's Lake and Streambed Alteration Program would be required for any proposed alterations to surface water features (both perennial and ephemeral).

- Groundwater should be used in accordance with rules and regulations set forth by the MWA regarding the Mojave River adjudicated groundwater basin for the portions of the SEZ located in Analysis Area 1.

- The groundwater-permitting process should be in compliance with the San Bernardino County groundwater ordinance.

- Groundwater monitoring and production wells should be constructed in accordance with standards set forth by the State of California (CDWR 1991) and San Bernardino County.

- Stormwater management best management practices should be implemented according to the California Stormwater Quality Association (CASQA 2003).

- Water for potable uses would have to meet or be treated to meet water quality standards in the California Safe Drinking Water Act (*California Health and Safety Code*, Chapter 4).

9.3.10 Vegetation

This section addresses vegetation that could occur or is known to occur within the potentially affected *area of the proposed Pisgah SEZ.* The affected area considered in this assessment included the areas of direct and indirect effects. The area of direct effects was defined as the area that would be physically modified during project development (i.e., where ground-disturbing activities would occur) and included only the SEZ. The area of indirect effects was defined as the area within 5 mi (8 km) of the SEZ boundary where ground-disturbing activities would not occur but that could be indirectly affected by activities in the area of direct effects. No area of direct or indirect effects was assumed for new transmission lines or access roads; they are not expected to be needed for development on the Pisgah SEZ because of the proximity of an existing transmission line and highway.

Indirect effects considered in the assessment included effects from surface runoff, dust, and accidental spills from the SEZ, but not ground-disturbing activities. The potential degree of indirect effects would decrease with increasing distance from the SEZ. This area of indirect effects was identified on the basis of professional judgment and was considered sufficiently large to bound the area that would potentially be subject to indirect effects. The affected area is the area bounded by the areas of direct and indirect effects. These areas are defined and the impact assessment approach is described in Appendix M.

9.3.10.1 Affected Environment

The proposed Pisgah SEZ is located within the Mojave Basin and Range Level III ecoregion, which primarily supports creosotebush (*Larrea tridentata*) habitats (EPA 2007). This ecoregion is characterized by broad basins and scattered mountains. Communities of sparse, scattered shrubs and grasses including creosotebush, white bursage (*Ambrosia dumosa*), and big galleta grass (*Pleuraphis rigida*) occur in basins; Joshua tree (*Yucca brevifolia*), other Yucca species, and cacti occur on arid footslopes; woodland and shrubland communities occur on mountain slopes, ridges, and hills (Bryce et al. 2003). Creosotebush, all-scale (*Atriplex polycarpa*), brittlebush (*Encelia farinosa*), desert holly (*Atriplex hymenelytra*), white burrobrush (*Hymenoclea salsola*), shadscale (*Atriplex confertifolia*), blackbrush (*Coleogyne ramosissima*), and Joshua tree (*Yucca brevifolia*) are dominant species within the Mojave desertscrub biome (Turner 1994). Annual precipitation in the Mojave Desert, occurring primarily in winter, is very low in the area of the SEZ, averaging about 3.8 in. (98 mm) at the Daggett Airport (see Section 9.3.13). Many ephemeral species (winter annuals) germinate in response to winter rains (Turner 1994).

Land cover types, described and mapped under CAReGAP (NatureServe 2010), were used to evaluate plant communities in and near the SEZ. Each cover type encompasses a range of similar plant communities. Land cover types occurring within the potentially affected area of the proposed Pisgah SEZ are shown in Figure 9.3.10.1-1. Table 9.3.10.1-1 provides the surface area of each cover type within the potentially affected area.

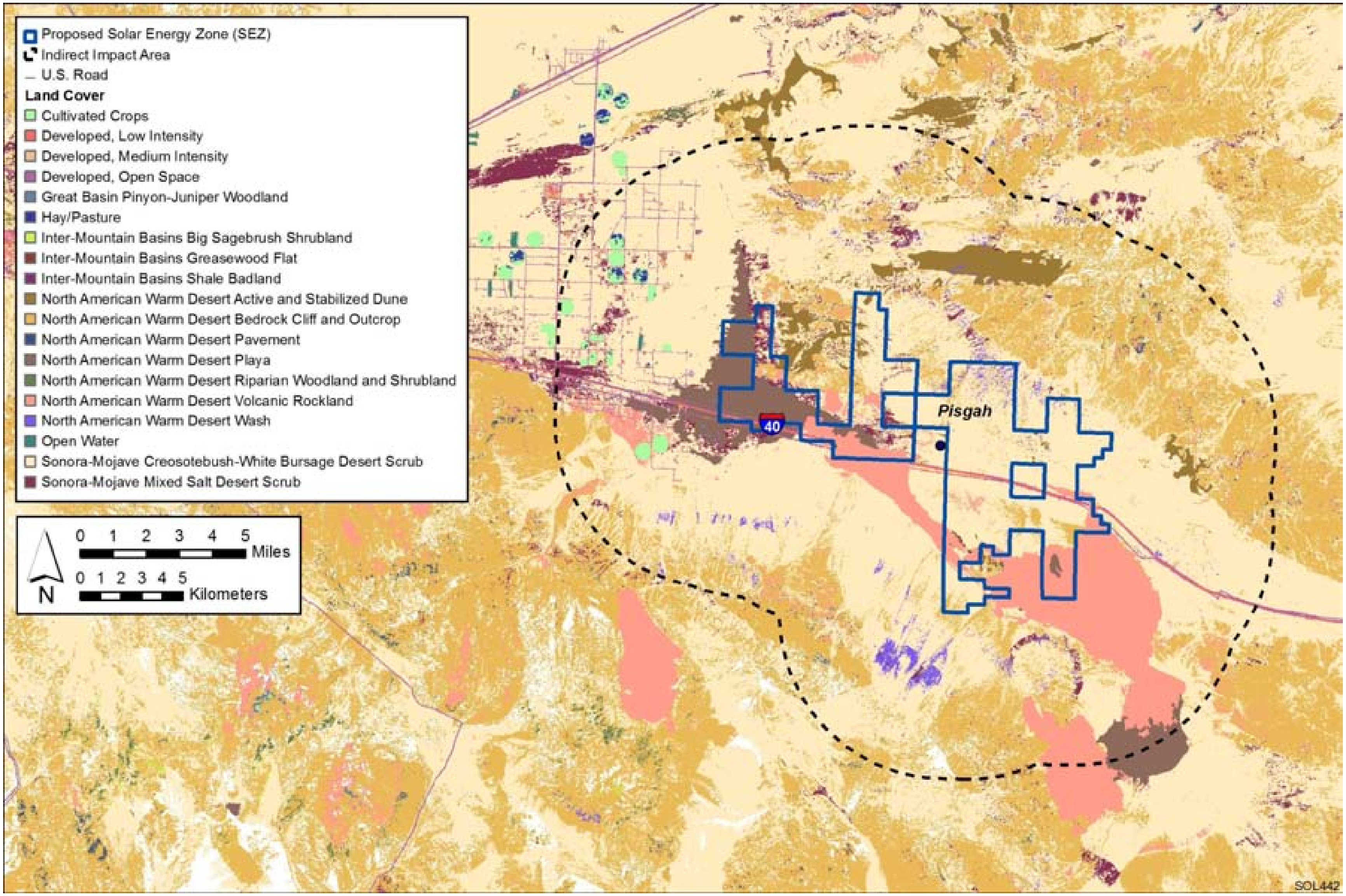

FIGURE 9.3.10.1-1 Land Cover Types within the Proposed Pisgah SEZ (Source: NatureServe 2010)

TABLE 9.3.10.1-1 Land Cover Types within the Potentially Affected Area of the Proposed Pisgah SEZ and Potential Impacts

	Area of Cover Type Affected (acres)[b]		
Land Cover Type[a]	Within SEZ[c] (Direct Effects)	Outside SEZ[d] (Indirect Effects)	Overall Impact Magnitude[e]
5264 Sonora-Mojave Creosotebush–White Bursage Desert Scrub: Occurs in broad valleys, lower bajadas, plains, and low hills in the Mojave and Sonoran Deserts. Shrubs form a sparse to moderately dense cover (2 to 50%), although the ground surface may be mostly barren. The dominant species are typically creosotebush (*Larrea tridentata*) and white bursage (*Ambrosia dumosa*). Other shrubs, dwarf-shrubs, and cacti may also be dominant or form sparse understories. Herbaceous species are typically sparse, but may be seasonally abundant.	14,548 acres[f] (0.6%, 1.4%)	156,519 acres (4.4%)	Small
3180 North American Warm Desert Volcanic Rockland: Consists of barren and sparsely vegetated (<10% plant cover) areas. Vegetation is variable and typically includes scattered desert shrubs.	3,193 acres (3.2%, 7.1%)	16,511 acres (16.4%)	Moderate
3161 North American Warm Desert Playa: Consists of barren and sparsely vegetated areas (generally <10% plant cover) that are intermittently flooded; salt crusts are common. Sparse shrubs occur around the margins, and patches of grass may form in depressions. In large playas, vegetation forms rings in response to salinity. Herbaceous species may be periodically abundant.	2,795 acres (2.6%, 6.1%)	4,767 acres (4.4%)	Moderate
3120 North American Warm Desert Bedrock Cliff and Outcrop: Occurs on subalpine to foothill steep cliff faces, narrow canyons, rock outcrops, unstable scree, and talus slopes. Consists of barren and sparsely vegetated areas (generally <10% plant cover) with desert species, especially succulents. Lichens are predominant in some areas.	1,505 acres (0.1%, 0.2%)	41,062 acres (3.2%)	Small
5265 Sonora-Mojave Mixed Salt Desert Scrub: Extensive open-canopied shrublands in the Mojave and Sonoran Deserts, usually occurring around playas and in valley bottoms or basins with saline soils. Vegetation typically comprises one or more *Atriplex* species; other salt-tolerant plants are often present or even co-dominant. Grasses occur at various densities.	879 acres (0.5%, 1.6%)	3,769 acres (2.0%)	Small

TABLE 9.3.10.1-1 (Cont.)

Land Cover Type[a]	Area of Cover Type Affected (acres)[b] Within SEZ[c] (Direct Effects)	Outside SEZ[d] (Indirect Effects)	Overall Impact Magnitude[e]
3121 North American Warm Desert Active and Stabilized Dune: Consists of unvegetated to sparsely vegetated (generally <10% plant cover) active dunes and sand sheets. Vegetation includes shrubs, forbs, and grasses. Includes unvegetated "blowouts" and stabilized areas.	322 acres (0.2%, 1.3%)	5,155 acres (3.5%)	Small
9151 North American Warm Desert Wash: Consists of intermittently flooded linear or braided strips within desert scrub or grassland landscapes on bajadas, mesas, plains, and basin floors. Although often dry, washes are associated with rapid sheet and gully flow. The vegetation varies from sparse and patchy to moderately dense and typically occurs along the banks, but may occur within the channel. Shrubs and small trees are typically intermittent to open. Common upland shrubs often occur along the edges.	244 acres (0.3%, 0.8%)	1,907 acres (2.3%)	Small
23, 24 Developed, Medium-High Density: Includes housing and commercial/industrial development. Impervious surfaces compose 50 to 100% of the total land cover.	9 acres (0.2%, 10.2%)	28 acres (0.5%)	Small
3139 Inter-Mountain Basins Shale Badland: Typically occurs on rounded hills and plains. Consists of barren and sparsely vegetated areas (<10% plant cover) with high rate of erosion and deposition. Vegetation consists of sparse dwarf shrubs and herbaceous plants.	6 acres (0.1%, 0.2%)	159 acres (1.8%)	Small
3143 North American Warm Desert Pavement: Consists of unvegetated to very sparsely vegetated (<2% plant cover) areas, usually in flat basins, with ground surfaces of fine to medium gravel coated with "desert varnish." Desert scrub species are usually present. Herbaceous species may be abundant in response to seasonal precipitation.	3 acres (<0.1%, <0.1%)	455 acres (2.3%)	Small

TABLE 9.3.10.1-1 (Cont.)

Land Cover Type[a]	Area of Cover Type Affected (acres)[b] Within SEZ[c] (Direct Effects)	Outside SEZ[d] (Indirect Effects)	Overall Impact Magnitude[e]
5259 Mojave Mid-Elevation Mixed Desert Scrub: The vegetation composition is quite variable. Dominant species include shrubs forbs and grasses and may include *Yucca* spp.	0 acres	2,816 acres (0.7%)	Small
81, 82 Hay/Pasture, Cultivated Crops: Areas where pasture/hay or cultivated crops account for more than 20% of total vegetation cover.	0 acres	1,182 acres (13.2%)	Small
9182 North American Warm Desert Riparian Woodland and Shrubland: Occurs along medium to large perennial streams in canyons and desert valleys. Consists of a mix of riparian woodlands and shrublands. Vegetation is dependent upon annual or periodic flooding, along with substrate scouring, and/or a seasonally shallow water table.	0 acres	56 acres (0.9%)	Small
11 Open Water: Plant or soil cover is generally less than 25%.	0 acres	47 acres (8.4%)	Small
9178 North American Warm Desert Riparian Mesquite Bosque: Occurs along perennial and intermittent streams as relatively dense riparian corridors composed of trees and shrubs. Honey mesquite (*Prosopis glandulosa*) and velvet mesquite (*P. velutina*) are the dominant trees. Vegetation is supported by groundwater when surface water is absent.	0 acres	12 acres (0.2%)	Small
5207 Inter-Mountain Basins Big Sagebrush Shrubland: Dominated by basin big sagebrush (*Artemisia tridentata tridentata*), Wyoming big sagebrush (*Artemisia tridentata wyomingensis*), or both. Other shrubs may be present. Perennial herbaceous plants are present but not abundant.	0 acres	9 acres (0.1%)	Small

TABLE 9.3.10.1-1 (Cont.)

	Area of Cover Type Affected (acres)[b]		
Land Cover Type[a]	Within SEZ[c] (Direct Effects)	Outside SEZ[d] (Indirect Effects)	Overall Impact Magnitude[e]
9103 Inter-Mountain Basins Greasewood Flat: Dominated or co-dominated by greasewood (*Sarcobatus vermiculatus*) and generally occurring in areas with saline soils, a shallow water table, and intermittent flooding, although remaining dry for most growing seasons. This community type generally occurs near drainages or around playas. These areas may include or be co-dominated by other shrubs and include a graminoid herbaceous layer.	0 acres	1 acre (0.1%)	Small

a Land cover descriptions are from NatureServe (2010). Full descriptions of land cover types, including plant species, can be found in Appendix I.

b Area in acres, determined from Sanborn Mapping (2008),

c Includes the area of the cover type within the SEZ, the percentage that area represents of all occurrences of that cover type within the SEZ region (i.e., a 50-mi [80-km] radius from the center of the SEZ), and the percentage that area represents of all occurrences of that cover type on BLM lands within the SEZ region.

d Area of indirect effects was assumed to be the area adjacent to the SEZ within 5 mi (8 km) of the SEZ boundary where ground-disturbing activities would not occur. Indirect effects include effects from surface runoff, dust, and other factors from project facilities. The potential degree of indirect effects would decrease with increasing distance from the SEZ. Includes the area of the cover type within the indirect effects area and the percentage that area represents of all occurrences of that cover type within the SEZ region.

e Overall impact magnitude categories were based on professional judgment and were (1) *small*: a relatively small proportion (≤1%) of the cover type within the SEZ region would be lost; (2) *moderate*: an intermediate proportion (>1 but ≤10%) of a cover type would be lost; (3) *large*: >10% of a cover type would be lost.

f To convert acres to km^2, multiply by 0.004047.

Lands within the Pisgah SEZ are classified primarily as Sonora-Mojave Creosotebush-White Bursage Desert Scrub. Additional cover types within the SEZ are given in Table 9.3.10.2-1. Creosotebush and white burrobrush were observed to be the dominant species over much of the SEZ in August 2009. Sensitive habitats on the SEZ include playa, sand dune, desert dry wash, and desert chenopod scrub/mixed salt desert scrub habitats.

The area surrounding the SEZ, within 5 mi (8 km), includes 14 cover types, which are listed in Table 9.3.10.1-1. The predominant cover types are Sonora-Mojave Creosotebush-White Bursage Desert Scrub and North American Warm Desert Bedrock Cliff and Outcrop.

There are no wetlands mapped by the NWI that occur within the SEZ or within the 5-mi (8-km) area of indirect effects. NWI maps are produced from high-altitude imagery and are subject to uncertainties inherent in image interpretation (USFWS 2009a). Troy Lake, a dry lakebed located in the western portion of Pisgah, occasionally holds shallow surface water and is sparsely vegetated. Troy Lake is primarily classified as North American Warm Desert Playa. Species occurring on the lakebed include white burrobush and saltbush (*Atriplex* sp.). In addition, a number of areas in the SEZ temporarily hold surface water after storms. These areas typically have a hard, cracked substrate and are often unvegetated. Tamarisk, a nonnative invasive tree or tall shrub, occurs in low areas that occasionally collect stormwater, such as along railroad embankments. Numerous ephemeral dry washes occur within the SEZ. These dry washes typically contain water for short periods during or following precipitation events, and include temporarily flooded areas, but typically do not support wetland or riparian habitats.

The proposed Pisgah SEZ is located within the MWMA. Table 9.3.10.1-2 lists problem weed species of the MWMA. Invasive species known to occur within the SEZ include tamarisk, which occurs along wet areas, Sahara mustard, and shizmus (*Schismus arabicus*). Tamarisk and Sahara mustard are included on the MWMA weed list.

9.3.10.2 Impacts

The construction of solar energy facilities within the Pisgah SEZ would result in direct impacts on plant communities because of the removal of vegetation within the facility footprint during land-clearing and land-grading operations. Approximately 80% of the SEZ (19,160 acres [77.5 km^2]) would be expected to be cleared with full development of the SEZ. The plant communities affected would depend on facility locations and could include any of the communities occurring on the SEZ. Therefore, for this analysis, all the area of each cover type within the SEZ is considered to be directly affected by removal with full development of the SEZ.

Indirect effects (e.g., caused by surface runoff or dust from the SEZ) have the potential to degrade affected plant communities and may reduce biodiversity by promoting the decline or elimination of species sensitive to disturbance. Indirect effects can also cause an increase in disturbance-tolerant species or invasive species. High impact levels could result in the elimination of a community or the replacement of one community type by another. The

TABLE 9.3.10.1-2 Problem Weeds of the MWMA

Common Name	Scientific Name
Tamarisk	*Tamarix ramosissima*
Halogeton	*Halogeton glomeratus*
White horsenettle,	*Solanum elaeagnifolium*
Yellow starthistle	*Centaurea solstitialis*
Dalmatian toadflax	*Linaria dalmatica*
Russian thistle	*Salsola tragus*
Puncture vine	*Tribulus terrestris*
Camelthorn	*Alhagi maurorum*
Giant reed	*Arundo donax*
Sahara mustard	*Brassica tournefortii*
Red brome	*Bromus madritensis* ssp. *rubens*
Fountain grass	*Pennisetum setaceum*
Tree of heaven	*Ailanthus altissima*
Perennial peppercress[a]	*Lepidium latifolium*
Spanish broom[a]	*Spartium junceum*

a Additional species are identified in MWMA (2008).

Source: MWMA (2002).

proper implementation of design features, however, would reduce indirect effects to a minor or small level of impact.

Possible impacts from solar energy facilities on vegetation that are encountered within the SEZ, as well as general mitigation measures, are described in more detail in Section 5.10.5. Any such impacts will be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2 (selected from the general mitigation measures), and from any additional mitigations applied. Design features specific to the proposed Pisgah SEZ are described in Section 9.3.10.3.

9.3.10.2.1 Impacts on Native Species

The impacts of construction, operation, and decommissioning were considered small if the impact affected a relatively small proportion (<1%) of the cover type in the SEZ region (within 50 mi [80 km] of the center of the SEZ); moderate if it could affect an intermediate proportion (>1 but <10%) of the cover type; and large if it could affect greater than 10% of the cover type.

Solar facility construction and operation would primarily affect communities of the Sonora-Mojave Creosotebush-White Bursage Desert Scrub cover type. Additional cover types within the SEZ that would be affected include North American Warm Desert Volcanic Rockland, North American Warm Desert Playa, North American Warm Desert Bedrock Cliff and Outcrop, Sonora-Mojave Mixed Salt Desert Scrub, North American Warm Desert Active and Stabilized Dune, North American Warm Desert Wash, Inter-Mountain Basins Shale Badland, North American Warm Desert Pavement. Although Developed, Open Space–Low Intensity and Developed, Medium-High Density cover types occur within the SEZ, these developed areas likely support few native plant communities. The potential impacts on native species cover types resulting from solar energy facilities in the proposed Pisgah SEZ are summarized in Table 9.3.10.2-1. Many of these cover types are relatively common in the SEZ region; however, Inter-Mountain Basins Shale Badland and North American Warm Desert Pavement are relatively uncommon, representing 0.2 and 0.4%, respectively, of the land area within the SEZ region. Sand dune, playa, chenopod scrub/mixed salt desert scrub, riparian, and dry wash communities are important sensitive habitats in the region.

The construction, operation, and decommissioning of solar projects within the SEZ would result in moderate impacts on North American Warm Desert Volcanic Rockland and North American Warm Desert Playa. Much of the playa cover type is associated with Troy Lake. Solar project development within the SEZ would result in small impacts on the remaining cover types in the affected area.

Disturbance of vegetation in dune communities within the SEZ, as by heavy equipment operation, could result in the loss of substrate stabilization. Re-establishment of dune species could be difficult due to the arid conditions and unstable substrates. Because of the arid conditions, reestablishment of desert scrub or other communities in temporarily disturbed areas would likely be very difficult and might require extended periods of time. In addition, noxious weeds could become established in disturbed areas and could colonize adjacent undisturbed habitats, thus reducing restoration success and potentially resulting in widespread habitat degradation. Cryptogamic soil crusts occur in many of the shrubland communities in the region, and likely occur on the SEZ. Damage to these crusts, caused by the operation of heavy equipment or other vehicles, can alter important soil characteristics, such as nutrient cycling and availability, and affect plant community characteristics (Lovich and Bainbridge 1999).

Communities associated with playa habitats or other intermittently flooded areas within or downgradient from solar projects could be affected by ground-disturbing activities. Riparian habitats, mesquite bosque, and greasewood communities outside the SEZ could also be affected. Site-clearing and site-grading could affect community function and disrupt surface water or groundwater flow patterns, resulting in changes in the frequency, duration, depth, or extent of inundation or soil saturation, and could potentially alter playa communities, riparian habitats, mesquite bosque, and greasewood communities, including occurrences outside of the SEZ. Increases in surface runoff from a solar energy project site could also affect hydrologic characteristics of these communities. The introduction of contaminants into these habitats could result from spills of fuels or other materials used on a project site. Soil disturbance could result in sedimentation in these areas, which could degrade or eliminate sensitive plant communities. Grading could also affect dry washes within the SEZ, and alteration of surface drainage patterns or hydrology could adversely affect downstream dry wash communities. Vegetation within these communities could be lost by erosion or desiccation. See Section 9.3.9 for further discussion of impacts on washes.

The deposition of fugitive dust from disturbed soil areas in habitats outside a solar project area could result in reduced productivity or changes in plant community composition. Fugitive dust deposition could affect plant communities of each of the cover types occurring within the indirect effects area identified in Table 9.3.10.1-1.

Although the use of groundwater within the Pisgah SEZ for technologies with high water requirements, such as wet-cooling systems, is considered unlikely, groundwater withdrawals for such systems near Troy Lake playa could contribute to the further depletion of the Lower Mojave Valley regional groundwater system (see Sections 9.3.9.1.2 and 9.3.12.2.1). Reductions in groundwater discharges at springs and seeps along the Mojave River that support riparian habitats could result in further degradation of these habitats. Communities that depend on accessible groundwater, such as mesquite bosque communities, could also become degraded or lost as a result of lowered groundwater levels.

9.3.10.2.2 Impacts from Noxious Weeds and Invasive Plant Species

E.O. 13112, "Invasive Species," directs federal agencies to prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological, and human health impacts of invasive species (*Federal Register*, Vol. 64, page 61836, Feb. 8, 1999). Potential impacts of noxious weeds and invasive plant species resulting from solar energy facilities are described in Section 5.10.1. Despite programmatic design features required to prevent the spread of noxious weeds, project disturbance could potentially increase the prevalence of noxious weeds and invasive species in the affected area of the proposed Pisgah SEZ and increase the probability that weeds could be transported into areas that were previously relatively weed-free. This could result in reduced restoration success and possible widespread habitat degradation.

Noxious weeds, including tamarisk, Sahara mustard, and shizmus occur on the SEZ. Additional species known to occur in the MWMA are given in Table 9.3.10.1-2.

Past or present land uses may affect the susceptibility of plant communities to the establishment of noxious weeds and invasive species. Small areas of Developed, Open Space–Low Intensity, totaling about 430 acres (1.7 km^2), occur within the SEZ, and approximately 2,237 acres (9.1 km^2) occurs in the indirect effects area. About 9 acres (0.04 km^2) of Developed, Medium-High Density occurs within the SEZ, and 28 acres (0.1 km^2) occurs within the indirect effects area. The developed areas likely support few native plant communities. Because disturbance may promote the establishment and spread of invasive species, developed areas may provide sources of such species. Existing roads, rail lines, transmission lines, and recreational OHV use within the SEZ region also likely contribute to the susceptibility of plant communities to the establishment and spread of noxious weeds and invasive species.

9.3.10.3 SEZ-Specific Design Features and Design Feature Effectiveness

The implementation of required programmatic design features described in Appendix A, Section A.2.2, would reduce the potential for impacts on plant communities. While some SEZ-specific design features are best established when considering specific project details, design features that can be identified at this time include the following:

- An Integrated Vegetation Management Plan, addressing invasive species control, and an Ecological Resources Mitigation and Monitoring Plan, addressing habitat restoration, should be approved and implemented to increase the potential for successful restoration of creosotebush–white bursage desert scrub communities and other affected habitats and to minimize the potential for the spread of tamarisk, Sahara mustard, schismus, or other invasive species. Invasive species control should focus on biological and mechanical methods to reduce the use of herbicides.

- All playa, chenopod scrub, sand dune and sand transport areas, and desert dry wash habitats, shall be avoided to the extent practicable, and any impacts minimized and mitigated. A buffer area shall be maintained around riparian areas, playas, and dry washes to reduce the potential for impacts on these habitats on or near the SEZ. Appropriate engineering controls shall be used to minimize impacts on these areas resulting from surface water runoff, erosion, sedimentation, altered hydrology, accidental spills, or fugitive dust deposition to these habitats. Appropriate buffers and engineering controls would be determined through agency consultation.

- Groundwater withdrawals should be prohibited to avoid the potential for indirect impacts on riparian habitat along the Mojave River or groundwater-dependent communities such as mesquite bosque.

If these SEZ-specific design features are implemented in addition to programmatic design features, it is anticipated that a high potential for impacts from invasive species and potential impacts on riparian, mesquite bosque, playa, chenopod scrub, sand dune, and dry wash habitat would be reduced to a minimal potential for impact.

This page intentionally left blank.

9.3.11 Wildlife and Aquatic Biota

This section addresses wildlife (amphibians, reptiles, birds, and mammals) and aquatic biota that could occur within the potentially affected area of the proposed Pisgah SEZ. Wildlife known to occur within 50 mi (80 km) of the SEZ (i.e., the SEZ region) were determined from the California Wildlife Habitat Relationships System (CDFG 2008). Land cover types suitable for each species were determined from the Southwest Regional Gap Analysis Program (SWReGAP) (USGS 2004, 2005, 2007). The amount of aquatic habitat within the SEZ region was determined by estimating the length of linear perennial stream and canal features and the area of standing water body features (i.e., ponds, lakes, and reservoirs) within 50 mi (80 km) of the SEZ by using available geographic information system (GIS) surface water datasets.

The affected area considered in this assessment included the areas of direct and indirect effects. The area of direct effects was defined as the area that would be physically modified during project development (i.e., where ground-disturbing activities would occur within the SEZ). The area of indirect effects was defined as the area within 5 mi (8 km) of the SEZ boundary where ground-disturbing activities would not occur but that could be indirectly affected by activities in the area of direct effects (e.g., surface runoff, dust, noise, lighting, and accidental spills from the SEZ). The potential degree of indirect effects would decrease with increasing distance from the SEZ. This area of indirect effects was identified on the basis of professional judgment and was considered sufficiently large to bound the area that would potentially be subject to indirect effects.

The affected area is the area bounded by the areas of direct and indirect effects. These areas are defined and the impact assessment approach is described in Appendix M. Due to the proximity of existing infrastructure, the impacts of construction and operation of transmission lines outside of the SEZ are not assessed, assuming that the existing transmission might be used to connect some new solar facilities to load centers and that additional project-specific analysis would be conducted for new transmission construction or line upgrades. Similarly, the impacts of construction or upgrades to access roads were not assessed for this SEZ due to the proximity of the existing state highway (see Section 9.3.1.2 for a discussion of development assumptions for this SEZ).

Dominant vegetation in the affected area is Mojave Desertscrub, and the primary land cover habitat type within the affected area is Sonora–Mojave creosotebush–white bursage desertscrub (see Section 9.3.10). Potentially unique habitats in the affected area in which wildlife species may reside include desert dunes, cliffs and rock outcrops, volcanic rocklands, desert washes, and playa wetland habitats. Playa wetland habitats in the affected area include the Troy Lake and Lavic Lake playas. The Troy Lake playa occurs in the western portion of the SEZ; Lavic Lake occurs outside of the SEZ but within the area of indirect effects approximately 4 mi (6 km) southeast of the SEZ. The Mojave River occurs outside of the affected area but flows as near as 7 mi (11 km) northwest of the SEZ (Figure 9.3.12.1-1).

9.3.11.1 Amphibians and Reptiles

9.3.11.1.1 Affected Environment

This section addresses amphibian and reptile species that are known to occur, or for which potentially suitable habitat occurs, on or within the potentially affected area of the proposed Pisgah SEZ. The list of amphibian and reptile species potentially present in the project area was determined from range maps and habitat information available from the California Wildlife Habitat Relationships System (CWHES) (CDFG 2008). Land cover types suitable for each species were determined from the SWReGAP (USGS 2004, 2005, 2007). See Appendix M for additional information on the approach used.

Based on the range, habitat preferences, and/or presence of potentially suitable land cover for the amphibian species that occur within southeastern California (CDFG 2008; USGS 2004, 2005, 2007), the red-spotted toad (*Bufo punctatus*) would be expected to occur within the proposed Pisgah SEZ. However, because it prefers dry, rocky areas near temporary sources of standing water, its occurrence within the SEZ would be spatially limited. It would most likely occur in the far western portion of the SEZ that overlaps portions of Troy Lake.

Thirty reptile species could occur within the proposed Pisgah SEZ (CDFG 2008). These species include 1 tortoise, 13 lizards, and 16 snakes. The desert tortoise (*Gopherus agassizii*) is a federally and state-listed threatened species. This species is discussed in Section 9.3.12. Among the more common lizard species that could occur within the SEZ are the desert horned lizard (*Phrynosoma platyrhinos*), long-nosed leopard lizard (*Gambelia wislizenii*), Mojave fringe-toed lizard (*Uma scoparia*), side-blotched lizard (*Uta stansburiana*), western banded gecko (*Coleonyx variegatus*), and zebra-tailed lizard (*Callisaurus draconoides*).

The most common snake species expected to occur within the proposed Pisgah SEZ are the coachwhip (*Masticophis flagellum*), glossy snake (*Arizona elegans*), gophersnake (*Pituophis catenifer*), groundsnake (*Sonora semiannulata*), and long-nosed snake (*Rhinocheilus lecontei*). The Mojave rattlesnake (*Crotalus scutulatus*) and sidewinder (*C. cerastes*) would be the most common poisonous snake species expected to occur on the SEZ.

Table 9.3.11.1-1 provides habitat information for the representative amphibian and reptile species that could occur on or in the affected area of the proposed Pisgah SEZ.

9.3.11.1.2 Impacts

The potential for impacts on amphibians and reptiles from utility-scale solar energy development within the proposed Pisgah SEZ is presented in this section. The types of impacts that amphibians and reptiles could incur from construction, operation, and decommissioning of utility-scale solar energy facilities are discussed in Section 5.10.2.1. Any such impacts would be minimized through the implementation of required programmatic design features described in

Appendix A, Section A.2.2, and through any additional mitigation applied. Section 9.3.11.1.3 identifies SEZ-specific design features of particular relevance to the proposed Pisgah SEZ.

The assessment of impacts on amphibians and reptile species is based on available information on the presence of species in the affected area as presented in Section 9.3.11.1.1, following the analysis approach described in Appendix M. Additional NEPA assessments and coordination with state natural resource agencies may be needed to address project-specific impacts more thoroughly. These assessments and consultations could result in additional required actions to avoid or mitigate impacts on amphibians and reptiles (see Section 9.3.11.1.3).

In general, impacts on amphibians and reptiles would result from habitat disturbance (i.e., habitat reduction, fragmentation, and alteration) and from disturbance, injury, or mortality to individual amphibians and reptiles. On the basis of the impacts on amphibians and reptiles summarized in Table 9.3.11.1-1, direct impacts on amphibian and reptile species would be small, because only 0.2 to 0.6% of potentially suitable habitats identified for the species in the SEZ region would be lost. Larger areas of potentially suitable habitats for the amphibian and reptile species occur within the area of potential indirect effects (e.g., up to 5.7% of available habitat for the long-nosed leopard lizard). Other impacts on amphibians and reptiles could result from surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, accidental spills, collection, and harassment. These indirect impacts are expected to be negligible with implementation of programmatic design features.

Decommissioning of facilities and reclamation of disturbed areas after operations cease could result in short-term negative impacts on individuals and habitats adjacent to project areas, but long-term benefits would accrue if suitable habitats were restored in previously disturbed areas. Section 5.10.2.1.4 provides an overview of the impacts of decommissioning and reclamation on wildlife. Of particular importance for amphibian and reptile species would be the restoration of original ground surface contours, soils, and native plant communities associated with semiarid shrublands.

9.3.11.1.3 SEZ-Specific Design Features and Design Feature Effectiveness

The implementation of required programmatic design features described in Appendix A, Section A.2.2, would reduce the potential for effects on amphibians and reptiles, especially for those species that utilize habitat types that can be avoided (e.g., Troy Lake, which could provide habitat for the red-spotted toad). Indirect impacts could be reduced to negligible levels by implementing programmatic design features, especially those engineering controls that would reduce runoff, sedimentation, spills, and fugitive dust. While SEZ-specific features are best established when considering specific project details, the following SEZ-specific design feature can be identified:

- To the extent practicable, avoid the ephemeral drainages and Troy Lake.

If this SEZ-specific design feature is implemented in addition to other programmatic design features, impacts on amphibian and reptile species could be reduced. Any residual

TABLE 9.3.11.1-1 Representative Amphibians and Reptiles That Could Occur on or in the Affected Area of the Proposed Pisgah SEZ and Potential Impacts

Common Name (Scientific Name)	Habitat	Maximum Area of Potential Habitat Affected[a]: Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a]: Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Amphibians				
Red-spotted toad (*Bufo punctatus*)	Rocky canyons and gullies in deserts, grasslands, and dry woodlands. When inactive, it occurs under rocks, in rock crevices, or underground. Often found near rocky areas associated with spring seepages, intermittent streams, and cattle tanks. Breeds in shallow water of temporary rain pools, spring-fed pools, and pools along intermittent streams. About 2,897,500 acres[f] of potentially suitable habitat occurs in the SEZ region.	15,427 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	107,664 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	Small. Avoid development within Troy Lake.
Lizards				
Desert horned lizard (*Phrynosoma platyrhinos*)	Deserts dominated by sagebrush, creosotebush, greasewood, or cactus. Occurs on sandy flats, alluvial fans, washes, and edge of dunes. Burrows in soil during periods of inactivity. Common throughout Mojave and Colorado Deserts. About 4,648,400 acres of potentially suitable habitat occurs in the SEZ region.	19,160 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	177,758 acres of potentially suitable habitat (3.8% of available potentially suitable habitat)	Small. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Long-nosed leopard lizard (*Gambelia wislizenii*)	Desert and semidesert areas with scattered shrubs. Prefers sandy or gravelly flats and plains. Also prefers areas with abundant rodent burrows that it occupies when inactive. Widely distributed in the Mojave, Colorado, and other desert areas in California. About 2,899,700 acres of potentially suitable habitat occurs in the SEZ region.	15,427 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	107,673 acres of potentially suitable habitat (5.7% of available potentially suitable habitat)	Small

1

TABLE 9.3.11.1-1 (Cont.)

Common Name (Scientific Name)	Habitat	Maximum Area of Potential Habitat Affected[a]		Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
		Within SEZ (Direct Effects)[b]	Outside SEZ (Indirect Effects)[c]	
Lizards (Cont.)				
Mojave fringe-toed lizard (*Uma scoparia*)	Restricted to sparsely vegetated windblown sand of dunes, flats, riverbanks, and washes. Requires fine, loose sand for burrowing. About 2,448,500 acres of potentially suitable habitat occurs in the SEZ region.	14,870 acres of potentially suitable habitat lost (0.6% of available potentially suitable habitat)	106,234 acres of potentially suitable habitat (4.3% of available potentially suitable habitat)	Small
Side-blotched lizard (*Uta stansburiana*)	Arid and semiarid locations with scattered bushes or scrubby trees. Often occurs in sandy washes with scattered rocks and bushes. About 4,075,100 acres of potentially suitable habitat occurs in the SEZ region.	16,297 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	146,864 acres of potentially suitable habitat (3.6% of available potentially suitable habitat)	Small
Western banded gecko (*Coleonyx variegatus*)	Wide variety of habitats including deserts with creosotebush and sagebrush and pinyon-juniper woodlands. Inhabits both rocky areas and barren dunes. Most abundant in sandy flats and desert washes. Uses rocks, burrows, and spaces beneath vegetative debris or trash during period of inactivity. About 3,099,200 acres of potentially suitable habitat occurs in the SEZ region.	18,466 acres of potentially suitable habitat lost (0.6% of available potentially suitable habitat)	114,406 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	Small
Zebra-tailed lizard (*Callisaurus draconoides*)	Sparsely vegetated deserts or open sandy washes, dunes, floodplains, beaches, or desert pavement. Common and widely distributed throughout Mojave and Colorado Deserts. About 3,352,300 acres of potentially suitable habitat occurs in the SEZ region.	19,160 acres of potentially suitable habitat lost (0.6% of available potentially suitable habitat)	136,527 acres of potentially suitable habitat (4.1% of available potentially suitable habitat)	Small. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

TABLE 9.3.11.1-1 (Cont.)

Common Name (Scientific Name)	Habitat	Maximum Area of Potential Habitat Affected[a] Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a] Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Snakes				
Coachwhip (*Masticophis flagellum*)	Wide variety of open terrain habitats. Most abundant in deserts, grasslands, scrub, chaparral, and pastures. Prefers relatively dry open terrain. Seeks cover in burrows, rocks, or vegetation. About 3,751,200 acres of potentially suitable habitat occurs in the SEZ region.	16,375 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	147,306 acres of potentially suitable habitat (3.9% of available potentially suitable habitat)	Small
Glossy snake (*Arizona elegans*)	Variety of habitats including barren to sparsely shrubby deserts, sagebrush flats, grasslands, and sand hills. Prefers sandy areas with scattered brush, but also occurs in rocky areas. Shelters and lays eggs underground. Common throughout southern California, particularly the desert regions. About 2,542,561 acres of potentially suitable habitat occurs in the SEZ region.	15,114 acres of potentially suitable habitat lost (0.6% of available potentially suitable habitat)	108,162 acres of potentially suitable habitat (4.3% of available potentially suitable habitat)	Small
Gophersnake (*Pituophis catenifer*)	Wide variety of habitats including deserts, prairies, shrublands, woodlands, and farmlands. May dig its burrow or occupy mammal burrows. Eggs are laid in burrows or under large rocks or logs. Most widespread and common snake in California. About 3,346,600 acres of potentially suitable habitat occurs in the SEZ region.	19,160 acres of potentially suitable habitat lost (0.6% of available potentially suitable habitat)	121,835 acres of potentially suitable habitat (3.6% of available potentially suitable habitat)	Small. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Groundsnake (*Sonora semiannulata*)	Arid and semiarid areas including desert flats, sand hummocks, rocky hillsides with pockets of loose soil. Ranges from prairie and desert lowlands to pinyon-juniper and oak-pine zone. About 2,729,300 acres of potentially suitable habitat occurs in the SEZ region.	14,548 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	103,972 acres of potentially suitable habitat (3.8% of available potentially suitable habitat)	Small

TABLE 9.3.11.1-1 (Cont.)

Common Name (Scientific Name)	Habitat	Maximum Area of Potential Habitat Affected[a] Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a] Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Snakes (Cont.)				
Long-nosed snake (*Rhinocheilus lecontei*)	Typically inhabits deserts, dry prairies, and river valleys. Occurs by day and lays eggs underground or rocks. Burrows rapidly in loose soil. Common in desert regions. About 242,200 acres of potentially suitable habitat occurs in the SEZ region.	566 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat)	7,130 acres of potentially suitable habitat (2.9% of available potentially suitable habitat)	Small
Mojave rattlesnake (*Crotalus scutulatus*)	Mostly upland desert and lower mountain slopes including barren desert, grasslands, open woodland, and scrubland. Generally avoids broken rocky terrain or densely vegetated areas. Takes refuge in animal burrows or spaces under or among rocks. Widely distributed throughout the Mojave and extreme northern Colorado Deserts. About 2,707,700 acres of potentially suitable habitat occurs in the SEZ region.	14,548 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	103,963 acres of potentially suitable habitat (3.8% of available potentially suitable habitat)	Small
Sidewinder (*Crotalus. cerastes*)	Open desert terrain with fine windblown sand, desert flats with sandy washes, or sparsely vegetated sand dunes. Concentrates near washes and areas of relatively dense vegetation where mammal burrows are common. During periods of inactivity, uses underground burrows, occurs under bushes, or almost completely snuggles under sand. Widely distributed and locally abundant in the Mojave and Colorado Deserts. About 2,850,100 acres of potentially suitable habitat occurs in the SEZ region.	14,870 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	109,106 acres of potentially suitable habitat (3.8% of available potentially suitable habitat)	Small

Footnotes on next page.

TABLE 9.3.11..1-1 (Cont.)

[a] Maximum area of potentially suitable habitat affected relative to total available potentially suitable habitat within the SEZ region (i.e., a 50-mi [80-km] radius from the center of the SEZ). Habitat availability was determined from potentially suitable land cover for each species (USGS 2004, 2005, 2007).

[b] Direct effects within the SEZ consist of ground-disturbing activities associated with construction and the maintenance of an altered environment associated with operations. A maximum of 19,160 acres would be developed in the SEZ.

[c] The area of indirect effects was assumed to be the area adjacent to the SEZ within 5 mi (8 km) of the SEZ boundary. Indirect effects include effects from surface runoff, dust, noise, lighting, etc., from the SEZ, but do not include ground-disturbing activities. The potential degree of indirect effects would decrease with increasing distance from the SEZ boundary.

[d] Overall impact magnitude categories were based on professional judgment and were (1) *small*: ≤1% of potentially suitable habitat for the species would be lost and the activity would not result in a measurable change in the carrying capacity or population size in the affected area; (2) *moderate*: >1 but ≤10% of potentially suitable habitat for the species would be lost and the activity would potentially result in a measurable but moderate (not destabilizing) change in the carrying capacity or population size in the affected area; and (3) *large*: >10% of potentially suitable habitat for the species would be lost and the activity would result in a potentially large, measurable, and destabilizing change in the carrying capacity or population size in the affected area. Note that much greater weight was given to the magnitude of direct effects, because those effects would be difficult to mitigate. Programmatic design features would reduce most indirect effects to negligible levels.

[e] Species-specific mitigation is presented for those species that have particular habitat features that could be readily avoided. For species or individuals occurring outside the SEZ (in the area of indirect effects), no mitigation measures beyond required programmatic design features have been identified.

[f] To convert acres to km^2, multiply by 0.004047.

Sources: CDFG (2008); NatureServe (2010); USGS (2004, 2005, 2007).

impacts on amphibians and reptiles are anticipated to be small, given the relative abundance of potentially suitable habitats in the SEZ region. However, as potentially suitable habitats for a number of the amphibian and reptile species occur throughout much of the SEZ, additional species-specific mitigation of direct effects for those species would be difficult or infeasible.

9.3.11.2 Birds

9.3.11.2.1 Affected Environment

This section addresses bird species that are known to occur, or for which potentially suitable habitat occurs, on or within the potentially affected area of the proposed Pisgah SEZ. The list of bird species potentially present in the project area was determined from range maps and habitat information available from the CWHRS (CDFG 2008). Land cover types suitable for each species were determined from SWReGAP (USGS 2004, 2005, 2007). See Appendix M for additional information on the approach used.

> **Desert Focal Bird Species**
>
> Bird species whose requirements define spatial attributes, habitat characteristics, and management regimes representative of a healthy desert system (Chase and Geupel 2005).

Almost 100 species of birds have a range that encompasses the proposed Pisgah SEZ region. However, habitats for more than 35 of these species either do not occur on or are limited within the SEZ (e.g., habitat for waterfowl and wading birds). In addition, the SEZ region is only within the winter range (40 species) or summer range (9 species) of a number of the bird species. Ten bird species that could occur on or in the affected area of the SEZ are considered focal species for the California Partners in Flight's *Desert Bird Conservation Plan* (CalPIF 2009): ash-throated flycatcher (*Myiarchus cinerascens*), black-tailed gnatcatcher (*Polioptila melanura*), black-throated sparrow (*Amphispiza bilineata*), burrowing owl (*Athene cunicularia*), common raven (*Corvus corax*), Costa's hummingbird (*Calypte costae*), ladder-backed woodpecker (*Picoides scalaris*), Le Conte's thrasher (*Toxostoma lecontei*), phainopepla (*Phainopepla nitens*), and verdin (*Auriparus flaviceps*). Habitats for these species are described in Table 9.3.11.2-1. The ash-throated flycatcher and black-throated sparrow would be summer residents within the SEZ, while the other desert focal bird species could occur year-round (CalPIF 2009).

Waterfowl, Wading Birds, and Shorebirds

As discussed in Section 4.10.2.2.2, waterfowl (ducks, geese, and swans), wading birds (herons and cranes), and shorebirds (avocets, gulls, plovers, rails, sandpipers, stilts, and terns) are among the most abundant groups of birds in the six-state study area. Nearly 20 waterfowl, wading bird, and shorebird species occur within the SEZ region. Within the SEZ, waterfowl, wading birds, and shorebirds are uncommon because of the lack of perennial aquatic habitat. The killdeer (*Charadrius vociferus*) and least sandpiper (*Calidris minutilla*) (shorebird species)

TABLE 9.3.11.2-1 Representative Bird Species That Could Occur on or in the Affected Area of the Proposed Pisgah SEZ and Potential Impacts

Common Name (Scientific Name)	Habitat and Seasonal Occurrence	Maximum Area of Potential Habitat Affected[a]		Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
		Within SEZ (Direct Effects)[b]	Outside SEZ (Indirect Effects)[c]	
Shorebirds				
Killdeer (*Charadrius vociferus*)	Widespread throughout California. Open areas such as fields, meadows, lawns, mudflats, and shores. Nests on ground in open dry or gravelly locations. About 189,600 acres[f] of potentially suitable habitat occurs in the SEZ region. Year-round.	3,234 acres of potentially suitable habitat lost (1.7% of available potentially suitable habitat)	7,079 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	Moderate. Avoid development within Troy Lake. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Least sandpiper (*Calidris minutilla*)	Wet meadows, mudflats, flooded fields, lake shores, edge of salt marshes, and river sandbars. About 12,100 acres of potentially suitable habitat occurs in the SEZ region. Common to abundant in winter.	0 acres of potentially suitable habitat lost (0.0% of available potentially suitable habitat)	115 acres of potentially suitable habitat (0.9% of available potentially suitable habitat)	None to small. Avoid development within Troy Lake. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 9.3.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat and Seasonal Occurrence	Maximum Area of Potential Habitat Affected[a] Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a] Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Neotropical Migrants				
Ash-throated flycatcher (*Myiarchus cinerascens*)	Common in scrub and woodland habitats including desert riparian and desert washes. Requires hole/cavity for nesting. Uses shrubs or small trees for foraging perches. About 3,010,200 acres of potentially suitable habitat occurs in the SEZ region. Summer.	15,671 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	109,649 acres of potentially suitable habitat (3.6% of available potentially suitable habitat)	Small. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Black-tailed gnatcatcher (*Polioptila melanura*)	Nests in bushes mainly in wooded desert washes with dense mesquite, palo verde, ironwood, and acacia. Also occurs in desert scrub habitat. About 2,536,600 acres of potentially suitable habitat occurs in the SEZ region. Year-round.	15,114 acres of potentially suitable habitat lost (0.6% of available potentially suitable habitat)	108,153 acres of potentially suitable habitat (4.3% of available potentially suitable habitat)	Small. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Black-throated sparrow (*Amphispiza bilineata*)	Chaparral and desert scrub habitats with sparse to open stands of shrubs. Often in areas with scattered Joshua trees. Nests in thorny shrubs or cactus. About 2,994,700 acres of potentially suitable habitat occurs in the SEZ region. Year-round.	18,072 acres of potentially suitable habitat lost (0.6% of available potentially suitable habitat)	126,187 acres of potentially suitable habitat (4.2% of available potentially suitable habitat)	Small. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 9.3.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat and Seasonal Occurrence	Maximum Area of Potential Habitat Affected[a]: Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a]: Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Neotropical Migrants (Cont.)				
Brewer's sparrow (*Spizella breweri*)	Common in Mojave and Colorado Deserts during winter. Occupies open desert scrub and cropland habitats. About 2,737,100 acres of potentially suitable habitat occurs in the SEZ region.	14,557 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	104,574 acres of potentially suitable habitat (3.8% of available potentially suitable habitat)	Small. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Cactus wren (*Campylorhynchus brunneicapillus*)	Desert (especially areas with cholla cactus or yucca), mesquite, arid scrub, coastal sage scrub, and trees in towns in arid regions. Nests in *Opuntia* spp.; twiggy, thorny trees and shrubs; and sometimes in buildings. Nests may be used as winter roost. Locally common in the Mojave and Colorado Deserts. About 1,765,100 acres of potentially suitable habitat occurs in the SEZ region. Year-round.	1,749 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat)	45,841 acres of potentially suitable habitat (2.6% of available potentially suitable habitat)	Small. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Common poorwill (*Phalaenoptilus nuttallii*)	Scrubby and brushy areas, prairie, desert, rocky canyons, open woodlands, and broken forests. Mostly in arid and semiarid habitats. Nests in open areas on a bare site. About 3,878,000 acres of potentially suitable habitat occurs in the SEZ region. Year-round.	17,176 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	147,883 acres of potentially suitable habitat (3.8% of available potentially suitable habitat)	Small. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 9.3.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat and Seasonal Occurrence	Maximum Area of Potential Habitat Affected[a]: Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a]: Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Neotropical Migrants (Cont.)				
Common raven (*Corvus corax*)	Occurs in most habitats. Trees and cliffs provide cover. Roosts primarily in trees. Nests on cliffs, bluffs, tall trees, or human-made structures. Forages in sparse, open terrain. About 3,024,200 acres of potentially suitable habitat occurs in the SEZ region. Year-round.	15,866 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	110,007 acres of potentially suitable habitat (3.6% of available potentially suitable habitat)	Small. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Costa's hummingbird (*Calypte costae*)	Desert and semidesert areas, arid brushy foothills, and chaparral. Main habitats are desert washes, edges of desert riparian and valley foothill riparian areas, coastal shrub, desert scrub, desert succulent shrub, lower-elevation chaparral, and palm oasis. Also in mountains, meadows, and gardens during migration and winter. Most common in canyons and washes when nesting. Nests are located in trees, shrubs, vines, or cacti. About 2,984,200 acres of potentially suitable habitat occurs in the SEZ region. Common in summer and uncommon in winter in California.	15,671 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	109,639 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	Small. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 9.3.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat and Seasonal Occurrence	Maximum Area of Potential Habitat Affected[a]: Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a]: Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Neotropical Migrants (Cont.)				
Greater roadrunner (*Geococcyx californianus*)	Desert scrub, chaparral, edges of cultivated lands, and arid open areas with scattered brush. Requires thickets, large bushes, or small trees for shade, refuge, and roosting. Usually nests low in trees, shrubs, or clump of cactus. Rarely nests on ground. About 4,623,800 acres of potentially suitable habitat occurs in the SEZ region. Year-round.	19,160 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	162,972 acres of potentially suitable habitat (3.5% of available potentially suitable habitat)	Small. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Horned lark (*Eremophila alpestris*)	Common to abundant resident in a variety of open habitats. Breeds in grasslands, sagebrush, semidesert shrublands, and alpine tundra. During migration and winter, inhabits the same habitats other than tundra, and also occurs in agricultural areas. Usually occurs where plant density is low and there are exposed soils. About 2,882,500 acres of potentially suitable habitat occurs in the SEZ region. Year-round.	15,427 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	107,665 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	Small. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 9.3.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat and Seasonal Occurrence	Maximum Area of Potential Habitat Affected[a]: Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a]: Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Neotropical Migrants (Cont.)				
House finch (*Carpodacus mexicanus*)	Variety of areas including arid scrub and brush, desert riparian areas, open woodlands, cultivated lands, and savannas. Usually forages in areas with elevated escape perches (e.g., trees, tall shrubs, transmission lines, and buildings). Roosts and nests in sheltered sites in trees; tall, dense shrubs; man-made structures; cliff crevices; or earthen banks. About 93,200 acres of potentially suitable habitat occurs in the SEZ region. Year-round.	439 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	2,334 acres of potentially suitable habitat (2.5% of available potentially suitable habitat)	Small. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Ladder-backed woodpecker (*Picoides scalaris*)	Fairly common in Mojave and Colorado Deserts. Variety of habitats including deserts, arid scrub, riparian woodlands, mesquite, scrub oak, pinyon-juniper woodlands. Digs nest hole in rotted stub or dead or dying branches of various trees. Also nests in saguaro, agave, yucca, fence posts, and utility poles. Nests on ledges; branches of trees, shrubs, and cactus; and holes in trees or walls. About 2,976,300 acres of potentially suitable habitat occurs in the SEZ region. Year-round.	15,671 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	109,639 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	Small. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Le Conte's thrasher (*Toxostoma lecontei*)	Open desert wash, alkali desert scrub, and desert succulent shrub habitats. Prefers to nest and forage in arroyos and washes lined with dense stands of creosotebush and salt bush. About 2,932,100 acres of potentially suitable habitat occurs in the SEZ region. Year-round, but uncommon to rare.	15,114 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	110,969 acres of potentially suitable habitat (3.8% of available potentially suitable habitat)	Small. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 9.3.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat and Seasonal Occurrence	Maximum Area of Potential Habitat Affected[a]		Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
		Within SEZ (Direct Effects)[b]	Outside SEZ (Indirect Effects)[c]	
Neotropical Migrants (Cont.)				
Lesser nighthawk (*Chordeiles acutipennis*)	Open country, desert regions, scrub, savanna, and cultivated areas. Usually near water including open marshes, salt ponds, large rivers, rice paddies, and beaches. Roosts on low perches or the ground. Nests in the open on bare sites. About 4,546,100 acres of potentially suitable habitat occurs in the SEZ region. Uncommon summer resident.	19,160 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	172,934 acres of potentially suitable habitat (3.8% of available potentially suitable habitat)	Small. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Loggerhead shrike (*Lanius ludovicianus*)	Open country with scattered trees and shrubs, savanna, desert scrub, desert riparian, Joshua tree, and occasionally open woodland habitats. Perches on poles, wires, or fence posts (suitable hunting perches are important aspect of habitat). Nests in shrubs and small trees. About 3,073,900 acres of potentially suitable habitat occurs in the SEZ region. Year-round.	16,101 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	111,886 acres of potentially suitable habitat (3.6% of available potentially suitable habitat)	Small. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 9.3.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat and Seasonal Occurrence	Maximum Area of Potential Habitat Affected[a]: Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a]: Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Neotropical Migrants (Cont.)				
Phainopepla (*Phainopepla nitens*)	Common in Mojave and Colorado Deserts. Desert scrub, mesquite, juniper and oak woodlands, tall brush, washes, riparian woodlands, and orchards. Nests in dense foliage of large shrubs or trees, sometimes in a clump of mistletoe. About 637,700 acres of potentially suitable habitat occurs in the SEZ region. Year-round, but many move to more western and northern portions of California during summer.	566 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat)	9,946 acres of potentially suitable habitat (1.6% of available potentially suitable habitat)	Small. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Say's phoebe (*Sayornis saya*)	Arid open country, deserts, sagebrush plains, dry barren foothills, canyons, cliffs, ranches, and rural homes. Nests in cliff crevices, holes in banks, sheltered ledges, tree cavities, under bridges and roofs, and in mines. About 4,245,300 acres of potentially suitable habitat occurs in the SEZ region. Year-round.	17,362 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	150,973 acres of potentially suitable habitat (3.6% of available potentially suitable habitat)	Small. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Verdin (*Auriparus flaviceps*)	Common to abundant in Colorado Desert, less common in Mojave Desert. Desert riparian, desert wash, desert scrub, and alkali desert scrub areas with large shrubs and small trees. Nests in shrubs, small trees, or cactus. About 2,790,400 acres of potentially suitable habitat occurs in the SEZ region. Year-round.	14,792 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	105,870 acres of potentially suitable habitat (3.8% of available potentially suitable habitat)	Small. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 9.3.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat and Seasonal Occurrence	Maximum Area of Potential Habitat Affected[a]: Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a]: Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Neotropical Migrants (Cont.)				
White-throated swift (*Aeronautes saxatalis*)	Mountainous country near cliffs and canyons where breeding occurs. Forages over forest and open situations. Nests in rock crevices and canyons, sometimes in buildings. Ranges widely over most terrain and habitats, usually high in the air. About 1,373,200 acres of potentially suitable habitat occurs in the SEZ region. Year-round.	1,944 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat)	43,395 acres of potentially suitable habitat (3.2% of available potentially suitable habitat)	Small. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Birds of Prey				
American kestrel (*Falco sparverius*)	Occurs in most open habitats, in various shrub and early successional forest habitats, forest openings, and various ecotones. Perches on trees, snags, rocks, utility poles and wires, and fence posts. Uses cavities in trees, snags, rock areas, banks, and buildings for nesting and cover. About 2,097,400 acres of potentially suitable habitat occurs in the SEZ region. Year-round.	6,016 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	66,501 acres of potentially suitable habitat (3.2% of available potentially suitable habitat)	Small.

TABLE 9.3.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat and Seasonal Occurrence	Maximum Area of Potential Habitat Affected[a]: Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a]: Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Birds of Prey (Cont.)				
Golden eagle (*Aquila chrysaetos*)	Grasslands, shrublands, pinyon-juniper woodlands, and ponderosa pine forests. Occasionally in most other habitats, especially during migration and winter. Nests on cliffs and sometimes trees in rugged areas, with breeding birds ranging widely over surrounding areas. About 4,481,900 acres of potentially suitable habitat occurs in the SEZ region. Winter.	19,160 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	171,977 acres of potentially suitable habitat (3.8% of available potentially suitable habitat)	Small. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Bald and Golden Eagle Protection Act.
Prairie falcon (*Falco mexicanus*)	Associated primarily with perennial grasslands, savannahs, rangeland, some agricultural fields, and desert scrub areas. Nests in pothole or well-sheltered ledge on rocky cliff or steep earth embankment. May also nest in man-made excavations on otherwise unsuitable cliffs and old nests of ravens, hawks, and eagles. Forages in large patch areas with low vegetation. May forage over irrigated croplands in winter. About 3,681,900 acres of potentially suitable habitat occurs in the SEZ region. Year-round.	16,297 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	144,104 acres of potentially suitable habitat (3.9% of available potentially suitable habitat)	Small.

TABLE 9.3.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat and Seasonal Occurrence	Maximum Area of Potential Habitat Affected[a] Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a] Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Birds of Prey (Cont.)				
Red-tailed hawk (*Buteo jamaicensis*)	Wide variety of habitats from deserts, mountains, and populated valleys. Open areas with scattered, elevated perch sites such as scrub desert, plains and montane grassland, agricultural fields, pastures urban parklands, broken coniferous forests, and deciduous woodland. Nests on cliff ledges or in tall trees. About 662,800 acres of potentially suitable habitat occurs in the SEZ region. Year-round.	1,309 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat)	8,831 acres of potentially suitable habitat (1.3% of available potentially suitable habitat)	Small.
Turkey vulture (*Cathartes aura*)	Occurs in open stages of most habitats that provide adequate cliffs or large trees for nesting, roosting, and resting. Migrates and forages over most open habitats. Will roost communally in trees, exposed boulders, and occasionally transmission line support towers. About 4,189,700 acres of potentially suitable habitat occurs in the SEZ region. Summer.	16,932 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	148,794 acres of potentially suitable habitat (3.6% of available potentially suitable habitat)	Small.
Upland Game Birds				
Gambel's quail (*Callipepla gambelii*)	Deserts, especially in areas with brushy or thorny growth, and adjacent cultivated areas. Usually occurs near water. Nests on the ground under cover of small trees, shrubs, and grass tufts. About 4,263,600 acres of potentially suitable habitat occurs in the SEZ region. Year-round.	17,176 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	150,711 acres of potentially suitable habitat (3.5% of available potentially suitable habitat)	Small.

TABLE 9.3.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat and Seasonal Occurrence	Maximum Area of Potential Habitat Affected[a]: Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a]: Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Upland Game Birds (Cont.)				
Mourning dove (*Zenaida macroura*)	Habitat generalist, occurring in grasslands, shrublands, croplands, lowland and foothill riparian forests, ponderosa pine forests, deserts, and urban and suburban areas. Rarely in aspen and other forests, coniferous woodlands, and alpine tundra. Nests on ground or in trees. Winters mostly in lowland riparian forests adjacent to cropland. About 3,207,400 acres of potentially suitable habitat occurs in the SEZ region. Year-round.	18,911 acres of potentially suitable habitat lost (0.6% of available potentially suitable habitat)	116,840 acres of potentially suitable habitat (3.6% of available potentially suitable habitat)	Small. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

[a] Maximum area of potentially suitable habitat affected relative to total available potentially suitable habitat within the SEZ region (i.e., a 50-mi [80-km] radius from the center of the SEZ). Habitat availability was determined from potentially suitable land cover for each species (USGS 2004, 2005, 2007).

[b] Direct effects within the SEZ consist of ground-disturbing activities associated with construction and the maintenance of an altered environment associated with operations. A maximum of 19,160 acres would be developed in the SEZ.

[c] The area of indirect effects was assumed to be the area adjacent to the SEZ within 5 mi (8 km) of the SEZ boundary. Indirect effects include effects from surface runoff, dust, noise, lighting, etc., from the SEZ, but do not include ground-disturbing activities. The potential degree of indirect effects would decrease with increasing distance away from the SEZ boundary.

[d] Overall impact magnitude categories were based on professional judgment and were (1) *small*: ≤1% of potentially suitable habitat for the species would be lost and the activity would not result in a measurable change in the carrying capacity or population size in the affected area; (2) *moderate*: >1 but ≤10% of potentially suitable habitat for the species would be lost and the activity would potentially result in a measurable but moderate (not destabilizing) change in the carrying capacity or population size in the affected area; and (3) *large*: >10% of potentially suitable habitat for the species would be lost and the activity would result in a potentially large, measurable, and destabilizing change in the carrying capacity or population size in the affected area. Note that much greater weight was given to the magnitude of direct effects, because those effects would be difficult to mitigate. Programmatic design features would reduce most indirect effects to negligible levels.

Footnotes continued on next page.

TABLE 9.3.11.2-1 (Cont.)

[e] Species-specific mitigation is presented for those species that have particular habitat features that could be readily avoided. For species or individuals occurring outside the SEZ (in the area of indirect effects), no mitigation measures beyond required programmatic design features have been identified.

[f] To convert acres to km^2, multiply by 0.004047

Sources: CDFG (2008); NatureServe (2010); USGS (2004, 2005, 2007).

would be expected to occur on the SEZ in the area of Troy Lake. The Colorado River, located more than 95 mi (153 km) east of the SEZ, and the Salton Sea, located more than 85 mi (137 km) south of the SEZ, would provide more productive habitat for this group of birds.

Neotropical Migrants

As discussed in Section 4.10.2.2.3, neotropical migrants represent the most diverse category of birds within the six-state study area. Neotropical migrants expected to occur on or in the affected area of the proposed Pisgah SEZ throughout the year include the black-tailed gnatcatcher, black-throated sparrow, cactus wren (*Campylorhynchus brunneicapillus*), common poorwill (*Phalaenoptilus nuttallii*), common raven, Costa's hummingbird, greater roadrunner (*Geococcyx californianus*), horned lark (*Eremophila alpestris*), house finch (*Carpodacus mexicanus*), ladder-backed woodpecker, Le Conte's thrasher, loggerhead shrike (*Lanius ludovicianus*), phainopepla, Say's phoebe (*Sayornis saya*), verdin, and white-throated swift (*Aeronautes saxatalis*). The winter range for the Brewer's sparrow (*Spizella breweri*), green-tailed towhee (*Pipilo chlorurus*), and sage sparrow (*Amphispiza belli*) encompasses the SEZ, while the summer range for the ash-throated flycatcher (*Myiarchus cinerascens*) and lesser nighthawk (*Chordeiles acutipennis*) encompasses the SEZ (CDFG 2008).

Birds of Prey

Section 4.10.2.2.4 provides an overview of the birds of prey (raptors, owls, and vultures) within the six-state study area. Sixteen birds of prey species have ranges that encompass the proposed Pisgah SEZ (CDFG 2008). Raptor species expected to occur within the SEZ include the American kestrel (*Falco sparverius*, year-round), burrowing owl (year-round), ferruginous hawk (*Buteo regalis*, winter), golden eagle (*Aquila chrysaetos*, winter), prairie falcon (*Falco mexicanus*, year-round), red-tailed hawk (*Buteo jamaicensis*, year-round), and turkey vulture (*Cathartes aura*, summer) (CDFG 2008). However, the American kestrel, golden eagle, prairie falcon, and red-tailed hawk make infrequent use of the desert regions within which the proposed Pisgah SEZ occurs. The golden eagle is a Fully Protected species in the State of California (CDFG 2010a).

Upland Game Birds

Section 4.10.2.2.5 provides an overview of the upland game birds (primarily pheasants, grouse, quail, and doves) that occur within the six-state study area. Upland game species that could occur year-round within the Pisgah SEZ are Gambel's quail (*Callipepla gambelii*) and mourning dove (*Zenaida macroura*) (CDFG 2008). Gambel's quail is common within the Colorado and Mojave Desert areas of California. It prefers riparian areas and also occurs near streams, springs, and water holes. While it feeds in open habitats, trees or tall shrubs are required for escape cover. It also requires a nearby source of water, particularly during hot summer months (CDFG 2008). Up to 400,000 Gambel's quail are harvested annually in California (CDFG 2008). The mourning dove is common throughout California and can be found in a wide variety of habitats. Regardless of habitat occupied, it requires a nearby water source (CDFG 2008).

Table 9.3.11.2-1 provides habitat information for the representative bird species that could occur on or in the affected area of the proposed Pisgah SEZ. Because of their special status standing, the burrowing owl, ferruginous hawk, and short-eared owl are discussed in Section 9.3.12.1.

9.3.11.2.2 Impacts

The types of impacts that birds could incur from construction, operation, and decommissioning of utility-scale solar energy facilities are discussed in Section 5.10.2.1. Any such impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2, and through any additional mitigation applied. Section 9.3.11.2.3, below, identifies design features of particular relevance to the proposed Pisgah SEZ.

The assessment of impacts on bird species is based on available information on the presence of species in the affected area as presented in Section 9.3.11.2.1 following the analysis approach described in Appendix M. Additional NEPA assessments and coordination with state natural resource agencies may be needed to address project-specific impacts more thoroughly. These assessments and consultations could result in additional required actions to avoid or mitigate impacts on birds (see Section 9.3.11.2.3).

In general, impacts on birds would result from habitat disturbance (i.e., habitat reduction, fragmentation, and alteration) and from disturbance, injury, or mortality to individual birds. Table 9.3.11.2-1 summarizes the potential impacts on representative bird species resulting from solar energy development that could occur on or in the affected area in the proposed Pisgah SEZ. Direct impacts on bird species would be small for most bird species; only 0.6% or less of habitats potentially suitable for most representative bird species would be lost, although a moderate impact is indicated for the killdeer, because 1.7% of its potentially suitable habitat would be lost (Table 9.3.11.2-1). Larger areas of suitable habitat for bird species that occur within the area of potential indirect effects (e.g., up to 4.3% of potentially suitable habitat for the black-tailed gnatcatcher). Other impacts on birds could result from collision with vehicles and facility structures, surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, noise, lighting, spread of invasive species, accidental spills, and harassment. Indirect impacts on areas outside the SEZ (e.g., impacts caused by dust generation, erosion, and sedimentation) are expected to be negligible with implementation of programmatic design features.

Decommissioning of facilities and reclamation of disturbed areas after operations cease could result in short-term negative impacts on individuals and habitats adjacent to project areas, but long-term benefits would accrue if suitable habitats were restored in previously disturbed areas. Section 5.10.2.1.4 provides an overview of the impacts of decommissioning and reclamation on wildlife. Of particular importance for bird species would be the restoration of original ground surface contours, soils, and native plant communities associated with semiarid shrublands.

9.3.11.2.3 SEZ-Specific Design Features and Design Feature Effectiveness

The successful implementation of programmatic design features presented in Appendix A, Section A.2.2, would reduce the potential for effects on birds. Indirect impacts could be reduced to negligible levels by implementing programmatic design features, especially those engineering controls that would reduce runoff, sedimentation, spills, and fugitive dust. While some SEZ-specific design features important to reducing impacts on birds are best established when project details are considered, some design features can be identified at this time, as follows:

- Pre-disturbance surveys should be conducted within the SEZ for bird species listed under the Migratory Bird Treaty Act. Impacts on potential nesting habitat of these species should be avoided, particularly during the nesting season.

- Pre-disturbance surveys should be conducted within the SEZ for the following desert bird focal species (CalPIF 2009): ash-throated flycatcher, black-tailed gnatcatcher, black-throated sparrow, burrowing owl, common raven, Costa's hummingbird, ladder-backed woodpecker, Le Conte's thrasher, phainopepla, and verdin. Impacts on potential nesting habitat of these species should be avoided.

- Plant species that positively influence the presence and abundance of the desert bird focal species should be avoided to the extent practicable. These species include Goodding's willow, yucca, Joshua tree, mesquite, honey mesquite, screwbean, desert mistletoe, big saltbush, smoketree, and catclaw acacia (CalPIF 2009)

- Take of golden eagles and other raptors should be avoided. Mitigation regarding the golden eagle should be developed in consultation with the USFWS and CDFG. A permit may be required under the Bald and Golden Eagle Protection Act.

- Development within the area of the ephemeral drainages and Troy Lake should be avoided.

If these SEZ-specific design features are implemented in addition to programmatic design features, impacts on bird species could be reduced. Any residual impacts on birds are anticipated to be small due to the relative abundance of suitable habitats in the SEZ region. However, as potentially suitable habitats for a number of the bird species occur throughout much of the SEZ, species-specific mitigation of direct effects for those species would be difficult or infeasible.

9.3.11.3 Mammals

9.3.11.3.1 Affected Environment

This section addresses mammal species that are known to occur, or for which suitable habitat occurs, on or within the potentially affected area of the Pisgah SEZ. The list of mammal species potentially present in the project area was determined from range maps and habitat information available from the CWHRS (CDFG 2008). Land cover types suitable for each species were determined from SWReGAP (USGS 2004, 2005, 2007). See Appendix M for additional information on the approach used. On the basis of species distributions and habitat preferences, about 35 mammal species could occur within the SEZ (CDFG 2008). The following discussion emphasizes big game and other mammal species that (1) have key habitats within or near the Pisgah SEZ, (2) are important to humans (e.g., big game, small game, and furbearer species), and/or (3) are representative of other species that share similar habitats.

Big Game

The desert bighorn sheep (*Ovis canadensis nelsoni*) and mule deer (*Odocoileus hemionus*) are the only big game species expected to occur in the area of the proposed Pisgah SEZ. Because it is a BLM sensitive species, the desert bighorn sheep is discussed in Section 9.3.12. The mule deer is common to abundant throughout California, except in deserts and intensely farmed areas (CDFG 2008). It prefers a mosaic of vegetation that has herbaceous openings, dense brush or tree thickets, riparian areas, and abundant edges. Mule deer are browsers and grazers, feeding on shrubs, forbs, and a few grasses. Brush is important for escape cover and for thermal regulation in winter and summer (CDFG 2008). Mule deer in San Bernardino County are found throughout the mountainous areas at elevations of 4,000 to 8,000 ft (1,219 to 2,438 m) (CDFG 2010b). Therefore, mule deer would not be expected with any regularity within the valley between Cady Mountains and the Rodman and Lava Bed Mountains where the proposed Pisgah SEZ would be located. The highest elevation of the SEZ is about 2,300 ft (701 m) (see Section 9.3.1.1).

Other Mammals

A number of small game and furbearer species occur within the area of the proposed Pisgah SEZ. These include the American badger (*Taxidea taxus*), black-tailed jackrabbit (*Lepus californicus*), bobcat (*Lynx rufus*), coyote (*Canis latrans*), desert cottontail (*Sylvilagus audubonii*), round-tailed ground squirrel (*Spermophilus tereticaudus*), and white-tailed antelope squirrel (*Ammospermophilus leucurus*) (CDFG 2008).

Nongame (small) mammal species such as bats, mice, kangaroo rats, and shrews also occur within the area of the proposed Pisgah SEZ. These include the cactus mouse (*Peromyscus eremicus*), canyon deermouse (*P. crinitus*), desert kangaroo rat (*Dipodomys deserti*), desert shrew (*Notiosorex crawfordi*), desert woodrat (*Neotoma lepida*), little pocket mouse

(*Perognathus longimembris*), long-tailed pocket mouse (*Chaetodipus formosus*), Merriam's kangaroo rat (*Dipodomys merriami*), and southern grasshopper mouse (*Onychomys torridus*) (CDFG 2008). The range of nine bat species encompasses the SEZ: big brown bat (*Eptesicus fuscus*), Brazilian free-tailed bat (*Tadarida brasiliensis*), Californian leaf-nosed bat (*Macrotus californicus*), California mastiff bat (*Eumops perotis californicus*), California myotis (*Myotis californicus*), pallid bat (*Antrozous pallidus*), spotted bat (*Euderma maculatum*), Townsend's big-eared bat (*Corynorhinus townsendii*), and western pipistrelle (*Parastrellus hesperus*). Most bat species would utilize the SEZ only during foraging. Roost sites for the species (e.g., caves, hollow trees, rock crevices, or buildings) are absent to scarce on or in the affected area of the SEZ.

Table 9.3.11.3-1 provides habitat information for the representative mammal species that could occur on or in the affected area of the proposed Pisgah SEZ. Because of their special status standing, the California mastiff bat, Californian leaf-nose bat, pallid bat, and Townsend's big-eared bat are discussed in Section 9.3.12.1.

9.3.11.3.2 Impacts

The types of impacts that mammals could incur from construction, operation, and decommissioning of utility-scale solar energy facilities are discussed in Section 5.10.2.1. Any such impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2, and through any additional mitigation applied. Section 9.3.11.3.3, below, identifies design features of particular relevance to the proposed Pisgah SEZ.

The assessment of impacts on mammal species is based on available information on the presence of species in the affected area as presented in Section 9.3.11.3.1 following the analysis approach described in Appendix M. Additional NEPA assessments and coordination with state natural resource agencies may be needed to address project-specific impacts more thoroughly. These assessments and consultations could result in additional required actions to avoid or mitigate impacts on mammals (see Section 9.3.11.3.3).

Table 9.3.11.3-1 summarizes the potential impacts on representative mammal species resulting from solar energy development (with the implementation of required programmatic design features) in the proposed Pisgah SEZ.

Direct impacts on small game, furbearers, and nongame (small) mammal species would be small, because 0.6% or less of potentially suitable habitats for representative mammal species would be lost (Table 9.3.11.3-1). Larger areas of suitable habitat for these species occur within the area of potential indirect effects (e.g., up to 4.2% for the desert cottontail). Other impacts on mammals could result from collision with fences and vehicles, surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, noise, lighting, spread of invasive species, accidental spills, and harassment. These indirect impacts are expected to be negligible with implementation of programmatic design features.

TABLE 9.3.11.3-1 Representative Mammal Species That Could Occur on or in the Affected Area of the Proposed Pisgah SEZ and Potential Impacts

Common Name (Scientific Name)	Habitat	Maximum Area of Potential Habitat Affected[a]		Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
		Within SEZ (Direct Effects)[b]	Outside SEZ (Indirect Effects)[c]	
Small Game and Furbearers				
American badger (*Taxidea taxus*)	Open grasslands and deserts, meadows in subalpine and montane forests, alpine tundra. Digs burrows in friable soils. Most common in areas with abundant populations of ground squirrels, prairie dogs, and pocket gophers. Relatively uncommon throughout California. About 2,729,900 acres[f] of potentially suitable habitat occurs in the SEZ region.	14,548 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	103,973 acres of potentially suitable habitat (3.8% of available potentially suitable habitat)	Small.
Black-tailed jackrabbit (*Lepus californicus*)	Open plains, fields, and deserts with scattered thickets or patches of shrubs. Also open, early stages of forests and chaparral habitats. Rests during the day in shallow depressions, and uses shrubs for cover. About 4,316,500 acres of potentially suitable habitat occurs in the SEZ region.	17,049 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	154,334 acres of potentially suitable habitat (3.6% of available potentially suitable habitat)	Small.
Bobcat (*Lynx rufus*)	Occurs in nearly all habitats and successional stages. Optimal habitats include mixed woodlands and forest edges, hardwood forests, swamps, forested river bottoms, brushlands, deserts, mountains, and other areas with thick undergrowth. Availability of water may limit its distribution in xeric regions. Uses rocky clefts, caves, hollow logs, spaces under fallen trees, and so forth when inactive; usually changes shelter areas daily. About 2,912,600 acres of potentially suitable habitat occurs in the SEZ region.	15,228 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	108,276 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	Small.

TABLE 9.3.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat	Maximum Area of Potential Habitat Affected[a]: Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a]: Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Small Game and Furbearers (Cont.)				
Coyote (*Canis latrans*)	Suitable habitat characterized by interspersions of brush and open areas with free water. Least common in dense coniferous forest. Where human control efforts occur, it is restricted to broken, rough country with abundant shrub cover and a good supply of rabbits or rodents. About 4,766,300 acres of potentially suitable habitat occurs in the SEZ region.	19,160 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	179,967 acres of potentially suitable habitat (3.8% of available potentially suitable habitat)	Small. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Desert cottontail (*Sylvilagus audubonii*)	Abundant to common in grasslands, open forests, and desert shrub habitats. Can occur in areas with minimal vegetation as long as adequate cover (e.g., rock piles, fallen logs, fence rows) is present. Thickets and patches of shrubs, vines, and brush also used as cover. About 2,486,400 acres of potentially suitable habitat occurs in the SEZ region.	15,222 acres of potentially suitable habitat lost (0.6% of available potentially suitable habitat)	105,245 acres of potentially suitable habitat (4.2% of available potentially suitable habitat)	Small.
Round-tailed ground squirrel (*Spermophilus tereticaudus*)	Optimum habitat includes desert succulent shrub, desert wash, desert scrub, alkali desert scrub, and levees in cropland habitat. Also occurs in urban habitats. Burrows usually at base of shrubs. About 2,893,600 acres of potentially suitable habitat occurs in the SEZ region.	15,427 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	107,732 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	Small.

TABLE 9.3.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat	Maximum Area of Potential Habitat Affected[a] Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a] Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Small Game and Furbearers (Cont.)				
White-tailed antelope squirrel (*Ammospermophilus leucurus*)	Common to abundant in California deserts. Optimal habitats are desert scrub, sagebrush, alkali desert scrub, Joshua tree, bitterbrush, and pinyon-juniper. Fairly common in desert riparian, desert succulent shrub, and desert wash habitats. Also occurs in mixed chaparral and annual grassland habitats. Requires friable soil for burrowing. Burrows may be under shrubs or in open; often uses abandoned kangaroo rat burrows. About 4,060,100 acres of potentially suitable habitat occurs in the SEZ region.	16,297 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	146,865 acres of potentially suitable habitat (3.6% of available potentially suitable habitat)	Small.
Nongame (small) Mammals				
Big brown bat (*Eptesicus fuscus*)	Deserts, forests and woodlands, old fields, shrublands, and urban/suburban areas. Uncommon in hot desert habitats. Summer roosts are in buildings, hollow trees, rock crevices, tunnels, and cliff swallow nests. Maternity colonies occur in attics, barns tree cavities, rock crevices, and caves. Caves, mines, and man-made structures used for hibernation sites. About 3,679,000 acres of potentially suitable habitat occurs in the SEZ region.	16,492 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	144,454 acres of potentially suitable habitat (3.9% of available potentially suitable habitat)	Small.

TABLE 9.3.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat	Maximum Area of Potential Habitat Affected[a]: Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a]: Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Nongame (small) Mammals (Cont.)				
Brazilian free-tailed bat (*Tadarida brasiliensis*)	Cliffs, deserts, grasslands, old fields, savannas, shrublands, woodlands, and suburban/urban areas. Roosts in buildings, caves, and hollow trees. May roost in rock crevices, bridges, signs, or cliff swallow nests during migration. Large maternity colonies inhabit caves, buildings, culverts, and bridges. About 3,921,000 acres of potentially suitable habitat occurs in the SEZ region.	17,058 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	151,534 acres of potentially suitable habitat (3.9% of available potentially suitable habitat)	Small.
Cactus mouse (*Peromyscus eremicus*)	Deserts, shrublands, chaparral, and coniferous woodlands. Occurs on rocky areas and areas with sandy substrates and loamy soils. Nests in rock heaps, stone walls, burrows, brush fences, and woodrat houses. About 2,992,500 acres of potentially suitable habitat occurs in the SEZ region.	15,671 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	109,640 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	Small.
Californian myotis (*Myotis californicus*)	Cliffs, deserts, forests, woodlands, grasslands, savannas, and shrublands. Often uses man-made structures for night roosts. Uses crevices for summer day roosts. May roost on small desert shrubs or on the ground. Hibernates in caves, mines, tunnels, or buildings. Maternity colonies occur in rock crevices, under bark, or under eaves of buildings. Common to abundant below 6,000 ft. About 3,682,100 acres of potentially suitable habitat occurs in the SEZ region.	16,297 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	144,126 acres of potentially suitable habitat (3.9% of available potentially suitable habitat)	Small.

TABLE 9.3.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat	Maximum Area of Potential Habitat Affected[a] Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a] Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Nongame (small) Mammals (Cont.)				
Canyon deermouse (*Peromyscus crinitus*)	Found in most desert and chaparral habitats. Gravelly desert pavement, talus, boulders, cliffs, and slickrock—rocky areas with virtually any type of plant cover. About 2,995,000 acres of potentially suitable habitat occurs in the SEZ region.	18,620 acres of potentially suitable habitat lost (0.6% of available potentially suitable habitat)	124,240 acres of potentially suitable habitat (4.1% of available potentially suitable habitat)	Small.
Desert kangaroo rat (*Dipodomys deserti*)	Low deserts, deep wind-drifted sandy soil with sparse vegetation, alkali sinks, and shadscale or creosotebush scrub. Nests in burrows dug in mounds, usually under vegetation. About 230,600 acres of potentially suitable habitat occurs in the SEZ region.	566 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat)	7,062 acres of potentially suitable habitat (3.1% of available potentially suitable habitat)	Small.
Desert shrew (*Notiosorex crawfordi*)	Generally found in arid areas with adequate cover for nesting and resting. Deserts, semiarid grasslands with scattered cactus and yucca, chaparral slopes, alluvial fans, sagebrush, gullies, juniper woodlands, riparian areas, and dumps. About 4,405,300 acres of potentially suitable habitat occurs in the SEZ region.	17,498 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	155,857 acres of potentially suitable habitat (3.5% of available potentially suitable habitat)	Small.
Desert woodrat (*Neotoma lepida*)	Sagebrush scrub; chaparral; deserts and rocky slopes with scattered cactus, yucca, pine-juniper, or other low vegetation; creosotebush desert; Joshua tree woodlands; scrub oak woodlands, pinyon-juniper woodlands; and riparian zones. Most abundant in rocky areas with Joshua trees. Dens built of debris on ground, among cacti or yucca, along cliffs, among rocks, or occasionally in trees. About 4,408,800 acres of potentially suitable habitat occurs in the SEZ region.	19,160 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	167,836 acres of potentially suitable habitat (3.8% of available potentially suitable habitat)	Small. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

TABLE 9.3.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat	Maximum Area of Potential Habitat Affected[a]: Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a]: Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Nongame (small) Mammals (Cont.)				
Little pocket mouse (*Perognathus longimembris*)	Common to abundant in southern California deserts. Preferred habitat includes desert riparian, desert scrub, desert wash, and sagebrush. Nests in an underground burrow. Sandy soil preferred for burrowing, but also commonly burrows on gravel washes and on stony soils. About 3,118,600 acres of potentially suitable habitat occurs in the SEZ region.	15,993 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	114,735 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	Small.
Long-tailed pocket mouse (*Chaetodipus formosus*)	Common in sagebrush, desert scrub, and desert succulent shrub habitats with rocky or stony groundcover. Often inhabits rocky washes and canyon mouths. Uses underground burrows. About 4,352,300 acres of potentially suitable habitat occurs in the SEZ region.	19,160 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	167,153 acres of potentially suitable habitat (3.8% of available potentially suitable habitat)	Small. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Merriam's kangaroo rat (*Dipodomys merriami*)	Most widespread kangaroo rat in California. In southern California, occurs in desert scrub and alkali desert scrub, sagebrush, Joshua tree, and pinyon-juniper habitats. Uses desert flats or slopes with sparse to moderate canopy coverage and sandy to gravelly substrates. Uses underground burrows often located at the base of a shrub. About 3,144,400 acres of potentially suitable habitat occurs in the SEZ region.	15,996 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	115,203 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	Small.

TABLE 9.3.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat	Maximum Area of Potential Habitat Affected[a]: Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a]: Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Nongame (small) Mammals (Cont.)				
Southern grasshopper mouse (*Onychomys torridus*)	Hot, arid valleys and scrub deserts with sparse and scattered vegetation such as mesquite, creosotebush cholla, yucca, and short grasses. Frequents scrub habitats with friable soils for digging. Also uses abandoned underground burrows. About 3,118,700 acres of potentially suitable habitat occurs in the SEZ region.	15,993 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	114,782 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	Small.
Spotted bat (*Euderma maculatum*)	Mostly found in the foothills, mountains, and desert regions of southern California. Roosts in caves and cracks or crevices in cliffs and canyons. About 4,100,900 acres of potentially suitable habitat occurs in the SEZ region.	16,297 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	146,942 acres of potentially suitable habitat (3.6% of available potentially suitable habitat)	Small.
Western pipistrelle (*Parastrellus hesperus*)	Deserts and lowlands, desert mountain ranges, desert scrub flats, and rocky canyons. Roosts mostly in rock crevices, sometimes mines and caves, and rarely in buildings. Suitable roosts occur in rocky canyons and cliffs. Most abundant bat in desert regions. About 3,668,800 acres of potentially suitable habitat occurs in the SEZ region.	16,492 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	144,416 acres of potentially suitable habitat (3.9% of available potentially suitable habitat)	Small.

[a] Maximum area of potentially suitable habitat affected relative to total available potentially suitable habitat within the SEZ region (i.e., a 50-mi [80-km] radius from the center of the SEZ). Habitat availability was determined from potentially suitable land cover for each species (USGS 2004, 2005, 2007).

[b] Direct effects within the SEZ consist of ground-disturbing activities associated with construction and the maintenance of an altered environment associated with operations. A maximum of 19,160 acres would be developed in the SEZ.

Footnotes continued on next page.

1

TABLE 9.3.11.3-1 (Cont.)

[c] The area of indirect effects was assumed to be the area adjacent to the SEZ within 5 mi (8 km) of the SEZ boundary. Indirect effects include effects from surface runoff, dust, noise, lighting, etc., from the SEZ, but do not include ground-disturbing activities. The potential degree of indirect effects would decrease with increasing distance from the SEZ boundary.

[d] Overall impact magnitude categories were based on professional judgment and were (1) *small*: ≤1% of potentially suitable habitat for the species would be lost and the activity would not result in a measurable change in the carrying capacity or population size in the affected area; (2) *moderate*: >1 but ≤10% of potentially suitable habitat for the species would be lost and the activity would potentially result in a measurable but moderate (not destabilizing) change in the carrying capacity or population size in the affected area; and (3) *large*: >10% of potentially suitable habitat for the species would be lost and the activity would result in a potentially large, measurable, and destabilizing change in the carrying capacity or population size in the affected area. Note that much greater weight was given to the magnitude of direct effects, because those effects would be difficult to mitigate. Programmatic design features would reduce most indirect effects to negligible levels.

[e] Species-specific mitigation is presented for those species that have particular habitat features that could be readily avoided. For species or individuals occurring outside the SEZ (in the area of indirect effects), no mitigation measures beyond required programmatic design features have been identified.

[f] To convert acres to km^2, multiply by 0.004047.

Sources: CDFG (2008); NatureServe (2010); USGS (2004, 2005, 2007).

Decommissioning of facilities and reclamation of disturbed areas after operations cease could result in short-term negative impacts on individuals and habitats adjacent to project areas, but long-term benefits would accrue if suitable habitats were restored in previously disturbed areas. Section 5.10.2.1.4 provides an overview of the impacts of decommissioning and reclamation on wildlife. Of particular importance for mammal species would be the restoration of original ground surface contours, soils, and native plant communities associated with semiarid shrublands.

9.3.11.3.3 SEZ-Specific Design Features and Design Feature Effectiveness

The implementation of required programmatic design features described in Appendix A, Section A.2.2, would reduce the potential for effects on mammals. While some SEZ-specific design features are best established when considering specific project details, the following design feature can be identified at this time:

- Development within the ephemeral drainages should be avoided in order to reduce impacts on species such as the round-tailed ground squirrel, white-tailed antelope squirrel, little pocket mouse, long-tailed pocket mouse, and any other mammal species that inhabit wash habitats.

If this SEZ-specific design feature is implemented in addition to programmatic design features, impacts on mammal species could be reduced. Any residual impacts on mammals are anticipated to be small given the relative abundance of suitable habitats in the SEZ region. However, as potentially suitable habitats for a number of the mammal species occur throughout much of the SEZ, additional species-specific mitigation of direct effects for those species would be difficult or infeasible.

9.3.11.4 Aquatic Biota

9.3.11.4.1 Affected Environment

This section addresses aquatic habitats and biota that are known to occur on the proposed Pisgah SEZ itself or within an area that could be affected, either directly or indirectly, by activities associated with solar energy development within the SEZ. For the proposed Pisgah SEZ, the area of direct effect was considered to be the entire SEZ area. As discussed in Section 9.3.1.1, a new access road would not be needed because I-40 runs east–west along the southern edge and then through the Pisgah SEZ. In addition, for this analysis, the impacts of construction and operation of transmission lines outside of the SEZ were not assessed, assuming that the existing 230-kV transmission line might be used to connect some new solar facilities to load centers, and that additional project-specific analysis would be done for new transmission construction or line upgrades.

Within the Pisgah SEZ, Troy Lake is the only body of water (Figure 9.3.10-2). Troy Lake is a dry lake consisting of playa and dune sediments, of which approximately 1,633 acres (6.6 km^2) are within the boundaries of the proposed SEZ. As a dry lake with sediments that contain alkali salts, Troy Lake contains no water, and is not expected to support aquatic biota or aquatic habitats. However, more site-specific data is needed to fully evaluate aquatic biota, if present, in Troy Lake. No other water body, stream, or wetland features are present in the Pisgah SEZ.

The area of potential indirect impacts on aquatic biota from SEZ development was assumed to extend up to 5 mi (8 km) beyond the SEZ boundary. Approximately 1,953 acres (8 km^2) of Troy Lake and 1,249 acres (5 km^2) of Lavic Lake are located within the area of indirect impacts (Figure 9.3.10-2). Like Troy Lake, Lavic Lake is dry and is not expected to support aquatic habitat or communities. However, more site-specific data is needed to fully evaluate aquatic biota, if present, in these dry lake features. No other water body, stream or wetland features are present within the area of indirect effects. Therefore, no aquatic biota or habitats are expected to be present within 5 mi (8 km) of the SEZ.

Outside of the indirect effects area, but within 50 mi (80 km) of the SEZ, there are approximately 2,102 acres (8.5 km^2) of lake (Big Bear Lake) and 16 dry lakes, totaling 86,413 acres (350 km^2). Also present within 50 mi (80 km) of the SEZ are 106 mi (171 km) of intermittent streams. No wetlands are present.

9.3.11.4.2 Impacts

Impacts that could affect aquatic habitats and biota as a result of the development of utility-scale solar energy facilities are discussed in Section 5.10.3.1. Effects particularly relevant to aquatic habitats and communities include water withdrawal and changes in water, sediment, and contaminant inputs associated with runoff. However, no permanent water bodies, perennial streams, or wetlands are present within the boundaries of the Pisgah SEZ or within the 5-mi

(8-km) radius potentially susceptible to indirect impacts. Consequently, no direct or indirect impacts on aquatic habitats are expected to result from construction and operation of utility-scale solar energy facilities at the Pisgah SEZ. However, more detailed site surveys of ephemeral and intermittent surface waters would be needed to determine whether solar energy development activities would result in direct or indirect impacts on aquatic biota.

In arid environments, reduction in the quantity of water in aquatic habitats is of particular concern. While no direct impacts on aquatic communities are anticipated from water withdrawal at the SEZ, the amount of water in surrounding aquatic habitats could be affected if significant amounts of surface water or groundwater are utilized for power-plant cooling water, for washing mirrors, or for other needs. The greatest need for water would occur if technologies that employed wet cooling, such as parabolic troughs or power towers, were developed at the site; the associated impacts would ultimately depend on the water source used (including groundwater from aquifers at various depths). As noted in Section 9.3.9.1.3, it seems unlikely that approval to withdraw water from the Lower Mojave River Valley basin (already fully allocated) and potentially the Lavic Valley basin could be obtained. Obtaining cooling water from other perennial surface water features in the region could affect water levels and, as a consequence, aquatic organisms in those water bodies. Additional details regarding the volume of water required and the types of organisms present in potentially affected water bodies would be required in order to further evaluate the potential for impacts from water withdrawals.

9.3.11.4.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features are identified because effects on aquatic habitats or biota from solar energy development within the proposed Pisgah SEZ would be negligible.

9.3.12 Special Status Species (Threatened, Endangered, Sensitive, and Rare Species)

This section addresses special status species that are known to occur, or for which suitable habitat occurs, on or within the potentially affected area of the proposed Pisgah SEZ. Special status species include the following types of species[6]:

- Species listed as threatened or endangered under the ESA;
- Species that are proposed for listing, under review, or are candidates for listing under the ESA;
- Species that are listed as threatened or endangered by the State of California under the CESA, or that are identified as fully protected by the state7;
- Species that are listed by the BLM as sensitive; and
- Species that have been ranked by the State of California as S1 or S2, or species of concern by the State of California or the USFWS; hereafter referred to as “rare” species.

Special status species known to occur within 50 mi (80 km) of the Pisgah SEZ center (i.e., the SEZ region) were determined from natural heritage records available through NatureServe Explorer (NatureServe 2010), information provided by the California Department of Fish and Game (CDFG 2010a), CNDDB (CDFG 2010b), and CAReGAP (Davis et al. 1998; USGS 2010a). Information reviewed consisted of county-level occurrences as determined from NatureServe, point and polygon element occurrences as determined from CNDDB, and modeled land cover types and predicted suitable habitats for the species within the 50-mi (80-km) region as determined from CAReGAP. The 50-mi (80-km) SEZ region (including the areas of direct and indirect effects) lies entirely within San Bernardino County, California. See Appendix M for additional information on the approach used to identify species that could be affected by development within the SEZ.

9.3.12.1 Affected Environment

The affected area considered in the assessment included the areas of direct and indirect effects. The area of direct effects was defined as the area that would be physically modified during project development (i.e., where ground-disturbing activities would occur). For the Pisgah SEZ, the area of direct effect was limited to the SEZ itself. Due to the proximity of existing infrastructure, the impacts of construction and operation of transmission lines outside of the SEZ

---

[6] See Section 4.6.4 for definitions of these species categories. Note that some of the categories of species included here do not fit BLM’s definition of special status species as defined in BLM Manual 6840 (BLM 2008). These species are included here to ensure broad consideration of species that may be most vulnerable to impacts.

[7] State-listed species are those listed as threatened or endangered under the CESA; California fully protected species are species that receive the strictest take provisions as identified by the CDFG.

are not assessed, assuming that the existing transmission infrastructure might be used to connect some new solar facilities to load centers, and that additional project-specific analysis would be conducted for new transmission construction or line upgrades. Similarly, the impacts of construction or upgrades to access roads were not assessed for this SEZ due to the proximity of I-40 (see Section 9.3.1.2 for a discussion of development assumptions for this SEZ). The area of indirect effects was defined as the area within 5 mi (8 km) of the SEZ boundary where ground-disturbing activities would not occur but that could be indirectly affected by activities in the area of direct effect. Indirect effects considered in the assessment include effects from surface runoff, dust, noise, lighting, and accidental spills from the SEZ, but do not include ground-disturbing activities. The potential magnitude of indirect effects would decrease with increasing distance away from the SEZ. This area of indirect effect was identified on the basis of professional judgment and was considered sufficiently large to bound the area that would potentially be subject to indirect effects. The affected area includes both the direct and indirect effects areas.

The primary habitat type in the affected area is Sonora–Mojave creosotebush–white bursage desert scrub (see Section 9.3.10). Potentially unique habitats in the affected area in which special status species may reside include desert dunes, rocky cliffs and outcrops, desert washes, and playas. Dry lake desert playas in the affected area include Troy Lake and Lavic Lake. The Troy Lake playa occurs in the western portion of the SEZ; Lavic Lake occurs outside of the SEZ but within the area of indirect effects approximately 4 mi (6 km) southeast of the SEZ. The Mojave River occurs outside of the affected area but flows as near as 7 mi (11 km) northwest of the SEZ (Figure 9.3.12.1-1).

In scoping comments on the proposed Pisgah SEZ (Stout 2009), the USFWS expressed concern that groundwater withdrawals associated with solar energy development on the SEZ may reduce the groundwater supply from the regional basin that supports aquatic and riparian habitat in the SEZ region, particularly artificial refugia for the federally listed endangered Mohave tui chub at Camp Cady, which is approximately 6 mi (10 km) northwest of the SEZ. Groundwater withdrawals within the SEZ may also affect aquatic and riparian habitats along the Mojave River, approximately 6 mi (10 km) northwest of the SEZ. Although these areas are outside the above-defined affected area, they are considered in the area of indirect effects for this evaluation.

All special status species that are known to occur within the Pisgah SEZ region (i.e., within 50 mi [80 km] of the center of the SEZ) are listed, with their status, nearest recorded occurrence, and habitats in Appendix J. Of these species, 54 could be affected by solar energy development within the SEZ, based on recorded occurrences or the presence of potentially suitable habitat in the area. These species, their status, and their habitats are presented in Table 9.3.12.1-1. For many of the species listed in the table, their predicted potential occurrence in the affected area is based only on a general correspondence between mapped CAReGAP land cover types and descriptions of species habitat preferences. This overall approach to identifying species in the affected area probably overestimates the number of species that actually occur in the affected area. For many of the species identified as having potentially suitable habitat in the affected area, the nearest known occurrence is more than 20 mi (32 km) away from the SEZ.

On the basis of CNDDB records and information provided by the CDFG and USFWS, there are 10 special status species that are known to occur within the affected area of the Pisgah SEZ: Emory's crucifixion-thorn, small-flowered androstephium, white-margined beardtongue, Arroyo chub, Mohave tui chub, desert tortoise, Mojave fringe-toed lizard, southwestern pond turtle, Bendire's thrasher, and Nelson's bighorn sheep. The nearest occurrences of the Arroyo chub, Mohave tui chub, and southwestern pond turtle are more than 5 mi (8 km) from the SEZ; however, these species are considered to occur within the affected area because they occur in areas that may be affected by groundwater withdrawal from the SEZ.

9.3.12.1.1 Species Listed under the ESA That Could Occur in the Affected Area

In their scoping comments on the proposed Pisgah SEZ, the USFWS expressed concern for impacts of project development within the Pisgah SEZ on the desert tortoise (a species listed as threatened under the ESA in the State of California) and the Mojave tui chub (a species listed as endangered under the ESA) (Stout 2009). Both of these species are known to occur in the affected area. These species are discussed below; additional basic information on life history, habitat needs, and threats to populations of these species is provided in Appendix J.

Mohave Tui Chub

The Mohave tui chub occurs in artificial refugia at the CDFG's Camp Cady Wildlife Area along the Mojave River, approximately 6 mi (10 km) northwest of the Pisgah SEZ. This site is one of only three known locations for this species globally (USFWS 2009b). The proximity of this location relative to the SEZ and area of indirect effects is shown in Figure 9.3.12.1-1 and summarized in Table 9.3.12.1-1.

In its scoping letter for the Pisgah SEZ, the USFWS discussed the interconnection of the groundwater system that supports the aquatic and riparian habitats of the Mojave River and Camp Cady and groundwater associated with Troy Lake (along the western portion of the SEZ). The USFWS expressed concern that groundwater withdrawals from the vicinity of Troy Lake to serve solar development on the Pisgah SEZ could contribute to the depletion of the regional groundwater system, which is already depleted, and could potentially affect the artificial habitat for the Mojave tui chub at the Camp Cady Wildlife Area by making it difficult to pump water to maintain this habitat (Stout 2009).

The USFWS has not designated critical habitat for this species.

Desert Tortoise

The desert tortoise has the potential to occur within the SEZ on the basis of observed occurrences on and near the SEZ, the presence of designated critical habitat within the area of indirect effects, and the presence of potentially suitable habitat in the SEZ (Figure 9.3.12.1-1; Table 9.3.12.1-1).

TABLE 9.3.12.1-1 Habitats, Potential Impacts, and Potential Mitigation for Special Status Species That Could Be Affected by Solar Energy Development on the Proposed Pisgah SEZ

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants						
Alkali mariposa-lily	*Calochortus striatus*	BLM-S; CA-S2; FWS-SC	Alkaline seeps, springs, and meadows at elevations between 2,600 and 4,600 ft.[h, i] Nearest recorded occurrences are 25 mi[j] northwest of the SEZ. About 107,377 acres[k] of potentially suitable habitat occurs within the SEZ region.	2,795 acres of potentially suitable habitat associated with the Troy Lake playa lost (2.6% of available potentially suitable habitat)	4,767 acres of potentially suitable habitat (4.4% of available potentially suitable habitat)	Moderate overall impact. Avoiding or minimizing disturbance of playa habitat on the SEZ could reduce impacts. In addition, pre-disturbance surveys and avoiding or minimizing disturbance of occupied habitats on the SEZ, translocation of individuals from areas of direct effect, or compensatory mitigation of direct effects on occupied habitats could reduce impacts. Note that these same potential mitigations apply to all special status plants.
Barstow woolly sunflower	*Eriophyllum mohavense*	BLM-S; CA-S2; FWS-SC	Known only from area surrounding Barstow, California on sandy or rocky substrates associated with creosotebush scrub, chenopod scrub, and playas at elevations between 2,000 and 3,000 ft. Nearest recorded occurrences are 20 mi northwest of the SEZ. About 2,677,079 acres of potentially suitable habitat occurs within the SEZ region.	18,466 acres of potentially suitable habitat lost (0.7% of available potentially suitable habitat)	111,523 acres of potentially suitable habitat (4.2% of available potentially suitable habitat)	Small overall impact. See alkali mariposa-lily for a list of potential mitigations applicable to all special status plant species.

TABLE 9.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
Black bog-rush	*Schoenus nigricans*	CA-S2	Endemic to California on alkaline or calcareous substrates within grasslands, marshes, springs, and swamps at elevations between 500 and 6,500 ft. Nearest recorded occurrences are 45 mi from the SEZ. About 107,377 acres of potentially suitable habitat occurs within the SEZ region.	2,795 acres of potentially suitable habitat associated with the Troy Lake playa lost (2.6% of available potentially suitable habitat)	4,767 acres of potentially suitable habitat (4.4% of available potentially suitable habitat)	Moderate overall impact. Avoiding or minimizing disturbance of playa habitat on the SEZ could reduce impacts. See alkali mariposa-lily for a list of potential mitigations applicable to all special status plant species.
Booth's evening-primrose	*Camissonia boothii* ssp. *boothii*	CA-S2	Shrubby, open, or dry areas of Joshua tree and pinyon-juniper woodlands at elevations between 3,000 and 7,900 ft. Nearest recorded occurrences are 45 mi from the SEZ. About 597,859 acres of potentially suitable habitat occurs within the SEZ region.	879 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat)	6,585 acres of potentially suitable habitat (1.1% of available potentially suitable habitat)	Small overall impact. See alkali mariposa-lily for a list of potential mitigations applicable to all special status plant species.
California saw-grass	*Cladium californicum*	CA-S2	Alkaline, freshwater, and riparian habitats, including meadows, marshes, swamps, and seeps at elevations between 200 and 2,000 ft. Nearest recorded occurrences are 45 mi from the SEZ. About 118,936 acres of potentially suitable habitat occurs within the SEZ region.	2,795 acres of potentially suitable habitat associated with the Troy Lake playa lost (2.4% of available potentially suitable habitat)	4,835 acres of potentially suitable habitat (4.1% of available potentially suitable habitat)	Moderate overall impact. Avoiding or minimizing disturbance of playa habitat on the SEZ could reduce impacts. See alkali mariposa-lily for a list of potential mitigations applicable to all special status plant species.

TABLE 9.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
Chaparral sand-verbena	*Abronia villosa* var. *aurita*	BLM-S; CA-S2	Endemic to southern California in chaparral desert sand dunes at elevations between 350 and 5,250 ft. Nearest recorded occurrences are 30 mi west of the SEZ. About 159,724 acres of potentially suitable habitat occurs within the SEZ region.	322 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat)	5,155 acres of potentially suitable habitat (3.2% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance to dunes and sand transport systems on the SEZ could reduce impacts. See alkali mariposa-lily for a list of potential mitigations applicable to all special status plant species.
Clokey's cryptantha	*Cryptantha clokeyi*	BLM-S; CA-S1	Mojave desertscrub on sandy or gravelly soils at elevations between 2,625 and 2,950 ft. Nearest recorded occurrences are 22 mi northwest of the SEZ. About 2,881,951 acres of potentially suitable habitat occurs within the SEZ region.	15,427 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	107,664 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	Small overall impact. See alkali mariposa-lily for a list of potential mitigations applicable to all special status plant species.
Coulter's goldfields	*Lasthenia glabrata* ssp. *coulteri*	BLM-S; CA-S2	Endemic to California in salt marshes, swamps, playas, alkaline sinks, and vernal pools at elevations below 4,000 ft. Nearest recorded occurrences are 50 mi south of the SEZ. About 107,377 acres of potentially suitable habitat occurs within the SEZ region.	2,795 acres of potentially suitable habitat associated with the Troy Lake playa lost (2.6% of available potentially suitable habitat)	4,767 acres of potentially suitable habitat (4.4% of available potentially suitable habitat)	Moderate overall impact. Avoiding or minimizing disturbance of playa habitat on the SEZ could reduce impacts. See alkali mariposa-lily for a list of potential mitigations applicable to all special status plant species.

TABLE 9.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
Creamy blazing-star	*Mentzelia tridentata*	BLM-S; CA-S2	Mojave desert creosotebush scrub communities on rocky and sandy substrates at elevations below 3,900 ft. Nearest recorded occurrences are 11 mi west of the SEZ. About 2,300,615 acres of potentially suitable habitat occurs within the SEZ region.	14,548 acres of potentially suitable habitat lost (0.6% of available potentially suitable habitat)	101,079 acres of potentially suitable habitat (4.4% of available potentially suitable habitat)	Small overall impact. See alkali mariposa-lily for a list of potential mitigations applicable to all special status plant species.
Darwin rock-cress	*Arabis pulchra* var. *munciensis*	CA-S1	Carbonate substrates along canyons, slopes, and washes at elevations between 3,600 and 6,800 ft. Nearest recorded occurrences are 50 mi from the SEZ. About 1,363,295 acres of potentially suitable habitat occurs within the SEZ region.	1,749 acres of potentially suitable rocky cliff and wash habitats lost (0.1% of available potentially suitable habitat)	42,969 acres of potentially suitable habitat (3.2% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance of desert washes on the SEZ could reduce impacts. See alkali mariposa-lily for a list of potential mitigations applicable to all special status plant species.
Desert bedstraw	*Galium proliferum*	CA-S2	Endemic to southern California on carbonate substrates of rocky banks and ledges within Joshua tree woodlands, creosotebush scrub, Mojave desertscrub, and pinyon-juniper woodland habitats at elevations between 3,900 and 5,150 ft. Nearest recorded occurrences are 50 mi from the SEZ. About 4,179,076 acres of potentially suitable habitat occurs within the SEZ region.	16,932 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	148,726 acres of potentially suitable habitat (3.6% of available potentially suitable habitat)	Small overall impact. See alkali mariposa-lily for a list of potential mitigations applicable to all special status plant species.

TABLE 9.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
Desert cymopterus	*Cymopterus deserticola*	BLM-S	Deep, loose, well-drained, fine to coarse sandy soils of alluvial fan basins, often in low sand dunes and on sandy slopes at elevations between 2,060 and 3,060 ft. Nearest recorded occurrences are 35 mi northwest of the SEZ. About 82,699 acres of potentially suitable habitat occurs within the SEZ region.	244 acres of potentially suitable desert wash habitat lost (0.3% of available potentially suitable habitat)	1,907 acres of potentially suitable habitat (2.3% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance of dunes and sand transport systems on the SEZ could reduce impacts. See alkali mariposa-lily for a list of potential mitigations applicable to all special status plant species.
Desert pincushion	*Coryphantha chlorantha*	CA-S1	Gravelly bajadas, limestone or dolomite rocky slopes often in association with pinyon-juniper woodland and Joshua tree woodland communities at elevations between 150 and 7,900 ft. Nearest recorded occurrences are 40 mi from the SEZ. About 2,898,476 acres of potentially suitable habitat occurs within the SEZ region.	15,427 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	107,664 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	Small overall impact. See alkali mariposa-lily for a list of potential mitigations applicable to all special status plant species.
Emory's crucifixion-thorn[l]	***Castela emoryi***[l]	CA-S2	Slightly wet areas with fine-textured alluvial bottomland soils associated with basalt flows within Mojave desertscrub, non-saline playas, creosotebush scrub, and Sonoran desertscrub communities at elevations between 295 and 2,200 ft. Known to occur on the SEZ and within other portions of the affected area. About 2,989,328 acres of potentially suitable habitat occurs within the SEZ region.	18,222 acres of potentially suitable habitat lost (0.6% of available potentially suitable habitat)	112,431 acres of potentially suitable habitat (3.8% of available potentially suitable habitat)	Small overall impact. See alkali mariposa-lily for a list of potential mitigations applicable to all special status plant species.

TABLE 9.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c] Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c] Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
Flat-seeded spurge	*Chamaesyce platysperma*	BLM-S; CA-S1; FWS-SC	Sandy substrates of desert dunes within desertscrub communities at elevations below 650 ft. Nearest recorded about 20 mi southwest of the SEZ; the species has not been recorded in the project area since 1974. About 147,861 acres of potentially suitable habitat occurs within the SEZ region.	322 acres of potentially suitable desert dune habitat lost (0.2% of available potentially suitable habitat)	5,155 acres of potentially suitable habitat (3.5% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance of desert dunes and sand transport systems could reduce impacts. See alkali mariposa-lily for a list of potential mitigations applicable to all special status plant species, however, translocation may not be a feasible option for this species.
Harwood's eriastrum	*Eriastrum harwoodii*	BLM-S; CA-S2	Desert dunes and other sandy habitats at elevations between 650 and 3,000 ft. Nearest recorded occurrences are 35 mi northeast of the SEZ. About 147,861 acres of potentially suitable habitat occurs within the SEZ region.	322 acres of potentially suitable desert dune habitat lost (0.2% of available potentially suitable habitat)	5,155 acres of potentially suitable habitat (3.5% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance of dunes and sand transport systems on the SEZ could reduce impacts. See alkali mariposa-lily for a list of potential mitigations applicable to all special status plant species.

TABLE 9.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
Jackass-clover	*Wislizenia refracta* ssp. *refracta*	CA-S1	Dunes, sandy washes, roadsides, and playas within creosotebush scrub, alkali sink, or desertscrub communities of the Mojave and northern Sonoran Desert at elevations between 2,000 and 2,600 ft. Nearest recorded occurrences are 30 mi from the SEZ. About 406,930 acres of potentially suitable habitat occurs within the SEZ region.	3,535 acres of potentially suitable desert dune, playa, and wash habitats lost (0.9% of available potentially suitable habitat)	13,813 acres of potentially suitable habitat (3.4% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance of desert playas and washes on the SEZ could reduce impacts. See alkali mariposa-lily for a list of potential mitigations applicable to all special status plant species.
Latimer's woodland-gilia	*Saltugilia latimeri*	BLM-S; CA-S2	Mojave desertscrub communities, pinyon-juniper woodlands, and washes on rocky or sandy substrates at elevations between 1,300 and 6,500 ft. Nearest recorded occurrence is 35 mi east of the SEZ. About 2,981,173 acres of potentially suitable habitat occurs within the SEZ region.	15,671 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	109,571 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	Small overall impact. See alkali mariposa-lily for a list of potential mitigations applicable to all special status plant species.
Limestone beardtongue	*Penstemon calcareus*	BLM-S; CA-S2	Mojave desertscrub communities, pinyon-juniper forests, and Joshua tree woodlands on rocky carbonate substrates at elevations between 3,280 and 6,550 ft. Nearest recorded occurrences are 45 mi east of the SEZ. About 2,898,474 acres of potentially suitable habitat occurs within the SEZ region.	15,427 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	107,664 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	Small overall impact. See alkali mariposa-lily for a list of potential mitigations applicable to all special status plant species.

TABLE 9.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
Little San Bernardino Mountains linanthus	*Linanthus maculatus*	BLM-S; CA-S1	Desert dunes and sandy flats within creosotebush scrub and Joshua tree woodland communities at elevations less than 6,900 ft. Nearest recorded occurrences are 30 mi south of the SEZ. About 147,861 acres of potentially suitable habitat occurs within the SEZ region.	322 acres of potentially suitable desert dune habitat lost (0.2% of available potentially suitable habitat)	5,155 acres of potentially suitable habitat (3.5% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance of dunes and sand transport systems on the SEZ could reduce impacts. See alkali mariposa-lily for a list of potential mitigations applicable to all special status plant species.
Long-stem evening-primrose	*Oenothera longissima*	CA-S1	Restricted to Inyo and San Bernardino counties in California in seasonally mesic desertscrub, creosotebush scrub, and pinyon-juniper woodland habitat at elevations between 3,300 and 5,500 ft. Nearest recorded occurrences are 50 mi from the SEZ. About 2,898,474 acres of potentially suitable habitat occurs within the SEZ region.	15,427 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	107,664 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	Small overall impact. See alkali mariposa-lily for a list of potential mitigations applicable to all special status plant species.
Mojave monkeyflower	*Mimulus mohavensis*	BLM-S; CA-S2; FWS-SC	Endemic to the western Mojave Desert in San Bernardino County, California on gravelly banks of desert washes at elevations below 3,900 ft. Nearest recorded occurrences are 8 mi west of the SEZ. About 82,699 acres of potentially suitable habitat occurs within the SEZ region.	244 acres of potentially suitable desert wash habitat lost (0.3% of available potentially suitable habitat)	1,907 acres of potentially suitable habitat (2.3% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance of desert wash habitats on the SEZ could reduce impacts. See alkali mariposa-lily for a list of potential mitigations applicable to all special status plant species.

TABLE 9.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
Narrow-leaved cottonwood	*Populus angustifolia*	CA-S2	Upland riparian forest habitats at elevations between 3,900 and 5,900 ft. Nearest recorded occurrences are 45 mi from the SEZ. About 11,559 acres of potentially suitable habitat occurs within the SEZ region.	0 acres of potentially suitable habitat	68 acres of potentially suitable habitat (0.6% of available potentially suitable habitat)	Small overall impact; no direct impact. No species-specific mitigation is warranted.
Palmer's mariposa-lily	*Calochortus palmeri* var. *palmeri*	BLM-S; CA-S2; FWS-SC	Moist to wet meadows or moist grassy knolls and along creeks or swales within chaparral, pinyon woodlands, and pine forest communities at elevations between 3,280 and 7,850 ft. Nearest recorded occurrences are 35 mi southwest of the SEZ. About 11,559 acres of potentially suitable habitat occurs within the SEZ region.	0 acres of potentially suitable habitat	68 acres of potentially suitable habitat (0.6% of available potentially suitable habitat)	Small overall impact; no direct impact. No species-specific mitigation is warranted.
Parish's brittlescale	*Atriplex parishii*	BLM-S; CA-S1; FWS-SC	Chenopod scrub, playas, and vernal pools in southern California at elevations between 100 and 6,200 ft. Nearest recorded occurrences are 35 mi southwest of the SEZ. About 376,464 acres of potentially suitable habitat occurs within the SEZ region.	3,918 acres of potentially suitable desert playa and wash habitats lost (1.0% of available potentially suitable habitat)	10,444 acres of potentially suitable habitat (2.8% of available potentially suitable habitat)	Moderate overall impact. Avoiding or minimizing disturbance of desert playa habitats on the SEZ could reduce impacts. See alkali mariposa-lily for a list of potential mitigations applicable to all special status plant species.

TABLE 9.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
Parish's club-cholla	*Grusonia parishii*	CA-S2	Silty, sandy, or gravelly flats, dunes, and hills within Joshua tree woodland, and desertscrub communities at elevations between 100 and 5,000 ft. Nearest recorded occurrences are 45 mi from the SEZ. About 3,150,630 acres of potentially suitable habitat occurs within the SEZ region.	18,945 acres of potentially suitable habitat lost (0.6% of available potentially suitable habitat)	129,785 acres of potentially suitable habitat (4.1% of available potentially suitable habitat)	Small overall impact. See alkali mariposa-lily for a list of potential mitigations applicable to all special status plant species.
Parish's phacelia	*Phacelia parishii*	BLM-S; CA-S1; FWS-SC	Mojave desertscrub communities and playas on alkaline-clay soils. Elevation ranges between 1,800 and 3,900 ft. Nearest recorded occurrences are 12 mi northwest of the SEZ. About 2,989,326 acres of potentially suitable habitat occurs within the SEZ region.	18,222 acres of potentially suitable habitat lost (0.6% of available potentially suitable habitat)	112,431 acres of potentially suitable habitat (3.8% of available potentially suitable habitat)	Small overall impact. See alkali mariposa-lily for a list of potential mitigations applicable to all special status plant species.
Prairie wedge grass	*Sphenopholis obtusata*	CA-S2	Cismontane woodland, foothill woodland, stream banks, ponds, and mesic meadows and seeps at elevations between 990 and 6,500 ft. Nearest recorded occurrences are 45 mi from the SEZ. About 11,559 acres of potentially suitable habitat occurs within the SEZ region.	0 acres of potentially suitable habitat	68 acres of potentially suitable habitat (0.6% of available potentially suitable habitat)	Small overall impact; no direct impact. No species-specific mitigation is warranted.
Purple-nerve cymopterus	*Cymopterus multinervatus*	CA-S2	Sandy or gravelly slopes within desertscrub, Joshua tree woodland, and pinyon-juniper woodland communities at elevations between 2,600 and 5,900 ft. Nearest recorded occurrences are 6 mi southwest of the SEZ. About 2,898,476 acres of potentially suitable habitat occurs within the SEZ region.	15,427 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	107,664 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	Small overall impact. See alkali mariposa-lily for a list of potential mitigations applicable to all special status plant species.

TABLE 9.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
Salt Spring checkerbloom	*Sidalcea neomexicana*	CA-S2	Alkaline or mesic substrates within riparian wetlands, marshes, springs, chaparral, coastal scrub, coniferous forest, desertscrub, and playas habitats at elevations between 50 and 5,000 ft. Nearest recorded occurrences are 35 mi from the SEZ. About 3,012,750 acres of potentially suitable habitat occurs within the SEZ region.	18,222 acres of potentially suitable habitat lost (0.6% of available potentially suitable habitat)	112,499 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	Small overall impact. See alkali mariposa-lily for a list of potential mitigations applicable to all special status plant species.
Slender cottonheads	*Nemacaulis denudata* var. *gracilis*	CA-S2	Sandy soils within coastal dunes, desert dunes, creosotebush scrub, and desertscrub communities at elevations below 1,300 ft. Nearest recorded occurrences are 35 mi from the SEZ. About 3,029,812 acres of potentially suitable habitat occurs within the SEZ region.	15,749 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	112,819 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	Small overall impact. See alkali mariposa-lily for a list of potential mitigations applicable to all special status plant species.
Small-flowered androsteph-ium	***Androstephium breviflorum***	CA-S1	Dry sandy to rocky soil substrates within desert dunes, creosotebush scrub, and desertscrub at elevations between 720 and 2,100 ft. Known to occur on the SEZ and within other portions of the affected area. About 3,130,736 acres of potentially suitable habitat occurs within the SEZ region.	18,942 acres of potentially suitable habitat lost (0.6% of available potentially suitable habitat)	129,330 acres of potentially suitable habitat (4.1% of available potentially suitable habitat)	Small overall impact. See alkali mariposa-lily for a list of potential mitigations applicable to all special status plant species.
Spear-leaf matelea	*Matelea parvifolia*	CA-S2	Rocky substrates within creosotebush scrub and desertscrub communities. Elevation ranges between 1,450 and 3,600 ft. Nearest recorded occurrences are 40 mi from the SEZ. About 2,881,951 acres of potentially suitable habitat occurs within the SEZ region.	15,427 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	107,664 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	Small overall impact. See alkali mariposa-lily for a list of potential mitigations applicable to all special status plant species.

TABLE 9.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c] Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c] Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
Stephens' beardtongue	*Penstemon stephensii*	BLM-S; CA-S2; FWS-SC	Restricted to Inyo and San Bernardino counties, California on rocky (usually carbonate) substrates, including rock crevices, cliffs, rocky slopes, and washes associated with pinyon-juniper and creosotebush scrub communities at elevations between 3,900 and 6,550 ft. Nearest recorded occurrences are 40 mi east of the SEZ. About 3,663,910 acres of potentially suitable habitat occurs within the SEZ region.	16,297 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	144,048 acres of potentially suitable habitat (3.9% of available potentially suitable habitat)	Small overall impact. See alkali mariposa-lily for a list of potential mitigations applicable to all special status plant species.
Three-awned grama	*Bouteloua trifida*	CA-S2	Eastern Mojave Desert mountains on dry, rocky, often calcareous slopes within desertscrub communities at elevations between 2,300 and 6,500 ft. Nearest recorded occurrence is 45 mi east of the SEZ. About 2,881,951 acres of potentially suitable habitat occurs within the SEZ region.	15,427 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	107,664 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	Small overall impact. See alkali mariposa-lily for a list of potential mitigations applicable to all special status plant species.
Tidestrom's milkvetch	*Astragalus tidestromii*	CA-S2	East-central Mojave Desert mountains on sandy or gravelly substrates of carbonate derivation within creosotebush and desertscrub communities at elevations between 1,950 and 5,200 ft. Nearest recorded occurrences are 35 mi from the SEZ. About 2,881,951 acres of potentially suitable habitat occurs within the SEZ region.	15,427 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	107,664 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	Small overall impact. See alkali mariposa-lily for a list of potential mitigations applicable to all special status plant species.

TABLE 9.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c] Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c] Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
Utah glasswort	*Sarcocornia utahensis*	CA-S1	Alkaline substrates within chenopod scrub and playa habitats at elevations near 1,050 ft. Known to occur as near as Harper Lake, approximately 45 mi west of the SEZ. About 376,464 acres of potentially suitable habitat occurs within the SEZ region.	3,918 acres of potentially suitable desert playa and wash habitats lost (1.0% of available potentially suitable habitat)	10,444 acres of potentially suitable habitat (2.8% of available potentially suitable habitat)	Moderate overall impact. Avoiding or minimizing disturbance of desert playa habitats on the SEZ could reduce impacts. See alkali mariposa-lily for a list of potential mitigations applicable to all special status plant species.
White-bracted spineflower	*Chorizanthe xanti* var. *leucotheca*	BLM-S; CA-S2	Mojave desertscrub communities and pinyon-juniper woodlands on sandy or gravelly soils at elevations below 3,925 ft. Nearest recorded occurrences are 45 mi south of the SEZ. About 2,898,476 acres of potentially suitable habitat occurs within the SEZ region.	15,427 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	107,664 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	Small overall impact. See alkali mariposa-lily for a list of potential mitigations applicable to all special status plant species.
White-margined beardtongue	***Penstemon albomarginatus***	BLM-S; CA-S1; FWS-SC	Desert sand dune habitats and Mojave desertscrub communities at elevations below 3,600 ft. Known to occur on the SEZ and in other portions of the affected area. About 3,029,810 acres of potentially suitable habitat occurs within the SEZ region.	15,749 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	112,819 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	Small overall impact. See alkali mariposa-lily for a list of potential mitigations applicable to all special status plant species.

TABLE 9.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
Arthropods						
Borrego parnopes cuckoo wasp	*Parnopes borregoensis*	CA-S1	Endemic to California, where it is known from the Sonoran and Mojave Deserts. General habitat preferences are poorly understood. May occur in desertscrub, creosotebush scrub, yucca and cholla cactus, saltbush, and desert dune communities. Nearest recorded occurrence is 45 mi south of the SEZ. About 3,029,812 acres of potentially suitable habitat occurs within the SEZ region.	15,749 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	112,819 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	Small overall impact. Pre-disturbance surveys and avoidance of occupied habitats on the SEZ; or compensatory mitigation of direct effects on occupied habitats could reduce impacts.
Fish						
Arroyo chub	***Gila orcuttii***	CA-S2	Endemic to the southern coastal drainages of California in headwaters, creeks, and small to medium rivers; often in intermittent streams. Nearest recorded occurrences are from the Mojave River, approximately 13 mi north of the SEZ. The species is unlikely to occur in the affected area due to lack of suitable habitat.	0 acres of potentially suitable habitat	0 acres of potentially suitable habitat	Small to large overall impact depending on the volume of groundwater withdrawals. Limiting withdrawals from this regional groundwater system could reduce impacts on this species to negligible levels. Note that these potential impact magnitudes and potential mitigation measures apply to all groundwater-dependent special status species that may occur in the SEZ region.

TABLE 9.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Fish (Cont.)						
Mohave tui chub	***Gila bicolor mohavensis***	ESA-E; CA-E; CA-FP; CA-S2	Restricted to a few known locations in San Bernardino County, California in deep pools or shallow portions of mineralized, alkaline waters. Formerly in mainstream Mojave River; now in lakes and mineral spring pools. Nearest recorded occurrences are from man-made ponds created in the Camp Cady Wildlife Area, approximately 6 mi northwest (downgradient) of the SEZ. The species is unlikely to occur in the affected area due to lack of suitable habitat.	0 acres of potentially suitable habitat	0 acres of potentially suitable habitat	Small to large overall impact depending on the volume of groundwater withdrawals. See Arroyo chub for potential impacts and mitigation measures applicable to all groundwater-dependent special status species. The potential for impact and need for mitigation should be determined in consultation with the USFWS and CDFG.

TABLE 9.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Reptiles						
Desert tortoise	***Gopherus agassizii***	ESA-T; CA-T; CA-S2	Desert creosotebush communities on firm soils for digging burrows, often along riverbanks, washes, canyon bottoms, creosote flats, and desert oases. Known to occur on the SEZ and in other portions of the affected area. About 4,001,056 acres of potentially suitable habitat occurs within the SEZ region.	16,720 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	143,604 acres of potentially suitable habitat (3.6% of available potentially suitable habitat)	Small overall impact. Pre-disturbance surveys and avoiding or minimizing disturbance of occupied habitats on the SEZ, translocation of individuals from areas of direct effect, or compensatory mitigation of direct effects on occupied habitats could reduce impacts. The potential for impact and need for mitigation should be determined in consultation with the USFWS and CDFG.

TABLE 9.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Reptiles (Cont.)						
Mojave fringe-toed lizard	***Uma scoparia***	BLM-S	Sparsely vegetated desert areas with fine windblown sand, including dunes, flats, and washes at elevations below 3,000 ft. Known to occur on the SEZ and in other portions of the affected area. About 3,849,554 acres of potentially suitable habitat occurs within the SEZ region.	19,218 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	156,798 acres of potentially suitable habitat (4.1% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance of desert dunes and sand transport systems or washes could reduce impacts. In addition, pre-disturbance surveys and avoiding or minimizing disturbance of occupied habitats on the SEZ, or compensatory mitigation of direct effects, could reduce impacts.
Southwestern pond turtle	***Actinemys marmorata pallida***	CA-S2	Ponds, lakes, rivers, streams, creeks, marshes, and irrigation ditches within woodland, forest, and grassland habitats. Slow-moving, shallow waters with abundant vegetation, and either rocky or muddy bottoms. Nearest recorded occurrences are from the Mojave River, approximately 8 mi northwest of the SEZ. The species is unlikely to occur in the affected area due to lack of suitable habitat.	0 acres of potentially suitable habitat	0 acres of potentially suitable habitat	Small to large overall impact depending on the volume of groundwater withdrawals. See Arroyo chub for potential impacts and mitigation measures applicable to all groundwater-dependent special status species.

TABLE 9.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]		Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
				Within SEZ (Direct Effects)[d]	Outside SEZ (Indirect Effects)[e]	
Birds						
Bendire's thrasher	***Toxostoma bendirei***	BLM-S	Summer resident in the SEZ region. Flats associated with succulent shrub and Joshua tree woodlands of the Mojave Desert. Known to occur on the SEZ and in other portions of the affected area. About 2,898,476 acres of potentially suitable habitat occurs within the SEZ region.	15,427 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	107,664 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	Small overall impact. Pre-disturbance surveys and avoiding or minimizing disturbance of occupied habitats, especially nesting habitats on the SEZ, or compensatory mitigation of direct effects on occupied habitats could reduce impacts.
Ferruginous hawk	*Buteo regalis*	BLM-S; FWS-SC	Winter resident in the SEZ region. Open grasslands, sagebrush flats, desertscrub, desert valleys, and fringes of pinyon-juniper habitats. Known to occur in San Bernardino County. About 2,988,171 acres of potentially suitable habitat occurs within the SEZ region.	15,598 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	110,385 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	Small overall impact on foraging habitat only. Avoidance of direct impacts on all foraging habitat is not feasible because suitable foraging habitat is widespread in the area of direct effect.

TABLE 9.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Birds (Cont.)						
Western burrowing owl	*Athene cunicularia hypugaea*	BLM-S; CA-S2; FWS-SC	Year-round resident in the SEZ region. Open areas with short, sparse vegetation, including grasslands, agricultural fields, and disturbed areas. Nests in burrows created by mammals or tortoises; local abundance is determined by small mammal prey abundance. Nearest recorded occurrence is 30 mi west of the SEZ. About 4,827,058 acres of potentially suitable habitat occurs within the SEZ region.	23,932 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	180,886 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	Small overall impact. Pre-disturbance surveys and avoiding or minimizing disturbance of occupied burrows and habitats in the area of direct effect or compensatory mitigation of direct effects on occupied habitats could reduce impacts.
Mammals						
Mohave ground squirrel	*Spermophilus mohavensis*	BLM-S; CA-T; CA-S2	Open desertscrub, grasslands, and Joshua tree woodlands in the Mojave Desert in San Bernardino County at elevations between 1,800 and 5,000 ft. Utilizes burrows at the bases of shrubs. Nearest recorded occurrence is in the vicinity of Barstow, California, approximately 15 mi west of the SEZ. About 2,898,476 acres of potentially suitable habitat occurs within the SEZ region.	15,427 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	107,664 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	Small overall impact. Pre-disturbance surveys and avoiding or minimizing disturbance of discovered populations and occupied habitats on the SEZ, or compensatory mitigation of direct effects on occupied habitats, could reduce impacts.

TABLE 9.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Mammals (Cont.)						
Nelson's bighorn sheep	***Ovis canadensis nelsoni***	BLM-S; FWS-SC	Open, steep rocky terrain in mountainous habitats of the eastern Mojave and Sonoran Deserts in California. Rarely uses desert lowlands, but may use them as corridors for travel between mountain ranges. Known to occur in the affected area from the Cady Mountains within 5 mi northeast of the SEZ. Suitable mountainous habitat does not exist on the site, but the species may migrate through the SEZ. About 1,846,238 acres of potentially suitable habitat occurs within the SEZ region.	20,578 acres of potentially suitable habitat lost (1.1% of available potentially suitable habitat)	126,778 acres of potentially suitable habitat (6.9% of available potentially suitable habitat)	Moderate overall impact. Pre-disturbance surveys and avoiding or minimizing disturbance of occupied habitats within the SEZ and habitats that serve as movement corridors could further reduce impacts.
Pallid bat	*Antrozous pallidus*	BLM-S; CA-SC; FWS-SC	Year-round resident in the SEZ region. Low-elevation desert communities, including grasslands, shrublands, and woodlands. Roosts in caves, crevices, and mines. Nearest recorded occurrence is from the Mojave River, approximately 6 mi northwest of the SEZ. About 4,230,325 acres of potentially suitable habitat occurs within the SEZ region.	16,932 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	148,804 acres of potentially suitable habitat (3.5% of available potentially suitable habitat)	Small overall impact on mostly foraging habitat. Pre-disturbance surveys and avoiding or minimizing disturbance of discovered roost areas on the SEZ could reduce impacts.
Spotted bat	*Euderma maculatum*	BLM-S; CA-S2; CA-SC; FWS-SC	Year-round resident in the SEZ region. Arid deserts, grasslands, and mixed conifer forests at elevations below 9,800 ft. Primarily forages within riparian habitats and washes. Roosts in rock crevices along cliffs. Nearest recorded occurrence is 45 mi south of the SEZ. About 2,893,510 acres of potentially suitable habitat occurs within the SEZ region.	15,427 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	107,732 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	Small overall impact on mostly foraging habitat. Pre-disturbance surveys and avoiding or minimizing disturbance of discovered roost areas on the SEZ could reduce impacts.

TABLE 9.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Mammals (Cont.)						
Townsend's big-eared bat	*Corynorhinus townsendii*	BLM-S; CA-S2; CA-SC; FWS-SC	Year-round resident in the SEZ region in all habitats but subalpine and alpine habitats. Roosts in caves, mines, tunnels, buildings, or other man-made structures. Nearest recorded occurrence is from the Mojave River, approximately 7 mi northwest of the SEZ. About 4,808,761 acres of potentially suitable habitat occurs within the SEZ region.	23,950 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	181,086 acres of potentially suitable habitat (3.8% of available potentially suitable habitat)	Small overall impact on mostly foraging habitat. Pre-disturbance surveys and avoiding or minimizing disturbance of discovered roost areas on the SEZ could reduce impacts.
Western mastiff bat	*Eumops perotis californicus*	BLM-S; CA-SC; FWS-SC	Year-round resident in the SEZ region. in many open semiarid habitats, including conifer and deciduous woodlands, shrublands, grasslands, chaparral, and urban areas. Roosts in crevices in cliff faces, buildings, and tall trees. Nearest recorded occurrence is 32 mi southwest of the SEZ. About 4,808,761 acres of potentially suitable habitat occurs within the SEZ region.	23,950 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	181,086 acres of potentially suitable habitat (3.8% of available potentially suitable habitat)	Small overall impact on mostly foraging habitat. Pre-disturbance surveys and avoiding or minimizing disturbance of discovered roost areas on the SEZ could reduce impacts.

[a] BLM-S = listed as a sensitive species by the BLM; CA-S1 = ranked as S1 in the State of California; CA-S2 = ranked as S2 in the State of California; CA-SC = species of concern in the State of California; CA-E = listed as endangered by the State of California; CA-T = listed as threatened by the State of California; CA-FP = California fully protected species; ESA-E = listed as endangered under the ESA; ESA-UR = under review for ESA listing; FWS-SC = USFWS species of concern.

[b] For plant and invertebrate species, potentially suitable habitat was determined using CAReGAP land cover types. For reptile, bird, and mammal species, potentially suitable habitat was determined using CAReGAP habitat suitability models as well as CAReGAP land cover models. Area of potentially suitable habitat for each species is presented for the SEZ region, defined as the area within 50 mi (80 km) of the SEZ center.

[c] Maximum area of potentially suitable habitat that could be affected relative to availability within the SEZ region. Habitat availability for each species within the region was determined using CAReGAP habitat suitability and land cover models. This approach probably overestimates the amount of suitable habitat in the project area. Impacts of access road and transmission line construction, upgrade, or operation are not assessed in this evaluation due to the proximity of existing infrastructure to the SEZ.

Footnotes continued on next page.

TABLE 9.3.12.1-1 (Cont.)

[d] Direct effects within the SEZ consist of the ground-disturbing activities associated with construction and maintenance of an altered environment associated with operations.

[e] Area of indirect effects was assumed to be the area adjacent to the SEZ within 5 mi (8 km) of the SEZ boundary. Indirect effects include effects from surface runoff, dust, noise, lighting, etc., from the SEZ, but do not include ground-disturbing activities. The potential degree of indirect effects would decrease with increasing distance away from the SEZ.

[f] Overall impact magnitude categories were based on professional judgment and include (1) *small*: ≤1% of the population or its habitat would be lost, and the activity would not result in a measurable change in carrying capacity or population size in the affected area; (2) *moderate*: >1 but ≤10% of the population or its habitat would be lost and the activity would result in a measurable but moderate (not destabilizing) change in carrying capacity or population size in the affected area; (3) *large*: >10% of a population or its habitat would be lost and the activity would result in a large, measurable, and destabilizing change in carrying capacity or population size in the affected area. Note that much greater weight was given to the magnitude of direct effects because those effects would be difficult to mitigate. Programmatic design features would reduce most indirect effects to negligible levels.

[g] Species-specific mitigations are suggested here but final mitigations should be developed in consultation with state and federal agencies, and should be based on pre-disturbance surveys.

[h] To convert ft to m, multiply by 0.3048.

[i] Elevations in the areas of direct and indirect effect range from about 1,750 ft (530 m) to 4,650 ft (1,420 m).

[j] To convert mi to km, multiply by 1.609.

[k] To convert acres to km^2, multiply by 0.004047.

[l] Species in bold text have been recorded or have designated critical habitat in the affected area.

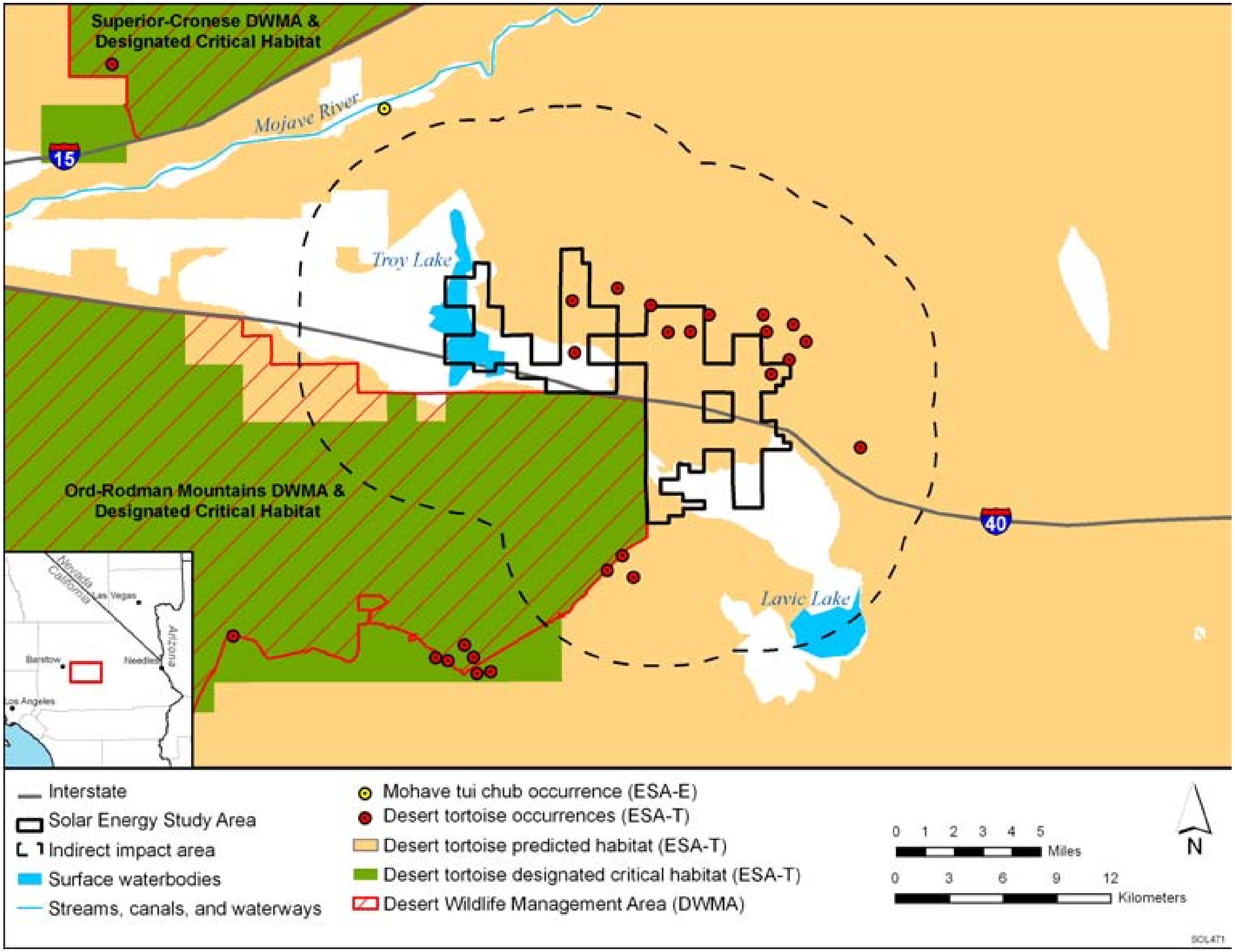

FIGURE 9.3.12.1-1 Known or Potential Occurrences of Species Listed as Endangered or Threatened under the ESA That May Occur in the Proposed Pisgah SEZ Affected Area (Sources: CDFG 2010b; USGS 2010a)

The desert tortoise occurs in the Ord-Rodman DWMA, which is adjacent to the southern boundary of the proposed Pisgah SEZ within the area of indirect effects. In 2007, surveys for desert tortoises were conducted by the USFWS Desert Tortoise Recovery Office in areas that overlap the Pisgah SEZ (Stout 2009). On the basis of these survey results, the USFWS estimated a desert tortoise density of about 3.5 individuals/km^2 within the 663,000-acre (2,682-km^2) survey area. Assuming the density across the Pisgah SEZ was similar to that within the survey area, the USFWS estimated that the SEZ may support up to 260 desert tortoises.

CNDDB records of desert tortoises within the SEZ are located primarily from the northern portion of the SEZ near the southern slopes of the Cady Mountains (Figure 9.3.12.1-1). According to the CAReGAP habitat suitability model, potentially suitable habitat for the desert tortoise occurs throughout the majority of the SEZ and area of indirect effects (Figure 9.3.12.1-1; Table 9.3.12.1-1). In addition, the USGS desert tortoise model (Nussear et al. 2009) predicts the presence of highly suitable habitat (modeled suitability value ≥0.8 out of 1.0) throughout the majority of the SEZ.

Designated critical habitat for this species does not occur on the SEZ, but adjacent critical habitat occurs south of the SEZ in the area of indirect effects within the Ord-Rodman DWMA. Designated critical habitat for the desert tortoise also occurs in the Superior-Cronese DWMA, approximately 10 mi (16 km) northwest of the SEZ. The Pisgah SEZ is situated between the Superior-Cronese (to the northwest) and Ord-Rodman (to the south) Critical Habitat units (Figure 9.3.12-1); therefore, the SEZ may provide important connectivity between these two critical habitat units.

9.3.12.1.2 BLM-Designated Sensitive Species

There are 29 BLM-designated sensitive species that may occur in the affected area of the Pisgah SEZ (Table 9.3.12.1-1). BLM-designated sensitive species that may occur in the Pisgah SEZ affected area include the following (1) plants: alkali mariposa-lily, Barstow woolly sunflower, chaparral sand-verbena, Clokey's cryptantha, Coulter's goldfields, creamy blazing-star, desert cymopterus, flat-seeded spurge, Harwood's eriastrum, Latimer's woodland-gilia, limestone beardtongue, Little San Bernardino Mountains linanthus, Mojave monkeyflower, Palmer's mariposa-lily, Parish's brittlescale, Parish's phacelia, Stephen's beardtongue, white-bracted spineflower, and white-margined beardtongue; (2) reptiles: Mojave fringe-toed lizard; (3) birds: Bendire's thrasher, ferruginous hawk, and western burrowing owl; and (4) mammals: Mojave ground squirrel, Nelson's bighorn sheep, pallid bat, spotted bat, Townsend's big-eared bat, and western mastiff bat. Of these species, the white-margined beardtongue, Mojave fringe-toed lizard, Bendire's thrasher, and Nelson's bighorn sheep have been recorded in the affected area. Habitats in which these species are found, the amount of potentially suitable habitat in the affected area, and known locations of the species relative to the SEZ are discussed below and presented in Table 9.3.12.1-1.

Alkali Mariposa-Lily

The alkali mariposa-lily is a perennial forb in the lily family that is known only from wetlands in the western Mojave Desert region of southern California. It inhabits alkaline seeps, springs, and meadows. The species is not known to occur on the SEZ, but potentially suitable habitat does occur there and in other portions of the affected area (Table 9.3.12.1-1). The nearest known occurrence of the species is about 25 mi (40 km) northwest of the Pisgah SEZ.

Barstow Woolly Sunflower

The Barstow woolly sunflower is an annual forb in the aster family that is restricted to the Mojave Desert region surrounding Barstow, California. The species inhabits sandy and rocky substrates within desertscrub communities and playas. The species is not known to occur on the SEZ, but potentially suitable habitat does occur there and in other portions of the affected area (Table 9.3.12.1-1). The nearest known occurrence of the species is about 20 mi (32 km) northwest of the Pisgah SEZ.

Chaparral Sand-Verbena

The chaparral sand-verbena is a flowering herb that is endemic to southern California. It historically occurred approximately 30 mi (48 km) west of the Pisgah SEZ, but it is currently only known to occur in Riverside and Orange Counties outside of the area of indirect effects. Although the species has not been recently recorded near the SEZ, potentially suitable sand dune habitat does occur there and in other portions of the affected area (Table 9.3.12.1-1).

Clokey's Cryptantha

The Clokey's cryptantha is an annual forb in the borage family that is endemic to southern California and known from only a few locations near Barstow in San Bernardino County. It inhabits desertscrub communities on sandy or gravelly soils. The species is not known to occur on the SEZ, but potentially suitable habitat does occur there and in other portions of the affected area (Table 9.3.12.1-1). The nearest known occurrence of the species is about 22 mi (35 km) northwest of the Pisgah SEZ.

Coulter's Goldfields

The Coulter's goldfields is an annual forb in the aster family that is endemic to southern California and northern Mexico. It inhabits salt marshes, swamps, playas, alkaline sinks, and vernal pools. The species is not known to occur on the SEZ, but potentially suitable habitat does occur there and in other portions of the affected area (Table 9.3.12.1-1). The nearest known occurrence of the species is about 50 mi (80 km) south of the Pisgah SEZ.

Creamy Blazing-Star

The creamy blazing-star is an annual forb in the aster family that is endemic to the Mojave Desert in southern California. It inhabits desert creosotebush scrub communities on rocky and sandy substrates. The species is not known to occur on the SEZ, but potentially suitable habitat does occur there and in other portions of the affected area (Table 9.3.12.1-1). The nearest known occurrence of the species is about 11 mi (18 km) west of the Pisgah SEZ.

Desert Cymopterus

The desert cymopterus is a perennial forb in the carrot family that is endemic to the western Mojave Desert in southern California. It inhabits deep, loose, well-drained, fine to coarse sandy soils of alluvial fan basins and desert dunes. The species is not known to occur on the SEZ, but potentially suitable habitat does occur there and in other portions of the affected area (Table 9.3.12.1-1). The nearest known occurrence of the species is about 35 mi (56 km) northwest of the Pisgah SEZ.

Flat-Seeded Spurge

The flat-seeded spurge is an annual forb in the spurge family that is known only from the Mojave and Sonoran Deserts in southern California and southwestern Arizona. The species inhabits sandy substrates of dunes within desertscrub communities. The species historically occurred about 20 mi (32 km) southwest of the Pisgah SEZ but has not been recorded in the SEZ region since 1974. It is not known to occur on the SEZ, but potentially suitable habitat does occur there and in other portions of the affected area (Table 9.3.12.1-1).

Harwood's Eriastrum

The Harwood's eriastrum is an annual forb in the phlox family that is known only from the Mojave Desert in southern California where it inhabits desert dunes. The species is not known to occur on the SEZ, but potentially suitable habitat does occur there and in other portions of the affected area (Table 9.3.12.1-1). The nearest known occurrence of the species is about 35 mi (56 km) northeast of the Pisgah SEZ.

Latimer's Woodland-Gilia

The Latimer's woodland-gilia is an annual forb in the phlox family that is endemic to southern California from San Bernardino and Riverside Counties. It inhabits desertscrub, washes, and pinyon-juniper woodland communities on rocky or sandy substrates. The species is not known to occur on the SEZ, but potentially suitable habitat does occur there and in other portions of the affected area (Table 9.3.12.1-1). The nearest known occurrence of the species is about 35 mi (56 km) east of the Pisgah SEZ.

Limestone Beardtongue

The limestone beardtongue is a perennial forb in the figwort family that is endemic to the mountains of the Mojave Desert in southern California. It inhabits desertscrub communities, pinyon-juniper forests, and Joshua tree woodlands. The species is not known to occur on the SEZ, but potentially suitable habitat does occur there and in other portions of the affected area (Table 9.3.12.1-1). The nearest known occurrence of the species is about 45 mi (72 km) east of the Pisgah SEZ.

Little San Bernardino Mountains Linanthus

The Little San Bernardino Mountains linanthus is an annual forb in the phlox family that is endemic to southern California in Riverside and San Bernardino Counties. It inhabits desert dunes and sandy flats within creosotebush and Joshua tree woodland communities. The species is not known to occur on the SEZ, but potentially suitable habitat does occur there and in other portions of the affected area (Table 9.3.12.1-1). The nearest known occurrence of the species is about 30 mi (48 km) south of the Pisgah SEZ.

Mojave Monkeyflower

The Mojave monkeyflower is an annual forb in the figwort family that is endemic to San Bernardino County, California, where it inhabits the gravelly banks of desert washes. The species is not known to occur on the SEZ, but potentially suitable habitat does occur there and in other portions of the affected area (Table 9.3.12.1-1). The nearest known occurrence of the species is about 8 mi (13 km) west of the Pisgah SEZ.

Palmer's Mariposa-Lily

The Palmer's mariposa-lily is a perennial forb in the lily family that is endemic to California. It inhabits moist to wet meadows, grassy knolls, creek sides, pinyon-juniper woodlands, and pine forests. The species is not known to occur on the SEZ, but potentially suitable habitat does occur there and in other portions of the affected area (Table 9.3.12.1-1). The nearest known occurrence of the species is about 35 mi (56 km) southwest of the Pisgah SEZ.

Parish's Brittlescale

The Parish's brittlescale is an annual forb in the goosefoot family that is known from only 11 occurrences in California. It is restricted to desertscrub, playas, and vernal pools. The species is not known to occur on the SEZ, but potentially suitable habitat does occur there and in other portions of the affected area (Table 9.3.12.1-1). The nearest known occurrence of the species is about 35 mi (56 km) southwest of the Pisgah SEZ.

Parish's Phacelia

The Parish's phacelia is an annual forb in the waterleaf family that is known from southwestern Nevada and the vicinity of Barstow, California, where it inhabits desertscrub and playa communities on alkaline-clay soils. The species is not known to occur on the SEZ, but potentially suitable habitat does occur there and in other portions of the affected area (Table 9.3.12.1-1). The nearest known occurrence of the species is about 12 mi (19 km) northwest of the Pisgah SEZ.

Stephen's Beardtongue

The Stephen's beardtongue is a perennial forb in the figwort family that is endemic to Inyo and San Bernardino Counties, California. It inhabits rocky substrates, including rock crevices, cliffs, rocky slopes, washes, and pinyon-juniper and creosote scrub communities. The species is not known to occur on the SEZ, but potentially suitable habitat does occur there and in other portions of the affected area (Table 9.3.12.1-1). The nearest known occurrence of the species is about 40 mi (64 km) east of the Pisgah SEZ.

White-Bracted Spineflower

The white-bracted spineflower is an annual forb in the buckwheat family that is endemic to the Mojave Desert of southern California, where it inhabits desertscrub communities and pinyon-juniper woodlands. The species is not known to occur on the SEZ, but potentially suitable habitat does occur there and in other portions of the affected area (Table 9.3.12.1-1). The nearest known occurrence of the species is about 45 mi (72 km) south of the Pisgah SEZ.

White-Margined Beardtongue

The white-margined beardtongue is a perennial forb in the figwort family that occurs in the deserts of Arizona, California, and Nevada. In California, it is known from fewer than 20 locations. It inhabits desert dunes and desertscrub communities of the Mojave Desert. This species is known to occur on the SEZ; potentially suitable habitat exists on the SEZ and in other portions of the affected area (Table 9.3.12.1-1).

Mojave Fringe-Toed Lizard

The Mojave fringe-toed lizard is a fairly small, smooth-skinned lizard that inhabits desert sand dune habitats in the Mojave Desert of southern California. The species occurs as scattered populations in specialized dune habitats composed of fine, loose, windblown sand deposits. The species, and potentially suitable dune habitats for it, are known to occur on the Pisgah SEZ and in other portions of the affected area (Table 9.3.12.1-1).

Bendire's Thrasher

The Bendire's thrasher is a small neotropical migrant bird that is a summer breeding resident in southern California. This species inhabits desert succulent shrub and Joshua tree habitats in the Mojave Desert where it is associated with sagebrush (*Artemisia* spp.), pinyon-juniper woodlands, cholla cactus, Joshua tree, palo verde, mesquite, and agave species. The species, and potentially suitable scrub and woodland habitats for it, are known to occur on the SEZ and in other portions of the affected area (Table 9.3.12.1-1).

Ferruginous Hawk

The ferruginous hawk is a winter resident and migrant in the Pisgah SEZ region. The species inhabits open grasslands, sagebrush flats, desertscrub, and the edges of pinyon-juniper woodlands. This species is known to occur in San Bernardino County, California, and potentially suitable foraging habitat occurs on the SEZ and in other portions of the affected area (Table 9.3.12.1-1).

Western Burrowing Owl

The western burrowing owl is a year-round resident of open, dry grasslands and desert habitats in southern California and Arizona. The species occurs locally in open areas with sparse vegetation. The nearest recorded occurrences are 30 mi (48 km) west of the Pisgah SEZ. Potentially suitable foraging and nesting habitat may occur on the SEZ and in other portions of the affected area (Table 9.3.12.1-1). The availability of nest sites (burrows) within the affected area has not been determined, shrubland habitat that may be suitable for either foraging or nesting occurs throughout the affected area.

Mojave Ground Squirrel

The Mohave ground squirrel is restricted to the San Bernardino, Los Angeles, Kern, and Inyo Counties of southern California. It inhabits Mojave Desertscrub, alkali desertscrub, grasslands, and Joshua tree woodlands. The species is not known to occur on the SEZ, but potentially suitable habitat does occur there and in other portions of the affected area (Table 9.3.12.2-1). The nearest known occurrence of the species is about 15 mi (24 km) west of the Pisgah SEZ.

Nelson's Bighorn Sheep

The Nelson's bighorn sheep is one of several subspecies of bighorn sheep known to occur in the southwestern United States. This species occurs in desert mountain ranges in Arizona, California, Nevada, Oregon, and Utah. The Nelson's bighorn sheep uses primarily montane shrubland, forest, and grassland habitats, and may utilize desert valleys as corridors for travel between range habitats. In California, the species is known from the desert mountain ranges from the White Mountains, south to the San Bernardino Mountains, and southeastward to the Mexican border. The nearest recorded occurrences are from the Cady Mountains about 5 mi (8 km) northeast of the Pisgah SEZ. The species is also known to occur in the Rodman Mountains outside of the affected area, approximately 10 mi (16 km) west of the Pisgah SEZ. The SEZ and other portions of the affected area may provide important habitat for sheep travelling between these two ranges (Table 9.3.12.1-1).

Pallid Bat

The pallid bat is a large, pale bat with large ears that is locally common in desert grasslands and shrublands in the southwestern United States. It roosts in caves, crevices, and mines. The species is a year-round resident throughout southern California. The nearest recorded occurrence is from the North Algodones Dunes Wilderness, approximately 18 mi (29 km) north of the Pisgah SEZ. Potentially suitable habitat may occur on the SEZ and in other portions of the affected area (Table 9.3.12.1-1). The potentially suitable habitat on the SEZ and in the area of indirect effects could include foraging and roosting habitat. On the basis of an evaluation of land cover types, approximately 1,500 acres (6 km^2) and 41,000 acres (166 km^2) of rocky cliffs and outcrops on the SEZ and in the area of direct effects, respectively, could be potentially suitable roosting habitat for this species.

Spotted Bat

The spotted bat is considered a rare year-round resident of southern California, where it forages in mountain foothills, desert shrublands, grasslands, washes, riparian areas, and mixed conifer forests. The species roosts in rock crevices along cliffs. The nearest recorded occurrences are approximately 45 mi (72 km) south of the Pisgah SEZ. Potentially suitable habitat may occur on the SEZ and in other portions of the affected area (Table 9.3.12.1-1). The potentially suitable habitat on the SEZ and in the area of indirect effects could include foraging and roosting habitat. On the basis of an evaluation of land cover types, approximately 1,500 acres (6 km^2) and 41,000 acres (166 km^2) of rocky cliffs and outcrops on the SEZ and in the area of direct effects, respectively, could be potentially suitable roosting habitat for this species.

Townsend's Big-Eared Bat

The Townsend's big-eared bat is widely distributed throughout the western United States. In California, the species forages year-round in a wide variety of desert and non-desert habitats. The species roosts in caves, mines, tunnels, buildings, and other man-made structures. The nearest recorded occurrences are approximately 35 mi (56 km) from the Pisgah SEZ. Potentially suitable habitat may occur on the SEZ and in other portions of the affected area (Table 9.3.12.1-1). The potentially suitable habitat on the SEZ and in the area of indirect effects could include foraging and roosting habitat. On the basis of an evaluation of land cover types, approximately 1,500 acres (6 km^2) and 41,000 acres (166 km^2) of rocky cliffs and outcrops on the SEZ and in the area of direct effects, respectively, could be potentially suitable roosting habitat for this species.

Western Mastiff Bat

The western mastiff bat is a large, uncommon resident of southern California and western Arizona. The species forages in many open semiarid habitats, including conifer and deciduous woodlands, shrublands, grassland, and urban areas. It roosts in crevices, trees, and buildings. The nearest recorded occurrences are 16 mi (26 km) west of the Pisgah SEZ. Potentially suitable habitat may occur on the SEZ and in other portions of the affected area (Table 9.3.12.1-1). The potentially suitable habitat on the SEZ and in the area of indirect effects could include foraging and roosting habitat. On the basis of an evaluation of land cover types, approximately 1,500 acres (6 km^2) and 41,000 acres (166 km^2) of rocky cliffs and outcrops on the SEZ and in the area of direct effects, respectively, could be potentially suitable roosting habitat for this species.

9.3.12.1.3 State-Listed Species

There are three species that are listed by the State of California that may occur in the Pisgah SEZ affected area (Table 9.3.12.2-1). Of these species, there is one fish species (Mojave tui chub), one reptile species (desert tortoise), and one mammal species (Mohave ground squirrel). Each of these species are discussed previously due to their status under the ESA (Section 9.3.12.1.1) or BLM (Section 9.3.12.1.2).

9.3.12.1.4 Rare Species

There are 51 rare species (i.e., state rank of S1 or S2 in California or a species of concern by the State of California or USFWS) may occur in the affected area of the Pisgah SEZ (Table 9.3.12.1-1). Of these species, 23 have not been discussed as ESA-listed (Section 9.3.12.1.1), BLM-designated sensitive (Section 9.3.12.1.2), or state-listed (Section 9.3.12.1.3).

9.3.12.2 Impacts

The potential for impacts on special status species from utility-scale solar energy development within the proposed Pisgah SEZ is presented in this section. The types of impacts that special status species could incur from construction and operation of utility-scale solar energy facilities are discussed in Section 5.10.4.

The assessment of impacts on special status species is based on available information on the presence of species in the affected area as presented in Section 9.3.12.1 following the analysis approach described in Appendix M. It is assumed that, prior to development, surveys would be conducted to determine the presence of special status species and their habitats in and near areas where ground-disturbing activities would occur. Additional NEPA assessments, ESA consultations, and coordination with state natural resource agencies may be needed to address project-specific impacts more thoroughly. These assessments and consultations could result in additional required actions to avoid, minimize, or mitigate impacts on special status species (see Section 9.3.12.3).

Solar energy development within the Pisgah SEZ could affect a variety of habitats (see Sections 9.3.9 and 9.3.10). These impacts on habitats could in turn affect special status species that are dependent on those habitats. Based on CNDDB records and information provided by the CDFG and USFWS, there are ten special status species known to occur in the affected area of the Pisgah SEZ: Emory's crucifixion-thorn, small-flowered androstephium, white-margined beardtongue, Arroyo chub, Mohave tui chub, desert tortoise, Mojave fringe-toed lizard, southwestern pond turtle, Bendire's thrasher, and Nelson's bighorn sheep. These species are listed in bold in Table 9.3.12.1-1. No other special status species have been recorded in the affected area (CDFG 2010b). Other special status species may occur on the SEZ or within the affected area based on the presence of potentially suitable habitat. As discussed in Section 9.3.12.1, this approach to identifying the species that could occur in the affected area probably overestimates the number of species that actually occur in the affected area, and may therefore overestimate impacts on some special status species.

Potential direct and indirect impacts on special status species within the SEZ and in the area of indirect effect outside the SEZ are presented in Table 9.3.12.1-1. In addition, the overall potential magnitude of impacts on each species (assuming programmatic design features are in place) is presented along with any potential species-specific mitigation measures that could further reduce impacts.

Impacts on special status species could occur during all phases of development (construction, operation, and decommissioning and reclamation) of a utility-scale solar energy project within the SEZ. Construction and operation activities could result in short- or long-term impacts on individuals and their habitats, especially if these activities are sited in areas where special status species are known to or could occur. As presented in Section 9.3.1.2, impacts of access road and transmission line construction, upgrade, or operation are not assessed in this evaluation due to the proximity of existing infrastructure to the SEZ.

Direct impacts would result from habitat destruction or modification. It is assumed that direct impacts would occur only within the SEZ, where ground-disturbing activities are expected to occur. Indirect impacts could result from surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, accidental spills, harassment, and lighting. No ground-disturbing activities associated with project developments are anticipated to occur within the area of indirect effects. Decommissioning of facilities and reclamation of disturbed areas after operations cease could result in short-term negative impacts on individuals and habitats adjacent to project areas. long-term benefits would accrue if original land contours and native plant communities were restored in previously disturbed areas.

The successful implementation of programmatic design features (discussed in Appendix A, Section A.2.2) would reduce direct impacts on some special status species, especially those that depend on habitat types that can be easily avoided (e.g., dunes and sand transport systems, playa and desert wash habitats). Indirect impacts on special status species could be reduced to negligible levels by implementing programmatic design features, especially those engineering controls that would reduce runoff, sedimentation, spills, and fugitive dust.

9.3.12.2.1 Impacts on Species Listed Under the ESA

Impacts on the two ESA-listed species that may occur in the Pisgah SEZ affected area, or that may be affected by solar energy development on the SEZ, are discussed below.

Mohave Tui Chub

The Mohave tui chub is listed as endangered under the ESA. It is known from only three locations in southern California. One location, a man-made pond at the CDFG's Camp Cady Wildlife Area, is located near the Mojave River approximately 6 mi (10 km) northwest of the Pisgah SEZ. Suitable habitat for this species does not occur on the SEZ or in the affected area, and the nearest potential habitat along the Mojave River and known occurrences within the Camp Cady refugia are outside of the affected area (Figure 9.3.12.1-1). However, the regional groundwater system that supports aquatic habitats within the Mojave River and Camp Cady Wildlife Area is supplemented by additive recharge from the Troy Lake playa in the western portion of the Pisgah SEZ (Stout 2009; see Section 9.3.9.1.2 for further details). Therefore, utilization of groundwater resources from the SEZ for cooling could affect the regional groundwater supply that supports aquatic habitat for the Mohave tui chub.

Groundwater withdrawals to serve the cooling needs of solar development on the Pisgah SEZ could contribute to the depletion of the regional groundwater system, which is already over-depleted, and could affect the habitat for the Mohave tui chub at the Camp Cady Wildlife Area by making it difficult to pump water to maintain this habitat (Stout 2009). However, impacts of groundwater depletion from solar energy development in the Pisgah SEZ cannot be quantified without identification of the cumulative amount of groundwater withdrawals need to support development on the SEZ. Consequently, the overall impact on the Mohave tui chub could range from small to large depending upon the solar energy technology deployed and the scale of development within the SEZ (Table 11.1.12.1-1).

The Mohave tui chub is listed by the CDFG as a California fully protected species. As such, the CDFG has the authority to prohibit direct and indirect impacts on this species under any circumstance. Therefore, the direct and indirect impacts on occupied and suitable habitats at Camp Cady and in the Mojave River should be completely avoided. The implementation of programmatic design features and the avoidance of groundwater withdrawals in the vicinity of the SEZ that would affect habitat quality and availability at Camp Cady and in the Mojave River could reduce impacts on this species to negligible levels. Consultation with the USFWS and CDFG should be required under the ESA and CESA to fully address the impacts of solar development on the Mohave tui chub and to determine any additional mitigation requirements. The strict mitigation measures provided to the Mohave tui chub may also successfully reduce or eliminate impacts on other groundwater-dependent species (e.g., Arroyo chub, southwestern pond turtle).

Desert Tortoise

The desert tortoise is listed as a threatened species under the ESA throughout the entire Pisgah SEZ region. The desert tortoise has the potential to occur within the SEZ on the basis of observed occurrences on and near the SEZ, presence of designated critical habitat within the area of indirect effects, and the presence of apparently suitable habitat in the SEZ (Figure 9.3.12.1-1; Table 9.3.12.1-1). The tortoise is known to occur in the Ord-Rodman DWMA within the area of indirect effects adjacent to the southern boundary of the SEZ; the species is also known to occur in the northern portion of the SEZ near the Cady Mountains (Figure 9.3.12.1-1). According to the CAReGAP habitat suitability model, approximately 16,720 acres (68 km^2) of potentially suitable habitat on the SEZ could be directly affected by construction and operations of solar energy facilities on the SEZ (Table 9.3.12.1-1). This direct effects area represents about 0.4% of available suitable habitat of the desert tortoise in the region. Much of this habitat within the SEZ is considered to be highly suitable (modeled suitability value ≥0.8 out of 1.0) according to the USGS desert tortoise habitat suitability model (Nussear et al. 2009). About 143,604 acres (581 km^2) of suitable habitat occurs in the area of potential indirect effects; this area represents about 3.6% of the available suitable habitat in the region (Table 9.3.12.1-2).

On the basis of desert tortoise surveys conducted in the areas near and overlapping the Pisgah SEZ, the USFWS estimated that full-scale solar energy development on the SEZ may directly affect up to 260 desert tortoises on the SEZ (Stout 2009). In addition to direct impacts, development on the SEZ could indirectly affect desert tortoises by fragmenting and degrading adjacent habitat (refer to Section 5.10.4 for a discussion of possible indirect impacts). Fragmentation would be exacerbated by the installation of exclusionary fencing at the perimeter of the SEZ or individual project areas. The SEZ is situated between the Ord-Rodman and Superior-Cronese DWMAs (these DWMAs also contain USFWS-designated critical habitat), and terrestrial habitats within the SEZ may provide important linkages between the DWMAs. Therefore, development on the SEZ may disrupt desert tortoise population dynamics in nearby DWMAs and designated critical habitat.

The overall impact on the desert tortoise from construction, operation, and decommissioning of utility-scale solar energy facilities within the Pisgah SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the region. The implementation of programmatic design features alone is unlikely to reduce these impacts to negligible levels. Avoidance of all potentially suitable habitats for this species is not a feasible means of mitigating impacts because these habitats (desertscrub) are widespread throughout the area of direct effect.

Development of actions to reduce impacts (e.g., reasonable and prudent alternatives, reasonable and prudent measures, and terms and conditions) for the desert tortoise, including development of a survey protocol, avoidance measures, minimization measures, and, potentially, translocation actions and compensatory mitigation, would require formal consultation with the USFWS under Section 7 of the ESA. These consultations may be used to authorize incidental take statements per Section 10 of the ESA (if necessary). In addition, the CESA provides authority to the CDFG to regulate potential impacts on the desert tortoise and other species listed under the CESA. Therefore, formal consultation with the CDFG would also be required to permit the incidental take of desert tortoises in the SEZ.

There are inherent dangers to tortoises associated with their capture, handling, and translocation from the SEZ. These actions, if done improperly, can result in injury or death. To minimize these risks, and as stated above, the desert tortoise translocation plan should be developed in consultation with the USFWS and CDGF, and follow the *Guidelines for Handling Desert Tortoises During Construction Projects* (Desert Tortoise Council 1994) and other current translocation guidance provided by the USFWS and CDFG. Consultation will identify potentially suitable recipient locations, density thresholds for tortoise populations in recipient locations, procedures for pre-disturbance clearance surveys and tortoise handling, as well as disease testing and post-translocation monitoring and reporting requirements. Despite some risk of mortality or decreased fitness, translocation is widely accepted as a useful strategy for the conservation of the desert tortoise (Field et al. 2007).

To offset impacts of solar development on the SEZ, compensatory mitigation may be needed to balance the acreage of habitat lost with acquisition of lands that would be improved and protected for desert tortoise populations (USFWS 1994). Compensation can be accomplished by improving the carrying capacity for the desert tortoise on the acquired lands. Other mitigation actions may include funding for the habitat enhancement of the desert tortoise on existing federal lands. Consultations with the USFWS and CDGF would be necessary to determine the appropriate mitigation ratio to acquire, enhance, and preserve desert tortoise compensation lands.

9.3.12.2.2 Impacts on BLM-Designated Sensitive Species

Impacts on the 28 BLM-designated sensitive species that have potentially suitable habitat within the SEZ and are not previously discussed as ESA-listed (Section 9.3.12.2.1) are discussed below.

Alkali Mariposa-Lily

The alkali mariposa-lily is not known to occur in the affected area of the Pisgah SEZ; however, according to the CAReGAP land cover model, approximately 2,795 acres (11 km^2) of potentially suitable desert playa habitat on the SEZ could be directly affected by construction and operations (Table 9.3.12.1-1). This direct impact area represents about 2.6% of available suitable habitat in the region. About 4,767 acres (19 km^2) of potentially suitable habitat occurs in the area of potential indirect effect; this area represents about 4.4% of the available suitable habitat in the region (Table 9.3.12.1-1).

The overall impact on the alkali mariposa-lily from construction, operation, and decommissioning of utility-scale solar energy facilities within the Pisgah SEZ is considered moderate because the amount of potentially suitable habitat for this species in the area of direct effects represents greater than 1% but less than 10% of potentially suitable habitat in the region. The implementation of programmatic design features would reduce indirect impacts to negligible levels.

Potentially suitable habitat for the alkali mariposa-lily occurs in a limited portion of the SEZ (primarily associated with Troy Lake) and could be completely avoided during the development of facilities and protected from indirect effects. Alternatively, avoiding or minimizing disturbance to occupied habitats also would reduce impacts on this species. If avoidance or minimization are not feasible options, plants could be translocated from the area of direct effects to protected areas that would not be affected directly or indirectly by future development. Alternatively, or in combination with translocation, a compensatory mitigation plan could be developed and implemented to mitigate direct effects on occupied habitats. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that used one or more of these options could be designed to completely offset the impacts of development. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Barstow Woolly Sunflower

The Barstow woolly sunflower is not known to occur in the affected area of the Pisgah SEZ; however, according to the CAReGAP land cover model, approximately 18,466 acres (75 km^2) of potentially suitable desertscrub and playa habitat on the SEZ could be directly affected by construction and operations (Table 9.3.12.1-1). This direct impact area represents about 0.7% of available suitable habitat in the region. About 111,523 acres (451 km^2) of potentially suitable habitat occurs in the area of potential indirect effect; this area represents about 4.2% of the available suitable habitat in the region (Table 9.3.12.1-1).

The overall impact on the Barstow woolly sunflower from construction, operation, and decommissioning of utility-scale solar energy facilities within the Pisgah SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features are expected to reduce indirect impacts to negligible levels.

The avoidance of all potentially suitable habitats is not a feasible way to mitigate impacts on the Barstow woolly sunflower because these habitats (mostly desert scrub) are widespread throughout the area of direct effects. However, impacts could be reduced to negligible levels with the implementation of programmatic design features and the mitigation options described previously for the alkali mariposa-lily. The need for mitigation should first be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Chaparral Sand-Verbena

The chaparral sand-verbena historically occurred as near as 30 mi (48 km) west of the SEZ, but it is currently only known to occur in Orange and Riverside Counties, California, outside of the area of indirect effects. According to the CAReGAP land cover model, approximately 322 acres (1 km^2) of potentially suitable desert sand dune habitat within the SEZ may be directly affected by project construction and operations (Table 9.3.12.1-1). This direct impact area represents 0.2% of available suitable habitat in the region. About 5,155 acres (21 km^2) of potentially suitable habitat occurs within the area of indirect effects; this area represents about 3.2% of the available suitable habitat in the region (Table 9.3.12.1-1).

The overall impact on the chaparral sand-verbena from construction, operation, and decommissioning of utility-scale solar energy facilities within the Pisgah SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features would reduce indirect impacts to negligible levels.

Chaparral sand-verbena habitat (desert sand dunes) occupies a limited portion of the SEZ and could be avoided during the development of facilities and protected from indirect effects. In conjunction with the implementation of programmatic design features, avoiding or minimizing disturbance of occupied habitats and desert dunes and sand transport systems, and the mitigation measures described previously for the alkali mariposa-lily, could further reduce impacts on this species. The need for mitigation should first be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Clokey's Cryptantha

The Clokey's cryptantha is not known to occur in the affected area of the Pisgah SEZ; however, according to the CAReGAP land cover model, approximately 15,427 acres (62 km^2) of potentially suitable desertscrub and playa habitat on the SEZ could be directly affected by construction and operations (Table 9.3.12.1-1). This direct impact area represents about 0.5% of available suitable habitat in the region. About 107,664 acres (436 km^2) of potentially suitable habitat occurs in the area of potential indirect effect; this area represents about 3.7% of the available suitable habitat in the region (Table 9.3.12.1-1).

The overall impact on the Clokey's cryptantha from construction, operation, and decommissioning of utility-scale solar energy facilities within the Pisgah SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the region. The implementation of programmatic design features would reduce indirect impacts to negligible levels.

Avoidance of all potentially suitable habitats is not a feasible way to mitigate impacts on the Clokey's cryptantha because some of these habitats (desertscrub) are widespread throughout the area of direct effect. However, impacts could be reduced to negligible levels with the implementation of programmatic design features and the mitigation options described previously for the alkali mariposa-lily. The need for mitigation should first be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Coulter's Goldfields

The Coulter's goldfields is not known to occur in the affected area of the Pisgah SEZ; however, according to the CAReGAP land cover model, approximately 2,795 acres (11 km^2) of potentially suitable desert playa habitat on the SEZ could be directly affected by construction and operations (Table 9.3.12.1-1). This direct impact area represents about 2.6% of available suitable habitat in the region. About 4,767 acres (19 km^2) of potentially suitable habitat occurs in the area of potential indirect effect; this area represents about 4.4% of the available suitable habitat in the region (Table 9.3.12.1-1).

The overall impact on the Coulter's goldfields from construction, operation, and decommissioning of utility-scale solar energy facilities within the Pisgah SEZ is considered moderate because the amount of potentially suitable habitat for this species in the area of direct effects represents greater than 1% but less than 10% of potentially suitable habitat in the region. The implementation of programmatic design features would reduce indirect impacts to negligible levels.

Potentially suitable habitat for the Coulter's goldfields (desert playa) occurs in a limited portion of the SEZ in association with Troy Lake near the western portion of the SEZ and could be avoided during the development of facilities and protected from indirect effects. In conjunction with the implementation of programmatic design features, avoiding or minimizing disturbance to occupied habitats and desert playa habitats, and the mitigation measures described previously for the alkali mariposa-lily, could further reduce impacts on this species. The need for mitigation should first be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Creamy Blazing-Star

The creamy blazing-star is not known to occur in the affected area of the Pisgah SEZ; however, according to the CAReGAP land cover model, approximately 14,548 acres (59 km^2) of potentially suitable desertscrub habitat on the SEZ could be directly affected by construction and operations (Table 9.3.12.1-1). This direct impact area represents about 0.6% of available suitable habitat in the region. About 101,079 acres (409 km^2) of potentially suitable habitat occurs in the area of potential indirect effect; this area represents about 4.4% of the available suitable habitat in the SEZ region (Table 9.3.12.1-1).

The overall impact on the creamy blazing-star from construction, operation, and decommissioning of utility-scale solar energy facilities within the Pisgah SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features would reduce indirect impacts to negligible levels.

Avoidance of all potentially suitable habitats is not a feasible way to mitigate impacts on the creamy blazing-star because some of these habitats (desertscrub) are widespread throughout the area of direct effect. However, impacts could be reduced to negligible levels with the implementation of programmatic design features and the mitigation options described previously for the alkali mariposa-lily. The need for mitigation should first be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Desert Cymopterus

The desert cymopterus is not known to occur in the affected area of the Pisgah SEZ; however, according to the CAReGAP land cover model, approximately 244 acres (1 km^2) of potentially suitable desert wash habitat on the SEZ could be directly affected by construction and operations (Table 9.3.12.1-1). This direct impact area represents about 0.3% of available suitable habitat in the region. About 1,907 acres (8 km^2) of potentially suitable habitat occurs in the area of potential indirect effect; this area represents about 2.3% of the available suitable habitat in the region (Table 9.3.12.1-1).

The overall impact on the desert cymopterus from construction, operation, and decommissioning of utility-scale solar energy facilities within the Pisgah SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features would reduce indirect impacts to negligible levels.

Potentially suitable habitat of the desert cymopterus (desert wash) occurs on a limited portion of the SEZ and could be avoided during the development of facilities and protected from indirect effects. In conjunction with the implementation of programmatic design features, avoiding or minimizing disturbance of occupied habitats and desert wash habitats, and the mitigation measures described previously for the alkali mariposa-lily, could further reduce impacts on this species. The need for mitigation should first be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Flat-Seeded Spurge

The flat-seeded spurge is not known to occur in the affected area of the Pisgah SEZ; however, according to the CAReGAP land cover model, approximately 322 acres (1 km^2) of potentially suitable desert sand dune habitat within the SEZ may be directly affected by project construction and operations (Table 9.3.12.1-1). This direct impact area represents 0.2% of available suitable habitat in the region. About 5,155 acres (21 km^2) of potentially suitable habitat occurs within the area of indirect effects; this area represents about 3.2% of the available suitable habitat in the region (Table 9.3.12.1-1).

The overall impact on the flat-seeded spurge from construction, operation, and decommissioning of utility-scale solar energy facilities within the Pisgah SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features would reduce indirect impacts to negligible levels.

Flat-seeded spurge habitat (desert sand dunes) occupies a limited portion of the SEZ and could be avoided during the development of facilities and protected from indirect effects. In conjunction with the implementation of programmatic design features, avoiding or minimizing disturbance of occupied habitats and desert dunes and sand transport systems, in addition to the mitigation measures described previously for the alkali mariposa-lily, could further reduce impacts on this species; however, translocation may not be a feasible mitigation option for this species. The need for mitigation should first be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Harwood's Eriastrum

The Harwood's eriastrum is not known to occur in the affected area of the Pisgah SEZ; however, according to the CAReGAP land cover model, approximately 322 acres (1 km^2) of potentially suitable desert dune habitat on the SEZ could be directly affected by construction and operations (Table 9.3.12.1-1). This direct impact area represents about 0.2% of available suitable habitat in the region. About 5,155 acres (21 km^2) of potentially suitable habitat occurs in the area of potential indirect effect; this area represents about 3.5% of the available suitable habitat in the SEZ region (Table 9.3.12.1-1).

The overall impact on the Harwood's eriastrum from construction, operation, and decommissioning of utility-scale solar energy facilities within the Pisgah SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features would reduce indirect impacts to negligible levels.

Potentially suitable habitat for the Harwood's eriastrum (desert sand dunes) occurs on a limited portion of the SEZ and could be avoided during the development of facilities and protected from indirect effects. In conjunction with the implementation of programmatic design features, avoiding or minimizing disturbance to occupied habitats and desert dunes and sand transport systems, and the mitigation measures described previously for the alkali mariposa-lily, could further reduce impacts on this species. The need for mitigation should first be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Latimer's Woodland-Gilia

The Latimer's woodland-gilia is not known to occur in the affected area of the Pisgah SEZ; however, according to the CAReGAP land cover model, approximately 15,671 acres (63 km^2) of potentially suitable desertscrub and wash habitat on the SEZ could be directly affected by construction and operations (Table 9.3.12.1-1). This direct impact area represents about 0.5% of available suitable habitat in the region. About 109,571 acres (443 km^2) of potentially suitable habitat occurs in the area of potential indirect effect; this area represents about 3.7% of the available suitable habitat in the region (Table 9.3.12.1-1).

The overall impact on the Latimer's woodland gilia from construction, operation, and decommissioning of utility-scale solar energy facilities within the Pisgah SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features would reduce indirect impacts to negligible levels.

Avoidance of all potentially suitable habitats is not a feasible way to mitigate impacts on the Latimer's woodland gilia because some of these habitats (desertscrub) are widespread throughout the area of direct effect. However, impacts could be reduced to negligible levels with the implementation of mitigation options described previously for the alkali mariposa-lily. The need for mitigation should first be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Limestone Beardtongue

The limestone beardtongue is not known to occur in the affected area of the Pisgah SEZ; however, according to the CAReGAP land cover model, approximately 15,427 acres (62 km^2) of potentially suitable desertscrub habitat on the SEZ could be directly affected by construction and operations (Table 9.3.12.1-1). This direct impact area represents about 0.5% of available suitable habitat in the SEZ region. About 107,664 acres (436 km^2) of potentially suitable habitat occurs in the area of potential indirect effect; this area represents about 3.7% of the available suitable habitat in the region (Table 9.3.12.1-1).

The overall impact on the limestone beardtongue from construction, operation, and decommissioning of utility-scale solar energy facilities within the Pisgah SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features would reduce indirect impacts to negligible levels.

Avoidance of all potentially suitable habitats is not a feasible way to mitigate impacts on the limestone beardtongue because some of these habitats (desertscrub) are widespread throughout the area of direct effect. However, impacts could be reduced to negligible levels with the implementation of mitigation options described previously for the alkali mariposa-lily. The need for mitigation should first be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Little San Bernardino Mountains Linanthus

The Little San Bernardino Mountains linanthus is not known to occur in the affected area of the Pisgah SEZ; however, according to the CAReGAP land cover model, approximately 322 acres (1 km^2) of potentially suitable desert dune habitat on the SEZ could be directly affected by construction and operations (Table 9.3.12.1-1). This direct impact area represents about 0.2% of available suitable habitat in the SEZ region. About 5,155 acres (21 km^2) of potentially suitable habitat occurs in the area of potential indirect effect; this area represents about 3.5% of the available suitable habitat in the SEZ region (Table 9.3.12.1-1).

The overall impact on the Little San Bernardino Mountains linanthus from construction, operation, and decommissioning of utility-scale solar energy facilities within the Pisgah SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features would reduce indirect impacts to negligible levels.

Potentially suitable habitat of the Little San Bernardino Mountains linanthus (desert sand dunes) occurs in a limited portion of the SEZ and could be avoided during the development of facilities and protected from indirect effects. In conjunction with the implementation of programmatic design features, avoiding or minimizing disturbance to occupied habitats and desert dunes and sand transport systems, and the mitigation measures described previously for the alkali mariposa-lily, could further reduce impacts on this species. The need for mitigation should first be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Mojave Monkeyflower

The Mojave monkeyflower is not known to occur in the affected area of the Pisgah SEZ; however, according to the CAReGAP land cover model, approximately 244 acres (1 km^2) of potentially suitable desert wash habitat on the SEZ could be directly affected by construction and operations (Table 9.3.12.1-1). This direct impact area represents about 0.3% of available suitable habitat in the region. About 1,907 acres (8 km^2) of potentially suitable habitat occurs in the area of potential indirect effect; this area represents about 2.3% of the available suitable habitat in the SEZ region (Table 9.3.12.1-1).

The overall impact on the Mojave monkeyflower from construction, operation, and decommissioning of utility-scale solar energy facilities within the Pisgah SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features would reduce indirect impacts to negligible levels.

Potentially suitable habitat of the Mojave monkeyflower (desert wash) occurs on a limited portion of the SEZ and could be avoided during the development of facilities and protected from indirect effects. In conjunction with the implementation of programmatic design features, avoiding or minimizing disturbance to occupied habitats and all desert wash habitats, and the mitigation measures described previously for the alkali mariposa-lily, could further reduce impacts on this species. The need for mitigation should first be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Palmer's Mariposa-Lily

The Palmer's mariposa-lily is not known to occur in the affected area of the Pisgah SEZ. Direct impacts on this species are not expected to occur because there is no suitable riparian habitat for this species on the SEZ. However, according to the CAReGAP land cover model, approximately 68 acres (<1 km^2) of potentially suitable riparian habitat occurs in the area of potential indirect effect; this area represents about 0.6% of the available suitable habitat in the SEZ region (Table 9.3.12.1-1).

The overall impact on the Palmer's mariposa-lily from construction, operation, and decommissioning of utility-scale solar energy facilities within the Pisgah SEZ is considered small because no suitable habitat occurs on the SEZ and only indirect effects are possible. The implementation of programmatic design features would reduce indirect impacts to negligible levels. No species-specific mitigation for the Palmer's mariposa-lily is feasible or warranted.

Parish's Brittlescale

The Parish's brittlescale is not known to occur in the affected area of the Pisgah SEZ; however, according to the CAReGAP land cover model, approximately 3,918 acres (16 km^2) of potentially suitable desert playa and wash habitat on the SEZ could be directly affected by construction and operations (Table 9.3.12.1-1). This direct impact area represents about 1.0% of available suitable habitat in the region. About 10,444 acres (42 km^2) of potentially suitable habitat occurs in the area of potential indirect effect; this area represents about 2.8% of the available suitable habitat in the SEZ region (Table 9.3.12.1-1).

The overall impact on the Parish's brittlescale from construction, operation, and decommissioning of utility-scale solar energy facilities within the Pisgah SEZ is considered moderate because the amount of potentially suitable habitat for this species in the area of direct effects represents greater than 1% but less than 10% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features would reduce indirect impacts to negligible levels.

Parish's brittlescale habitat (desert playa and wash) occupies a limited portion of the SEZ and could be avoided during the development of facilities and protected from indirect effects. In conjunction with the implementation of programmatic design features, avoiding or minimizing disturbance to occupied habitats and all desert playa and wash habitats, and the mitigation measures described previously for the alkali mariposa-lily, could further reduce impacts on this species. The need for mitigation should first be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Parish's Phacelia

The Parish's phacelia is not known to occur in the affected area of the Pisgah SEZ; however, according to the CAReGAP land cover model, approximately 18,222 acres (74 km^2) of potentially suitable desertscrub and playa habitat on the SEZ could be directly affected by construction and operations (Table 9.3.12.1-1). This direct impact area represents about 0.6% of available suitable habitat in the region. About 112,431 acres (455 km^2) of potentially suitable habitat occurs in the area of potential indirect effect; this area represents about 3.8% of the available suitable habitat in the SEZ region (Table 9.3.12.1-1).

The overall impact on the Parish's phacelia from construction, operation, and decommissioning of utility-scale solar energy facilities within the Pisgah SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features would reduce indirect impacts to negligible levels.

Avoidance of all potentially suitable habitats is not a feasible way to mitigate impacts on the Parish's phacelia because some of these habitats (desertscrub) are widespread throughout the area of direct effect. However, impacts could be reduced to negligible levels with the implementation of mitigation options described previously for the alkali mariposa-lily. The need for mitigation should first be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Stephen's Beardtongue

The Stephen's beardtongue is not known to occur in the affected area of the Pisgah SEZ; however, according to the CAReGAP land cover model, approximately 16,297 acres (66 km^2) of potentially suitable desertscrub and wash habitat on the SEZ could be directly affected by construction and operations (Table 9.3.12.1-1). This direct impact area represents about 0.4% of available suitable habitat in the region. About 144,048 acres (583 km^2) of potentially suitable habitat occurs in the area of potential indirect effect; this area represents about 3.9% of the available suitable habitat in the SEZ region (Table 9.3.12.1-1).

The overall impact on the Stephen's beardtongue from construction, operation, and decommissioning of utility-scale solar energy facilities within the Pisgah SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features would reduce indirect impacts to negligible levels.

Avoidance of all potentially suitable habitats is not a feasible way to mitigate impacts on the Stephen's beardtongue because some of these habitats (desertscrub) are widespread throughout the area of direct effect. However, impacts could be reduced to negligible levels with the implementation of programmatic design features and the mitigation options described previously for the alkali mariposa-lily. The need for mitigation should first be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

White-Bracted Spineflower

The white-bracted spineflower is not known to occur in the affected area of the Pisgah SEZ; however, according to the CAReGAP land cover model, approximately 15,427 acres (62 km^2) of potentially suitable desertscrub habitat on the SEZ could be directly affected by construction and operations (Table 9.3.12.1-1). This direct impact area represents about 0.5% of available suitable habitat in the SEZ region. About 107,664 acres (436 km^2) of potentially suitable habitat occurs in the area of potential indirect effect; this area represents about 3.7% of the available suitable habitat in the SEZ region (Table 9.3.12.1-1).

The overall impact on the white-bracted spineflower from construction, operation, and decommissioning of utility-scale solar energy facilities within the Pisgah SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features would reduce indirect impacts to negligible levels.

Avoidance of all potentially suitable habitats is not feasible to mitigate impacts on the white-bracted spineflower because some of these habitats (desertscrub) are widespread throughout the area of direct effect. However, impacts could be reduced to negligible levels with the implementation of programmatic design features and the mitigation options described previously for the alkali mariposa-lily. The need for mitigation should first be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

White-Margined Beardtongue

The white-margined beardtongue is known to occur on the Pisgah SEZ and in other portions of the affected area. According to the CAReGAP land cover model, approximately 15,749 acres (64 km^2) of potentially suitable desertscrub and dune habitat on the SEZ could be directly affected by construction and operations (Table 9.3.12.1-1). This direct impact area represents about 0.5% of available suitable habitat in the SEZ region. About 112,819 acres

(457 km^2) of potentially suitable habitat occurs in the area of potential indirect effect; this area represents about 3.7% of the available suitable habitat in the SEZ region (Table 9.3.12.1-1).

The overall impact on the white-margined beardtongue from construction, operation, and decommissioning of utility-scale solar energy facilities within the Pisgah SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features would reduce indirect impacts to negligible levels.

Avoidance of all potentially suitable habitats is not a feasible way to mitigate impacts on the white-margined beardtongue because some of these habitats (desertscrub) are widespread throughout the area of direct effect. However, impacts could be reduced to negligible levels with the implementation of programmatic design features and the mitigation options described previously for the alkali mariposa-lily. The need for mitigation should first be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Mojave Fringe-Toed Lizard

The Mojave fringe-toed lizard is known to occur on the Pisgah SEZ and in other portions of the affected area. According to the CAReGAP habitat suitability model, approximately 19,218 acres (78 km^2) of potentially suitable habitat on the SEZ could be directly affected by construction and operations (Table 9.3.12.1-1). This direct impact area represents about 0.5% of available suitable habitat in the SEZ region. About 156,798 acres (635 km^2) of potentially suitable foraging habitat occurs in the area of potential indirect effect; this area represents about 4.1% of the available suitable habitat in the SEZ region (Table 9.3.12.1-1).

The overall impact on the Mojave fringe-toed lizard from construction, operation, and decommissioning of utility-scale solar energy facilities within the Pisgah SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the region. The implementation of programmatic design features would reduce indirect impacts to negligible levels.

Avoidance of all potentially suitable habitats is not a feasible way to mitigate impacts on the Mojave fringe-toed lizard because, according to the CAReGAP habitat suitability model, these habitats are widespread throughout the area of direct effect. However, avoiding or minimizing disturbance to occupied habitats, dune and sand transport systems, and desert wash habitats could reduce impacts on this species. If avoiding or minimizing is not a feasible option, a compensatory mitigation plan could be developed and implemented to mitigate direct effects on occupied habitats. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that uses one or both of these options could be designed to completely offset the impacts of development. The need for mitigation should first be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Bendire's Thrasher

The Bendire's thrasher is a summer resident in southern California and is known to occur on the Pisgah SEZ and in other portions of the affected area. According to the CAReGAP land cover model, approximately 15,427 acres (62 km^2) of potentially suitable habitat on the SEZ could be directly affected by construction and operations of solar energy development (Table 9.3.12.1-1). This direct effects area represents about 0.5% of available suitable habitat in the SEZ region. About 107,664 acres (436 km^2) of suitable habitat occurs in the area of potential indirect effects; this area represents about 3.7% of the available suitable habitat in the SEZ region (Table 9.3.12.1-1).

The overall impact on the Bendire's thrasher from construction, operation, and decommissioning of utility-scale solar energy facilities within the Pisgah SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features are expected to reduce indirect impacts to negligible levels.

Avoidance of all potentially suitable habitats is not feasible to mitigate impacts on the Bendire's thrasher because potentially suitable desertscrub habitats are widespread throughout the area of direct effect. Impacts could be reduced to negligible levels through the implementation of programmatic design features and by conducting pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats on the SEZ, especially nesting habitats. If avoidance or minimization is not a feasible option, a compensatory mitigation plan could be developed and implemented to mitigate direct effects on occupied habitats. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that used one or both of these options could be designed to completely offset the impacts of development. The need for mitigation should first be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Ferruginous Hawk

The ferruginous hawk is a winter resident in southern California within the Pisgah SEZ region. According to the CAReGAP land cover model, approximately 15,598 acres (63 km^2) of potentially suitable foraging habitat on the SEZ could be directly affected by construction and operations (Table 9.3.12.1-1). This direct impact area represents about 0.5% of available suitable habitat in the SEZ region. About 110,385 acres (447 km^2) of potentially suitable habitat occurs in the area of potential indirect effect; this area represents about 3.7% of the available suitable habitat in the SEZ region (Table 9.3.12.1-1).

The overall impact on the ferruginous hawk from construction, operation, and decommissioning of utility-scale solar energy facilities within the Pisgah SEZ is considered small because direct effects would only occur on potentially suitable foraging habitat, and the amount of this habitat in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features are expected to reduce indirect impacts to negligible levels. Avoidance of direct impacts on all potentially suitable foraging habitat is not a feasible way to mitigate impacts on the ferruginous hawk because potentially suitable shrubland is widespread throughout the area of direct effects and readily available in other portions of the affected area.

Western Burrowing Owl

The western burrowing owl is not known to occur in the affected area of the Pisgah SEZ. However, according to the CAReGAP habitat suitability model, approximately 23,932 acres (97 km^2) of potentially suitable habitat on the SEZ could be directly affected by construction and operations (Table 9.3.12.1-1). This direct impact area represents 0.5% of available suitable habitat in the SEZ region. About 180,886 acres (732 km^2) of potentially suitable habitat occurs in the area of potential indirect effect; this area represents about 3.7% of the available suitable habitat in the SEZ region (Table 9.3.12.1-1). Most of this area could serve as foraging and nesting habitat (shrublands). The abundance of burrows suitable for nesting on the SEZ and in the area of indirect effects has not been determined.

The overall impact on the western burrowing owl from construction, operation, and decommissioning of utility-scale solar energy facilities within the Pisgah SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts on this species to negligible levels.

Avoidance of all potentially suitable habitats is not feasible to mitigate impacts on the ferruginous hawk because potentially suitable desertscrub habitats are widespread throughout the area of direct effect. However, impacts on the western burrowing owl could be reduced by avoiding or minimizing disturbance to occupied burrows and habitat in the area of direct effects. If avoidance or minimization of disturbance to all occupied habitat is not a feasible option, a compensatory mitigation plan could be developed and implemented to mitigate direct effects. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that used one or both of these options could be designed to completely offset the impacts of development. The need for mitigation should first be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Mojave Ground Squirrel

The Mohave ground squirrel is not known to occur in the affected area of the Pisgah SEZ. However, the species is known to occur about 15 mi (24 km) west of the SEZ and, according to the CAReGAP land cover model, approximately 15,427 acres (62 km^2) of potentially suitable desertscrub habitat on the SEZ could be directly affected by construction and operations (Table 9.3.12.1-1). This direct impact area represents about 0.5% of available suitable foraging habitat in the SEZ region. About 107,664 acres (436 km^2) of potentially suitable habitat occurs in the area of potential indirect effect; this area represents about 3.7% of the available suitable habitat in the SEZ region (Table 9.3.12.1-1).

The overall impact on the Mohave ground squirrel from construction, operation, and decommissioning of utility-scale solar energy facilities within the Pisgah SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts on this species to negligible levels.

Avoidance of all potentially suitable habitats is not a feasible way to mitigate impacts on the Mohave ground squirrel because potentially suitable desertscrub habitats are widespread throughout the area of direct effect. Impacts could be reduced to negligible levels through the implementation of programmatic design features and by avoiding or minimizing disturbance to occupied habitats on the SEZ. If avoidance or minimization is not a feasible option, a compensatory mitigation plan could be developed and implemented to mitigate direct effects on occupied habitats. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that used one or both of these options could be designed to completely offset the impacts of development. The need for mitigation should first be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Nelson's Bighorn Sheep

The Nelson's bighorn sheep (also called the desert bighorn sheep) is known to occur in the affected area from the Cady Mountains within 5 mi (8 km) northeast of the Pisgah SEZ. The species is also known to occur in the Rodman Mountains outside of the affected area, approximately 10 mi (16 km) west of the SEZ. Sheep may utilize habitats within the SEZ as migration corridors between these ranges. According to the CAReGAP habitat suitability model, approximately 20,578 acres (83 km^2) of potentially suitable habitat on the SEZ could be directly affected by construction and operations (Table 9.3.12.1-1). This direct impact area represents about 1.1% of available suitable habitat in the SEZ region. About 126,778 acres (513 km^2) of potentially suitable habitat occurs in the area of potential indirect effect; this area represents about 6.9% of the available suitable habitat in the SEZ region (Table 9.3.12.1-1).

The overall impact on the Nelson's bighorn sheep from construction, operation, and decommissioning of utility-scale solar energy facilities within the Pisgah SEZ is considered moderate because the amount of potentially suitable habitat for this species in the area of direct effects represents greater than 1% but less than 10% of potentially suitable habitat in the region, and the implementation of programmatic design features alone is unlikely to substantially reduce impacts.

Impacts on the Nelson's bighorn sheep could be reduced to small or negligible levels by avoiding or minimizing disturbance of occupied habitats and important movement corridors on the SEZ. If avoidance or minimization are not a feasible options, a compensatory mitigation plan could be developed and implemented to mitigate direct effects on occupied habitats. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that used one or both of these options could be designed to completely offset the impacts of development. The need for mitigation should first be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Pallid Bat

The pallid bat is a year-round resident in southern California within the Pisgah SEZ region. According to the CAReGAP land cover model, approximately 16,932 acres (69 km^2) of potentially suitable foraging habitat on the SEZ could be directly affected by construction and operations (Table 9.3.12.1-1). This direct impact area represents about 0.4% of available suitable foraging habitat in the SEZ region. About 148,804 acres (602 km^2) of potentially suitable foraging habitat occurs in the area of potential indirect effect; this area represents about 3.5% of the available suitable foraging habitat in the SEZ region (Table 9.3.12.1-1). The potentially suitable habitat on the SEZ is primarily foraging habitat (desert shrubland); however, suitable roosting habitat may occur on the SEZ. On the basis of an evaluation of land cover types, approximately 1,500 acres (6 km^2) of rocky cliffs and outcrops that may be potentially suitable roosting habitat occurs on the SEZ. An additional 41,000 acres (166 km^2) of rocky cliffs and outcrops occurs in the area of direct effects.

The overall impact on the pallid bat from construction, operation, and decommissioning of utility-scale solar energy facilities within the Pisgah SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features are expected to reduce indirect impacts to negligible levels.

Avoidance of direct impacts on all foraging habitat (shrublands) is not feasible because suitable foraging habitat (shrublands) is widespread in the area of direct effect and readily available in other portions of the affected area. However, avoiding or minimizing disturbance of all potential roosting habitat (rocky cliffs and outcrops) on the SEZ is feasible, and could reduce impacts. If avoidance or minimization of disturbance to all occupied or suitable roosting habitat is not a feasible option, a compensatory mitigation plan could be developed and implemented to mitigate direct effects. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that used one or both of these options could be designed to completely offset the impacts of development. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat within the area of direct effects.

Spotted Bat

The spotted bat is considered to be a rare year-round resident in southern California within the Pisgah SEZ region. According to the CAReGAP land cover model, approximately 15,427 acres (62 km^2) of potentially suitable foraging habitat on the SEZ could be directly affected by construction and operations (Table 9.3.12.1-1). This direct impact area represents about 0.5% of available suitable foraging habitat in the SEZ region. About 107,732 acres (436 km^2) of potentially suitable foraging habitat occurs in the area of potential indirect effect; this area represents about 3.7% of the available suitable foraging habitat in the SEZ region (Table 9.3.12.1-1). The potentially suitable habitat on the SEZ is primarily foraging habitat (desert shrubland); however, suitable roosting habitat may occur on the SEZ. On the basis of an evaluation of land cover types, approximately 1,500 acres (6 km^2) of rocky cliffs and outcrops that may be potentially suitable roosting habitat occurs on the SEZ. An additional 41,000 acres (166 km^2) of rocky cliffs and outcrops occurs in the area of direct effects.

The overall impact on the spotted bat from construction, operation, and decommissioning of utility-scale solar energy facilities within the Pisgah SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features are expected to reduce indirect impacts to negligible levels.

Avoidance of direct impacts on all foraging habitat (shrublands) is not feasible because suitable foraging habitat (shrublands) is widespread in the area of direct effect and readily available in other portions of the affected area. However, avoiding or minimizing disturbance of all potential roosting habitat (rocky cliffs and outcrops) on the SEZ is feasible, and could reduce impacts. If avoidance or minimization of disturbance to all occupied or suitable roosting habitat is not a feasible option, a compensatory mitigation plan could be developed and implemented to mitigate direct effects. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that used one or both of these options could be designed to completely offset the impacts of development. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat within the area of direct effects.

Townsend's Big-Eared Bat

The Townsend's big-eared bat is a year-round resident in southern California within the Pisgah SEZ region. According to the CAReGAP land cover model, approximately 23,950 acres (97 km^2) of potentially suitable foraging habitat on the SEZ could be directly affected by construction and operations (Table 9.3.12.1-1). This direct impact area represents about 0.5% of available suitable foraging habitat in the SEZ region. About 181,086 acres (733 km^2) of potentially suitable foraging habitat occurs in the area of potential indirect effect; this area represents about 3.8% of the available suitable foraging habitat in the SEZ region (Table 9.3.12.1-1). The potentially suitable habitat on the SEZ is primarily foraging habitat (desert shrubland); however, suitable roosting habitat may occur on the SEZ. On the basis of an evaluation of land cover types, approximately 1,500 acres (6 km^2) of rocky cliffs and outcrops that may be potentially suitable roosting habitat occurs on the SEZ. An additional 41,000 acres (166 km^2) of rocky cliffs and outcrops occurs in the area of direct effects.

The overall impact on the Townsend's big-eared bat from construction, operation, and decommissioning of utility-scale solar energy facilities within the Pisgah SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features are expected to reduce indirect impacts to negligible levels.

Avoidance of direct impacts on all foraging habitat (shrublands) is not feasible because suitable foraging habitat (shrublands) is widespread in the area of direct effect and readily available in other portions of the affected area. However, avoiding or minimizing disturbance of all potential roosting habitat (rocky cliffs and outcrops) on the SEZ is feasible, and could reduce impacts. If avoidance or minimization of disturbance to all occupied or suitable roosting habitat is not a feasible option, a compensatory mitigation plan could be developed and implemented to mitigate direct effects. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that used one or both of these options could be designed to completely offset the impacts of development. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat within the area of direct effects.

Western Mastiff Bat

The western mastiff bat is a year-round resident in southern California within the Pisgah SEZ region. According to the CAReGAP land cover model, approximately 23,950 acres (97 km^2) of potentially suitable foraging habitat on the SEZ could be directly affected by construction and operations (Table 9.3.12.1-1). This direct impact area represents about 0.5% of available suitable foraging habitat in the SEZ region. About 181,086 acres (733 km^2) of potentially suitable foraging habitat occurs in the area of potential indirect effect; this area represents about 3.8% of the available suitable foraging habitat in the SEZ region (Table 9.3.12.1-1). The potentially suitable habitat on the SEZ is primarily foraging habitat (desert shrubland); however, suitable roosting habitat may occur on the SEZ. On the basis of an evaluation of land cover types, approximately 1,500 acres (6 km^2) of rocky cliffs and outcrops that may be potentially suitable roosting habitat occurs on the SEZ. An additional 41,000 acres (166 km^2) of rocky cliffs and outcrops occurs in the area of direct effects.

The overall impact on the western mastiff bat from construction, operation, and decommissioning of utility-scale solar energy facilities within the Pisgah SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the region. The implementation of programmatic design features are expected to reduce indirect impacts to negligible levels.

Avoidance of direct impacts on all foraging habitat (shrublands) is not feasible because suitable foraging habitat (shrublands) is widespread in the area of direct effect and readily available in other portions of the affected area. However, avoiding or minimizing disturbance of all potential roosting habitat (rocky cliffs and outcrops) on the SEZ is feasible, and could reduce impacts. If avoidance or minimization of disturbance to all occupied or suitable roosting habitat is not a feasible option, a compensatory mitigation plan could be developed and implemented to mitigate direct effects. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that used one or both of these options could be designed to completely offset the impacts of development. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat within the area of direct effects.

9.3.12.2.3 Impacts on State-Listed Species

There are three species listed by the State of California that could occur in the affected area of the Pisgah SEZ (Section 9.3.12.1.4; Table 9.3.12.1-1): Mojave tui chub, desert tortoise, and Mohave ground squirrel. Potential impacts on each of these species is discussed in Section 9.3.12.2.1 or 9.3.12.2.2 because of their status under the ESA or BLM.

9.3.12.2.4 Impacts on Rare Species

There are 51 species with a state rank of S1 or S2 in California or considered a species of concern by the State of California or the USFWS may occur in the affected area of the Pisgah SEZ. Impacts have been previously discussed for 28 of these species that are also listed under the ESA (Section 9.3.12.2.1), BLM-designated sensitive (Section 9.3.12.2.2), or state-listed (Section 9.3.12.2.3). Impacts on the remaining 23 rare species that do not have any other special status designation are presented in Table 9.3.12.1-1.

9.3.12.3 SEZ-Specific Design Features and Design Feature Effectiveness

The implementation of required programmatic design features described in Appendix A would greatly reduce or eliminate the potential for effects of utility-scale solar energy development on special status species. While some SEZ-specific mitigation measures are best established when specific project details are being considered, some design features can be identified at this time, including the following:

- Pre-disturbance surveys should be conducted within the SEZ to determine the presence and abundance of all special status species, including those identified in Table 9.3.12.1-1; disturbance of occupied habitats for these species should be avoided or minimized to the extent practicable. If avoiding or minimizing impacts on occupied habitats is not possible, translocation of individuals from areas of direct effect, or compensatory mitigation of direct effects on occupied habitats could reduce impacts. A comprehensive mitigation strategy for special status species that used one or more of these options to offset the impacts of development should be developed in coordination with the appropriate federal and state agencies.

- Disturbance of desert playa and wash habitats within the SEZ should be avoided or minimized to the extent practicable. In particular, development should be avoided in and near Troy Lake in the western portion of the SEZ. Adverse impacts on the following species could be reduced with the avoidance of Troy Lake and desert wash habitats on the SEZ: alkali mariposa-lily, black bog-rush, California saw-grass, Coulter's goldfields, Darwin rock-cress, desert cymopterus, jackass-clover, Mojave monkeyflower, Parish's brittlescale, Utah glasswort, and Mojave fringe-tailed lizard.

- Avoidance or minimization of disturbance to desert dunes and sand transport systems on the SEZ could reduce impacts on the following special status species: chaparral sand-verbena, flat-seeded spurge, Harwood's eriastrum, jackass-clover, Little San Bernardino Mountains linanthus, and Mojave fringe-toed lizard.

- Avoidance or minimization of disturbance to rocky cliff and outcrop habitats on the SEZ could reduce impacts on the Nelson's bighorn sheep, pallid bat (roosting), spotted bat (roosting),Townsend's big-eared bat (roosting), and western mastiff bat (roosting).

- Avoidance of groundwater withdrawals from the SEZ would reduce or prevent impacts on the following special status species that may occur in aquatic habitats outside of the affected area: Arroyo chub, Mojave tui chub, and southwestern pond turtle.

- As California fully protected species, direct and indirect impacts on the Mohave tui chub should be completely avoided. This includes the avoidance of groundwater withdrawals from the SEZ that may affect habitats at Camp Cady and in the Mojave River. Coordination with the CDFG should be conducted for the Mohave tui chub to address the potential for impact when project-related groundwater demands are better identified.

- Consultations with the USFWS and the CDFG should be conducted to address the potential for impacts on the Mojave tui chub and desert tortoise species listed as endangered and threatened, respectively, under the ESA and CESA. Consultation would identify an appropriate survey protocol, avoidance measures, and, if appropriate, reasonable and prudent alternatives, reasonable and prudent measures, and terms and conditions for incidental take statements.

- Harassment or disturbance of special status species and their habitats in the affected area should be mitigated. This can be accomplished by identifying any additional sensitive areas and implementing necessary protection measures based upon consultation with the USFWS and CDFG.

If these SEZ-specific design features are implemented in addition to required programmatic design features, impacts on the special status and rare species would be reduced.

9.3.13 Air Quality and Climate

9.3.13.1 Affected Environment

9.3.13.1.1 Climate

The proposed Pisgah SEZ is located in the central portion of San Bernardino County in southeastern California. The SEZ with an average elevation of 1,980 ft (604 m) lies in the western portion of the Mojave Desert, which has an extremely arid climate marked by mild winters and hot summers, large daily temperature swings, scant precipitation, high evaporation rates, low relative humidity, and abundant sunshine. Meteorological data collected at the Barstow-Daggett Airport, which is about 12 mi (19 km) west of the Pisgah SEZ, are summarized below.

A wind rose from the Barstow-Daggett Airport in Daggett, California, for the 5-year period 2003 to 2005 and for 2007 to 2008 and taken at a level of 33 ft (10 m), is presented in Figure 9.3.13.1-1 (NCDC 2010a). During this period, the annual average wind speed at the airport was about 10.9 mph (4.9 m/s), with a predominant wind direction from the west (about 28% of the time) and secondarily from the west–southwest (about 19% of the time). Predominance of west wind components (about 72% in wind directions ranging from southwest to northwest inclusive) is reflective of the statewide prevailing westerlies (NCDC 2010b), because the airport is located far from topographic features and not affected by local terrain. Winds blew predominantly from the west every month throughout the year. Wind speeds categorized as calm (less than 1.1 mph [0.5 m/s]) occurred frequently (almost 9% of the time) because of the stable conditions caused by strong radiative cooling from late night to sunrise. Average wind speeds by season were the highest in spring at 13.7 mph (6.1 m/s); lower in summer and fall at 12.2 mph (5.4 m/s) and 9.5 mph (4.2 m/s), respectively; and lowest in winter at 8.4 mph (3.8 m/s).

For the 1948 to 2009 period, the annual average temperature at Barstow-Daggett Airport was 67.5°F (19.7°C) (WRCC 2010b). December was the coldest month with an average minimum temperature of 35.6°F (2.0°C), and July was the warmest month with an average maximum of 104.3°F (40.2°C). On most days in summer, daytime maximum temperatures were in the 100s, and minimums were in the upper 60s or higher. In winter, the minimum temperatures recorded were below freezing (≤32°F [0°C]) on about 10 days of each of the colder months (January and December), but subzero temperatures were never recorded. During the same period, the highest temperature, 118°F (47.8°C), was reached in June 1994 and the lowest, 5°F (–15.0°C), in December 1985. In a typical year, about 139 days had a maximum temperature of 90°F (32.2°C) or more, while about 27 days had minimum temperatures at or below freezing.

Along with prevailing westerlies, Pacific air masses lose most of their moisture on the windward side of mountain ranges parallel to the California coastline. Thus, leeward areas like the Pisgah SEZ area experience a lack of precipitation. For the period 1948 to 2009, annual

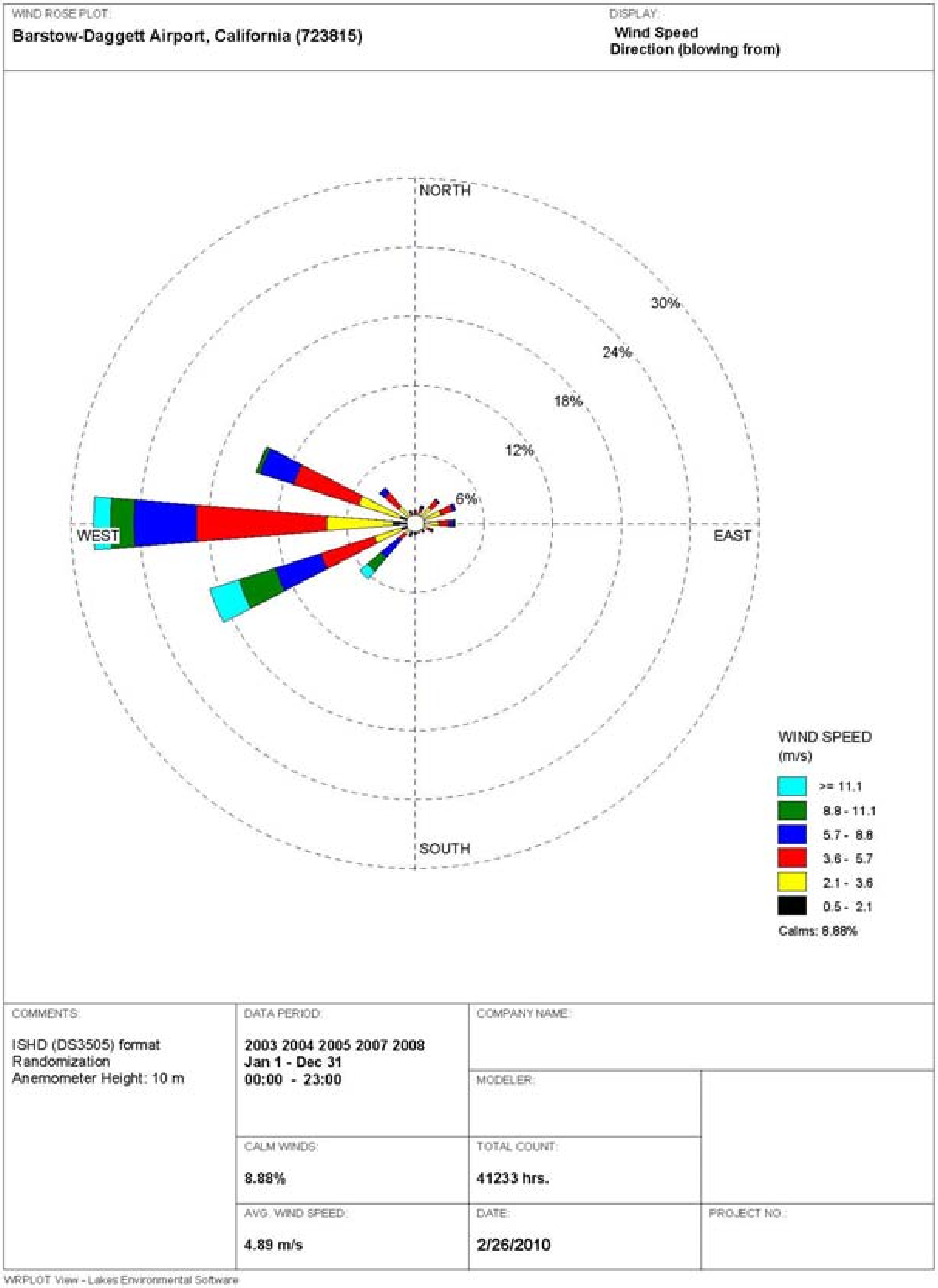

FIGURE 9.3.13.1-1 Wind Rose at 33 ft (10 m) at Barstow-Daggett Airport, Daggett, California, 2003–2005 and 2007–2008 (Source: NCDC 2010a)

precipitation at Barstow-Daggett Airport averaged about 3.84 in. (9.8 cm) (WRCC 2010b). There is an average of 23 days annually with measurable precipitation (0.01 in. [0.025 cm] or higher). About 39% of the annual precipitation occurs during winter months and the remaining precipitation is relatively evenly distributed over the other seasons. Snowfall at the airport is uncommon and mostly limited to December to January, infrequently in February and November. The annual average snowfall is about 0.8 in. (2.0 cm), and the highest monthly snowfall recorded was 14 in. (35.6 cm) in January 1949.

Because the area surrounding the proposed Pisgah SEZ is far from major water bodies (more than 110 mi [177 km]) and because surrounding mountain ranges block air masses from penetrating into the area, severe weather events, such as hurricanes and tornadoes, are rare.

Since 1993, 281 floods (mostly flash floods) were reported in San Bernardino County (NCDC 2010c) , with peaks in July and August. They caused a total of 12 deaths, 48 injuries, and considerable property and crop damage.

In San Bernardino County, 51 hail events in total have been reported since 1966; they caused minor property damage. Hail measuring 2.00 in. (5.1 cm) in diameter was reported in 1999. In San Bernardino County, 129 high wind events, which peaked in winter months, have been reported since 1996; they have caused eight deaths, 70 injuries, and significant property and crop damage (NCDC 2010c). A high wind event with a maximum wind speed of 120 mph (53.5 m/s) occurred in 1999. Since 1957, 101 thunderstorm wind events, peaking in summer months, have been reported; they caused one death, five injuries, and minor property damage. Many thunderstorms in California are accompanied by little to no precipitation, and lightning strikes sometimes cause forest fires (NCDC 2010b).

Since 1998, seven dust storm events were reported in San Bernardino County (NCDC 2010c). The ground surface of the SEZ is predominantly covered with gravelly alluvial sands and fine-grained eolian sands, which have relatively high dust storm potential. High winds can trigger large amounts of blowing dust in areas of San Bernardino County that have dry and loose soils with sparse vegetation. Dust storms can deteriorate air quality and visibility and have adverse effects on health.

Hurricanes and tropical storms formed off the coast of Central America and Mexico weaken over the cold waters off the California Coast. Accordingly, hurricanes rarely hit California. Historically, two tropical depressions have passed within 100 mi (160 km) of the proposed Pisgah SEZ (CSC 2010). Tornadoes in San Bernardino County, which encompasses the proposed Pisgah SEZ, occur infrequently. In the period 1950 to June 2010, a total of 29 tornadoes (0.5 per year) were reported in San Bernardino County (NCDC 2010c). However, most tornadoes occurring in San Bernardino County were relatively weak (i.e., seven were uncategorized, 20 were F0 or F1, and two were F2 on the Fujita tornado scale). Several of these tornadoes caused three injuries and minor property damage in total. Most tornadoes in San Bernardino County were reported far from the proposed Pisgah SEZ, except two F0 tornadoes occurring near Daggett about 16 mi (26 km) west of the SEZ.

9.3.13.1.2 Existing Air Emissions

San Bernardino County, which encompasses the proposed Pisgah SEZ, has many industrial emission sources, which are mainly concentrated over the valley region near the City of San Bernardino. No point source emissions are located around the proposed Pisgah SEZ, except a natural gas transmission facility about 2 mi (3 km) southwest of the SEZ. Mobile source emissions are substantial, because the county is crossed by several interstate highways, including I-10, I-15, I-40, and I-215. Data on annual emissions of criteria pollutants and VOCs in San Bernardino County for 2002 are presented in Table 9.3.13.1-1 (WRAP 2009). Emission data are classified into six source categories: point, area, onroad mobile, nonroad mobile, biogenic, and fire (wildfires, prescribed fires, agricultural fires, structural fires). In 2002, nonroad sources were major contributors to total SO_2 emissions (about 43%) and secondary contributors to total NO_x emissions (about 28%). Point sources were secondary contributors to SO_2 emissions (about 38%), but with contributions comparable to nonroad sources. Onroad sources were major contributors to NO_x and CO emissions (about 31% and 43%, respectively). Biogenic sources (i.e., vegetation—including trees, plants, and crops—and soils) that release naturally occurring emissions accounted for most of VOC emissions (about 91%) and secondarily contributed to CO emissions (about 19%). Area sources accounted for about 70% of PM_{10} and 47% of $PM_{2.5}$. Fire sources are secondary contributors to $PM_{2.5}$ emissions (about 27%).

TABLE 9.3.13.1-1 Annual Emissions of Criteria Pollutants and VOCs in San Bernardino County, California, Encompassing the Proposed Pisgah SEZ, 2002[a]

Pollutant	Emissions (tons/yr)
SO_2	3,774
NO_x	102,722
CO	373,128
VOC	512,377
PM_{10}	44,722
$PM_{2.5}$	17,879

[a] Includes point, area, onroad and nonroad mobile, biogenic, and fire emissions.

[b] Notation: CO = carbon monoxide; NO_x = nitrogen oxides; $PM_{2.5}$ = particulate matter with a diameter of ≤2.5 µm; PM_{10} = particulate matter with a diameter of ≤10 µm; SO_2 = sulfur dioxide; and VOC = volatile organic compounds.

Source: WRAP (2009).

In 2006, California produced about 483.9 MMt of *gross*[8] carbon dioxide equivalent (CO_2e)[9] emissions (CARB 2010a). GHG emissions in California increased by about 12% from 1990 to 2006, which was three-fourths of the increase in the national rate (about 16%). In 2006, transportation (38.4%) and electricity use (21.9%) were the primary contributors to gross GHG emission sources in California. Fossil fuel use in the residential, commercial, and industrial (RCI) sectors combined accounted for about 29.0% of total state emissions. California's *net* emissions were about 479.8 MMt CO_2e, taking into account carbon sinks from forestry activities and agricultural soils throughout the state. The EPA (EPA 2009a) also estimated 2005 emissions in California. Its

[8] Excluding GHG emissions removed as a result of forestry and other land uses and excluding GHG emissions associated with exported electricity.

[9] A measure used to compare the emissions from various GHGs on the basis of their global warming potential, defined as the cumulative radiative forcing effects of a gas over a specified time horizon resulting from the emission of a unit mass of gas relative to a reference gas, CO_2. The CO_2e for a gas is derived by multiplying the mass of the gas by the associated global warming potential.

estimate of CO_2 emissions from fossil fuel combustion was 390.6 MMt, which was comparable to the state's estimate. The transportation and RCI sectors accounted for about 58.7% and 30.5% of total CO_2 emissions, respectively, while electric power generation accounted for the remainder (about 10.8%).

9.3.13.1.3 Air Quality

CAAQS address the same six criteria pollutants as does NAAQS (CARB 2010b; EPA 2010a): SO_2, NO_2, CO, O_3, PM, PM_{10}, $PM_{2.5}$, and Pb. CAAQS are more stringent than NAAQS for most of criteria pollutants. In addition, California has set standards for some pollutants that are not addressed by NAAQS: visibility-reducing particles, sulfates, hydrogen sulfide, and vinyl chloride. The NAAQS and CAAQS for criteria pollutants are presented in Table 9.3.13.1-2.

Most San Bernardino County is located administratively within Southeast Desert Intrastate AQCR (Title 40, Part 81, Section 167 of the *Code of Federal Regulations* [40 CFR 81.167]), along with parts of Kern, Los Angeles, and Riverside Counties, and all of Imperial County. In addition, the Pisgah SEZ is located within the Mojave Desert Air Basin, one of 15 geographic air basins designated for the purpose of managing air resources in California, which also includes the desert portions of Kern, Los Angeles, Riverside, and San Bernardino Counties. Currently, the area surrounding the proposed SEZ is designated as being in unclassifiable attainment of NAAQS for all criteria pollutants, except O_3 and PM_{10} (40 CFR 81.305). Further, the area is designated as a nonattainment area for O_3, PM_{10}, and $PM_{2.5}$ based on CAAQS (CARB 2010c).

With a low population density, the Mojave Desert area has no significant emission sources of its own, except mobile emissions along interstate highways. Air quality in the Mojave Desert area primarily depends on upwind emissions transported from the South Coast Air Basin including Los Angeles. As a result of upwind emissions controls, air quality of the Mojave Desert area has improved, but concentrations of O_3 are still relatively high.

There are no ambient air monitoring stations in San Bernardino County near the proposed Pisgah SEZ. To characterize ambient air quality around the SEZ, two monitoring stations in San Bernardino County were chosen: Barstow, about 26 mi (42 km) to the west, and Victorville, about 48 mi (77 km) to the west–southwest of the SEZ. These monitoring stations are considered representative of the proposed SEZ. Ambient concentrations of NO_2, CO, O_3, and PM_{10} are recorded at Barstow, while those of SO_2, NO_2, CO, O_3, PM_{10}, and $PM_{2.5}$ are recorded at Victorville. No Pb measurements are made in the Mojave Desert area, so Pb measurements from the City of San Bernardino are presented to demonstrate that Pb is not a concern in San Bernardino County. The background concentrations of criteria pollutants at these stations for the period 2004 to 2008 are presented in Table 9.3.13.1-2 (EPA 2010b). The monitored SO_2, NO_2, CO, and Pb levels at either station were lower than their respective standards. Monitored $PM_{2.5}$ levels were approaching NAAQS and CAAQS, while PM_{10} levels were lower than NAAQS but higher than CAAQS. The highest O_3 concentrations exceeded both NAAQS and CAAQS.

TABLE 9.3.13.1-2 NAAQS, CAAQS, and Background Concentration Levels Representative of the Proposed Pisgah SEZ in San Bernardino County, California, 2004–2008

				Background Concentration Level	
Pollutant[a]	Averaging Time	NAAQS	CAAQS	Concentration[b,c]	Measurement Location, Year
SO_2	1-hour	0.075 ppm[d]	0.25 ppm	0.015 ppm (–; 6.0%)	Victorville, 2006
	3-hour	0.5 ppm	–[e]	0.009 ppm (1.8%; –)	Victorville, 2006
	24-hour	0.14 ppm	0.04 ppm	0.005 ppm (3.6%; 13%)	Victorville, 2007
	Annual	0.030 ppm	–	0.002 ppm (6.7%; –)	Victorville, 2006
NO_2	1-hour	0.100 ppm[f]	0.18 ppm	0.097 ppm (–; 54%)	Barstow, 2004
	Annual	0.053 ppm	0.030 ppm	0.023 ppm (43%; 77%)	Barstow, 2004
CO	1-hour	35 ppm	20 ppm	2.6 ppm (7.4%; 13%)	Barstow, 2006
	8-hour	9 ppm	9.0 ppm	1.2 ppm (13%; 13%)	Barstow, 2005
O_3	1-hour	0.12 ppm[g]	0.09 ppm	0.108 ppm (–; 120%)	Barstow, 2006
	8-hour	0.075 ppm	0.070 ppm	0.090 ppm (120%; 129%)	Barstow, 2008
PM_{10}	24-hour	150 μg/m³	50 μg/m³	103 μg/m³ (69%; 206%)	Barstow, 2007
	Annual	–[h]	20 μg/m³	30 μg/m³ (–; 150%)	Barstow, 2007
$PM_{2.5}$	24-hour	35 μg/m³	–	33 μg/m³ (94%; –)	Victorville, 2004
	Annual	15.0 μg/m³	12 μg/m³	10.8 μg/m³ (72%; 90%)	Victorville, 2004
Pb	30-day	–	1.5 μg/m³	–	–
	Calendar quarter	1.5 μg/m³	–	0.02 μg/m³ (1.3%; –)	San Bernardino, 2007
	Rolling 3-month	0.15 μg/m³ [i]	–	–	–

a Notation: CO = carbon monoxide; NO_2 = nitrogen dioxide; O_3 = ozone; Pb = lead; $PM_{2.5}$ = particulate matter with a diameter of ≤2.5 μm; PM_{10} = particulate matter with a diameter of ≤10 μm; and SO_2 = sulfur dioxide.

b Monitored concentrations are the highest for calendar-quarter Pb; second-highest for all averaging times less than or equal to 24-hour averages, except fourth-highest daily maximum for 8-hour O_3 and the 98th percentile for 24-hour $PM_{2.5}$; and arithmetic mean for annual SO_2, NO_2, PM_{10}, and $PM_{2.5}$.

c First and second values in parentheses are background concentration levels as a percentage of NAAQS and CAAQS, respectively. Calculation of 1-hour SO_2, 1-hour NO_2, and rolling 3-month Pb to NAAQS was not made, because no measurement data based on new NAAQS standard are available.

d Effective August 23, 2010.

e A dash denotes “not applicable” or “not available.”

f Effective April 12, 2010.

g The EPA revoked the 1-hour O_3 standard in all areas, although some areas have continuing obligations under that standard (“anti-backsliding”).

h Effective December 18, 2006, the EPA revoked the annual PM_{10} standard of 50 μg/m³.

i Effective January 12, 2009.

Sources: CARB (2010b); EPA (2010a,b).

The PSD regulations (see 40 CFR 52.21), which are designed to limit the growth of air pollution in clean areas, apply to a major new source or modification of an existing major source within an attainment or unclassified area (see Section 4.11.2.3). As a matter of policy, EPA recommends that the permitting authority notify the Federal Land Managers when a proposed PSD source would locate within 62 mi (100 km) of a sensitive Class I area. There are several Class I areas around the Pisgah SEZ, three of which are situated within 62 mi (100 km). The nearest Class I area is the Joshua Tree NP (40 CFR 81.405), about 43 mi (69 km) south–southeast of the Pisgah SEZ. This Class I area is not located downwind of prevailing winds at the Pisgah SEZ (Figure 9.3.13.1-1). The next nearest Class I areas within 62 mi (100 km) are the San Gorgonio and San Jacinto WAs, which are located about 44 mi (71 km) and 60 mi (96 km) south–southwest of the Pisgah SEZ, respectively.

9.3.13.2 Impacts

Potential impacts on ambient air quality associated with a solar project would be of most concern during the construction phase. Impacts on ambient air quality from fugitive dust emissions resulting from soil disturbances are anticipated, but they would be of short duration. During the operations phase, only a few sources with generally low-level emissions would exist for any of the four types of solar technologies evaluated. A solar facility would either not burn fossil fuels or burn only small amounts during operation. (For facilities using heat transfer fluids [HTFs], fuel could be used to maintain the temperature of the HTFs for more efficient daily start-up.) Conversely, solar facilities would displace air emissions that would otherwise be released from fossil fuel–fired power plants.

Air quality impacts shared by all solar technologies are discussed in detail in Section 5.11.1, and technology-specific impacts are discussed in Section 5.11.2. Impacts specific to the proposed Pisgah SEZ are presented in the following sections. Any such impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2, and through any additional mitigation applied. Section 9.3.13.3 below identifies SEZ-specific design features of particular relevance to the Pisgah SEZ.

9.3.13.2.1 Construction

The Pisgah SEZ has a relatively flat terrain, thus only a minimum number of site preparation activities, perhaps with no large-scale earthmoving operations, would be required. However, fugitive dust emissions from soil disturbances during the entire construction phase would be a major concern because of the large areas that would be disturbed in a region that experiences windblown dust problems. Fugitive dusts, which are released near ground level, typically have more localized impacts than similar emissions from an elevated stack with additional plume rise induced by buoyancy and momentum effects.

Methods and Assumptions

Air quality modeling for PM_{10} and $PM_{2.5}$ emissions associated with construction activities was performed using the EPA-recommended AERMOD model (EPA 2009b). Details for emissions estimation, the description of AERMOD, input data processing procedures, and modeling assumptions are described in Section M.13 of Appendix M. Estimated air concentrations were compared with the applicable NAAQS/CAAQS levels at the site boundaries and nearby communities and with Prevention of Significant Deterioration (PSD) increment levels at nearby Class I areas.[10] However, no receptors were modeled for PSD analysis at the nearest Class I area, Joshua Tree NP, because it is about 43 mi (69 km) from the SEZ, which is over the maximum modeling distance of 31 mi (50 km) for the AERMOD. Rather, several regularly spaced receptors in the direction of the Joshua Tree NP were selected as surrogates for the PSD analysis. For the Pisgah SEZ, the modeling was conducted based on the following assumptions and input:

- Emissions were uniformly distributed over the 3,000 acres (12.1 km^2) each and 6,000 acres (24.3 km^2) in total, and in the western half of the SEZ, close to the nearest residences and towns such as Newberry Springs and Daggett;

- Surface hourly meteorological data came from the Barstow-Daggett Airport and upper air sounding data from Desert Rock/Mercury, Nevada, for the 2003 to 2005 and 2007 to 2008 period; and

- A receptor grid was regularly spaced over a modeling domain of 62 mi × 62 mi (100 km × 100 km), centered on the proposed SEZ, and there were additional discrete receptors at the SEZ boundaries.

Results

The modeling results for both PM_{10} and $PM_{2.5}$ concentration increments and total concentrations (modeled plus background concentrations) that would result from construction-related fugitive emissions are summarized in Table 9.3.13.2-1. Maximum 24-hour PM_{10} concentration increments modeled to occur at the site boundaries would be an estimated 457 $\mu g/m^3$, which far exceeds the relevant NAAQS level of 150 or CAAQS level of 50 $\mu g/m^3$. Total 24-hour PM_{10} concentrations of 560 $\mu g/m^3$ would also exceed the NAAQS and CAAQS levels at the SEZ boundary. However, high PM_{10} concentrations would be limited to the immediate areas surrounding the SEZ boundary and would decrease quickly with distance. Predicted maximum 24-hour PM_{10} concentration increments would be about 173 $\mu g/m^3$ at the nearby residence, which is located about 0.1 mi (0.2 km) south of the SEZ boundary.

---

[10] To provide a quantitative assessment, the modeled air impacts of construction were compared to the NAAQS/CAAQS levels and the PSD Class I increment levels. Although the Clean Air Act exempts construction activities from PSD requirements, a comparison with the Class I increment levels was used to quantify potential impacts. Only monitored data can be used to determine the attainment status. Modeled data are used to assess potential problems and as a consideration in the permitting process.

TABLE 9.3.13.2-1 Maximum Air Quality Impacts from Emissions Associated with Construction Activities for the Proposed Pisgah SEZ

			Concentration ($\mu g/m^3$)				Percentage of NAAQS/CAAQS[e]	
Pollutant[a]	Averaging Time	Rank[b]	Maximum Increment[b]	Background[c]	Total	NAAQS/ CAAQS[d]	Increment	Total
PM_{10}	24 hours	H6H	457	103	560	150/50	305/914	373/1,120
	Annual	–	83.7	30	114	–[f]/20	–/419	–/569
$PM_{2.5}$	24 hours	H8H	31.4	33	64.4	35/–	90/–	184/–
	Annual	–	8.4	10.8	19.2	15.0/12	56/70	128/160

a $PM_{2.5}$ = particulate matter with a diameter of ≤2.5 μm; PM_{10} = particulate matter with a diameter of ≤10 μm.

b Concentrations for attainment demonstration are presented. H6H = highest of the sixth-highest concentrations at each receptor over the 5-year period. H8H = highest of the multiyear average of the eighth-highest concentrations at each receptor over the five-year period. For the annual average, multiyear averages of annual means over the five-year period are presented. Maximum concentrations are predicted to occur at the site boundaries.

c See Table 9.3.13.1-2.

d First and second values are NAAQS and CAAQS, respectively.

e First and second values are concentration levels as a percentage of NAAQS and CAAQS, respectively.

f A dash denotes "not applicable."

Predicted maximum 24-hour PM_{10} concentration increments would be about 18 $\mu g/m^3$ at Ludlow (a downwind receptor about 12 mi [19 km] east-southeast of the SEZ); about 10 $\mu g/m^3$ at Harvard and Newberry Springs; and about 4 $\mu g/m^3$ at Daggett. Annual average modeled PM_{10} concentration increments and total concentrations (increment plus background) at the SEZ boundary would be about 83.7 $\mu g/m^3$ and 114 $\mu g/m^3$, respectively, which are much higher than the CAAQS level of 20 $\mu g/m^3$. Annual PM_{10} increments would be much lower, about 13.0 $\mu g/m^3$, at the nearest residence, adjacent to the northwestern corner of the SEZ boundary, about 0.7 $\mu g/m^3$ at Ludlow, about 0.4 $\mu g/m^3$ at Newberry Springs, and about 0.1 $\mu g/m^3$ at Daggett and Harvard.. Total 24-hour $PM_{2.5}$ concentrations would be 64 $\mu g/m^3$ at the SEZ boundary, which is much higher than the NAAQS level of 35 $\mu g/m^3$; modeled increment and background concentrations make comparable contributions to this total. The total annual average $PM_{2.5}$ concentration would be 19.2 $\mu g/m^3$, which is above the NAAQS and CAAQS levels of 15.0 and 12 $\mu g/m^3$, respectively. At the nearest residence, predicted maximum 24-hour and annual $PM_{2.5}$ concentration increments would be about 7.3 and 1.3 $\mu g/m^3$, respectively.

Predicted 24-hour and annual PM_{10} concentration increments at the surrogate receptors for the nearest Class I Area—Joshua Tree NP—would be about 8.4 and 0.2 $\mu g/m^3$, or 105 and 4.4%, respectively, of the PSD increments for Class I area. The surrogate receptor where the maximum concentration occurs is more than 28 mi (44 km) from the Joshua Tree NP, and thus predicted concentrations in Joshua Tree NP would be lower than the above values (about 64% of the PSD increments for 24-hour PM_{10}), considering the same decay ratio with distance.

In conclusion, predicted 24-hour and annual PM_{10} and $PM_{2.5}$ concentration levels could exceed the standard levels at the SEZ boundaries and in immediate surrounding areas during the construction of solar facilities. To reduce potential impacts on ambient air quality and in compliance with programmatic design features, aggressive dust control measures would be used. Potential air quality impacts on nearby communities would be much lower. Modeling indicates that emissions from construction activities are not anticipated to exceed Class I PSD PM_{10} increments at the nearest federal Class I area (Joshua Tree NP). Construction activities are not subject to the PSD program, and the comparison provides only a screen for gauging the magnitude of the impact. Accordingly, it is anticipated that impacts of construction activities on ambient air quality would be moderate and temporary.

Construction emissions from the engine exhaust of heavy equipment and vehicles could cause impacts on AQRVs (e.g., visibility and acid deposition) at the nearby federal Class I areas. SO_x emissions from engine exhaust would be very low, because programmatic design features would require that ultra-low-sulfur fuel with a sulfur content of 15 ppm be used. NO_x emissions from engine exhaust would be primary contributors to potential impacts on AQRVs. Construction-related emissions are temporary in nature and thus would cause some unavoidable but short-term impacts.

For this analysis, the impacts of construction and operation of transmission lines outside of the SEZ were not assessed, assuming that the existing regional 230-kV transmission line might be used to connect some new solar facilities to load centers, and that additional project-specific analysis would be done for new transmission construction or line upgrades. However, some construction of transmission lines could occur within the SEZ. Potential impacts on ambient air quality would be a minor component of construction impacts in comparison with solar facility construction and would be temporary in nature.

9.3.13.2.2 Operations

Emission sources associated with the operation of a solar facility would include auxiliary boilers; vehicle (commuter, visitor, support, and delivery) traffic; maintenance (e.g., mirror cleaning and repair and replacement of damaged mirrors); and drift from cooling towers for the parabolic trough or power tower technology if wet cooling was implemented (drift comprises low-level particulate emissions).

The type of emission sources caused by and offset by operation of a solar facility are discussed in Section M.13.4 of Appendix M.

Estimates of potential air emissions displaced by the solar project development at the Pisgah SEZ are presented in Table 9.3.13.2-2. Total power generation capacity ranging from 2,129 to 3,832 MW is estimated for the Pisgah SEZ for various solar technologies (see Section 9.3.2). The estimated amount of emissions avoided for the solar technologies

TABLE 9.3.13.2-2 Annual Emissions from Combustion-Related Power Generation Displaced by Full Solar Development of the Proposed Pisgah SEZ

Area Size (acres)	Capacity (MW)[a]	Power Generation (GWh/yr)[b]	Emissions Displaced (tons/yr; 10^3 tons/yr for CO_2)[c]			
			SO_2	NO_x	Hg	CO_2
23,950	2,129–3,832	3,730–6,714	477–858 (2,817–5,071)	783–1,410 (4,152–7,474)	0.007–0.012 (0.033–0.059)	1,853–3,336 (2,943–5,297)
Percentage of total emissions from electric power systems in California[d]			3.5–6.3%	3.5–6.3%	3.5–6.3%	3.5–6.3%
Percentage of total emissions from all source categories in California[e]			0.67–1.2%	0.07–0.12%	–[f]	0.43–0.77%
Percentage of total emissions from electric power systems in the six-state study area[d]			0.19–0.34% (1.1–2.0%)	0.21–0.38% (1.1–2.0%)	0.24–0.42% (1.1–2.0%)	0.71–1.3% (1.1–2.0%)
Percentage of total emissions from all source categories in the six-state study area[e]			0.10–0.18% (0.60–1.1%)	0.03–0.05% (0.15–0.28%)	– (–)	0.22–0.40% (0.35–0.64%)

[a] It is assumed that the SEZ would eventually have development on 80% of the lands and that a range of 5 acres (0.020 km^2) per MW (for parabolic trough technology) to 9 acres (0.036 km^2) per MW (power tower, dish engine, and PV technologies) would be required.

[b] Assumed a capacity factor of 20%.

[c] Composite combustion-related emission factors for SO_2, NO_x, Hg, and CO_2 of 0.26, 0.42, 3.7×10^{-6}, and 994 lb/MWh, respectively, were used for the state of California. Values in parentheses are estimated based on composite combustion-related emission factors for SO_2, NO_x, Hg, and CO_2 of 1.51, 2.23, 1.8×10^{-5}, and 1,578 lb/MWh, respectively, averaged over six southwestern states.

[d] Emission data for all air pollutants are for 2005.

[e] Emission data for SO_2 and NO_x are for 2002, while those for CO_2 are for 2005.

[f] A dash indicates "not estimated."

Sources: EPA (2009a,c); WRAP (2009).

evaluated depends only on the megawatts of conventional fossil fuel–generated power displaced, because a composite emission factor per megawatt-hour of power by conventional technologies is assumed (EPA 2009c). If the Pisgah SEZ was fully developed, it is expected that emissions avoided would be substantial. Development of solar power in the SEZ would result in avoided air emissions ranging from 3.5% to 6.3% of total emissions of SO_2, NO_x, Hg, and CO_2 from electric power systems in the state of California (EPA 2009c). Avoided emissions would be up to 1.3% of total emissions from electric power systems in the six-state study area. When compared with all source categories, power production from the solar facilities would displace up to 1.2% of SO_2, 0.12% of NO_x, and 0.77% of CO_2 emissions in the state of California

(EPA 2009a; WRAP 2009). These emissions would be up to 0.40% of total emissions from all source categories in the six-state study area. Power generation from fossil fuel–fired power plants accounts for only 53% of the total electric power generation in California, most of which is from natural-gas combustion. Thus, solar facilities to be built in the Pisgah SEZ could considerably reduce fuel-combustion-related emissions in California but relatively less so than facilities built in other states with higher fossil fuel use rates.

About one-quarter of electricity consumed in California is generated out of state, with about three-quarters of this amount coming from the southwestern states. Thus it is possible that a solar facility in California would replace power from fossil fuel–fired power plants outside of California but within the six-state study area. It is also possible that electric power transfer between the states will increase in the future. To assess the potential region-wide emissions benefit, emissions being displaced were also estimated based on composite emission factors averaged over the six-state study area. For SO_2, NO_x, and Hg, composite emission factors for the six-state study area would be about 5 to 6 times higher than those for California alone. For CO_2, the six-state emission factor is about 60% higher than the California-only emission factor. If the Pisgah SEZ were fully developed, emissions avoided would be considerable. Development of solar power in the SEZ would result in avoided air emissions ranging from 1.1 to 2.0% of total emissions of SO_2, NO_x, Hg, and CO_2 from electric power systems in the six southwestern states. These emissions would be up to 1.1% of total emissions from all source categories in the six-state study area.

As discussed in Section 5.11.1.5, the operation of associated transmission lines would generate some air pollutants from activities such as periodic site inspections and maintenance. However, these activities would occur infrequently, and the amount of emissions would be small. In addition, transmission lines could produce minute amounts of O_3 and its precursor NO_x associated with corona discharge (i.e., the breakdown of air near high-voltage conductors), which is most noticeable for higher voltage lines during rain or very humid conditions. Since the Pisgah SEZ is located in an arid desert environment, these emissions would be small, and potential impacts on ambient air quality associated with transmission lines would be negligible, considering the infrequent occurrences and small amount of emissions from corona discharges.

9.3.13.2.3 Decommissioning/Reclamation

As discussed in Section 5.11.1.4, decommissioning/reclamation activities are similar to construction activities but are on a more limited scale and of shorter duration. Potential impacts on ambient air quality would be correspondingly less than those from construction activities. Decommissioning activities would last for a short period, and their potential impacts would be moderate and temporary. The same design features adopted during the construction phase would also be implemented during the decommissioning phase (Section 5.11.3).

9.3.13.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features are required. Limiting dust generation during construction and operations at the proposed Pisgah SEZ (such as increased watering frequency or road paving or treatment) is a required programmatic design feature under BLM's Solar Energy Program. These extensive fugitive dust control measures would keep off-site PM levels as low as possible during construction.

This page intentionally left blank.

9.3.14 Visual Resources

9.3.14.1 Affected Environment

The proposed Pisgah SEZ is located within the CDCA in San Bernardino County in southeastern California. The SEZ (23,950 acres [97 km^2]) occupies an area approximately 10 mi (16 km) north to south (at greatest extent) and 12 mi (19 km) east to west and is located approximately 7 mi (11 km) (at closest approach) east of the community of Newberry Springs, California, and 12 mi (19 km) west to northwest of the community of Ludlow. I-40 and Historic Route 66 pass through the SEZ, and I-15 is 11 mi (18 km) north of the far northern boundary. The SEZ and surrounding mountain ranges are shown in Figure 9.3.14.1-1. The SEZ ranges in elevation from 1,783 ft (544 m) in the southwestern portion of the SEZ along I-40, to 2,370 ft (722 m) near the Cady Mountains the northeastern portion of the SEZ.

The Pisgah SEZ is located in the Mojave Basin and Range ecoregion (EPA 2007) and the USFS's Bullion Mountains-Bristol Lake subsection. The subsection is characterized by gently to moderately sloping alluvial fans and volcanic flows, nearly level basin floor and dry lake bed, steep mountains and moderately steep hills (USFS 1997).

The SEZ is located within the east-west trending Mojave Valley. The valley falls between the Cady and Bristol Mountains to the north and northeast and the Bullion, Lava Bed, Rodman, and Newberry Mountains to the south and southwest. The SEZ is located between the Rodman and Lava Bed Mountains to the south and the Cady Mountains, which rise abruptly immediately northeast of the SEZ. The valley floor ranges from approximately 1,800 to 2,200 ft (549 to 671 m) in elevation; the mountains rise to between 3,000 ft and 4,400 ft (914 and 1,341 m) in elevation. The Pisgah SEZ is relatively flat, but the northeastern portion slopes upward toward the Cady Mountains. Portions of the SEZ include dark lava flows, mostly devoid of vegetation, and sandy areas with sparse vegetation. Pisgah Crater is located on the south border of the SEZ.

Vegetation consists mostly of widely spaced creosote shrubs. Because vegetation is generally sparse, the blacks of lava flows, the light tans of sand, and the grays of gravel beds are prominent in many areas, and the wide spacing of the creosotebushes results in generally coarse foreground textures. In most locations, the vegetation is too short and too sparse to screen views. There are some scattered tamarisk trees, but otherwise the SEZ lacks hardwood vegetation. This landscape type is common within the region.

No permanent water features are present on the SEZ. Troy Lake is a dry lake located within the western portion of the SEZ. It is subject to intermittent flooding.

The mountain ranges surrounding the SEZ generally block views to and from neighboring valleys; however, the view is more open to the east of the SEZ. Within the valley, the general lack of topographic relief and vegetative screening affords panoramic views of the SEZ, the rest of the valley, and the surrounding mountains. Panoramic views of the SEZ are shown in Figures 9.3.14.1-2, 9.3.14.1-3, and 9.3.14.1-4.

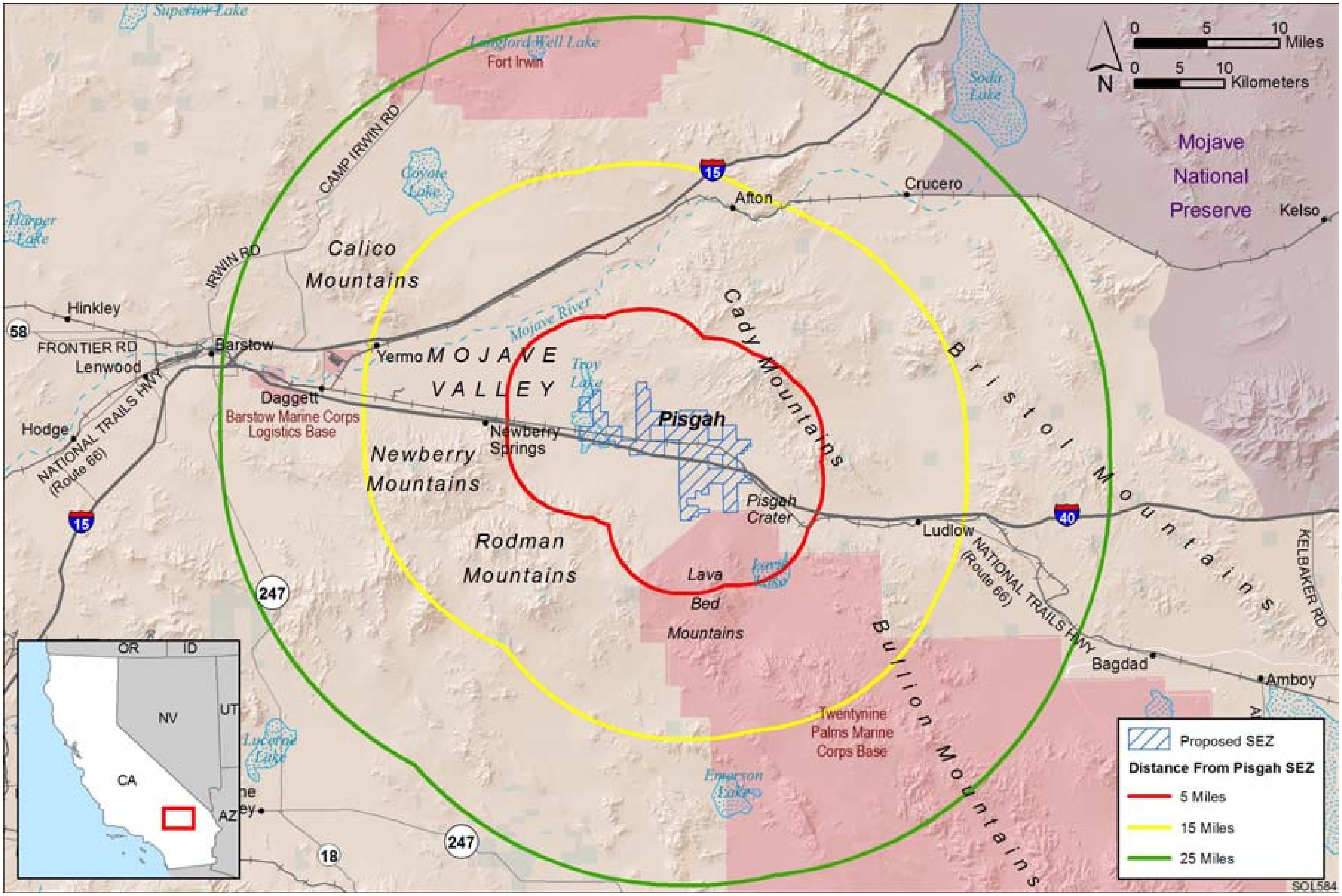

FIGURE 9.3.14.1-1 Proposed Pisgah SEZ and Surrounding Lands

FIGURE 9.3.14.1-2 Approximately 120° Panoramic View from the Far Western Portion of the Proposed Pisgah SEZ Facing East, Including Cady Mountains

FIGURE 9.3.14.1-3 Approximately 150° Panoramic View from I-40 in the South-Central Portion of the Proposed Pisgah SEZ Facing West, Including Lava Fields, Route 66 (Left), Rodman Mountains (Background Left), and Cady Mountains (Background Right)

FIGURE 9.3.14.1-4 Approximately 180° Panoramic View from Route 66 in the Eastern Portion of the Proposed Pisgah SEZ Facing East, Including I-40 and Cady Mountains at Left, and Pisgah Crater at Far Right

Although the SEZ itself is generally natural appearing away from I-40, cultural modifications within the SEZ detract somewhat from the SEZ's scenic quality. In addition to I-40, Route 66 and several gravel and dirt roads of various sizes cross the SEZ. Traffic on I-40 is visible from much of the SEZ. There is also a railroad line, transmission lines, and a substation located on the SEZ; however, the SEZ is large enough that these elements do not dominate views in most of the SEZ.

Off-site views are dominated by the Cady Mountains to the northeast and Rodman Mountains to the southwest of the SEZ. The low, black form of Pisgah Crater is visible from much of the southeast portion of the SEZ. Although the scenic quality of the valley floor is low, these adjacent mountain ranges and volcanic cinder cone add to the scenic quality of the SEZ. The colors of the mountains ranges are generally brown and garnet. Black lava flows visible from the SEZ provide additional color contrast and visual interest.

The mountain slopes and peaks around the SEZ are generally visually pristine, as they are partially within congressionally designated WAs or WSAs. The boundary of the Cady Mountains WSA is immediately adjacent to portions of the northern boundary of the SEZ; the Rodman WA is visible to the southwest; and the Newberry Mountains WA is visible to the west of the SEZ. In addition to these areas, other important scenic resources within the 25-mi (40-km) viewshed of the SEZ include the Kelso Dunes, Bristol Mountains WAs, the Soda Mountains WSA, the Old Spanish National Historic Trail, and the historic Route 66 Highway.

While the lands to the north, east, and south of the SEZ are mostly undeveloped, the land to the west includes agricultural fields utilizing center-pivot irrigation. Isolated ranches and homes and associated structures are visible in private lands adjacent to the SEZ, as are roads and local traffic. Scattered tanks and other structures associated with ranching and farming are visible, primarily west of the SEZ.

The BLM conducted a VRI for the SEZ and surrounding lands in 2010 (BLM 2010h). The VRI evaluates BLM-administered lands based on scenic quality; sensitivity level, in terms of public concern for preservation of scenic values in the evaluated lands; and distance from travel routes or KOPs. Based on these three factors, BLM-administered lands are placed into one of four VRI Classes, which represent the relative value of the visual resources. Classes I and II are the most valued; Class III represents a moderate value; and Class IV represents the least value. Class I is reserved for specially designated areas, such as national wildernesses and other congressionally and administratively designated areas where decisions have been made to preserve a natural landscape. Class II is the highest rating for lands without special designation. More information about VRI methodology is available in Section 5.12 and in *Visual Resource Inventory*, BLM Manual Handbook 8410-1 (BLM 1986a).

The VRI map for the SEZ and surrounding lands is shown in Figure 9.3.14.1-5. The VRI values for the SEZ and immediate surroundings are primarily VRI Class IV, indicating low relative visual values, but with an area assigned VRI Class III (moderate visual values) in the far northeastern portion of the SEZ near the Cady Mountains, and three smaller areas inventoried as VRI Class II. One of the VRI Class II areas is associated with lava flows in the eastern portion of the SEZ, while the other two VRI Class II areas are associated with areas of higher physical

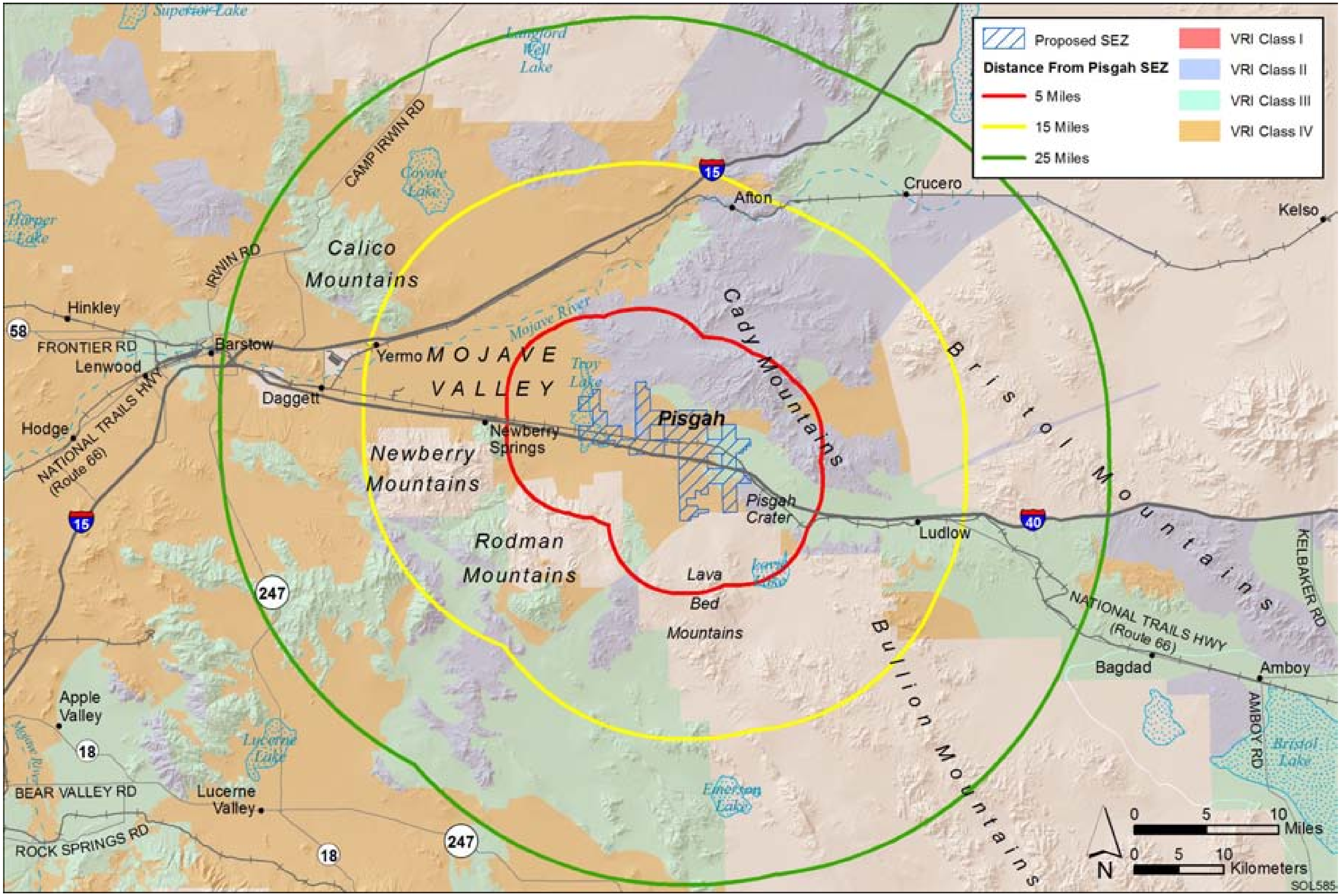

FIGURE 9.3.14.1-5 Visual Resource Inventory Values for the Proposed Pisgah SEZ and Surrounding Lands

relief in the northwestern portion of the SEZ. The inventory indicates low to moderate scenic quality for the SEZ and its immediate surroundings, with "moderate" ratings for portions of the SEZ based in part on landscape features of interest, such as the lava flows, the dry lake, and rolling terrain in some parts of the SEZ. Positive scenic quality attributes also included some variety in vegetation types and color, and the off-site views of the surrounding mountain ranges. The inventory indicates a moderate to high level of use, largely due to traffic on I-40 and Historic Route 66, and a moderate to high level of public interest, due primarily to national interest in Route 66 and the backcountry experience of Cady Mountains. Also noted in the inventory is the special area sensitivity due to the Pisgah SEZ's inclusion within the CDCA.

Lands within the 25-mi (40-km), 650-ft (198-m) viewshed of the SEZ contain 56,711 acres [229.50 km^2) of VRI Class II areas, primarily northeast of the SEZ in the Cady Mountains; 70,816 acres [286.58 km^2) of Class III areas, primarily east of the SEZ in the Mojave Valley; and 301,758 acres [1,221.17 km^2) of VRI Class IV areas, primarily west of the SEZ in the Mojave Valley.

The BLM has not assigned Visual Resource Management (VRM) classes for the SEZ and surrounding BLM lands. More information about the BLM's VRM program is available in Section 5.12 and in *Visual Resource Management*, BLM Manual Handbook 8400 (BLM 1984).

9.3.14.2 Impacts

The potential for impacts from utility-scale solar energy development on visual resources within the proposed Pisgah SEZ and surrounding lands, as well as the impacts of related developments (e.g., access roads and transmission lines) outside of the SEZ, is presented in this section.

Site-specific impact assessment is needed to systematically and thoroughly assess visual impact levels for a particular project. Without precise information about the location of a project and a relatively complete and accurate description of its major components and their layout, it is not possible to assess precisely the visual impacts associated with the facility. However, if the general nature and location of a facility are known, a more generalized assessment of potential visual impacts can be made by describing the range of expected visual changes and discussing contrasts typically associated with these changes. In addition, a general analysis can be used to identify sensitive resources that may be at risk if a future project is sited in a particular area. Detailed information about the methodology employed for the visual impact assessment for this Solar Energy PEIS, including assumptions and limitations, is presented in Appendix M.

Potential Glint and Glare Impacts. Similarly, the nature and magnitude of potential glint- and glare-related visual impacts for a given solar facility is highly dependent on viewer position, sun angle, the nature of the reflective surface and its orientation relative to the sun and the viewer, atmospheric conditions and other variables. The determination of potential impacts from glint and glare from solar facilities within a given proposed SEZ would require precise knowledge of these variables, and is not possible given the scope of the PEIS. Therefore, the following analysis does not describe or suggest potential contrast levels arising from glint and glare for facilities that might be developed within the SEZ; however, it should be assumed that glint and glare are possible visual impacts from *any* utility-scale solar facility, regardless of size, landscape setting, or technology type. The occurrence of glint and glare at solar facilities could potentially cause large, but temporary, increases in brightness and visibility of the facilities. The visual contrast levels projected for sensitive visual resource areas discussed in the following analysis do not account for potential glint and glare effects; however, these effects would be incorporated into a future site-and project-specific assessment that would be conducted for specific proposed utility-scale solar energy projects. For more information about potential glint and glare impacts associated with utility-scale solar energy facilities, see Section 5.12 of this PEIS.

9.3.14.2.1 Impacts on the Proposed Pisgah SEZ

Some or all of the SEZ could be developed for one or more utility-scale solar energy projects, utilizing one or more of the solar energy technologies described in Appendix E. Because of the industrial nature and large size of utility-scale solar energy facilities, large visual impacts on the SEZ would occur as a result of the construction, operation, and decommissioning of solar energy projects. In addition, large impacts could occur at solar facilities utilizing highly reflective surfaces or major light-emitting facility components (solar dish, parabolic trough, and power tower technologies), with lesser impacts associated with reflective surfaces expected from PV facilities. These impacts would be expected to involve major modification of the existing character of the landscape and would likely dominate the views from nearby locations. Additional, and potentially large, impacts would occur as a result of the construction, operation, and decommissioning of access roads and transmission lines within the SEZ (however no new transmission lines construction outside of the proposed SEZ was assessed; see Section 9.3.1.2). While the primary visual impacts associated with solar energy development within the SEZ would occur during daylight hours, lighting required for utility-scale solar energy facilities would be a potential source of visual impacts at night, both within the SEZ and on surrounding lands.

Common and technology-specific visual impacts from utility-scale solar energy development, as well as impacts associated with electric transmission lines, are discussed in Section 5.12 of this PEIS. Impacts would last throughout construction, operation, and decommissioning, and some impacts could continue after project decommissioning. Visual impacts resulting from solar energy development in the SEZ would be in addition to impacts from solar energy development and other development that may occur on other public or private lands within the SEZ viewshed, and are subject to cumulative effects. For discussion of cumulative impacts, see Section 9.3.22.4.13 of the PEIS.

The changes described previously would be expected to be consistent with BLM visual resource management objectives for VRM Class IV, as seen from nearby KOPs. VRM Class IV objectives include major modification of the existing character of the landscape. The BLM has not assigned VRM classes to the SEZ and surrounding lands. More information about the BLM VRM program is available in Section 5.12 and in *Visual Resource Management*, BLM Manual

Handbook 8400 (BLM 1984). More information about impact determination using the BLM's VRM program is available in Section 5.12 and in *Visual Resource Contrast Rating*, BLM Manual Handbook 8431-1 (BLM 1986b).

Implementation of the programmatic design features intended to reduce visual impacts (described in Appendix A, Section A.2.2, of the PEIS) would be expected to reduce visual impacts associated with utility-scale solar energy development within the SEZ; however, the degree of effectiveness of these design features could be assessed only at the site- and project-specific level. Given the large scale, reflective surfaces, and strong regular geometry of utility-scale solar energy facilities, and the lack of screening vegetation and landforms within the SEZ viewshed, siting the facilities away from sensitive visual resource areas and other sensitive viewing areas would be the primary means of mitigating visual impacts. The effectiveness of other visual impact mitigation measures would generally be limited, but would be important to reduce visual contrasts to the greatest extent possible.

9.3.14.2.2 Impacts on Lands Surrounding the Proposed Pisgah SEZ

Because of the large size of utility-scale solar energy facilities and the generally flat, open nature of the proposed SEZ, lands outside the SEZ would be subjected to visual impacts related to construction, operation, and decommissioning of utility-scale solar energy facilities. The affected areas and extent of impacts would depend on a number of visibility factors and viewer distance (for a detailed discussion of visibility and related factors, see Section 5.12). A key component in determining impact levels is the intervisibility between the project and potentially affected lands; if topography, vegetation, or structures screen the project from viewer locations, there is no impact.

Preliminary viewshed analyses were conducted to identify which lands surrounding the proposed SEZ could have views of solar facilities in at least some portion of the SEZ (see Appendix M for information on assumptions and limitations of the methods used). Four viewshed analyses were conducted, assuming four different heights representative of project elements associated with potential solar energy technologies: PV and parabolic trough arrays (24.6 ft [7.5 m]), solar dishes and power blocks for CSP technologies (37 ft [11.6 m]), transmission towers and short solar power towers (150 ft [45.7 m]), and tall solar power towers (650 ft [198.1 m]). Viewshed maps for the SEZ for all four solar technology heights are available in Appendix N.

Figure 9.3.14.2-1 shows the combined results of the viewshed analyses for all four solar technologies. The colored portions indicate areas with clear lines of sight to one or more areas within the SEZ and from which solar facilities within these areas of the SEZ would be expected to be visible, assuming the absence of screening vegetation or structures and adequate lighting and other atmospheric conditions. The light brown areas are locations from which PV and parabolic trough arrays located in the SEZ could be visible. Solar dishes and power blocks for CSP technologies would be visible from the areas shaded in light brown and the additional areas shaded in light purple. Transmission towers and short solar power towers would be visible

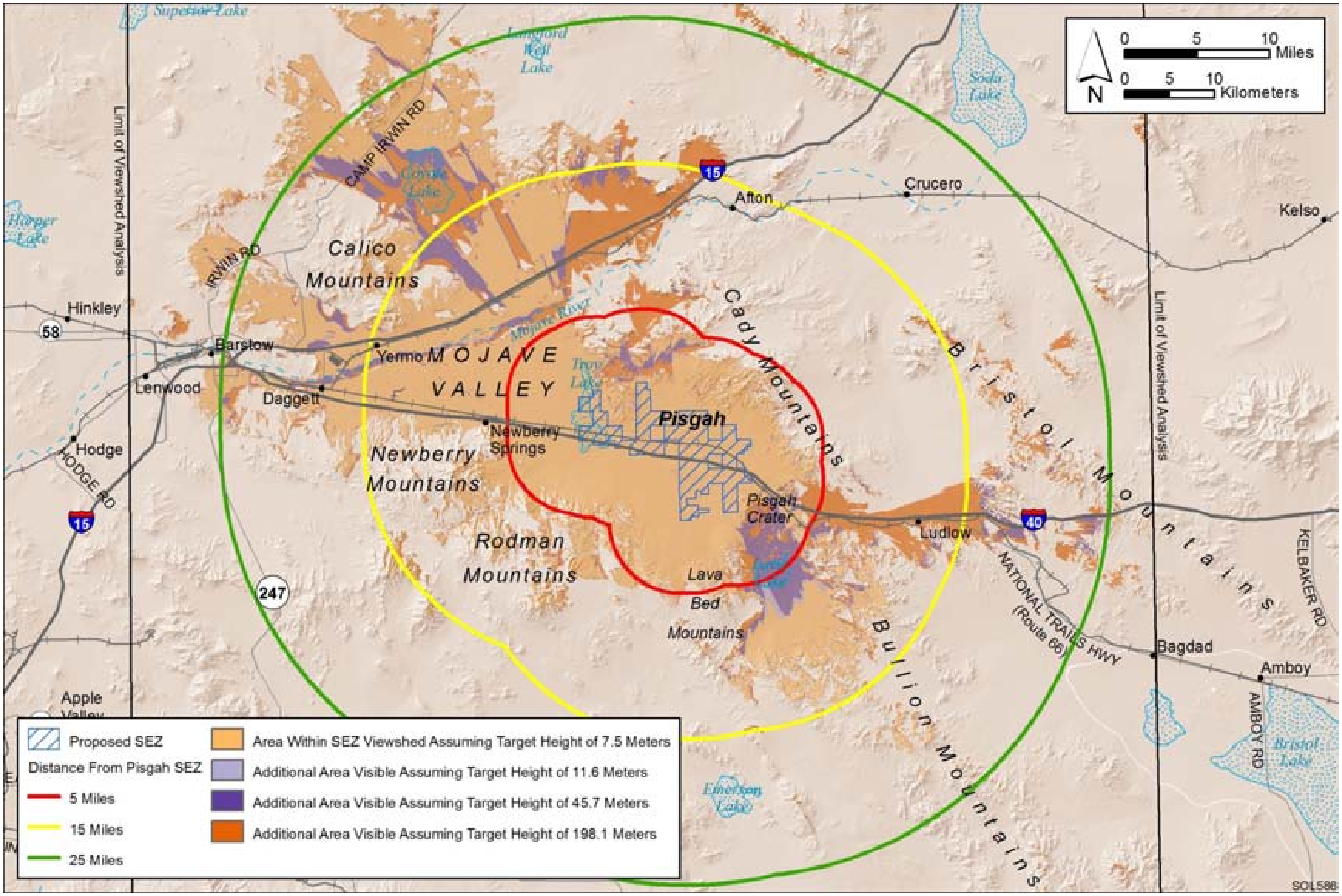

FIGURE 9.3.14.2-1 Viewshed Analyses for the Proposed Pisgah SEZ and Surrounding Lands, Assuming Solar Technology Heights of 24.6 ft (7.5 m), 37 ft (11.6 m), 150 ft (45.7 m), and 650 ft (198.1 m) (shaded areas indicate lands from which solar development within the SEZ could be visible)

from the areas shaded light brown, light purple, and the additional areas shaded in dark purple. Power tower facilities located in the SEZ could be visible from areas shaded light brown, light purple, dark purple, and at least the upper portions of power tower receivers could be visible from in the additional areas shaded in medium brown.

For the following visual impact discussion, the tall solar power tower (650 ft [198.1 m]) and PV and parabolic trough array (24.6 ft [7.5 m]) viewsheds are shown in the figures and discussed in the text. These heights represent the maximum and minimum landscape visibility for solar energy technologies analyzed in the PEIS. Viewsheds for solar dish and CSP technology power blocks (37 ft [11.6 m]), and for transmission towers and short solar power towers (150 ft [45.7 m]) are presented in Appendix N. The visibility of these facilities would fall between that for tall power towers and PV and parabolic trough arrays.

Impacts on Selected Federal-, State-, and BLM-Designated Sensitive Visual Resource Areas

Figure 9.3.14.2-2 shows the results of a GIS analysis that overlays selected federal-, state-, and BLM-designated sensitive visual resource areas onto the combined tall solar power tower (650 ft [198.1 m]) and PV and parabolic trough array (24.6 ft [7.5 m]) viewsheds, in order to illustrate which of these sensitive visual resource areas could have views of solar facilities within the SEZ and therefore potentially would be subject to visual impacts from those facilities. Distance zones that correspond with the BLM's VRM system-specified foreground-middleground distance (5 mi [7 km]), background distance (15 mi [24 km]), and a 25-mi (40-km) distance zone are shown as well, in order to indicate the effect of distance from the SEZ on impact levels, which are highly dependent on distance.

The scenic resources included in the analyses were as follows:

- National Parks, National Monuments, National Recreation Areas, National Preserves, National Wildlife Refuges, National Reserves, National Conservation Areas, National Historic Sites;
- Congressionally authorized Wilderness Areas;
- Wilderness Study Areas;
- National Wild and Scenic Rivers;
- Congressionally authorized Wild and Scenic Study Rivers;
- National Scenic Trails and National Historic Trails;
- National Historic Landmarks and National Natural Landmarks;
- All-American Roads, National Scenic Byways, State Scenic highways, and BLM- and USFS-designated scenic highways/byways, BLM-designated Special Recreation Management Areas; and
- ACECs designated because of outstanding scenic qualities.

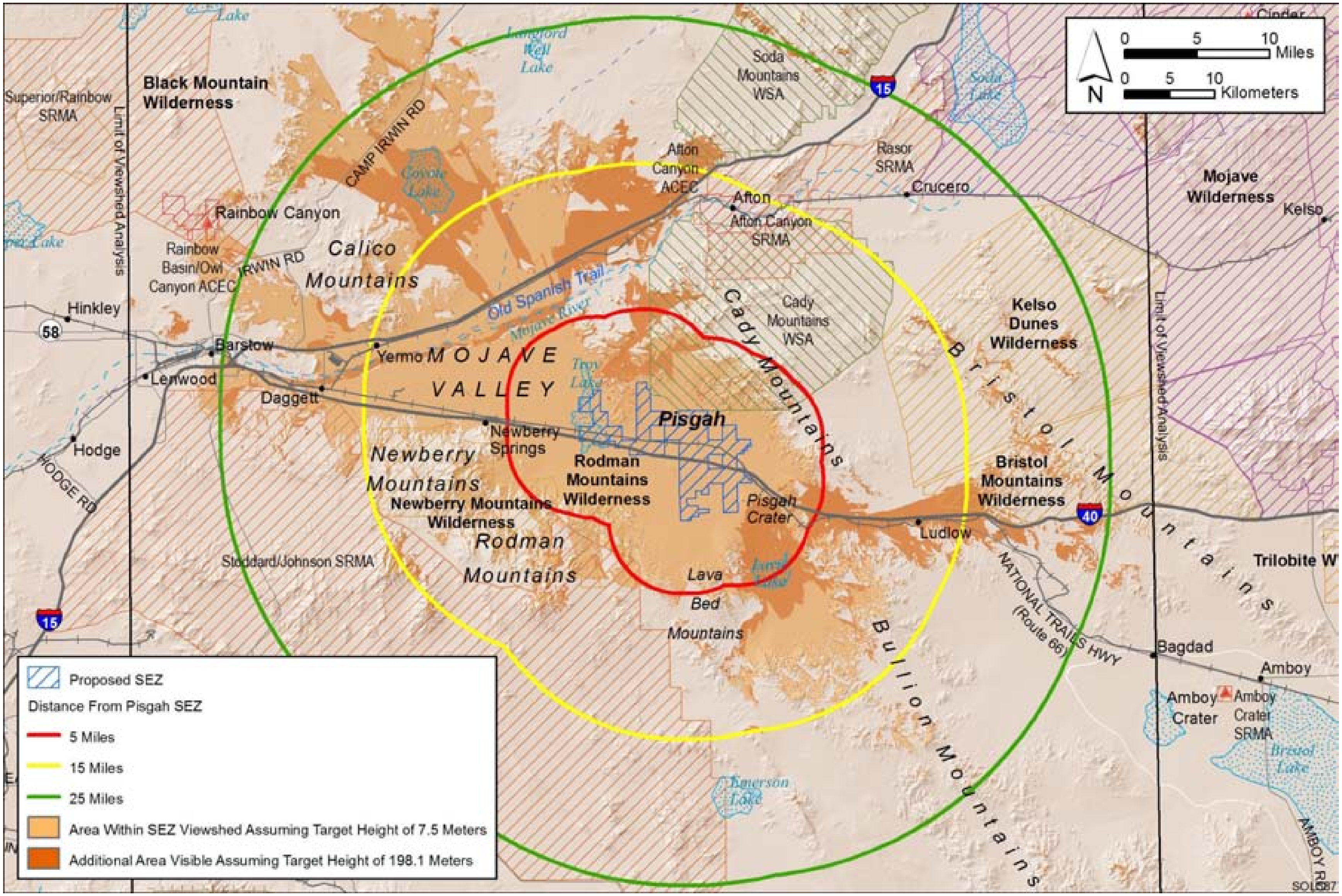

FIGURE 9.3.14.2-2 Overlay of Selected Sensitive Visual Resource Areas onto Combined 650-ft (197.1-m) and 24.6-ft (7.5-m) Viewsheds for the Proposed Pisgah SEZ

Potential impacts on specific sensitive resource areas visible from and within 25 mi (40 km) of the proposed Pisgah SEZ are discussed below. The results of this analysis are also summarized in Table 9.3.14.2-1. Further discussion of impacts on these areas is available in Sections 9.3.3 (Specially Designated Areas and Lands with Wilderness Characteristics) and 9.3.17 (Cultural Resources) of this PEIS.

The following visual impact analysis describes *visual contrast levels* rather than *visual impact levels*. *Visual contrasts* are changes in the seen landscape, including changes in the forms, lines, colors, and textures of objects seen in the landscape. A measure of *visual impact* includes potential human reactions to the visual contrasts arising from a development activity, based on viewer characteristics, including attitudes and values, expectations, and other

TABLE 9.3.14.2-1 Selected Potentially Affected Sensitive Visual Resources within a 25-mi (40.2-km) Viewshed of the Proposed Pisgah SEZ, Assuming a Viewshed Analysis Target Height of 650 ft (198.1 m)

		Feature Area or Linear Distance[a]		
			Visible between	
Feature Type	Feature Name and Total Acreage	Visible within 5 mi	5 and 15 mi	15 and 25 mi
National Conservation Area	California Desert Conservation Area (25,919,319 acres)	178,231 acres (0.7%)[b]	228,302 acres (0.9%)	145,805 acres (0.6%)
National Historic Trail	Old Spanish	0 acres	33.2 mi	3.8 mi
WAs	Bristol Mountains (77, 026 acres)	0 acres	1,776 acres (2.3%)	6,577 acres (8.5%)
	Kelso Dunes (154,335 acres)	0 acres	694 acres (0.4%)	3,689 acres (2.4%)
	Newberry Mountains (27,768 acres)	0 acres	6,498 acres (23.4%)	0 acres
	Rodman Mountains (34,341 acres)	9,120 acres (26.6%)	10,780 acres (31%)	0 acres
WSAs	Cady Mountains (120,197 acres)	20,677 acres (17.2%)	3,275 acres (3%)	0 acres
	Soda Mountains (121,680 acres)	0 acres	0 acres	3,005 acres (2.5%)

[a] To convert acres to km^2, multiply by 0.004047; to convert mi to km, multiply by 1.609.

[b] Percentage of total feature area for areal features.

characteristics that are viewer- and situation-specific. Accurate assessment of visual impacts requires knowledge of the potential types and numbers of viewers for a given development and their characteristics and expectations; specific locations from which the project might be viewed; and other variables that were not available or not feasible to incorporate in the PEIS analysis. These variables would be incorporated into a future site-and project-specific assessment that would be conducted for specific proposed utility-scale solar energy projects. For more discussion of visual contrasts and impacts, see Section 5.12 of the PEIS.

National Conservation Areas

- *California Desert Conservation Area*—The California Desert Conservation Area (CDCA) is a 26-million-acre (105,000-km^2) parcel of land in southern California designated by Congress in 1976 through the FLPMA. About 10 million acres (40,000 km^2) of the CDCA are administered by the BLM). The proposed Pisgah SEZ is located within the CDCA.

  Portions of the CDCA within the 650-ft (198.1-m) viewshed for the Pisgah SEZ include approximately 552,338 acres (2,235 km^2), or 2.1% of the total CDCA acreage. Portions of the CDCA within the 24.6-ft (7.5-m) viewshed encompass approximately 361,194 acres (1,462 km^2), or 1.4% of the total CDCA acreage.

  The CDCA management plan notes the "superb variety of scenic values" in the CDCA (BLM 1999) and lists scenic resources as needing management to preserve their value for future generations. The CDCA management plan divides CDCA lands into multiple-use classes based on management

GOOGLE EARTH™ VISUALIZATIONS

The visual impact analysis discussion in this section utilizes three-dimensional Google Earth™ perspective visualizations of hypothetical solar facilities placed within the SEZ. The visualizations include simplified wireframe models of a hypothetical solar power tower facility. The models were placed at various locations within the SEZ as visual aids for assessing the approximate size and viewing angle of utility-scale solar facilities. The visualizations are intended to show the apparent size, distance, and configuration of the SEZ, as well as the apparent size of a typical utility-scale solar power tower project and its relationship to the surrounding landscape, as viewed from potentially sensitive visual resource areas within the viewshed of the SEZ.

The visualizations are not intended to be realistic simulations of the actual appearance of the landscape or of proposed utility-scale solar energy projects. The placement of models within the SEZ did not reflect any actual planned or proposed projects within the SEZ, and did not take into account engineering or other constraints that would affect the siting or choice of facilities for this particular SEZ. The number of facility models placed in the SEZ does not reflect the 80% development scenario analyzed in the PEIS, but it should be noted that the discussion of expected visual contrast levels does account for the 80% development scenario. A solar power tower was chosen for the models because the unique height characteristics of power tower facilities make their visual impact potential extend beyond other solar technology types.

objectives. The class designations govern the type and degree of land use actions allowed within the areas defined by class boundaries. All land use actions and resource-management activities on public lands within a multiple-use class delineation must meet the guidelines given for that class.

The proposed SEZ is within areas classified as multiple-use classes “L” and “M.” Class “L” protects sensitive, natural, scenic, ecological, and cultural resource values. Class “L” management provides for generally lower intensity, carefully controlled multiple use of resources, while ensuring that sensitive values are not significantly diminished. The area of the SEZ below I-40 is designated as Class “L.” Multiple-Use Class “M” (Moderate Use) is based upon a controlled balance between higher intensity use and protection of public lands. This class provides for a wide variety of present and future uses such as mining, livestock grazing, recreation, energy, and utility development. Class “M” management is also designed to conserve desert resources and to mitigate damage to those resources which permitted uses may cause.

Utility-scale solar development within the SEZ would be an allowable use under the CDCA management plan, assuming NEPA requirements were met and mitigation measures were used to minimize visual impacts. However, construction and operation of solar facilities under the PEIS development scenario would result in substantial visual impacts on the SEZ and some surrounding lands within the SEZ viewshed that could not be completely mitigated.

Wilderness Areas

- *Bristol Mountains*—The 77,026-acre (312-km^2) Bristol Mountains WA is a congressionally designated WA located 11.9 mi (19.2 km) at the point of closest approach east of the SEZ. The trail-less WA contains the tilted volcanic plain called Old Dad Mountains and the northern portion of the Bristol Mountains. The terrain is rolling and consists of volcanic uplands. The broad Budweiser Wash drains into the eastern portion of the wilderness. Hiking, horseback riding, hunting, camping, rock hounding, photography, and backpacking are recreational activities within the wilderness.

  Portions of the WA within the 650-ft (198.1-m) SEZ viewshed (approximately 8,353 acres [33.8 km^2], or 10.8% of the total WA acreage) extend from the point of closest approach at the eastern boundary of the SEZ to approximately 16 mi (26 km) from the SEZ. Approximately 775 acres (3 km^2) of the WA are within the 24.6-ft (7.5-m) SEZ viewshed.

  As shown in Figure 9.3.14.2-2, the viewshed analysis indicates that the upper western slopes and peaks of the highest mountains in the Bristol Mountains

WA would have views of the southeastern portion of the SEZ; however, in most of the WA, views of the SEZ would be almost completely screened by the Cady Mountains, and only the tops of tall power towers at certain locations within the SEZ could potentially be seen. If the receivers of operating power towers were visible within the SEZ, they would likely appear as points of light just above the western horizon. If sufficiently tall, power towers could have red or white flashing hazard navigation lights that could be visible from the WA at night. From scattered locations within the SEZ, portions of lower-height facilities could potentially be seen, but these areas would occupy very small portions of the horizontal field of view, and the viewing angle would be low. Primarily because of the near complete screening of the SEZ, under the 80% development scenario analyzed in the PEIS, expected visual contrast levels from solar facilities in the SEZ would be expected to be minimal to weak for viewpoints in the Bristol Mountains WA.

- *Kelso Dunes*—The 154,335-acre (625-km^2) Kelso Dunes WA is located approximately 12 mi (19 km) east of the SEZ at the point of closest approach. A small portion of the WA (approximately 4,383 acres [18 km^2], or 2.8% of the total WA acreage) is within the 650-ft (197.1-m) viewshed of the SEZ. The area within the viewshed extends 17 mi (27 km) from the point of closest approach at the eastern boundary of the SEZ to approximately 24 mi (38 km) from the SEZ. None of the WA is visible within the lower-height viewsheds.

  The western portion of the WA includes parts of the Bristol Mountains, and the viewshed analysis indicates that the western slopes and peaks of some of the Bristol Mountains within the WA could have views of the upper portions of power towers within the eastern portion of the SEZ. At a distance of 16.5 mi (26.6 km) to approximately 24 mi (38 km), the light from power towers receivers would likely appear as distant points of light on the western horizon. Only very small portions of the SEZ would be visible from the WA, and the affected area within the WA is small, so impacts on the WA from solar energy development within the SEZ are expected to be minimal.

- *Newberry Mountains*—The 27,768-acre (112-km^2) Newberry Mountains WA is located approximately 6 mi (10 km) west of the SEZ at the point of closest approach. The Newberry Mountains WA is known for its rugged, generally flat-topped volcanic mountains and deep, maze-like canyons. Elevations range from 2,200 ft (671 m) in the north to 5,100 ft (1,554 m) in the south.

  Solar energy facilities within the SEZ could be visible from the eastern slopes of the Newberry Mountains within the WA, and from scattered peaks in the western portion of the WA as well. Portions of the WA within the 650-ft (198.1-m) viewshed (approximately 6,498 acres [26 km^2], or 23% of the total WA acreage) extend from the point of closest approach at the western boundary of the SEZ to approximately 10 mi (16 km) from the SEZ.

Approximately 5,349 acres (22 km^2) of the WA are within the 24.6-ft (7.5-m) SEZ viewshed.

Figure 9.3.14.2-3 is a three-dimensional Google Earth™ perspective visualization of the SEZ (highlighted in orange) as seen from an unnamed peak (elevation approximately 4,800 ft [1,500 m]) in the east-central portion of the WA, approximately 9 mi (15 km) from the southwest corner of the SEZ, and approximately 3,000 ft (900 m) above the valley floor. The visualization includes simplified wireframe models of a hypothetical solar power tower facility. The models were placed within the SEZ as a visual aide for assessing the approximate size and viewing angle of utility-scale solar facilities. The receiver towers depicted in the visualization are properly scaled models of a 459-ft (139.9-m) power tower with an 867-acre (3.5-km^2) field of 12-ft (3.7-m) heliostats, each representing approximately 100 MW of electric generating capacity. Ten models were placed in the SEZ for this and other visualizations shown in this section of the PEIS. In the visualization, the SEZ area is depicted in orange, the heliostat fields in blue.

The upper slopes and peaks of the Newberry Mountains are barren with little opportunity for screening. I-40, Route 66, agricultural fields, and other cultural disturbances would be visible west of the SEZ and in the southern portion of the SEZ. While the presence of these existing disturbances might tend to lessen the contrast associated with the introduction of solar facilities into the viewshed, the scale and strong geometry of the solar facilities would be such that any reduction of contrast would be slight.

As shown in the visualization, the entire SEZ is visible from this location, although the angle of view is low. The SEZ would occupy much of the horizontal field of view. At the higher elevations within the WA, the angle of view is great enough that the tops of collector/reflector arrays for solar facilities within the SEZ might be visible in the closer portions of the SEZ, which would make their large areal extent and regular geometry more apparent, tending to increase associated visual contrasts. At lower elevations within the WA, the angle of view is lower, so solar collector/reflector arrays would be seen nearly edge-on, their size and regular geometry would be less apparent, and they would appear to repeat the line of the plain in which the SEZ is located, tending to reduce contrast.

Tall power towers, power blocks, plumes, and transmission towers located in the nearest parts of the SEZ would add very short oblique and vertical lines and form elements that would likely project above the solar collector/reflector arrays and tend to increase visual contrast. In the farthest portions of the SEZ, these elements might be visible but might not attract the attention of casual viewers.

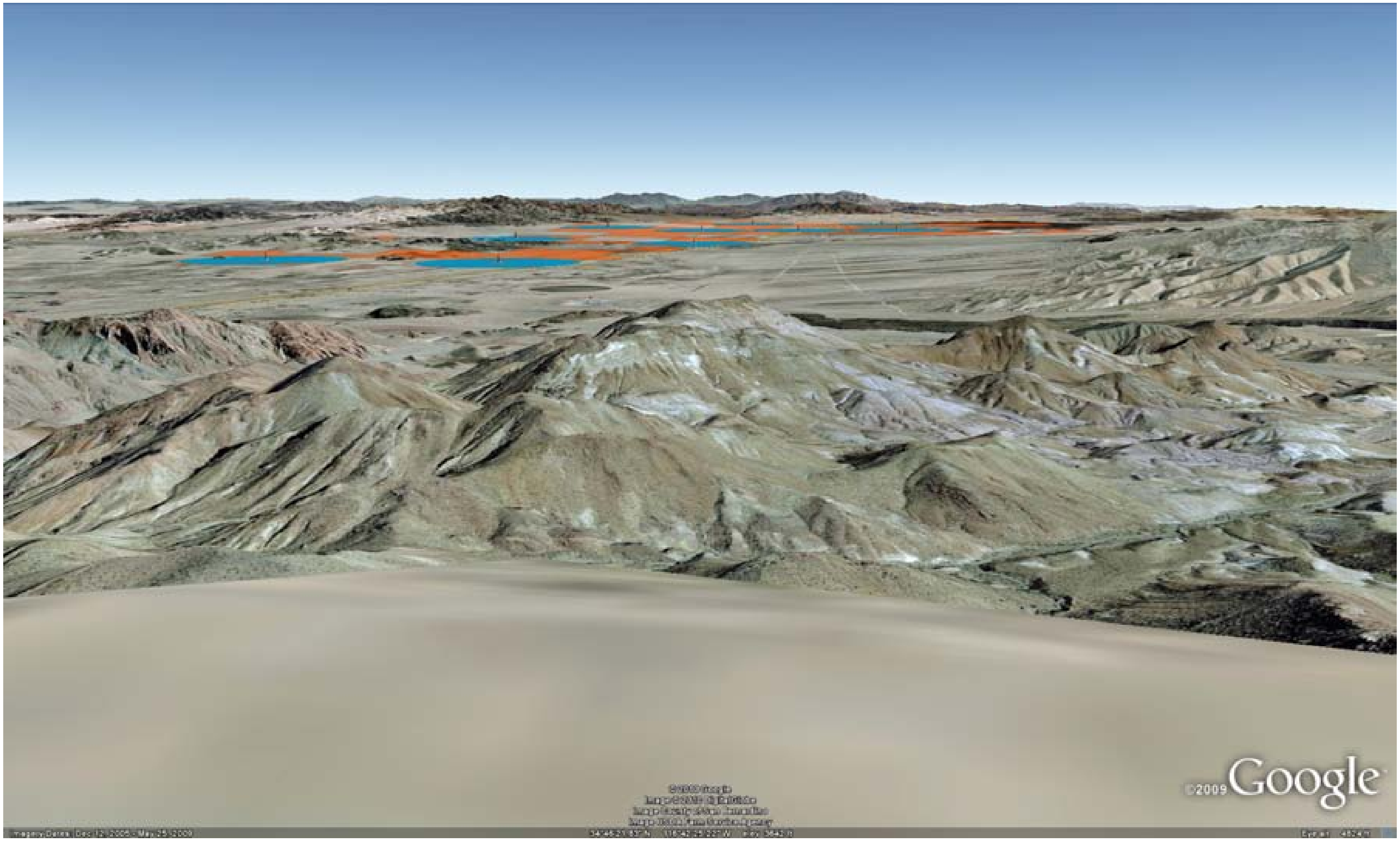

FIGURE 9.3.14.2-3 Google Earth Visualization of the Proposed Pisgah SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from a Peak in the Newberry Mountains Wilderness

If power towers were present in the closer portions of the SEZ, when operating, the receivers would likely appear as bright lights atop discernable tower structures against the backdrop of the valley floor, while for power towers in the more distant sections of the SEZ, the receivers would likely appear as distant points of light against the backdrop of the valley floor, or possibly the Cady Mountains, depending on viewing angle and facility location.

If sufficiently tall, the power towers could have red or white flashing hazard navigation lights that would likely be visible from the WA at night, and could be conspicuous from this viewpoint, given the dark night skies in the vicinity of the SEZ. Other lighting associated with solar facilities in the SEZ could potentially be visible as well, at least for facilities in the closest portions of the SEZ.

The nature of the visual contrasts from solar facilities in the SEZ as observed from this location would depend on the numbers, types, sizes and locations of solar facilities in the SEZ, and other project- and site-specific factors. Under the 80% development scenario analyzed in this PEIS, solar facilities within the SEZ would be expected to create moderate visual contrasts as seen from this viewpoint.

In general, the range of visual contrasts from solar facilities within the SEZ that would be experienced by WA visitors would be highly dependent on viewer location within the WA, as well as the numbers, types, sizes and locations of solar facilities in the SEZ, and other project- and site-specific factors. Under the 80% development scenario analyzed in this PEIS, solar facilities within the SEZ would be expected to create weak to moderate visual contrasts as viewed from the WA. The highest levels of visual contrast would be expected for viewing locations at higher elevations in the far eastern portion of the WA, with less visibility and lower contrast levels expected at lower elevations and/or more distant locations.

- *Rodman Mountains*—The 34,341-acre (139-km^2) Rodman Mountains WA is located approximately 1.2 mi (1.9 km) southwest of the SEZ at the point of closest approach. The Rodman Mountains reach elevations of 5,000 ft (1,524 m), and the WA contains deep canyons and wide washes cutting through mountain ridges and sloping bajadas that descend from the central core of peaks.

  As shown in Figure 9.3.14.2-2, the SEZ is visible from more than half of the WA, particularly the northern and eastern portions; however, visibility extends to the southern and western boundaries of the WA in some areas. Portions of the WA within the 650-ft (198.1-m) viewshed (approximately 19,900 acres [81 km^2], or 57.9% of the total WA acreage) extend from the point of closest approach at the eastern boundary of the SEZ to approximately

9 mi (15 km) from the SEZ. Visible portions extend up to 5 mi (7 km) from the northern boundary of the SEZ. Approximately 17,347 acres (70 km^2) of the WA are within the 24.6-ft (7.5-m) SEZ viewshed.

Figure 9.3.14.2-4 is a Google Earth visualization of the SEZ (highlighted in orange) as seen from an unnamed peak (elevation approximately 4,300 ft [1,300 m]) in the north-central portion of the WA, approximately 6 mi (10 km) from the southwest corner of the SEZ, and approximately 2,500 ft (760 m) above the valley floor. The nearest power tower in the visualization (at left) is about 6.5 mi (10.5 km) from the viewpoint. The SEZ area is depicted in orange, the heliostat fields in blue.

The upper slopes and peaks of the Rodman Mountains are barren, with little opportunity for screening. I-40, Route 66, agricultural fields, and other cultural disturbances would be visible west of the SEZ, and in the southern portion of the SEZ. While the presence of these existing disturbances might tend to lessen the contrast associated with the introduction of solar facilities into the viewshed, the scale and strong geometry of the solar facilities would be such that any reduction of contrast would be slight.

The visualization suggests that from this elevated viewpoint, under the 80% development scenario analyzed in the PEIS, solar facilities in the SEZ would fill the horizontal field of view. The tops of solar collector/reflector arrays in the closest parts of the SEZ would be visible, which would make their large areal extent and strong regular geometry more apparent, tending to increase contrast. The angle of view would be low enough that visible solar collector/reflector arrays in the northeast portion of the SEZ (farthest away from this viewpoint) would be seen nearly edge-on, which would tend to reduce contrast.

Taller ancillary facilities, such as buildings, transmission structures, and cooling towers; and plumes (if present) could be visible projecting above the collector/reflector arrays, at least for nearby facilities. The ancillary facilities could create form and line contrasts with the strongly horizontal, regular, and repeating forms and lines of the collector/reflector arrays.

If power towers were present within the closer parts of the SEZ, when operating, the receivers would likely appear as very bright points of light atop discernable tower structures, against the backdrop of the valley floor. If sufficiently tall, the power towers could have red or white flashing hazard navigation lights that would likely be visible from the WA at night, and could be conspicuous from this viewpoint, although other lights would be visible in the vicinity of the SEZ. Other lighting associated with solar facilities in the SEZ could potentially be visible as well, at least for facilities in the closest portions of the SEZ.

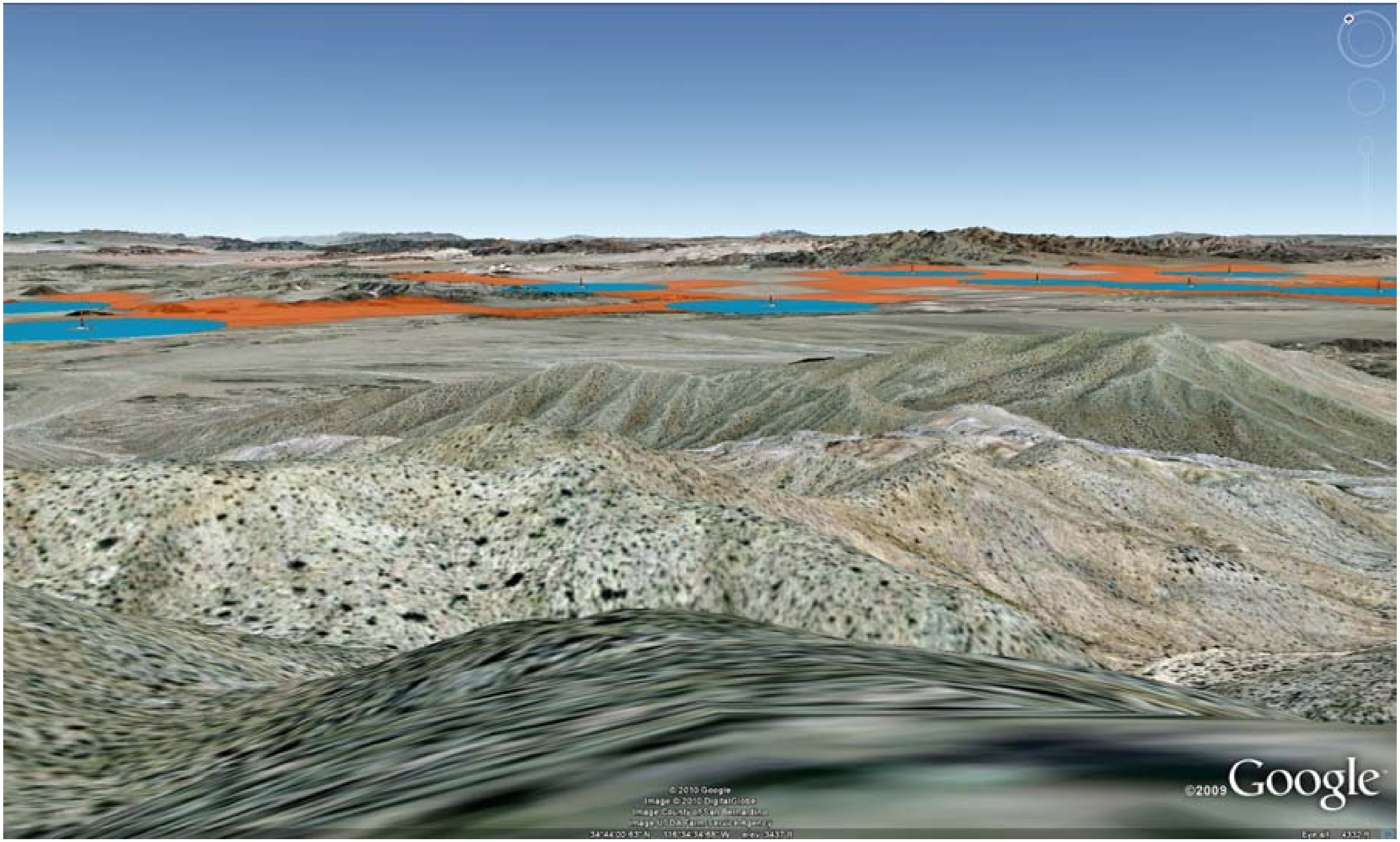

FIGURE 9.3.14.2-4 Google Earth Visualization of the Proposed Pisgah SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from a Peak in the Rodman Mountains Wilderness

The nature of the visual contrasts from solar facilities in the SEZ as observed from this location would depend on the numbers, types, sizes, and locations of solar facilities in the SEZ, and other project- and site-specific factors. Under the 80% development scenario analyzed in this PEIS, solar facilities within the SEZ would be expected to create moderate visual contrasts as seen from this viewpoint.

Figure 9.3.14.2-5 is a Google Earth visualization of the SEZ (highlighted in orange) as seen from an unnamed hill (elevation approximately 3,000 ft [900 m]) in the northeastern portion of the WA, approximately 4 mi (6 km) from the nearest point in the SEZ, and approximately 1,200 ft (370 m) above the valley floor. The nearest power tower in the visualization (at left) is about 5.0 mi (8.0 km) from the viewpoint. This distance is within the BLM VRM Program's 3 to 5 mi (5 to 8 km) foreground-middleground distance.

The viewpoint area lacks vegetation dense or tall enough for screening. From this viewpoint, I-40, Route 66, agricultural fields, and other cultural disturbances would be visible in the southern portion of the SEZ. While the presence of these existing disturbances might tend to lessen the contrast associated with the introduction of solar facilities into the viewshed, the scale and strong geometry of the solar facilities would be such that any reduction of contrast would be slight.

The visualization suggests that from this elevated viewpoint, the SEZ would be too large to be encompassed in one view, and viewers would need to turn their heads to scan across the whole SEZ. The tops of solar collector/reflector arrays in the closest parts of the SEZ would be visible, which would make their large areal extent and strong regular geometry more apparent,, tending to increase contrast. The angle of view would be low enough that visible solar collector/reflector arrays in the northeast portion of the SEZ (farthest away from this viewpoint) would be seen more nearly edge-on, which would tend to reduce contrast.

Taller ancillary facilities, such as buildings, transmission structures, and cooling towers; and plumes (if present) would likely be visible projecting above the collector/reflector arrays, at least for nearby facilities. The ancillary facilities could create form and line contrasts with the strongly horizontal, regular, and repeating forms and lines of the collector/reflector arrays. Color and texture contrasts would also be possible, but their extent would depend on the materials and surface treatments utilized in the facilities.

If power towers were present within the SEZ, when operating, the receivers would likely appear as very bright points of light against the backdrop of the valley floor or the bajadas of the Cady Mountains. If sufficiently tall, the power towers could have red or white flashing hazard navigation lights that would likely be visible from the WA at night, and could be conspicuous from

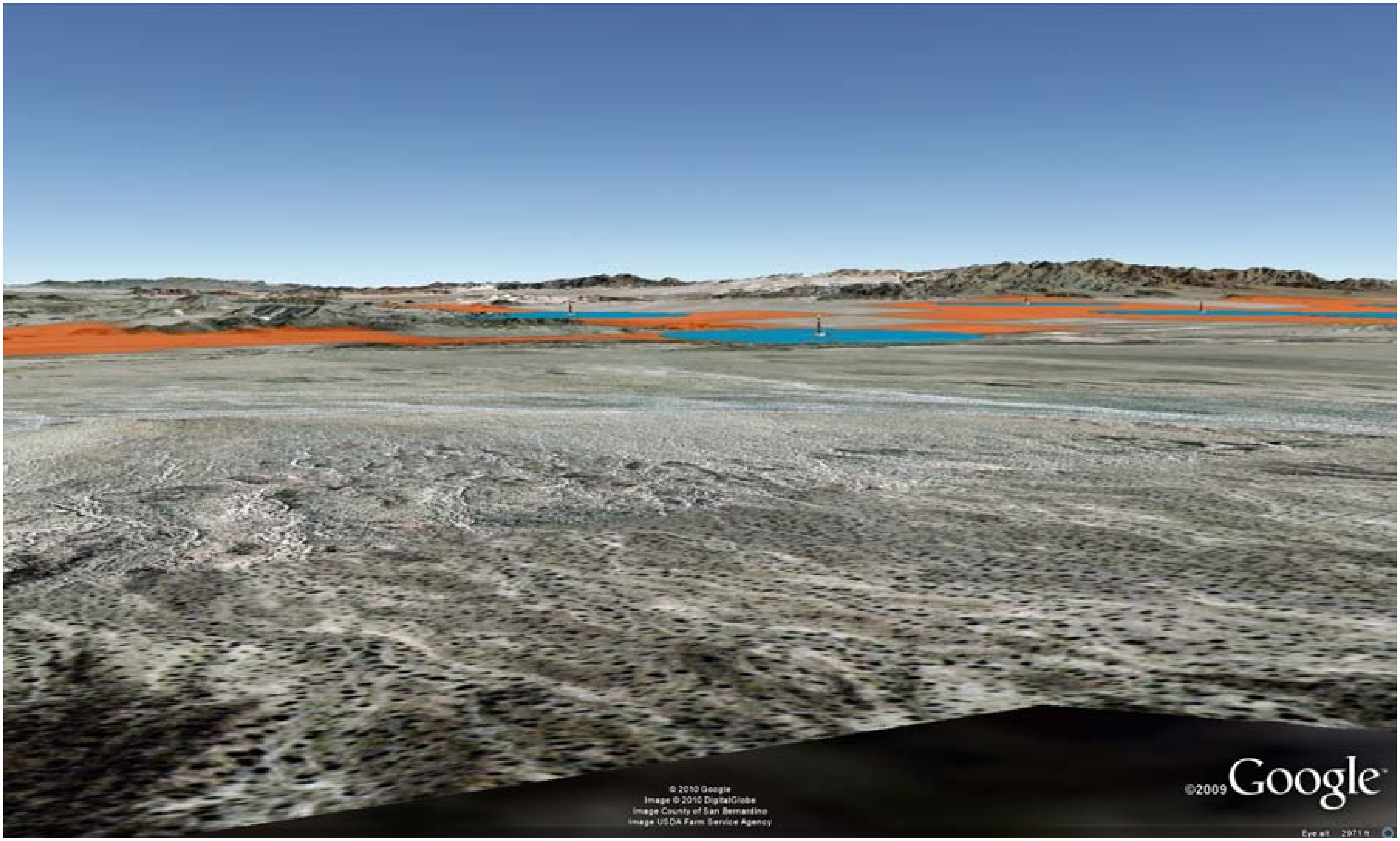

FIGURE 9.3.14.2-5 Google Earth Visualization of the Proposed Pisgah SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Model, as Seen from a Hill in the Rodman Mountains Wilderness

this viewpoint, although other lights would be visible in the vicinity of the SEZ. Other lighting associated with solar facilities in the SEZ could potentially be visible as well, at least for facilities in the closest portions of the SEZ.

The potential visual contrast expected for this viewpoint would vary depending on the numbers, types, sizes, and locations of solar facilities in the SEZ, and other project- and site-specific factors, but under the 80% development scenario analyzed in this PEIS, solar facilities within the SEZ would be expected to create strong visual contrasts as viewed from this location within the WA.

In summary, the Rodman Mountains WA is very close to the SEZ, and many locations within the WA could have clear views of solar facilities in the SEZ across much of the field of view to the northeast of the WA. Given that there could be numerous solar facilities within the SEZ, with a variety of technologies employed, and a range of supporting facilities that would contribute to visual impacts, such as transmission towers and lines, substations, power block components, and roads, the resulting visually complex landscape would be essentially industrial in appearance and would contrast greatly with the surrounding more natural-appearing landscape. Under the 80% development scenario analyzed in the PEIS, strong levels of visual contrast from solar facilities within the SEZ could be observed from many locations within the WA, especially from elevated viewpoints.

Wilderness Study Areas

- *Soda Mountains*—The Soda Mountains WSA is located 15 mi (25 km) north of the SEZ at the point of closest approach and encompasses 121,680 acres (492 km^2). The topography of the WSA varies from several gently sloping bajadas to the rugged Soda Mountains. This highly eroded mountain range has jagged ridges and sharp peaks that reach 3,663 ft (1,116 m) in elevation.

  The area of the WSA within the 650-ft (198.1-m) viewshed of the SEZ includes 3,005 acres (12.2 km^2), or 2.5% of the total WSA acreage. None of the WA is visible within the lower-height viewsheds. The visible area extends from the point of the closest approach from the northernmost boundary of the SEZ to approximately 18 mi (29 km) from the SEZ.

  The viewshed analysis indicates that the far southwest portion of the Soda Mountains WSA and the highest mountains in the central portion of the WSA could have views of solar facilities in the far western portions of the SEZ. The Cady Mountains screen views of most of the SEZ from locations in the WSA. However, where views of the SEZ existed, because of the long distance to the

SEZ and the low angle of view, visual contrasts seen from the WSA would be expected to be minimal.

- *Cady Mountains*—The Cady Mountains WSA is located directly adjacent to the SEZ on the central northern boundary and encompasses 120,197 acres (486 km^2). Within the center of the WSA, and completely surrounded by the mountains, is the large, broad area known as Hidden Valley. Major peaks within the Cady Mountains include Cady Peak and Sleeping Beauty, at the southern end of the range (also known as the Sleeping Beauty Mountains). The Cady Peak summit is at an elevation of 4,627 ft (1,410 m). A number of four-wheel drive roads provide access to the WSA.

  The area of the WSA within the 650-ft (198.1-m) viewshed of the SEZ includes 23,952 acres (97 km^2), or 19.9% of the total WSA acreage. The area within the 24.6-ft (7.5-m) viewshed of the SEZ includes 16,056 acres (65 km^2), or 13.4% of the total WSA acreage. The area of the WSA with potential visibility of solar facilities in the SEZ extends from the northeast corner of the SEZ to approximately 6 mi (9 km) from the SEZ.

  Figure 9.3.14.2-6 is a Google Earth visualization of the SEZ (highlighted in orange) as seen from Cady Peak (elevation 4,627 ft [1,410 m]) in the south-central portion of the WSA, approximately 5 mi (7 km) from the closest point in the SEZ, and approximately 2,600 ft (790 m) above the valley floor. The nearest power tower in the visualization (at left) is about 6.1 mi (9.8 km) from the viewpoint.

  The visualization suggests that from this elevated viewpoint, under the 80% development scenario analyzed in the PEIS, solar facilities within the SEZ would nearly fill the horizontal field of view. The tops of solar collector/reflector arrays in the SEZ would be visible, which would make their large areal extent and strong regular geometry more apparent, increasing visual contrasts.

  Taller ancillary facilities, such as buildings, transmission structures, and cooling towers; and plumes (if present) would likely be visible projecting above the collector/reflector arrays, at least for nearby facilities. The ancillary facilities could create form and line contrasts with the strongly horizontal, regular, and repeating forms and lines of the collector/reflector arrays. Color and texture contrasts would also be possible, but their extent would depend on the materials and surface treatments utilized in the facilities.

  If power towers were present within the SEZ, when operating, the receivers would likely appear as bright points of light against the backdrop of the valley floor. If sufficiently tall, the power towers could have red or white flashing hazard navigation lights that would likely be visible from the WSA at night, and could be conspicuous from this viewpoint, although other lights would be

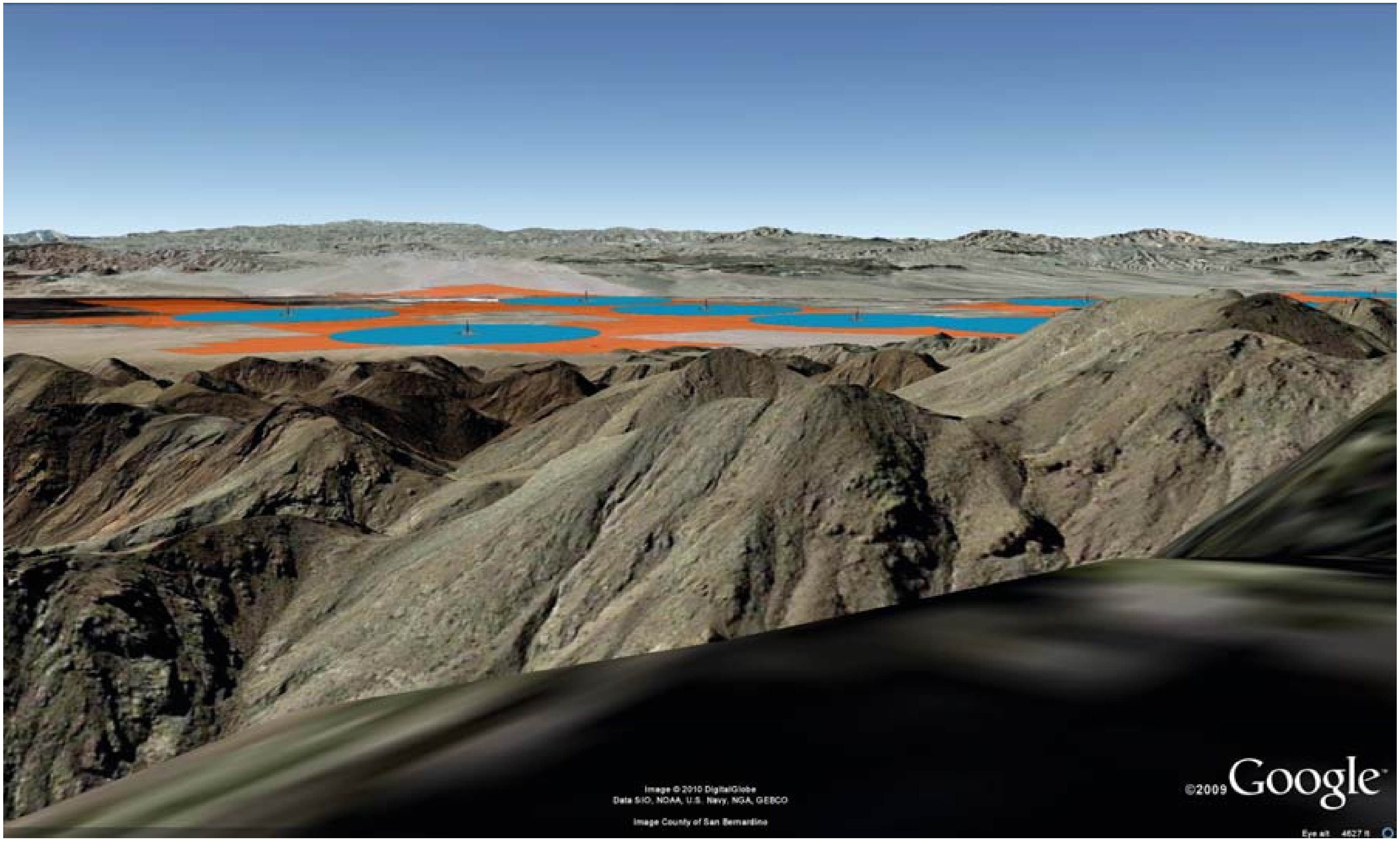

FIGURE 9.3.14.2-6 Google Earth Visualization of the Proposed Pisgah SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Model, as Seen from Cady Peak in the Cady Mountains WSA

visible in the vicinity of the SEZ. Other lighting associated with solar facilities in the SEZ could potentially be visible as well, at least for facilities in the closest portions of the SEZ.

The potential visual contrast expected for this viewpoint would vary depending on the numbers, types, sizes, and locations of solar facilities in the SEZ, and other project- and site-specific factors, but under the 80% development scenario analyzed in this PEIS, solar facilities within the SEZ would be expected to create strong visual contrasts as viewed from this location within the WSA.

Figure 9.3.14.2-7 is a Google Earth visualization of the SEZ (highlighted in orange) as seen from an unnamed hill (elevation 2,626 ft [1,410 m]) in the far western portion of the WSA, approximately 3 mi (5 km) from the closest point in the SEZ, and approximately 600 ft (180 m) above the valley floor. The nearest power tower in the visualization (at right) is about 5.6 mi (9.0 km) from the viewpoint.

The visualization suggests that views of the SEZ would be partially screened by intervening terrain within the WSA; however, the SEZ and solar facilities within the SEZ would still likely occupy a substantial portion of the horizontal field of view. Solar facilities visible within the SEZ would be seen nearly edge-on, so that the collector/reflector arrays would tend to repeat the line of the horizon, and their apparent size would be reduced, which would tend to reduce contrast; however, taller ancillary facilities, such as buildings, transmission structures, and cooling towers; and plumes (if present) would likely be visible projecting above the collector/reflector arrays, at least for nearby facilities. The ancillary facilities could create form and line contrasts with the strongly horizontal, regular, and repeating forms and lines of the collector/reflector arrays.

If power tower receivers were located within the SEZ, when operating, they would likely appear as very bright point-like or nearly point-like light sources against the bajadas of the Rodman Mountains. If sufficiently tall, the power towers could have red or white flashing hazard navigation lights that would likely be visible from the WSA at night, and could be conspicuous from this viewpoint, although other lights would be visible in the vicinity of the SEZ. Other lighting associated with solar facilities in the SEZ could potentially be visible as well, at least for facilities in the closest portions of the SEZ.

Even though the viewpoint is close to the SEZ, solar facilities would be partially screened by topography, and in addition the vertical angle of view to solar facilities in the SEZ would be low. As a result, from this viewpoint, under the 80% development scenario analyzed in the PEIS, solar energy

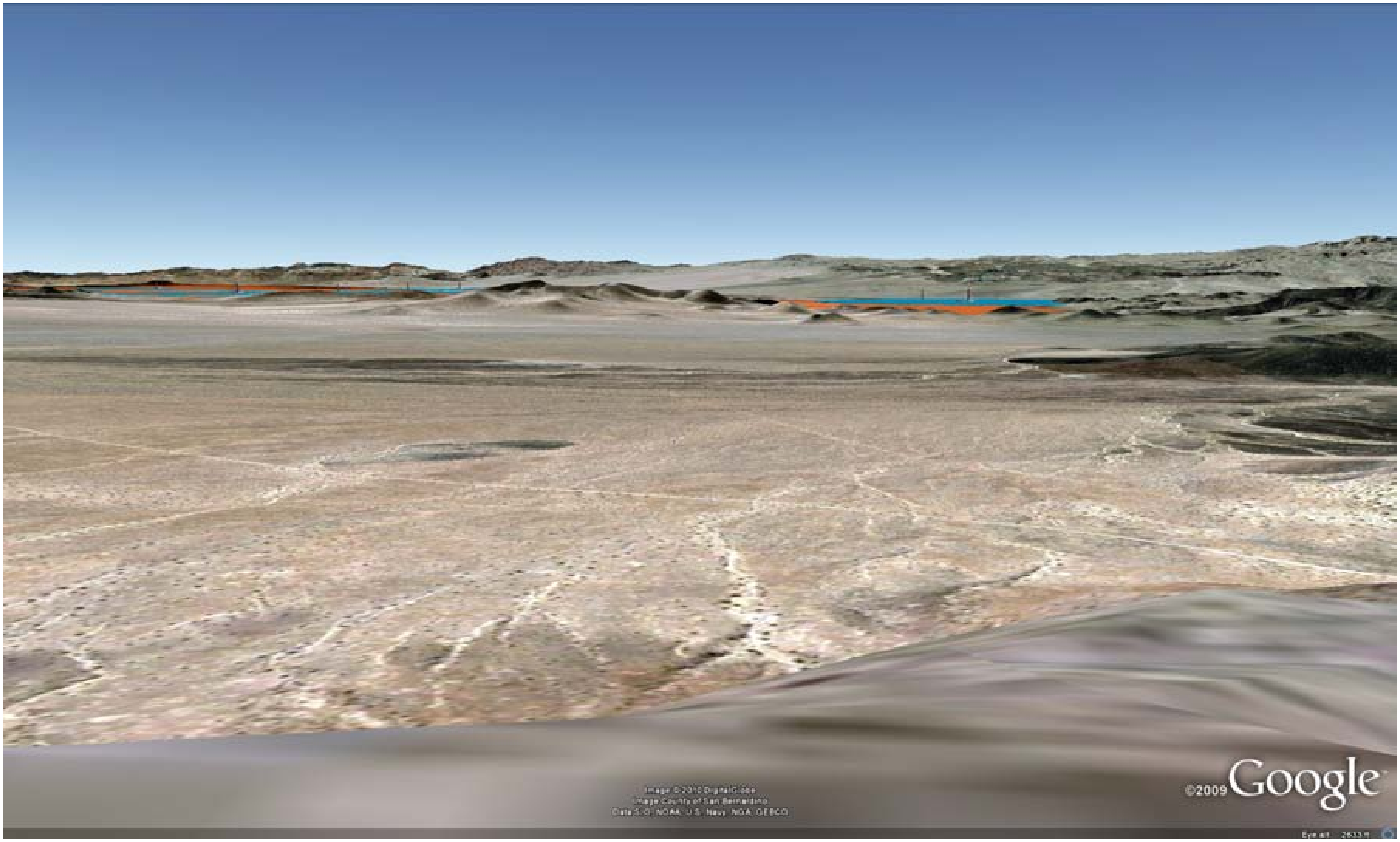

FIGURE 9.3.14.2-7 Google Earth Visualization of the Proposed Pisgah SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Model, as Seen from a Hill in the Far Western Portion of the Cady Mountains WSA

development within the SEZ would be expected to create moderate visual contrasts.

Figure 9.3.14.2-8 is a Google Earth visualization of the SEZ (highlighted in orange) as seen from an unnamed hill (elevation 4,627 ft [1,410 m]) in the southern portion of the WSA, approximately 0.5 mi (0.8 km) from the closest point in the SEZ, and approximately 500 ft (150 m) above the valley floor. The closest power tower in the visualization is about 1.3 mi (2.0 km) from the viewpoint.

The visualization suggests that from this elevated viewpoint, the SEZ would be too large to be encompassed in one view, and viewers would need to turn their heads to scan across the whole SEZ. Solar energy facilities within the closest portions of the SEZ would occupy much of the field of view looking out over the valley, and would be expected to dominate views in that direction. The tops of nearby solar collector/reflector arrays in the nearer portions of the SEZ would be visible, which would make their large areal extent and strong regular geometry more apparent, tending to increase contrast. Facilities farther from the viewpoint would be seen at a lower viewing angle and would therefore exhibit reduced contrast levels.

Taller ancillary facilities, such as buildings, transmission structures, and cooling towers; and plumes (if present) would likely be visible projecting above the collector/reflector arrays. The ancillary facilities could create strong form and line contrasts with the strongly horizontal, regular, and repeating forms and lines of the collector/reflector arrays. Color and texture contrasts would also be likely, at least for facilities close to the viewpoint, but their extent would depend on the materials and surface treatments utilized in the facilities.

If power tower receivers were located in the nearest portions of the SEZ, when operating, they would likely appear as brilliant nonpoint (i.e. having a cylindrical or rectangular surface area) light sources projecting above the collector/reflector arrays along the horizon line, and would likely strongly attract visual attention, as seen from this viewpoint. In addition, during certain times of the day from certain angles, sunlight on dust particles in the air might result in the appearance of light streaming down from the tower(s).

If sufficiently tall, the power towers could have red or white flashing hazard navigation lights that would likely be visible from the WSA at night, and would likely be very conspicuous from this viewpoint, although other lights would be visible in the vicinity of the SEZ. Other lighting associated with solar facilities in the SEZ would likely be visible as well, at least for facilities in the closest portions of the SEZ.

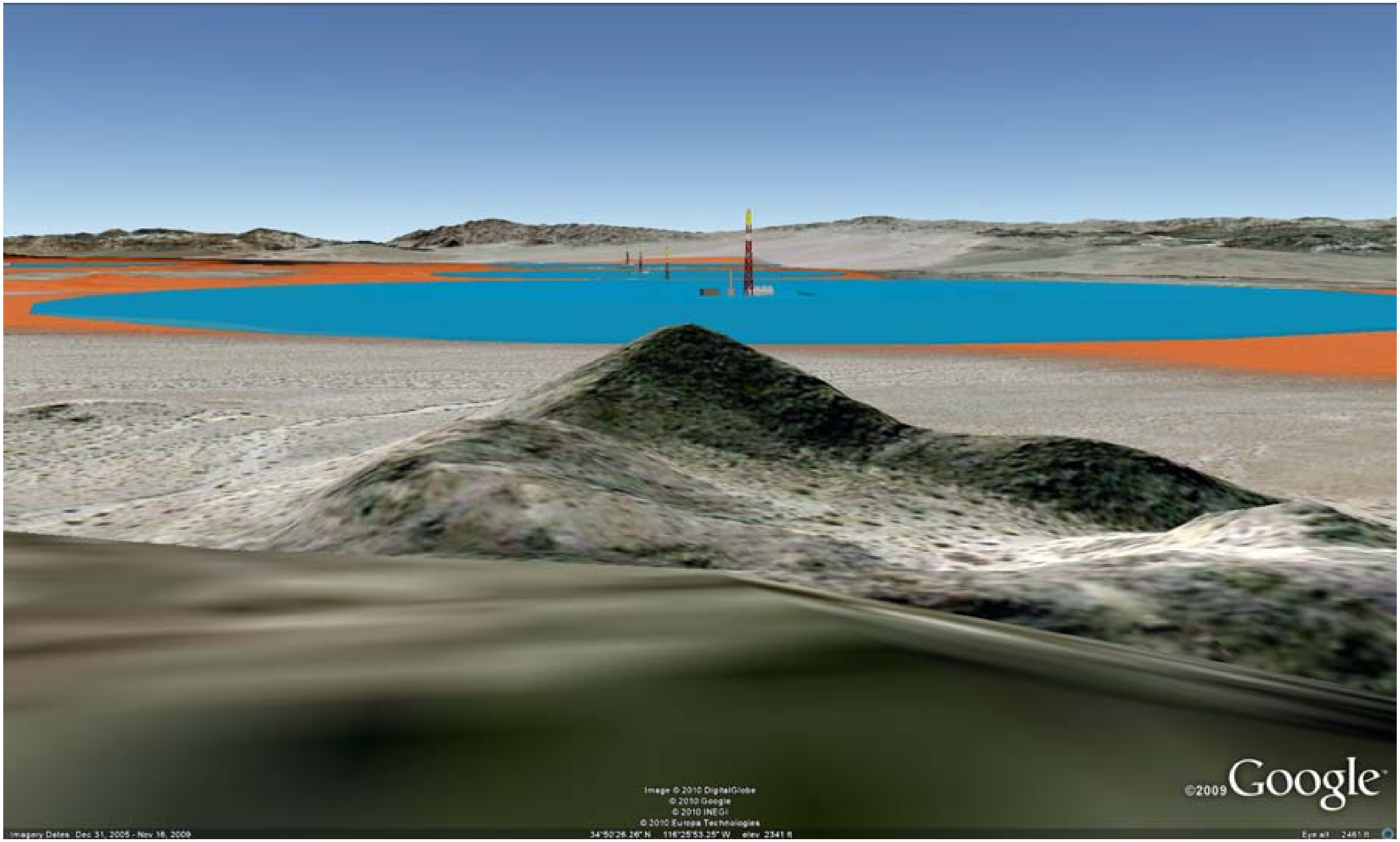

FIGURE 9.3.14.2-8 Google Earth Visualization of the Proposed Pisgah SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Model, as Seen from a Hill in the Southern Portion of the Cady Mountains WSA

The elevated viewpoint would make the very regular geometry of nearby solar collector/reflector arrays apparent, structural details of facility components could be visible, and power tower receivers and other tall solar facility components (e.g., associated transmission towers) could be seen in the BLM foreground-middleground distance, which would tend to increase visual contrast. From this elevated viewpoint, and with the short distance to the SEZ, under the 80% development scenario analyzed in the PEIS, solar energy development within the SEZ would be expected to create strong visual contrasts.

In summary, portions of the Cady Mountains WSA border the SEZ, and many locations within the WSA could have clear views of solar facilities in the SEZ across much of the field of view to the south and southwest of the WSA. Given that there could be numerous solar facilities within the SEZ, with a variety of technologies employed, and a range of supporting facilities that would contribute to visual impacts, such as transmission towers and lines, substations, power block components, and roads, the resulting visually complex landscape would be essentially industrial in appearance and would contrast greatly with the surrounding more natural-appearing landscape. Under the 80% development scenario analyzed in the PEIS, strong levels of visual contrast from solar facilities within the SEZ could be observed from many locations within the WSA, especially from elevated viewpoints.

National Historic Trail

- *Old Spanish*—The Old Spanish National Historic Trail is a congressionally designated multistate historic trail that passes within 6 mi (10 km) of the SEZ at the point of closest approach on the northwest side of the SEZ. Approximately 8 mi (13 km) northwest of the SEZ, the trail divides into the main Northern Route and the Armijo Route. Approximately 29 mi (46 km) of the trail are within the viewshed of the SEZ, including 6 mi (9 km) of the Armijo segment.

  Within 20 mi (32 km) of the SEZ, the trail runs generally east–west through the Mojave Valley and along the Mojave River. Where the trail divides, the main Northern Route runs in a north-south direction. The SEZ is within view of the trail for much of the area. Within the viewshed, the trail runs through alluvial plains and pediments.

  From the west, the trail enters the 25-mi (40-km) SEZ in hills just north of the community of Daggett, approximately 18 mi (29 km) west of the SEZ. In these hills, screening vegetation is absent, and the SEZ would be visible on the distant eastern horizon, but would occupy a very small portion of the field of view. Power tower receivers would come into view first, likely appearing as distant points of light on the eastern horizon. The viewing angle would be quite low, and a variety of cultural disturbances, including the SEGS 1 and 2 solar power tower and parabolic trough facilities, would be visible in the foreground. Trail users who followed the Mojave River bed just south of the hills would not likely see the SEZ until passing the SEGS facilities, at which point the upper portions of sufficiently tall power towers in the far western portion of the SEZ might appear just over the horizon, absent screening by vegetation or structures. At this long distance, the receivers of operating power towers in the SEZ would likely appear as distant points of light on the eastern horizon directly down the trail, against a sky backdrop. If sufficiently tall, the power towers could have red or white flashing hazard navigation lights that could be visible from the trail at night, although other lights would be visible in the vicinity of the SEZ.

From Daggett eastward, the trail follows the northern edge of the bed of the dry Mojave River, turning gradually northeastward, starting just south of the community of Yermo. The trail changes elevation very little and is only slightly higher than the SEZ; thus the angle of view would stay very low, and the appearance of the SEZ (and solar development within the SEZ) would change only slightly and very gradually as trail users traveled eastward on the trail.

Figure 9.3.14.2-9 is a Google Earth visualization of the SEZ (highlighted in orange) as seen from the Old Spanish National Historic Trail just south of the community of Yermo, approximately 14 mi (23 km) from the closest point in the SEZ.

The visualization suggests that at this point on the trail, only the upper portions of sufficiently tall power towers would be visible just above the eastern horizon. At this distance, the power tower receivers would appear as distant points of light on the eastern horizon, against a sky backdrop, and would be expected to create weak visual contrasts.

As the trail turns northeastward after passing south of Yermo, receivers on operating power towers in the western portion of the SEZ would gradually increase in brightness, project slightly higher over the horizon, and would gradually move to the right in the field of view. Low-height solar facilities might not be visible from some locations, and screening by vegetation or structures might wholly obscure the SEZ at some viewpoints, as in this area, the trail passes through agricultural lands, with roads, scattered residences, and other cultural disturbances typical of a rural setting, including transmission towers and lines.

At a distance of about 8 mi (14 km) from the nearest point in the SEZ, the trail forks, with the Armijo segment continuing east-northeast, while the Northern Route turns more northward and gradually climbs toward Alvord Mountain. Figure 9.3.14.2-10 is a Google Earth visualization of the SEZ (highlighted

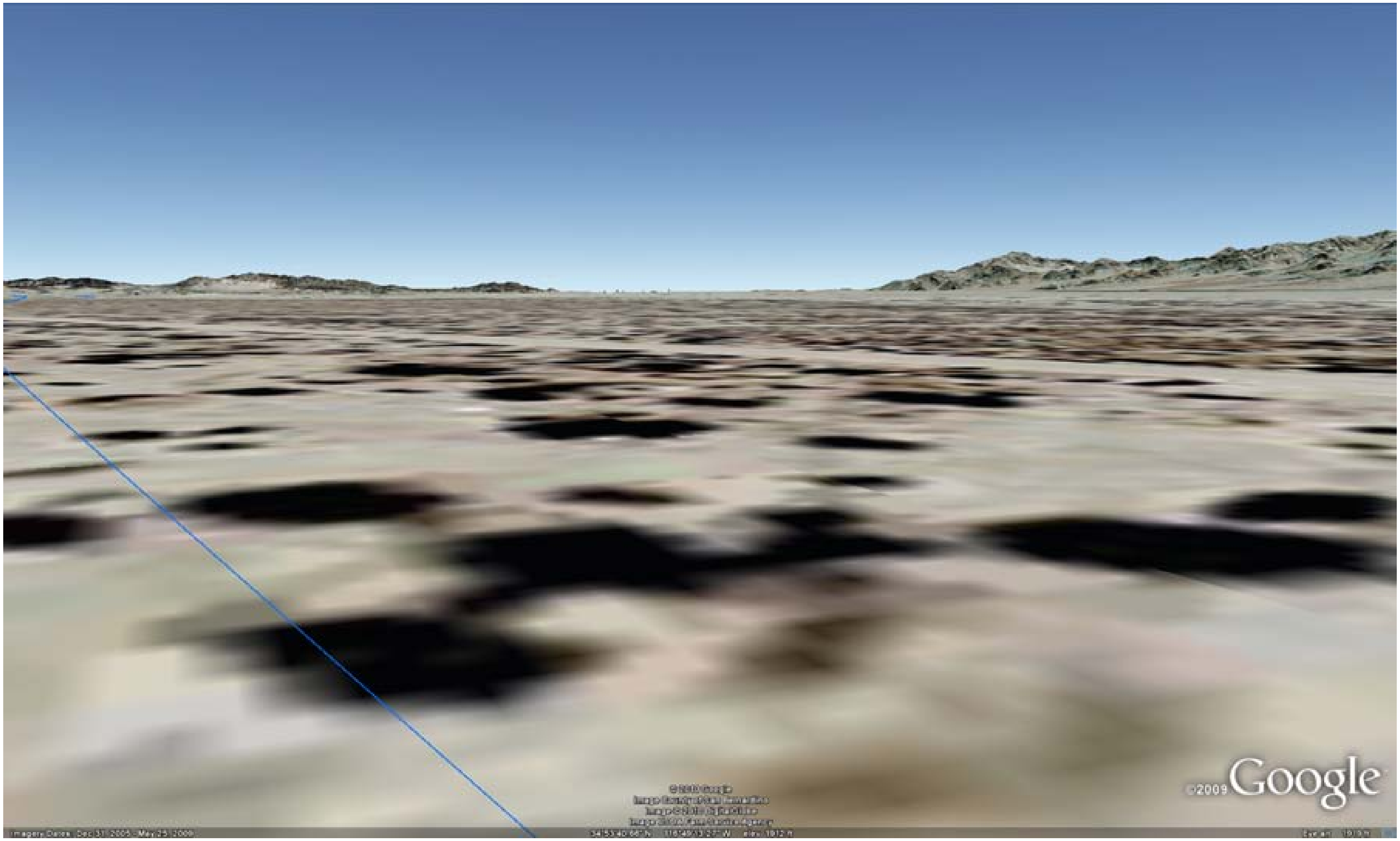

FIGURE 9.3.14.2-9 Google Earth Visualization of the Proposed Pisgah SEZ (power towers visible on horizon) and Surrounding Lands, with Power Tower Wireframe Model, as Seen from the Old Spanish National Historic Trail near Yermo, California

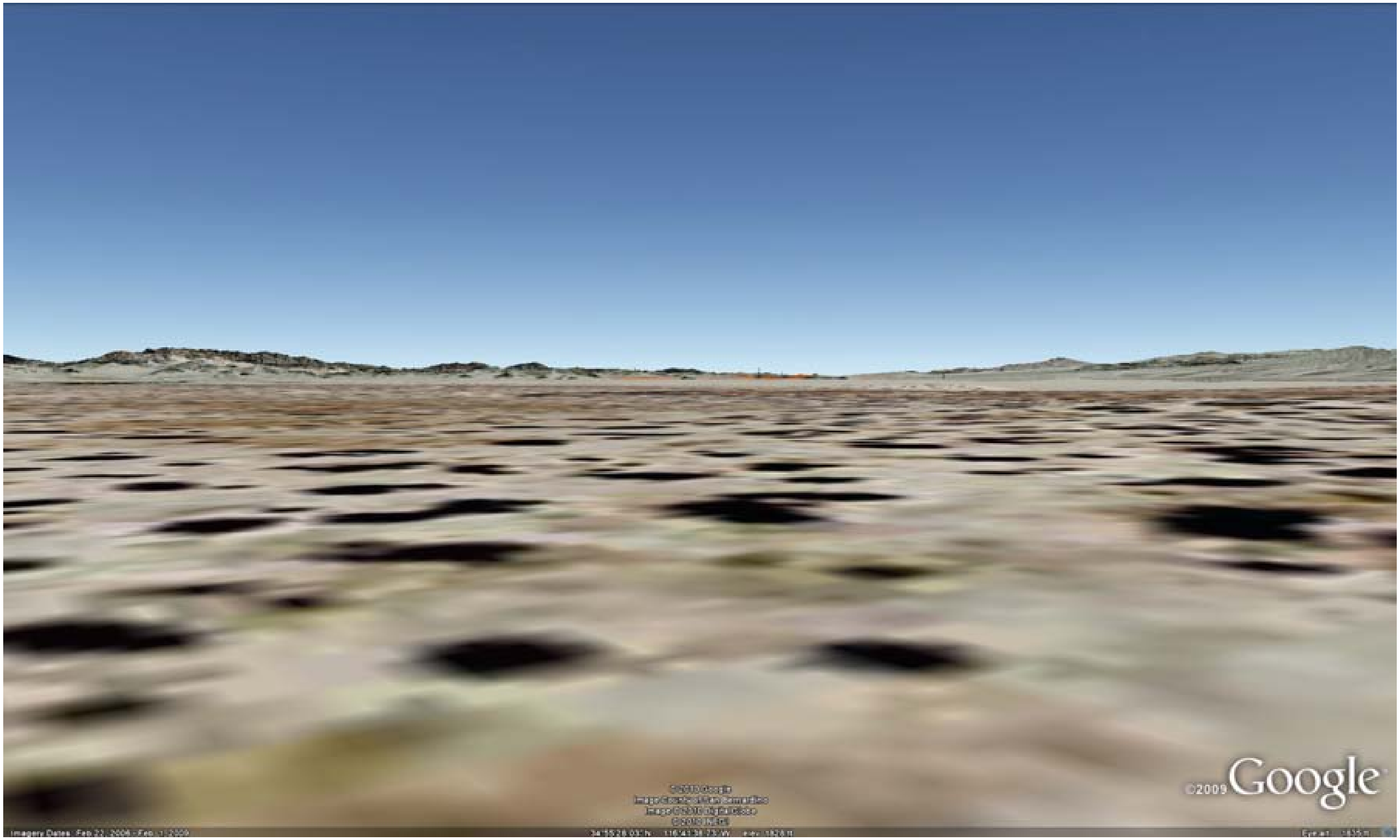

FIGURE 9.3.14.2-10 Google Earth Visualization of the Proposed Pisgah SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Model, as Seen from the Old Spanish National Historic Trail near the Trail Fork North of Newberry Springs, California

in orange) as seen from the Old Spanish National Historic Trail near the trail fork, north of the community of Newberry Springs.

The visualization suggests that at this point on the trail, lower height facilities within the western portion of the SEZ could be visible, in the absence of screening by vegetation or structures. At this distance, the receivers of operating power towers in the SEZ would appear as distant points of light on the eastern horizon, against a sky backdrop, or the bajadas of the Cady or Rodman Mountains. The tower structures would likely be visible underneath the receiver lights.

If sufficiently tall, the power towers could have red or white flashing hazard navigation lights that could be visible from the trail at night, although other lights would be visible in the vicinity of the SEZ. Other lighting associated with solar facilities in the SEZ could be visible as well, at least for facilities in the closest portions of the SEZ.

Because of the distance and partial screening by intervening landforms, the SEZ would occupy a small portion of the field of view, and the viewing angle would be low. Weak visual contrasts would be expected at this location on the trail.

For trail users continuing along the Armijo segment, after the fork, the trail loses elevation and passes out of the SEZ viewshed approximately 1.2 mi (1.9 km) east of the fork. The Northern Route turns more northward and gradually climbs approximately 100 ft (30 m) over about 10 mi (18 km) to reach Alvord Mountain, and there passes out of the SEZ viewshed.

As trail users traveled northward on the Northern Route, the SEZ would be behind them, and solar facilities within the western portion of the SEZ would potentially be visible to the south and east. In some stretches of the trail, however, only the upper portions of sufficiently tall power towers located in visible portions of the SEZ could be seen. Because of the distance and partial screening by intervening landforms, the SEZ would occupy a small portion of the field of view, and the viewing angle would be low. Weak visual contrasts would be expected.

As the trail rose into the Alvord Mountain area, slightly more of the SEZ would become visible, but the distance would be great enough (15+ mi [25+ km]) and the angle of view still low enough that visual contrasts would be expected to remain weak.

Trail users westbound on the trail would view the SEZ to the southeast as they either descended from Alvord Mountain (if traveling the Northern Route) or passed the Cady Mountains and entered the viewshed 1.2 mi (1.9 km) east of the trail fork (if on the Armijo segment). Travelers on the Armijo segment would have already passed the SEZ when they entered the viewshed, and it would be visible only briefly and with very low levels of visual contrast expected. Travelers on the Northern Route would have longer views of the SEZ as they traveled southward to the fork, but as noted above, visual contrasts seen from this section of the trail would be expected to be very low.

In summary, although about 29 mi (46 km) of the Old Spanish National Historic Trail are within the 25-mi (40-km) viewshed of the Pisgah SEZ, and the trail passes within 6 mi (10 km) of the SEZ, trail viewpoints are either too distant from the SEZ, partially screened from views of the SEZ, and/or have too low an angle of view to the SEZ to be subject to even moderate visual contrasts from solar facilities within the SEZ. The nature of the visual contrasts from solar facilities in the SEZ as observed from the trail would depend on viewer location, the numbers, types, sizes, and locations of solar facilities in the SEZ, and other project- and site-specific factors, but under the 80% development scenario analyzed in the PEIS, solar facilities in the SEZ would be expected to cause weak levels of visual contrast for viewpoints on the Old Spanish National Historic Trail.

Additional scenic resources exist at the national, state, and local levels, and impacts on both federal and nonfederal lands may occur, including sensitive traditional cultural properties important to Tribes. In addition to the resource types and specific resources analyzed in this PEIS, future site-specific NEPA analyses would include state and local parks, recreation areas, other sensitive visual resources, and communities close enough to the proposed project to be affected by visual impacts. Selected other lands and resources are included in the discussion below.

In addition to impacts associated with the solar energy facilities themselves, sensitive visual resources could be affected by facilities that would be built and operated in conjunction with the solar facilities. With respect to visual impacts, the most important associated facilities would be access roads and transmission lines, the precise location of which cannot be determined until a specific solar energy project is proposed. Currently there is a 230-kV transmission line within the proposed SEZ. For this analysis, the impacts of construction and operation of transmission lines outside of the SEZ were not assessed, assuming that the existing 230-kV transmission line might be used to connect some new solar facilities to load centers, and that additional project-specific analysis would be done for new transmission construction or line upgrades. Note that depending on project- and site-specific conditions, visual impacts associated with access roads, and particularly transmission lines, could be large. Detailed information about visual impacts associated with transmission lines is presented in Section 5.7.1. A detailed site-specific NEPA analysis would be required to precisely determine visibility and associated impacts for any future solar projects, based on more precise knowledge of facility location and characteristics.

Impacts on Selected Other Lands and Resources

Historic Route 66 (National Old Trails Highway) and Interstate 40. Since 1990, Route 66 in California has been designated as "State Historic Highway Route 66," but Route 66 is not designated as a scenic highway, though it is of nationwide historic interest. I-40 is eligible for designation as a state scenic highway but has not been officially designated. Traveling east from Barstow, Route 66 follows I-40. The AADT value for I-40 at Hector Road is 12,500 vehicles, with an expected 15% increase as a result of solar energy development within the SEZ. East of Daggett, Route 66 leaves I-40, but crosses it three times. Because the two routes parallel each other so closely in the area of the SEZ, they would be subject to similar levels of visual contrasts from solar facilities within the SEZ, and are therefore discussed together.

As shown in Figure 9.3.14.2-2, approximately 48 mi (77 km) of Route 66 and I-40 are within the 650-ft (198.1-m) viewshed of the Pisgah SEZ, with an estimated 8 mi (13 km) of I-40 and 5 mi (8 km) of Route 66 running through the SEZ. I-40 intersects the SEZ in five separate areas ranging in lengths from approximately 0.7 to 2 mi (1 to 3 km). Route 66 intersects the SEZ in four separate areas ranging in lengths from approximately 0.1 to 2 mi (0.2 to 3 km). Undulations in topography as well as buildings screen views of portions of the SEZ from some locations along the two roadways; however, there are generally open views of the SEZ throughout the viewshed.

For westbound travelers on the roadways, the receivers of sufficiently tall power towers might be just visible over the western horizon 13 mi (21 km) east of Ludlow, about 26 mi (42 km) from the eastern boundary of the SEZ; however, at that distance, the impacts would be minimal. As travelers crested a hill approximately 5 mi (8 km) west of the SEZ, lower height solar facilities in the eastern portion of the SEZ would come into view, and contrast levels would increase rapidly over the next few minutes as travelers approached the SEZ at highway speeds. The road passes through several dips that might partially conceal some facilities within the SEZ briefly.

Figure 9.3.14.2-11 is a Google Earth visualization of the SEZ as seen from I-40, approximately 3 mi (5 km) east of the intersection of I-40 and the SEZ, facing northwest toward the center of the SEZ. The visualization suggests that from this location, the SEZ would occupy much of the horizontal field of view, but because the viewing angle is very low, small undulations in topography might screen views of lower-height solar facilities away from the roadways. Power blocks, power towers, transmission towers, and other taller facilities, as well as steam plumes (if present) would likely be visible, however, and sufficiently close to cause stronger visual contrasts, primarily line contrasts. The receivers of operating power towers in the far eastern portion of the SEZ could appear as very bright, non-point light sources atop plainly visible tower structures and would strongly attract visual attention. These bright light sources could interfere with views of the distant mountains to the south and west, or could project above the horizon onto a sky backdrop.

FIGURE 9.3.14.2-11 Google Earth Visualization of the Proposed Pisgah SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from I-40 Approximately 2.7 mi (4.3 km) East of the SEZ

If sufficiently tall, power towers could have flashing red or white hazard navigation lights that could be visible for long distances down the roadways at night. These lights could become conspicuous as travelers approached the SEZ, and would be likely to attract visual attention.

Figure 9.3.14.2-12 is a Google Earth visualization of the SEZ as seen from I-40, approximately 0.7 mi (1 km) east of the intersection of the highway and the SEZ, facing northwest toward the center of the SEZ. The visualization suggests that from this location, solar facilities within the SEZ would be in full view, and the SEZ would occupy more than the entire field of view, and travelers would have to turn their heads to scan across the full SEZ. Facilities located within the southeastern portion of the SEZ would strongly attract the eye and likely dominate views from the roadways. Structural details of some facility components could be visible. Views of the Mojave Valley to the west and northwest would be completely or partially screened by solar facilities, and views of the Cady Mountains and Rodman Mountains could be fully or near fully screened as well, depending on the layout of solar facilities within the SEZ. Because of the very short distance from the roadways, strong visual contrasts could result, depending on solar project characteristics and location within the SEZ.

Visual contrast would increase farther as travelers on the roadways entered the SEZ. If power tower facilities were located in the SEZ, the receivers could appear as brilliant white light sources on either side of the roadways and would likely strongly attract views. In addition, during certain times of the day from certain angles, sunlight on dust particles in the air might result in the appearance of light streaming down from the tower(s). Looking ahead down the roadways, if solar facilities were located on both the north and south sides of the roads, the banks of solar collectors on both sides of the byway could form a visual “tunnel” that travelers would pass through briefly. If solar facilities were located close to the roadways, given the 80% development scenario analyzed in the PEIS, they would be expected to dominate views from the roadways and would create strong visual contrasts. After passing through the section of SEZ, the SEZ would still be very close to the roadways on one or the other side of the highways, with impact levels dependent on the presence of solar facilities in areas near the roadways and solar facility characteristics.

Figure 9.3.14.2-13 is a Google Earth visualization of the SEZ as seen from Route 66 within the SEZ, 3 mi (5 km) west of the easternmost intersection of Route 66 and the SEZ, facing north toward the center of the SEZ. The largest power tower receiver visible is approximately 1.7 mi (2.7 km) northwest of the viewpoint.

The visualization suggests that if viewed from this location on Route 66, the SEZ would occupy more than the entire field of view, and that solar energy facilities within the SEZ could potentially dominate the view from Route 66, depending on the technology employed and other visibility factors. Structural details of some facility components might be visible, and if sufficiently tall power tower receivers were present within the SEZ, they could project above mountains to the north and be visible against a sky backdrop. Steam plumes, transmission towers, and other tall facility components could also project above the mountains. From this viewpoint, solar collector/reflector arrays would be seen nearly edge on and would repeat the horizontal line of the plain in which the SEZ is situated, which would tend to reduce visual line contrast. As the viewer passed through the SEZ, however, the collector arrays could increase in

FIGURE 9.3.14.2-12 Google Earth Visualization of the Proposed Pisgah SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from I-40 Approximately 0.7 mi (1 km) East of the SEZ

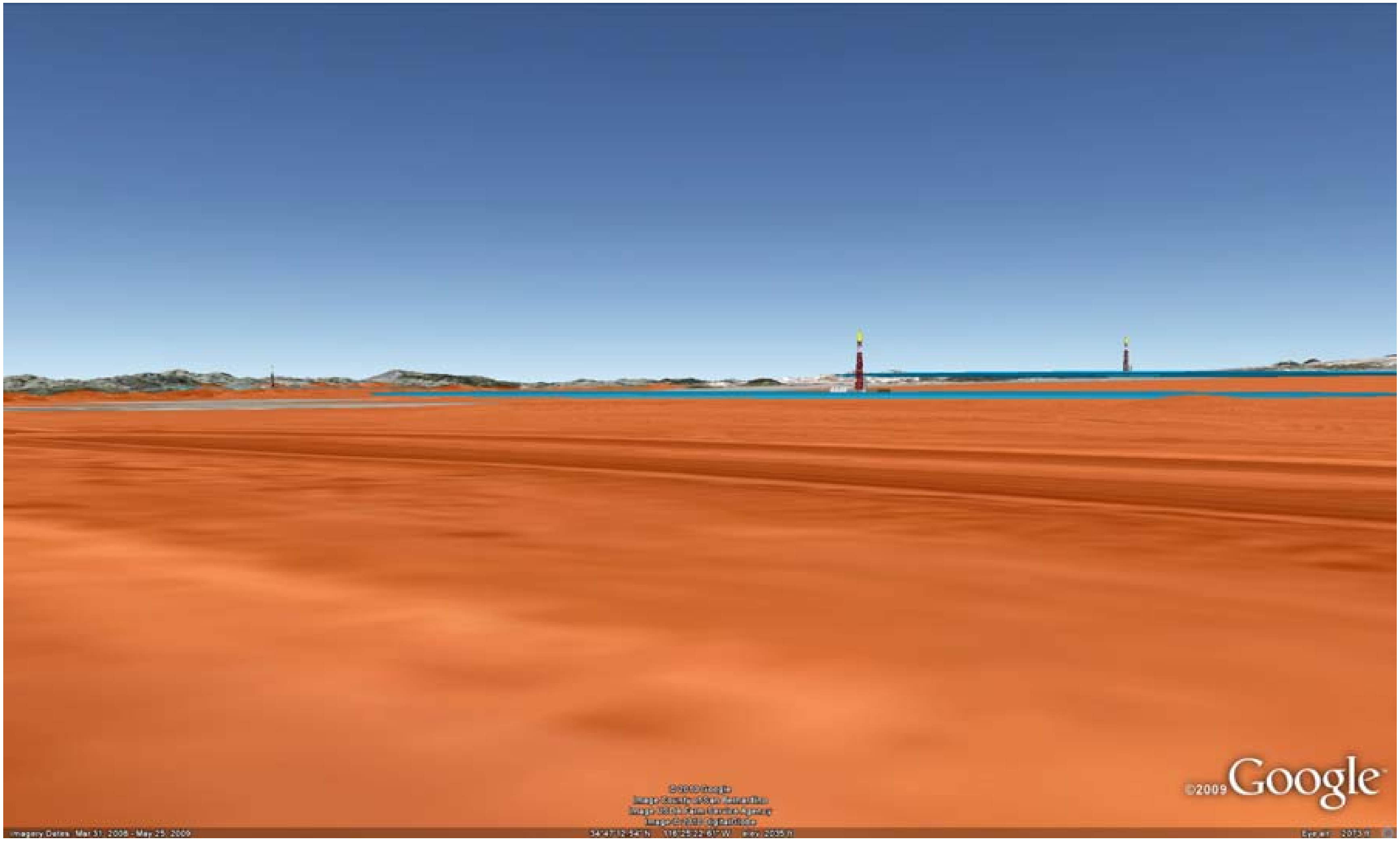

FIGURE 9.3.14.2-13 Google Earth Visualization of the Proposed Pisgah SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from Route 66 within the SEZ, 2.8 mi (4.5 km) West of the Easternmost Intersection of Route 66 and the SEZ

apparent size until they no longer appeared as horizontal lines against the natural appearing backdrop.

Road travelers heading east on the roadways would in general be subjected to the same types of visual contrasts, but the order would be reversed, which could change the perceived impact levels. Because of differences in topography between the eastern and western approaches to the SEZ, more of the SEZ would be visible for longer distances for eastbound travelers. Solar facilities within the SEZ could be visible as far as Barstow (25+ mi [41+ km]), with power tower receivers appearing as distant lights on the eastern horizon at that distance.

From Barstow eastward, except for brief periods, travelers would have continuous visibility of solar facilities within some part of the SEZ as they approached it. Solar facilities within the SEZ would gradually increase in apparent size, with the view opening up substantially (and visual contrast levels rising accordingly) as travelers approached Newberry Springs. Visual dominance of the solar facilities within the SEZ would increase steadily until peaking when travelers entered and passed through the SEZ.

The nature of the visual contrasts from solar facilities in the SEZ as observed from I-40 and Route 66 would depend on the numbers, types, sizes, and locations of solar facilities in the SEZ, and other project- and site-specific factors. Under the 80% development scenario analyzed in the PEIS, because the roadways pass through the SEZ, strong visual contrasts could be observed from the roadways in and near the SEZ.

Interstate 15. As shown in Figure 9.3.14.2-2, approximately 34 mi (55 km) of I-15 is within the 650-ft (198.1-m) viewshed of the Pisgah SEZ, with an estimated 18 mi (29 km) within the 7.5-m (24.6-ft) viewshed. Undulations in topography as well as buildings screen views of portions of the SEZ from some locations along I-15; however, there are generally open views of the SEZ from I-15 throughout the SEZ viewshed. Visibility distances from I-15 to the SEZ within the 25-mi (41-km) SEZ viewshed range from 9 to 22 mi (14 to 35 km).

For about one-half of the distance, the SEZ is in view of I-15, primarily in the northeast portion of the SEZ viewshed, and intervening topography would screen all but the upper portions of sufficiently tall power towers located in visible portions of the SEZ. From these areas, generally 9 to 18 mi (14 to 29 km) from the SEZ, the receivers on power towers would look like point-like or nearly point-like lights on the southern horizon, against the backdrop of the valley floor or the Rodman Mountains. If sufficiently tall, power towers could have flashing red or white hazard navigation lights that would likely be visible from I-15 at night, although other lights would be visible in the vicinity.

Farther southwest on I-15, lower height solar facilities would become visible. The point of closest approach to the SEZ on I-15 is north of Newberry Springs. At this distance, the power tower receivers would appear as distant points of light on the eastern horizon, against a sky backdrop, or bajadas of the Cady or Rodman Mountains. Depending on project-specific factors, lighting, and other visibility factors, power tower structures could be visible underneath the receiver lights. Because of the distance and partial screening by intervening landforms, the SEZ would occupy a small portion of the field of view, and the viewing angle would be low. Weak visual contrasts would be expected. Westward beyond this point, the distance to the SEZ would increase, and therefore the apparent size of the SEZ and solar facilities within the SEZ would decrease, and associated visual contrasts would diminish accordingly.

Burlington Northern Santa Fe Railroad. The Burlington Northern Santa Fe (BNSF) Railroad and Union Pacific (UP) Railroad are privately run freight train services whose rail lines are within the viewshed of the SEZ. The BNSF rail line also runs through the SEZ. Amtrak's Southwest Chief passenger train travels these same BNSF tracks through the SEZ and within the SEZ viewshed. It provides daily service between Chicago and Los Angeles and promotes the scenery of the American West to its passengers. The rail line serves Barstow and travels through the SEZ for approximately 9 mi (15 km). Approximately 55 mi (89 km) of the passenger service line are within the SEZ viewshed. The railroad roughly parallels I-40 within the SEZ, and impacts on passengers on the Southwest Chief would be similar to those described for travelers on I-40 and Route 66 (see above). Strong visual contrasts would be expected under the 80% development scenario analyzed in the PEIS.

Communities of Barstow, Daggett, Yermo, Newberry Springs, and Ludlow. The viewshed analyses indicate visibility of the SEZ from the communities of Barstow (approximately 25 mi [41 km] west of the SEZ), Daggett (approximately 17.7 mi [28.5 km] west of the SEZ), Yermo (approximately 15 mi [23 km] northwest of the SEZ), Newberry Springs (approximately 7 mi [11 km] west of the SEZ), and Ludlow (approximately 12 mi [19 km] east of the SEZ). Screening by small undulations in topography, vegetation, buildings, or other structures would likely restrict or eliminate visibility of the SEZ and associated solar facilities within these communities, but a detailed future site-specific NEPA analysis is required to determine visibility precisely. However, note that even with existing screening, solar power towers, cooling towers, plumes, transmission lines and towers, or other tall structures associated with the development could potentially be tall enough to exceed the height of screening and cause visual impacts on these communities.

Barstow is elevated approximately 450 ft (140 m) above the western boundary of the SEZ, and as the valley slopes downward gently but steadily to the east, the easternmost portions of Barstow would have a view of the distant SEZ. At 25 mi (42 km), however, the SEZ would occupy a very small part of the field of view, and the angle of view would be very low, so that if solar facilities were visible within the SEZ, they would be viewed edge-on. The light from power tower receivers within the SEZ would likely appear as distant points of light on the eastern horizon. If sufficiently tall, power towers could have flashing red or white hazard navigation lights that could potentially be visible from Barstow at night, although other lights would be visible in the vicinity. Visual contrasts associated with solar facilities within the SEZ would be minimal.

Daggett is elevated approximately 250 ft (76 m) above the western boundary of the SEZ. At 18 mi (29 km), the SEZ occupies a slightly larger portion of the field of view than viewed from Barstow, but the angle of view would still be very low, so that if solar facilities were visible within the SEZ, they would be viewed edge-on. The light from power tower receivers within the SEZ would likely appear as distant points of light on the eastern horizon. If sufficiently tall, power towers could have flashing red or white hazard navigation lights that could potentially be visible from Daggett at night, although other lights would be visible in the vicinity. Visual contrasts associated with solar facilities within the SEZ would be expected to be weak. It should be noted that a variety of industrial facilities, including the SEGS I and II solar plants, are located immediately east of Daggett and likely screen much of the view of the SEZ from some locations in Daggett.

Yermo is elevated approximately 250 ft (76 m) above the western boundary of the SEZ. At 15 mi (23 km), the SEZ occupies a slightly larger portion of the field of view than viewed from Daggett, but the angle of view would still be very low, so that if solar facilities were visible within the SEZ, they would be viewed edge-on. The light from power tower receivers within the SEZ would likely appear as points of light on the eastern horizon. If sufficiently tall, power towers could have flashing red or white hazard navigation lights that would likely be visible from Yermo at night, although other lights would be visible in the vicinity. Visual contrasts associated with solar facilities within the SEZ would be expected to be weak.

Newberry Springs is elevated approximately 80 ft (24 m) above the western boundary of the SEZ. At 7 mi (11 km), the SEZ would occupy a substantial portion of the field of view, but the angle of view would be low, so that if solar facilities were visible within the SEZ, they would be viewed edge-on and would repeat the line of the horizon, tending to reduce visual contrast. The light from power tower receivers within the SEZ would likely appear as very bright non-point sources of light on the eastern horizon. If sufficiently tall, power towers could have flashing red or white hazard navigation lights that could potentially be conspicuous from Newberry Springs at night, although other lights would be visible in the vicinity. Visual contrasts associated with solar facilities within the SEZ would be expected to be moderate.

Ludlow is elevated approximately 390 ft (120 m) below the eastern boundary of the SEZ. Intervening topography between Ludlow and the SEZ would screen all but the upper portions of sufficiently tall power towers located in visible portions of the SEZ from view from Ludlow. At 12 mi (19 km) from the SEZ, the receivers on visible power towers would look like point-like or nearly point-like lights on the western horizon. If sufficiently tall, power towers could have flashing red or white hazard navigation lights that could potentially be visible from Ludlow at night, although other lights would be visible in the vicinity. Visual contrasts associated with solar facilities within the SEZ would be expected to be minimal.

Regardless of visibility from within these communities, residents, workers, and visitors would be likely to experience visual impacts from solar energy facilities located within the SEZ (as well as any associated access roads and transmission lines) as they travel area roads, including the roads discussed above.

Nearby Residents. Scattered ranches and other residences are located on private lands immediately adjacent or close to the SEZ and within the SEZ viewshed. Depending on technology and project-specific factors, because of the close proximity and large size of likely facilities, these residents could be subjected to large visual impacts from solar energy development within the SEZ. These impacts would be determined in the course of a site-specific environmental impact analysis.

9.3.14.2.3 Summary of Visual Resource Impacts for the Proposed Pisgah SEZ

Under the 80% development scenario analyzed in this PEIS, there could be multiple solar facilities within the Pisgah SEZ, a variety of technologies employed, and a range of supporting facilities that would contribute to visual impacts, such as transmission towers and lines, substations, power block components, and roads. The resulting visually complex landscape would be essentially industrial in appearance and would contrast strongly with the surrounding more natural-appearing landscape. Large visual impacts on the SEZ and surrounding lands within the SEZ viewshed would be associated with solar energy development due to major modification of the character of the existing landscape. There is the potential for additional impacts from construction and operation of transmission lines and access roads within the SEZ.

Residents, workers, and visitors to the area may experience visual impacts from solar energy facilities located within the SEZ (as well as any associated access roads and transmission lines) as they travel area roads, including I-40, I-15, and Historic Route 66. Travelers on I-40 and Historic Route 66 would be likely to experience strong visual contrasts as they pass through the SEZ, as would passengers on the Amtrak rail line serving Barstow. Nearby residents could be subjected to large visual impacts from solar energy development within the SEZ. Of the nearby communities, residents of Newberry Springs would be likely to experience moderate visual contrasts.

Utility-scale solar energy development within the proposed Pisgah SEZ is likely to cause moderate to strong visual impacts on highly sensitive visual resource areas within the 25-mi (40-km) viewshed of the SEZ, including the Cady Mountains WSA and the Rodman Mountains WA. Because the SEZ is located within the CDCA, some CDCA lands within the SEZ viewshed could be subject to strong visual contrast levels as a result of solar facility development within the SEZ.

9.3.14.3 SEZ-Specific Design Features and Design Feature Effectiveness

As noted in Section 5.12, the presence and operation of large-scale solar energy facilities and equipment would introduce major visual changes into nonindustrialized landscapes and could create strong visual contrasts in line, form, color, and texture that could not easily be mitigated substantially. Implementation of the programmatic design features that are presented in Appendix A, Section A.2.2, would be expected to reduce the magnitude of visual impacts experienced; however, the degree of effectiveness of these design features could be assessed only at the site- and project-specific level. Given the large-scale, reflective surfaces and strong regular geometry of utility-scale solar energy facilities, and the typical lack of screening vegetation and landforms within the SEZ viewsheds, siting the facilities away from sensitive visual resource areas and other sensitive viewing areas is the primary means of mitigating visual impacts. The effectiveness of other visual impact mitigation measures would generally be limited.

While the applicability and appropriateness of some mitigation measures would depend on site- and project-specific information that would be available only after a specific solar energy project had been proposed, the following SEZ-specific design features can be identified for the Pisgah SEZ at this time:

- Within the SEZ, in areas visible from and within 1 mi (1.6 km) of the Cady Mountains WSA, visual impacts associated with solar energy project operation should be consistent with VRM Class II management objectives (see Table 9.3.14.3-1), as experienced from KOPs (to be determined by the BLM) within the WSA, and in areas visible from between 1 and 3 mi (1.6 and 4.8 km); visual impacts should be consistent with VRM Class III management objectives. The VRM Class II impact level consistency mitigation would affect approximately 2,237 acres (9 km^2) within the western portion of the SEZ. The VRM Class III impact level consistency mitigation would affect approximately 7,961 additional acres (32 km^2).

TABLE 9.3.14.3-1 VRM Management Class Objectives

VRM Management Class Objectives	
Class I Objective	The objective of this class is to preserve the existing character of the landscape. This class provides for natural ecological changes; however, it does not preclude very limited management activity. The level of change to the characteristic landscape should be very low and must not attract attention.
Class II Objective	The objective of this class is to retain the existing character of the landscape. The level of change to the characteristic landscape should be low. Management activities may be seen, but should not attract the attention of the casual observer. Any changes must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape.
Class III Objective	The objective of this class is to partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.
Class IV Objective	The objective of this class is to provide for management activities which require major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high. These management activities may dominate the view and be the major focus of viewer attention. However, every attempt should be made to minimize the impact of these activities through careful location, minimal disturbance, and repeating the basic elements.

Source: BLM (1986b).

- Within the SEZ, in areas located south of I-40 and visible from and between 1 and 3 mi (1.6 and 4.7 km) of the Rodman Mountains WA, visual impacts associated with solar energy project operation should be consistent with VRM Class III management objectives as experienced from KOPs determined by the BLM within the WA. The VRM Class III impact level consistency mitigation would affect approximately 454 acres (1.8 km^2).

Figure 9.3.14.3-1 shows the areas within the SEZ affected by these SEZ-specific design features.

Application of the SEZ-specific design features above would substantially reduce visual impacts associated with solar energy development within the SEZ.

Application of the SEZ-specific design feature to restrict allowable visual impacts associated with solar energy project operations within 3 mi (4.8 km) of the Cady Mountains WSA would substantially reduce potential visual impacts on the WA by limiting impacts within the BLM-defined foreground of the viewshed of this area, where potential visual impacts would be greatest.

Application of the SEZ-specific design feature to restrict allowable visual impacts associated with solar energy project operations south of I-40 and between 1 and 3 mi (2 and 5 km) of the Rodman Mountains WA would substantially reduce potential visual impacts on the WA by limiting impacts within the BLM-defined foreground of the viewshed of this area, where potential visual impacts would be greatest. This design feature would also reduce impacts on travelers on I-40 and Route 66.

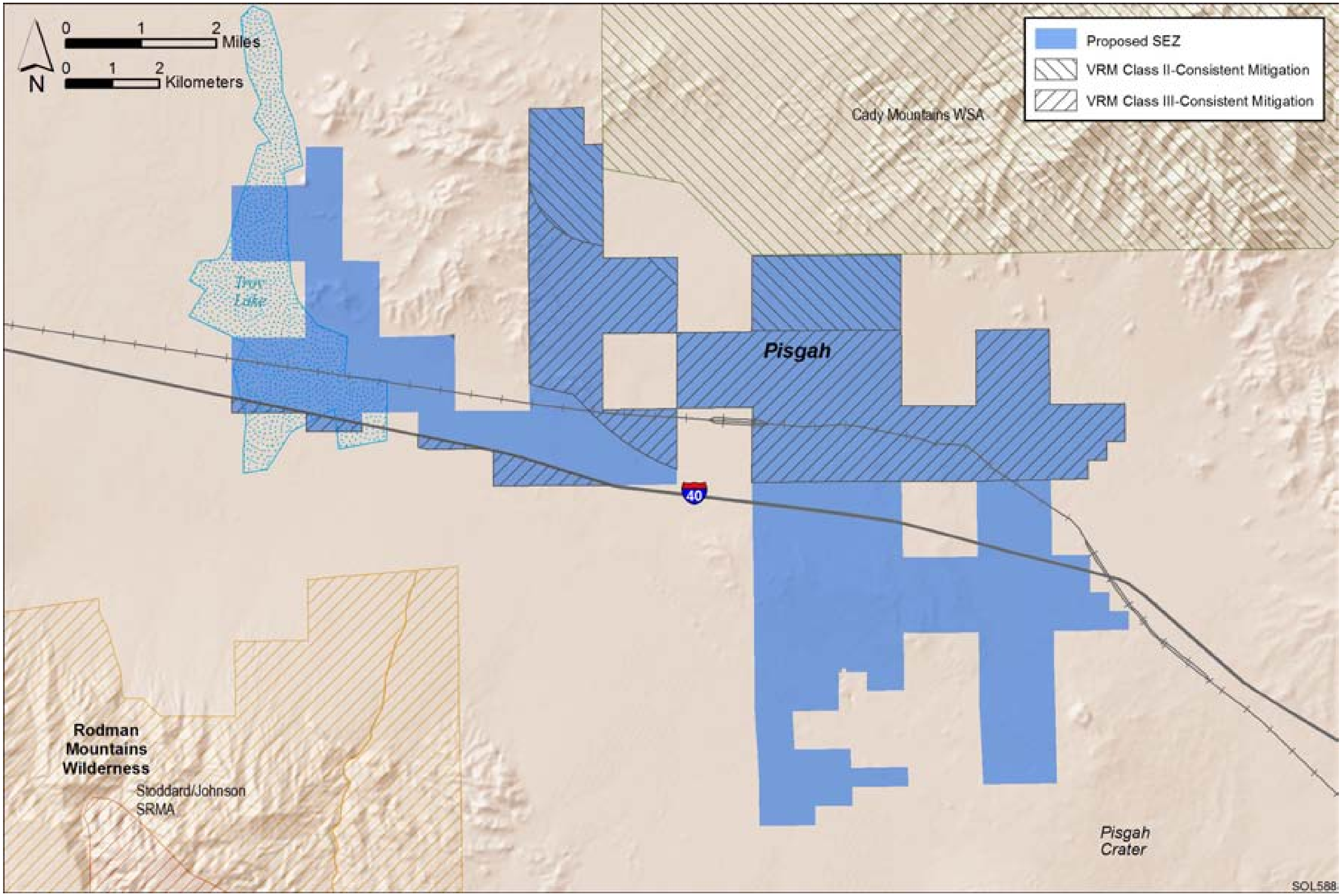

FIGURE 9.3.14.3-1 Areas within the Proposed Pisgah SEZ Affected by Zone-Specific Distance-Based Visual Impact Design Features

This page intentionally left blank.

9.3.15 Acoustic Environment

9.3.15.1 Affected Environment

The proposed Pisgah SEZ is located in the central portion of San Bernardino County in Southeastern California. The County of San Bernardino has established noise standards for stationary sources, mobile sources, and all other structures (County of San Bernardino 2009). Noise standards applicable to solar energy development are those for stationary sources based on affected land use and time of day: 55 dBA daytime L_{eq} and 45 dBA nighttime L_{eq} for residential land use. Combining these two levels is the same as the EPA guideline of 55 dBA as L_{dn} for residential areas. In San Bernardino County, temporary construction activities between 7 a.m. and 7 p.m., except Sundays and federal holidays, are exempted from the noise regulations.

I-40, State Route 66 (National Trails Highway), and the BNSF Railway run east–west through the proposed Pisgah SEZ, and Memorial Drive runs through the southern edge of the western portion of SEZ. The nearest airports are Barstow-Daggett Airport and the privately owned Ludlow Airport, which are located about 12 mi (19 km) west and east of the SEZ, respectively. Twentynine Palms Marine Corps Base is located just south of the SEZ. Because of the presence of the Mojave Aquifer, the largest aquifer in the western U.S., diverse agricultural activities including irrigated crops, livestock, and aquaculture are scattered over the area to the west of the SEZ. Many man-made water-skiing and jet-skiing lakes are also located to the west of the SEZ. Mining operations exist in the southeastern portion of the SEZ. No livestock grazing exists, and little recreational use and limited hunting occurs onsite. No sensitive receptors (e.g., hospitals, schools, or nursing homes) exist near the Pisgah SEZ. The nearest noise receptor lies next to the northwestern corner of the SEZ boundary (about 40 ft [12 m] away). The next nearest receptors are a cluster of residences within about 500 ft (150 m) of the SEZ just south of the I-40 rest area at the south-central edge of the western portion of the SEZ. No residences exist to the east of the SEZ, downwind of prevailing westerly winds in the area. The closest population center with schools is Newberry Springs, which is located about 6 mi (10 km) west of the proposed Pisgah SEZ. Therefore, noise sources around the SEZ include road traffic, railroad traffic, aircraft flyover, agricultural activities, industrial activities including mining, and activities and events at nearby communities. The proposed Pisgah SEZ is mostly undeveloped, and its overall character is considered rural to industrial. To date, no environmental noise survey has been conducted near the Pisgah SEZ. On the basis of the population density in San Bernardino County, the day-night average sound level (L_{dn} or DNL) is estimated to be 41 dBA for San Bernardino County, typical of a rural area[11] (Eldred 1982; Miller 2002). However, maximum noise levels in the SEZ would be over 70 dBA L_{dn} along I-40 or the BNSF Railway (County of San Bernardino 2009); thus, noise levels are estimated to be higher than 55 dBA L_{dn} up to 0.3 mi (0.5 km) from I-40 or the railroad. In addition, noise levels would be relatively high near the western boundary of the SEZ because of agricultural and industrial activities that take place to the west.

[11] Rural and undeveloped areas have sound levels in the range of 33 to 47 dBA as L_{dn} (Eldred 1982). Typically, the nighttime level is 10 dBA lower than daytime level, and it can be interpreted as 33 to 47 dBA (mean 40 dBA) during the daytime hours and 23 to 37 dBA (mean 30 dBA) during nighttime hours.

9.3.15.2 Impacts

Potential noise impacts associated with solar projects in the Pisgah SEZ would occur during all phases of the projects. During the construction phase, potential noise impacts associated with operation of heavy equipment and vehicular traffic would be anticipated, albeit of short duration, at the nearest residence (just next to the northwestern SEZ boundary). During the operations phase, potential impacts on nearby residences would be anticipated, depending on the solar technologies employed. Noise impacts shared by all solar technologies are discussed in detail in Section 5.13.1, and technology-specific impacts are presented in Section 5.13.2. Impacts specific to the Pisgah SEZ are presented in this section. Any such impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2, and through any additional SEZ-specific design features applied (see Section 9.3.15.3 below). This section primarily addresses potential noise impacts on humans, although potential impacts on wildlife at nearby sensitive areas are discussed. Additional discussion on potential noise impacts on wildlife is presented in Section 5.10.2.

9.3.15.2.1 Construction

The proposed Pisgah SEZ has a relatively flat terrain; thus, minimal site preparation activities would be required, and associated noise levels would be lower than those during general construction (e.g., erecting building structures and installing equipment, piping, and electrical). Solar array construction would also generate noise, but both noise and construction would be spread over a wide area.

For the parabolic trough and power tower technologies, the highest construction noise levels would occur at the power block area; a maximum of 95 dBA at a distance of 50 ft (15 m) is assumed, if impact equipment such as pile drivers or rock drills is not being used. Typically, the power block area is located in the center of the solar facility, at a distance of more than 0.5 mi (0.8 km) from the facility boundary. However, noise levels from construction of the solar array would be lower than 95 dBA. With geometric spreading and ground effects, as explained in Section 4.13.1, noise levels would attenuate to about 40 dBA at a distance of 1.2 mi (1.9 km) from the power block area. This noise level is typical of daytime mean rural background level. In addition, mid- and high-frequency noise from construction activities is significantly attenuated by atmospheric absorption under the low-humidity conditions typical of an arid desert environment, and by temperature lapse conditions typical of daytime hours; thus, noise attenuation to background levels would occur at distances somewhat shorter than 1.2 mi (1.9 km). If a 10-hour daytime work schedule is considered, the EPA guideline level of 55 dBA L_{dn} for residential areas (EPA 1974) would occur at about 1,200 ft (370 m) from the power block area, which would be well within the facility boundary. For construction activities occurring near the northwestern SEZ, estimated noise levels at the nearest residence would be about 74 dBA,[12] which is well above the San Bernardino County standard of 55 dBA daytime L_{eq} for residential

[12] Typically, the heavy equipment operators would not allow public access any closer than 330 ft (100 m) for safety reasons. In other words, construction and solar facility would not occur within this distance from the nearest residence.

land use. In addition, an estimated 70 dBA L_{dn}[13] at this receptor is well above the EPA guideline of 55 dBA L_{dn} for residential areas.

About 72% of the time, winds in the area blow from directions ranging from southwest through northwest inclusive. Accordingly, actual noise levels at the receptors, which are located upwind of prevailing winds, would be much lower than the estimated noise levels due to a shadow zone in the upwind area (discussed below).

It is assumed that a maximum of two projects would be developed at any one time for SEZs greater than 10,000 acres (40.47 km^2) and less than 30,000 acres (121.4 km^2), such as the Pisgah SEZ. If two projects were to be built within the SEZ near the nearest residence, noise levels would be a little higher than the above-mentioned values, below a just-noticeable increase of about 3 dB over a single project.

In addition, noise levels were estimated at the specially designated areas within a 5-mi (8-km) range from the Pisgah SEZ, which is the farthest distance at which noise, other than extremely loud noise, would be discernable. There are three specially designated areas within the range where noise might be an issue. Cady Mountains WSA, Pisgah ACEC, and Ord-Rodman DWMA abut the SEZ to the northeast, the east, and southwest, respectively. For construction activities occurring near one of the specially designated areas, noise levels are estimated to be about 74 dBA at the boundaries of these specially designated areas, higher than the typical daytime mean rural background level of 40 dBA. Thus, if construction would occur near the specially designated areas, portions of those areas close to the SEZ (within approximately 1 mi [1.6 km]) could be disturbed by construction noise from the SEZ. However, sound levels above 90 dB are likely to adversely affect wildlife (Manci et al. 1988). Thus, construction noise is not likely to adversely affect wildlife in nearby specially designated areas, except in areas directly adjacent to the construction site.

Depending on soil conditions, pile driving might be required for the installation of solar dish engines. However, relatively small and quiet pile drivers, such as vibratory or sonic drivers, would be used, rather than the impulsive impact pile drivers frequently seen at large-scale construction sites. Potential impacts on the nearest residence (next to the northwestern SEZ boundary) would be anticipated to be minor, except when pile driving occurred near the residence.

It is assumed that most construction activities would occur during the day, when noise is better tolerated than at night because of the masking effects of background noise. In addition, construction activities for a utility-scale facility are temporary in nature (typically a few years). Construction would cause some unavoidable but localized short-term impacts on neighboring communities, particularly for activities occurring near the northwestern proposed SEZ boundary, close to the nearest residence.

---

[13] For this analysis, background levels of 40 and 30 dBA for daytime and nighttime hours, respectively, are assumed, which result in day-night average noise level (L_{dn}) of 40 dBA.

Construction activities could result in various degrees of ground vibration, depending on the equipment used and construction methods employed. All construction equipment causes ground vibration to some degree, but activities that typically generate the most severe vibrations are high-explosive detonations and impact pile driving. As for noise, vibration would diminish in strength with distance. For example, vibration levels at receptors beyond 140 ft (43 m) from a large bulldozer (87 VdB at 25 ft [7.6 m]) would diminish below the threshold of perception for humans, which is around 65 VdB (Hanson et al. 2006). During the construction phase, no major construction equipment that can cause ground vibration would be used, and no residences or sensitive structures are located in close proximity. Therefore, no adverse vibration impacts are anticipated from construction activities, except pile driving for dish engines occurring near the residences.

It is assumed that the existing 230-kV transmission line located within the SEZ might be used to connect new solar facilities to the regional grid, and that additional project-specific analysis would be conducted for new transmission construction or line upgrades. However, some construction of transmission lines could occur within the SEZ. Potential noise impacts on nearby residences would be a minor component of construction impacts in comparison with solar facility construction and would be temporary in nature.

9.3.15.2.2 Operations

Noise sources common to all or most types of solar technologies include equipment motion from solar tracking, maintenance and repair activities (e.g., washing of mirrors or replacement of broken mirrors) at the solar array area, commuter/visitor/support/delivery traffic within and around the solar facility, and control/administrative buildings, warehouses, and other auxiliary buildings/structures. Diesel-fired emergency power generators and fire water pump engines would be additional sources of noise, but their operations would be limited to several hours per month (for preventive maintenance testing).

With respect to the main solar energy technologies, noise-generating activities in the PV solar array area would be minimal, related mainly to solar tracking, if used. Dish engine technology, which employs collector and converter devices in a single unit, on the other hand, generally has the strongest noise production.

For the parabolic trough and power tower technologies, most noise during operations would come from the power block area, including the turbine generator (typically in an enclosure), pumps, boilers, and dry- or wet-cooling systems. The power block is typically located in the center of the facility. On the basis of a 250-MW parabolic trough facility with a cooling tower (Beacon Solar, LLC 2008), simple noise modeling indicates that noise levels around the power block would be more than 85 dBA, but that they would decrease to about 51 dBA at the facility boundary, about 0.5 mi (0.8 km) from the power block area. For a facility located near the northwestern corner of the SEZ the predicted noise level would be about 51 dBA at the nearest residence, just next to the SEZ boundary, which is higher than typical daytime mean rural background level of 40 dBA but lower than the San Bernardino County standard of 55 dBA daytime L_{eq}. If TES was not used (i.e., if the operation was limited to daytime, 12 hours only[14]), the EPA guideline level of 55 dBA (as L_{dn} for residential areas) would occur at about 1,370 ft (420 m) from the power block area and thus would not be exceeded outside of the proposed SEZ boundary. At the nearest residence, about 49 dBA L_{dn} would be estimated, which is below the EPA guideline level of 55 dBA (as L_{dn} for residential areas). As for construction, if two parabolic trough and/or power tower facilities were operating close to the nearest residence, combined noise levels would be a little higher than the above-mentioned values, below a just-noticeable increase of about 3 dBA over a single facility. However, if TES was used during nighttime hours, L_{dn} higher than those estimated above would be anticipated, as explained below and in Section 4.13.1.

On a calm, clear night typical of the proposed Pisgah SEZ setting, the air temperature would likely increase with height (temperature inversion) because of strong radiative cooling. Such a temperature profile tends to focus noise downward toward the ground. Thus, there would be little, if any, shadow zone[15] within 1 or 2 mi (2 or 3 km) of the noise source in the presence of a strong temperature inversion (Beranek 1988). In particular, such conditions add to the effect of noise being more discernable during nighttime hours, when the background levels are the lowest. To estimate L_{dn}, 6-hour nighttime generation with TES is assumed after 12-hour daytime generation. For nighttime hours under temperature inversion, 10 dB is added to noise levels estimated from the uniform atmosphere (see Section 4.13.1). On the basis of these assumptions, the estimated nighttime noise level at the nearest residence (about 0.5 mi [0.8 km]) from the power block area for a solar facility located near the northwestern SEZ boundary) would be 61 dBA L_{eq}, which is well above typical nighttime mean rural background level of 30 dBA and the San Bernardino County regulation of 45 dBA nighttime L_{eq}. The day-night average noise level at this residence is estimated to be about 63 dBA L_{dn}, which is higher than the EPA guideline of 55 dBA L_{dn} for residential areas. The assumptions are conservative in terms of operating hours, and no credit was given to other attenuation mechanisms, so it is likely that noise levels would be lower than 63 dBA L_{dn} at the nearest residence, even if TES is used at a solar facility. However, operating parabolic trough or power tower facilities using TES and located near the northwestern SEZ boundary could result in noise levels above typical mean rural background levels, the noise standard/guideline, and corresponding adverse noise impacts on the nearest residence.

Associated with operation of a parabolic trough or power tower solar facility occurring near the Cady Mountains WSA, Pisgah ACEC, and Ord-Rodman DWMA, the estimated daytime level of 51 dBA at the boundary of these areas is higher than the typical daytime mean rural background level of 40 dBA, while the estimated nighttime level of 61 dBA is much higher than the typical nighttime mean rural background level of 30 dBA. However, operation noise from a parabolic trough or power tower solar facility with TES is not likely to adversely affect wildlife at the nearby specially designated areas (Manci et al. 1988).

In the permitting process, refined noise propagation modeling would be warranted, along with measurement of background noise levels.

---

[14] Maximum possible operating hours at the summer solstice, but limited to 7 to 8 hours at the winter solstice.

[15] A shadow zone is defined as the region where direct sound does not penetrate because of upward diffraction.

The solar dish engine is unique among CSP technologies because it generates electricity directly and does not require a power block. A single, large, solar dish engine has relatively low noise levels, but a solar facility might employ tens of thousands of dish engines, which would cause high noise levels around such a facility. For example, the proposed 750-MW SES Solar Two dish engine facility in California would employ as many as 30,000 dish engines (SES Solar Two, LLC 2008). At the Pisgah SEZ, assuming a dish engine facility of up to 2,129 MW covering 80% of the total area (19,160 acres [77.54 km^2]), 85,160 25-kW dish engines could be employed. In addition, for a large dish engine facility, more than 1,000 step-up transformers would be embedded in the dish engine solar field, along with several substations; the noise from these sources, however, would be masked by dish engine noise.

The composite noise level of a single dish engine would be about 89 dBA at a distance of 3 ft (0.9 m) (SES Solar Two, LLC 2008). This noise level would be attenuated to about 40 dBA (typical of the mean rural daytime environment) within 340 ft (105 m). However, the combined noise level from tens of thousands of dish engines operating simultaneously would be high in the immediate vicinity of the facility; for example, noise levels would reach about 51 dBA at 1.0 mi (1.6 km) and 48 dBA at 2 mi (3 km) from the boundary of the modeled square-shaped dish engine solar field, both of which are higher than the typical daytime mean rural background level of 40 dBA but lower than the San Bernardino County standard of 55 dBA daytime L_{eq}. These levels would occur at somewhat shorter distances than the aforementioned distances, considering noise attenuation by atmospheric absorption and temperature lapse during daytime hours would reduce noise levels. To estimate noise levels at the nearby residences, it was assumed that dish engines were placed throughout the Pisgah SEZ at intervals of 98 ft (30 m). Under these assumptions, the estimated noise level at the nearest residence (just next to the northwestern SEZ boundary) would be about 56 dBA, which is much higher than the typical daytime mean rural background level of 40 dBA and slightly higher than the daytime San Bernardino County regulation of 55 dBA daytime L_{eq}. On the basis of 12-hour daytime operation, the estimated 54 dBA L_{dn} at this residence is just below the EPA guideline of 55 dBA L_{dn} for residential areas. Estimated noise levels of 59 dBA and 56 dBA L_{dn} at the next nearest residence (about 500 ft [150 m] south of I-40) would be higher but are considerably masked by heavy road traffic noise from I-40. Accordingly, noise from dish engines could cause adverse impacts on the nearby residences, depending on background noise levels and meteorological conditions.

For dish engines placed throughout the SEZ, estimated noise levels would be about 59 dBA at the boundaries of Cady Mountains WSA and Ord-Rodman DWMA and about 56 dBA at the boundary of Pisgah ACEC, which are higher than the typical daytime mean rural background level of 40 dBA. However, dish engine noise from the SEZ is not likely to adversely affect the nearby specially designated areas (Manci et al. 1988).

Consideration of minimizing noise impacts is very important during the siting of dish engine facilities. Direct mitigation of dish engine noise through noise control engineering could also be considered.

During operations, no major ground-vibrating equipment would be used. In addition, no sensitive structures are located close enough to the Pisgah SEZ to experience physical damage. Therefore, potential vibration impacts on surrounding communities and vibration-sensitive structures during operation of any solar facility would be minimal.

Transformer humming noises and switchyard impulsive noises would be generated during the operation of solar facilities. These noise sources would be located near the power block area, typically near the center of a solar facility. Noise from these sources would generally be limited to within the facility boundary and rarely be heard at nearby residences, assuming a 0.5-mi (0.8-km) distance (at least 0.5 mi [0.8 km] to the facility boundary and another 40 ft [10 m] to the nearest residence). Accordingly, potential impacts of these noise sources on the nearest residence would be minimal.

Regarding impacts from transmission line corona discharge noise during rainfall events (discussed in Section 5.13.1.5), the noise level at 50 ft (15 m) and 300 ft (91 m) from the center of a 230-kV transmission line's towers would be about 39 and 31 dBA (Lee et al. 1996), respectively, typical of daytime and nighttime mean background levels in rural environments. Corona noise includes high-frequency components, which is considered to be more annoying than low-frequency environmental noise. However, corona noise would not likely cause impacts, unless a residence was located close to it (e.g., within 500 ft [152 m] of a 230-kV transmission line). The Pisgah SEZ is located in an arid desert environment, and incidents of corona discharge are infrequent. Therefore, potential impacts on nearby residents from corona noise along the transmission line ROW would be negligible.

9.3.15.2.3 Decommissioning/Reclamation

Decommissioning/reclamation requires many of the same procedures and equipment as traditional construction. Decommissioning/reclamation would include dismantling of solar facilities and support facilities such as buildings/structures and mechanical/electrical installations, disposal of debris, grading, and revegetation as needed. Activities for decommissioning would be similar to those for construction but on a more limited scale. Potential noise impacts on surrounding communities would be correspondingly lower than those for construction activities. Decommissioning activities would be of short duration, and their potential impacts would be minor and temporary in nature. The same design features adopted during the construction phase could also be implemented during the decommissioning phase.

Similarly, potential vibration impacts on surrounding communities and vibration-sensitive structures during decommissioning of any solar facility would be lower than those during construction and thus minimal.

9.3.15.3 SEZ-Specific Design Features and Design Feature Effectiveness

The implementation of required programmatic design features described in Appendix A, Section A.2.2, would greatly reduce or eliminate the potential for noise impacts from development and operation of solar energy facilities. While some SEZ-specific design features are best established when specific project details are being considered, measures that can be identified at this time include the following:

- Noise levels from cooling systems equipped with TES should be managed so that levels at the nearby residences to the northwest and to the south of the SEZ are kept within applicable guidelines. This could be accomplished in several ways, for example, through placing the power block approximately 1 to 2 mi (1.6 to 3 km) or more from residences, limiting operations to a few hours after sunset, and/or installing fan silencers.

- Dish engine facilities within the Pisgah SEZ should be located more than 1 to 2 mi (1.6 to 3 km) from the nearest residences located to the northwest and the south of the SEZ (i.e., the facilities should be located in other portions of the proposed SEZ). Direct noise control measures applied to individual dish engine systems could also be used to reduce noise impacts at the nearest residences.

9.3.16 Paleontological Resources

9.3.16.1 Affected Environment

The Pisgah SEZ is covered predominantly by Quaternary/Tertiary deposits of varying types. The northern and eastern half is mostly thick alluvial deposits (over 100 ft [3 m] thick) ranging in age from the Pliocene to Holocene. The alluvial deposits cover 16,551 acres (67 km^2), or about 69% of the SEZ. The southern and western sections consist primarily of eolian (dune sand), playa, and lacustrine sediments. The eolian sediments cover 588 acres (2.4 km^2), or less than 3% of the SEZ; the playa sediments cover 2,928 acres (12 km^2), or 12% of the SEZ; and the lacustrine sediments cover 767 acres (3 km^2) or 3% of the SEZ. The southeastern sections of the SEZ are composed of volcanic rocks (basalt and andesite). These volcanic deposits cover 2,718 acres (11 km^2), or 11% of the SEZ. Peripheral sections of the northern portions of the SEZ are composed of igneous and metamorphic rocks covering 398 acres (1.6 km^2), or 2% of the SEZ.

In the absence of a PFYC map for the California Desert District, a preliminary classification of PFYC Class 3b is assumed for the alluvial, eolian, playa, and lacustrine deposits. Paleontological resources have been found in ancient lake deposits of Lake Manix, including camel, horse, and a variety of invertebrates (Enzel et al 2003). Class 3 indicates that the potential for the occurrence of significant fossil materials is unknown and needs to be investigated further (see Section 4.8 for a discussion of the PFYC system). The PFYC for the volcanic deposits is Class 1, indicating that the occurrence of significant fossil materials is nonexistent or extremely rare.

A pedestrian survey was conducted in 2008 for the Calico Solar Project (then referred to as the Stirling Solar One Project) to look for surface fossils and exposures of potential fossil-bearing geologic units. A records search completed in addition to the field reconnaissance indicated that the potential for paleontological material is mostly low for areas of younger Quaternary alluvium and volcanic deposits. The potential for paleontological deposits is moderate to high for areas of older Quaternary alluvium, but these deposits are buried at unknown depths. Conditions of certification for the project have been proposed in the CEC staff assessment and Draft EIS for the Calico Solar Project to mitigate possible adverse effects on paleontological resources. These conditions include a worker education program, monitoring of ground disturbance by a professional paleontologist, development of a paleontological resources monitoring and mitigation plan, and instruction to stop work upon discovery of a paleontological resource.

9.3.16.2 Impacts

The potential for impacts on significant paleontological resources at the Pisgah SEZ is unknown. A more detailed investigation of the local geological deposits of the SEZ and their potential depth is needed prior to project approval. Once a project area has been chosen, a paleontological survey will likely be needed following consultation with BLM. The appropriate course of action would be determined as established in BLM IM2008-009 and IM2009-011 (BLM 2007a, 2008). Section 5.14 discusses the types of impacts that could occur to any significant paleontological resources found within the Pisgah SEZ. Impacts would be minimized through the implementation of applicable general mitigation measures listed in Section 5.14, such as monitoring by a qualified paleontologist and development of a management/mitigation plan, as well as required programmatic design features described in Appendix A, Section A.2.2.

Indirect impacts on paleontological resources outside of the SEZ, such as through looting or vandalism, are unknown but unlikely as any such resources would be below the surface and not readily accessible. Programmatic design features for controlling water runoff and sedimentation would prevent erosion-related impacts on buried deposits outside of the SEZ.

No new roads or transmission lines have been assessed for the proposed Pisgah SEZ, assuming the existing corridors would be used; impacts on paleontological resources related to the creation of new corridors would be evaluated at the project-specific level if new road or transmission construction or line upgrades are to occur.

A programmatic design feature requiring a stop work order in the event of an inadvertent discovery of paleontological resources would reduce impacts by preserving some information and allowing possible excavation of the resource, if warranted. Depending on the significance of the find, some modification to the project footprint could result. Since the SEZ is located in an area preliminarily classified as PFYC Class 3b or greater, a stipulation would be included in permitting documents to alert solar energy developers of the possibility of a delay if paleontological resources are uncovered during surface-disturbing activities.

9.3.16.3 SEZ-Specific Design Features and Design Feature Effectiveness

Impacts would be minimized through the implementation of required programmatic design features, including a stop-work stipulation in the event that paleontological resources are encountered during construction, as described in Appendix A, Section A.2.2.

The need for and the nature of any SEZ-specific design features would depend on findings of paleontological surveys.

9.3.17 Cultural Resources

9.3.17.1 Affected Environment

9.3.17.1.1 Prehistory

The proposed Pisgah SEZ is located in the central Mojave Desert. The earliest use of the Mojave Desert is during the Paleoindian Period sometime between 12,000 and 10,000 B.P. Sites associated with this period are located predominantly around inland pluvial lakes (notably China Lake, located northwest of the Pisgah SEZ) created during the Pleistocene, and around desert terraces, which suggests that subsistence was focused mainly on mega-fauna. This region is also interesting because of the number of pre-Paleoindian sites that have been suggested nearby. These unsubstantiated claims are a major point of contention amongst archaeologists, but the fact that so many have been suggested in the Mojave Desert (Calico Man site northwest of the SEZ, Tule Springs site near Las Vegas, Nevada, and Lake Manix, portions of which include Troy Lake in the Pisgah SEZ) make them worth mentioning here. This hunting-intensive period came to an end around 7,000 to 8,000 B.P., when the mega-fauna became extinct, likely due to intensive hunting and a warming climate; this warming climate also was one of the major contributing factors causing the pluvial lakes to recede. These early sites are characterized by the Clovis complex of fluted points, and later by the Lake Mojave complex, characterized by core and flake-based tools, crescents, choppers, planes and scrapers, and some leaf-projectile points. When Troy Lake, portions of which are within the Pisgah SEZ, was surveyed in 1965, more than 20 sites were found in the proximity of the lake; many of these were multi-component sites that contained a wide range of projectile points, affirming the chronological sequences proposed by earlier archaeologists. Newberry Cave, located to the east of the SEZ, was a single-component site that contained a sacred assemblage, characterized by perishable and non-perishable artifacts and pictographs (Rogers 1939; Jones and Klar 2007; Moratto 1984).

The Archaic Period in the Mojave Desert lasted from approximately 8,000 to 1,500 B.P. Characterized mainly by the Pinto Complex, the groups of people from this period transitioned from big-game hunting to a more broadly based subsistence economy, incorporating more hard seeds into their diets, as evidenced by the increase in milling stones and mortars and pestles in archaeological assemblages. Sites are usually found in open settings that are in well-watered areas. The Medithermal Climatic Anomaly occurred from 5,000 to 3,500 B.P., bringing about cooler temperatures and a moister climate and allowing for more intensive desert occupation during this time period. Other later complexes associated with the Archaic Period in the Mojave Desert are the Gypsum and Rose Springs Complexes, based on changes in projectile point technology and transitions in population movements (Jones and Klar 2007; Sutton 1996).

The Late Prehistoric Period began about 1,500 B.P. and extended until contact with European explorers and colonization of the area. The archaeological Patayan Complex characterizes this period, and is thought to be ancestral to the later Yuman ethnographic groups. The archaeological assemblages related to this period include paddle-and-anvil pottery (brownware ceramics and lower Colorado buff ware), bow-and-arrow technology (evidenced by smaller Cottonwood and Desert side-notched points), rock art and intaglios, bedrock milling features, a shift in burial practices from inhumation to cremation techniques, and an extensive system of trails (notably the Mohave Trail, portions of which passed near the Pisgah SEZ) along which “pot-drops,” lithic debitage, and shrines are found (Norwood 1980; Jones and Klar 2007). Turquoise mines located near Halloran Springs, northeast of the Pisgah SEZ, were mined by local indigenous groups, and likely were part of the larger turquoise trade that involved areas as far as central Mexico and Chaco Canyon in New Mexico. The following section describes the cultural history of this time period in greater detail.

9.3.17.1.2 Ethnohistory

Although of differing linguistic stock, the Native Americans that inhabited the southeastern California deserts when Euro-Americans first arrived shared similar ways of life and broadly similar beliefs, norms, and values (Halmo 2003). The mountains and valleys of their shared environment provided a variety of seasonally available resources. Native American groups harvested these resources following a regular seasonal pattern. They lived in kin-based groups, or lineages, that would join together or split apart depending on the type and abundance of available resources. A pattern of seasonal camps combined with semi-permanent villages or rancherias emerged. Lineages tended to consider specific highly productive areas as their own, while the areas between them were shared with other lineages of varying ethnicity. Wild plant resources were often managed; stands of plant resources might be pruned, watered, or burned to encourage growth (Lightfoot and Parish 2009). The pattern of seasonal migration to exploit particular resources allowed the groups to adapt to changes in their subsistence base with the arrival of new cultural impulses and populations (Halmo 2003).

The various Native American ethnic groups that inhabited the southeastern California deserts each had an area that they considered their homeland, but the boundaries between these areas were not sharply drawn and fluctuated over time. Travel to hunt, trade, or just visit neighboring groups was common (Kelly and Fowler 1986; Knack 1980). The territorial claims of the different ethnic groups overlapped each other. Lineages would sometimes share territory, or one group would invite its neighbors to share an abundant resource (CSRI 2002). A network of trails, often still discernable, reflect a web of social and trade links that tied the area together and ultimately stretched from the Pacific coast to the Great Plains. As discussed in Section 9.3.18.1, the Native Americans living in southeastern California tend to view the landscape they inhabit holistically, each part intrinsically and inextricably connected to the whole. In some sense, the network of trails tied the landscape together. Trails could have sacred as well as profane aspects.

Located between the Cady and the Rodman Mountains in a valley that opens onto the Mojave Valley, the proposed Pisgah SEZ is about 6 mi (10 km) southeast of the Mojave River. While aboriginal ethnic boundaries are difficult to delineate in this sparsely populated area, Martha Knack (1980) and Alfred Kroeber (1925) considered the location to have been included in the traditional use area of the Vanyume branch of the Serrano people. The Mojave River, which flows eastward into the Mojave Desert, lies along the route of an important trail corridor. The Mohave often traveled and traded along the corridor and consider the area within their traditional use area. It is likely that it was an area used jointly by the surrounding Tribes including the Kawaiisu, who ranged as far south as the Mojave River, and the Chemehuevi as well.

Vanyume

Little is known of the Vanyume. Their population was small (Kroeber 1925) and dwindled rapidly in the early nineteenth century. They are thought to have become extinct before the beginning of the twentieth century. They are often thought of as the desert branch of the Serrano (Knack 1980), with whom they share linguistic ties. Politically, however, they were distinct, having friendly relations with the Mohave and the Chemehuevi, who were enemies to most Serrano (Bean and Smith 1978). The Vanyume resided in small groups based along the lower Mojave River and its sinks. Like their neighbors to the east, they lived in small kinship-based groups, less politically elaborated than their Serrano cousins, who are discussed in more detail in Section 9.2.17.1. They traveled in small bands to exploit food resources, following a pattern tied to the season and local rainfall. These groups joined or split apart with the abundance of the food resource they were harvesting (Knack 1980). Early Spanish explorers reported that the Vanyume relied on mesquite, screwbeans, and tule roots for food, and though normally unclothed, possessed rabbit-skin and otter-skin blankets (Kroeber 1925).

The Serrano had little contact with the Spanish and were not successfully missionized; however, missionization and the spread of European diseases among neighboring Tribes resulted in significant reductions in the native population, possibly allowing the Vanyume to retreat to more lush northern mountains (Knack 1980). The Vanyume continued to dwindle. Any surviving Vanyume descendants most likely have merged with Serrano or other surrounding groups.

Mohave

The Mohave were primarily at home along the Colorado River, from time to time reaching as far south as Blythe, but they travelled and traded widely, following the Mojave River to visit coastal Tribes. They are likely to have travelled through or near the Pisgah SEZ on their journeys to and from the coast. They had sprawling settlements, rather than villages, with houses situated on low hills above the floodplain.

Their traditional use area claims extend far beyond the valleys of the Colorado River, reflecting their propensity for travel. They claim all the Mojave Desert and the land as far south as the Turtle, Granite, and Eagle Mountains, and as far west as the Tehachapi and San Gabriel Mountains (CSRI 2002), thus including the SEZ. This larger range was where they traded, hunted, and gathered to supplement their planted crops and the fish they took from the river. They are likely to have traded, hunted, and gathered in the Pisgah SEZ area. They were less reliant on hunting and gathering than the Chemehuevi, who hunted and gathered in much of the same area (Knack 1980).

Chemehuevi

The Chemehuevi are a Southern Paiute group who first entered the Parker and Blythe Valleys along the Colorado at the invitation of their allies, the Mohave, sometime between 1825 and 1830. Although partially settled along the river, they retained their ties to mountains and valleys of the Great Basin. Those retaining a desert way of life have been called Desert Chemehuevi (*Tiiranniwiwi*). The Tiiranniwiwi are said to have ranged well west of the eastern Mojave in search of particular resources and may have moved farther west when missionization and the spread of European diseases resulted in the depopulation of some areas (Knack 1980). They may have been present periodically in the Pisgah SEZ.

In the late 1860s, hostilities erupted between the Mohave and Chemehuevi, and part of the Chemehuevi moved west to join Cahuilla and Serrano villages near Twentynine Palms. In 1874, the Office of Indian Affairs set aside part of the Mohave reservation along the Colorado River for the Chemehuevi, but many did not want to return. In 1907, a separate reservation was established for them north of Parker, Arizona (Kelly and Fowler 1986).

Chemehuevi settlements were scattered, and band size varied with the season and available water, plant, and animal resources. Dwellings varied from pole structures covered with brush to rock shelters in the desert areas to earth-covered huts, often with open fronts, adopted from the Mohave along the Colorado River. Other items of Mohave material culture were likewise adopted, including ceramic styles, square metates (grinding stones), storage platforms, and personal adornment (Kelly and Fowler 1986).

The relations between the Chemehuevi and neighboring Tribes were mostly amicable. They maintained a trading relationship with the Cahuilla. Groups of Chemehuevi would travel as far west as the coast to trade for shells and as far east as the Hopi mesas. They were involved in a trade network that stretched from the Channel Islands to the Gila River Valley and the Great Plains, with the potential to bring material culture from some distance away to the Chemehuevi homeland.

Kawaiisu

The territory occupied by the Kawaiisu straddled the southern portion of the Sierra Nevada Mountains and extended into the Mojave Desert to the Mojave River. The proposed Pisgah SEZ lies close to the southern extent of their traditional use area. They are Southern Numic speakers and some linguists are of the opinion that due to their relative isolation from other Numic-speaking groups, their dialect of Southern Numic was a separate language (Goss 1966). It has been suggested that theirs was the central area from where the Proto-Numic and Southern Numic language groups dispersed. Based on this evidence, it is thought that the Kawaiisu have occupied the area for the last 2,000 years (Zigmond 1986).

Ethnographic accounts of the Kawaiisu suggest the group was peaceful and neither violent nor warlike. Tribal unity was not a major factor in the Kawaiisu cultural mindset, and consequently the chieftainship was recognized but only through tacit acknowledgment by the people. Several leaders could have been accepted in local areas, the most important qualifications for chieftainship being wealth and generosity. This limited political organization was also reflective of their social organization, as bands of related family groups were the most extensive form of social organization (Zigmond 1986). Acorns were easily accessible in the region and it was this resource that was often traded, notably with Western Shoshone for obsidian and salt and with the Southern Valley Yokuts Tribes (Garfinkel and Schiffman 1981). The Kawaiisu congenial nature is evidenced in their participation of intertribal game drives, in which nearby Tribal groups (Tubatulabal, Chumash, and Yokuts) would contribute in large hunts, notably for antelope. Because acorns were the staple crop for the Kawaiisu, typical desert plants such as mesquite and screwbean did not factor into the diet as heavily as in other desert-residing Tribes, suggesting that the Kawaiisu were a unique hybrid California-desert and Great Basin Tribal group due to their close proximity and their ability to avail themselves of both resource zones so easily (Zigmond 1986).

9.3.17.1.3 History

European explorers first entered the southeastern California deserts in the sixteenth century. Early explorers of Alta California reached the Colorado River by way of the Gulf of Mexico and proceeded upstream past the confluence of the Gila River, but they explored little of the interior deserts. For the next 200 years Spanish penetration of the interior deserts was intermittent, resulting in a prolonged protohistoric period (see Sections 9.3.17.1.1 and 9.3.17.1.2). Juan Bautista de Anza crossed the Colorado River with the assistance of the Quechan on his way to Monterey in 1774. His route, which is located well south of the Pisgah SEZ, near the border of California and Mexico, became the main travel corridor between Arizona and central California in the 1800s.

The Mojave Desert has a history of being a corridor, both prehistorically and historically. Several trails and railroads passed through the area; however, the lack of water caused problems in traversing the arid desert. The Old Spanish Trail refers to several different trails that traversed the Mojave Desert, utilized for exploratory, commercial, and settlement interests. Parts of the Old Spanish Trail likely followed parts of the prehistoric Mohave Trail, but there were divergences in both and it is difficult to determine an exact extensive route for either trail. Later referred to as Government Road, water holes were all nearly one day's travels apart, causing several groups to perish along the treacherous desert crossing. Beale's Wagon Road, an historic trail that ran along the 35th parallel and intersected parts of the Mohave Trail, was used for a short period of time with the aid of camels to assist wagon trains in traveling from the Colorado River to Los Angeles, but because it constantly encountered hostile Mojave groups the trail was abandoned in 1861. Another trail that ran north of the Old Spanish Trail, referred to as the Mormon Trail, connected Salt Lake City to the Mormon-established town of San Bernardino, but like the other trails various routes were used. Along the Mormon Trail was Salt Spring, where the first confirmed gold strike in San Bernardino County took place in 1849 (von Till Warren 1980).

Mining has been the most important commercial industry in San Bernardino County, with 1900 through 1919 referred to as "The Great Years" for mining in the area. In 1863, prior to this period, silver was discovered, but copper, lead, zinc, and gold were also mined in the area, and during both World Wars chromium, manganese, tungsten, and vanadium were mined there. More recently, clay, talc, cinders, and aggregate mining (sand and gravel), have become more profitable resources to mine. There are three mines in relatively close proximity to the Pisgah SEZ: Black Butte Mine to the east, Pisgah Mine to the south, and Logan Mine to the north. These sites consist of open pit mines, borrow pits, and open mines (von Till Warren 1980; Shumway et. al. 1980).

Railroad development in the area facilitated the mining operations and made water more readily available. The BNSF Railroad, historically known as the Atlantic and Pacific Railroad, and later the Atchison, Topeka, and Santa Fe Railroad, passes directly through the Pisgah SEZ. Sidings associated with this rail line were constructed in Troy, Hector, Pisgah, and Lavic, all locations in close proximity to the Pisgah SEZ. A water tank was constructed at Newberry Springs, east of the SEZ, and was the primary source of water for the railroad. Prior to the construction of the railroad, there were few people who lived in the area except for those associated with the mining industry. With the coming of the railroad, towns were built and populations were sustained at several nearby locations, notably at Ludlow and Newberry Springs.

As southern California began to grow, its need for resources also increased. Consequently, natural gas and transmission lines had to be built to facilitate this growth. With the construction of the Hoover Dam in 1937, several transmission lines crossed the SEZ and a substation was built in the proposed Pisgah SEZ to provide power to the southern California area.

The Mojave Desert provides ideal conditions for military use. The vast open spaces, lack of population, and access to rail lines have caused the military to seek use of the Desert for several of its operations. In 1860 a fort was built at Camp Cody, located northwest of the SEZ, in an effort to suppress Paiute Indian attacks. More recently, military installations have been constructed at Twentynine Palms, south of the SEZ, and Fort Irwin, north of the SEZ. In 1942, General George Patton identified an 18,000 mi^2 (46,800 km^2) area, a vast area east of the SEZ, for use in training troops for combat in the North African Desert during WWII. While this Desert Training Area did not enter into the SEZ, traffic was significantly increased throughout the SEZ due to the construction and operation of this and other military operations.

With the widespread adoption of the automobile after World War I, the need for roads that were capable of handling automobile traffic rose. In the early twentieth century, travel in and around the proposed Pisgah SEZ was basically restricted to prehistoric trails and roads that were created by the railroads to aid in their construction. The National Auto Trail System was an informal network of automobile routes that were marked by local organizations, and a part of this Trail System was the Old National Trails Highway. This highway was established in 1912 in the vicinity of old wagon roads and adjacent to the Santa Fe Railroad tracks. In 1916, the Federal Highway Aid Act was passed, helping to fund the increasingly necessary road system; due to the increased traffic on the roads, the section of the road in the vicinity of the proposed Pisgah SEZ had been widened and oiled or covered with gravelly sand by the 1920s. By, 1926 the Old National Trails Highway in the Mojave Desert had been designated U.S. Route 66. It became one of the first highways to provide a route of travel from Chicago to the Pacific Ocean, a major artery of the National Highway System. Realignment of U.S. Route 66 occurred in the 1930s, putting the road on the alignment to which it currently adheres. The new alignment eliminated steep grades and straightened the road, allowing for faster speeds. The section of the road from Needles, California, to Los Angeles, California, was the most heavily traveled section of the highway, which encouraged paving of the road surface along this route in 1934, while the rest of the highway was paved by 1938. With the establishment of this extensive road system, thousands of businesses, including grocery stores, service stations, restaurants, motels, and tourist attractions, opened along the route to provide services to those travelling. These businesses and the road itself became an integral part of culture of America during the 1920s through the 1960s, as evidenced by its mention in both songs and literature (Stirling Energy Systems 2008).

9.3.17.1.4 Traditional Cultural Properties—Landscape

The Tribes of southeastern California tend to take a holistic view of the world; they see the features of their environment as an interconnected whole imbued with a life force. Prominent features may be seen as places of power—sacred places. High hills and mountains tend to be regarded as sacred, while some peaks have special status. Other features that tend to be regarded as sacred include caves, certain rock formations, springs, and hot springs. Revered locations include panels of rock art, evidence of ancestral settlements, arranged-rock sites, burial or cremation areas, and systems of trails. Sacred sites are often seen as places of power where offerings are left (Halmo 2003). Tribes see themselves as exercising divinely given responsibilities of stewardship over the lands where they believe they were created and as retaining a divine birthright to those lands. Specific mountain peaks are seen as points of emergence associated with creation stories. Hot springs and petroglyphs panels were thought to be associated with supernatural power; hot springs were thought to have healing powers, and petroglyphs panels were associated with the shaman's spirit helpers (Knack 1980). During consultation with the BLM regarding the Calico Solar Power Project, part of which lies within the proposed SEZ, Tribal representatives found that the prehistoric rock cluster features and lithic scatters that had been determined eligible for the NRHP were important components of the Native American cultural landscape (BLM and CA SHPO 2010).

According to a Sacred Lands File Search through the California Native American Heritage Commission (NAHC), no sacred sites were identified within the proposed Pisgah SEZ (Singleton 2010).

9.3.17.1.5 Cultural Surveys and Known Archaeological and Historic Resources

At least 19 previous surveys have been conducted in proposed Pisgah SEZ, twelve of which were linear pedestrian surveys, and two of which were associated with the Calico Solar Power Project (previously the Stirling Solar One Project) APE. The surveys resulted in the recording of 146 archaeological sites and ten architectural resources. Of the 146 archaeological sites, 108 sites need further evaluation regarding their NRHP and California Register of Historic Places (CRHR) eligibility, and two of the ten historic structures are considered NRHP eligible.

Of the 108 sites that require further evaluation, 100 are prehistoric in nature, five are historic, and three are multi-component sites (Stirling Energy Systems 2008).

There are two historic resources that intersect the Pisgah SEZ and are NRHP eligible: U.S. 66, also known as National Old Trails Highway, and the Southern California Edison (SCE) 220-kV transmission line built in 1937. Portions of Old Route 66 are found throughout the SEZ. Most are in poor condition; however, its significance as an early automobile route across the Mojave Desert lends itself to its consideration for NRHP eligibility. Associated with U.S. 66 are historic refuse scatters, and outside the Pisgah SEZ locations along the road that were used by travelers, such as restaurants and motels. The SCE transmission line was constructed to bring power from the Hoover Dam to Southern California, and its significance lies in the fact that it is one of the earliest transmission lines in the area from the Hoover Dam to Southern California.

There are three prehistoric archaeological sites and two multi-component sites that are located either in or within 5 mi (8 km) of the proposed Pisgah SEZ that are also potentially eligible for inclusion on the NRHP. Four of these sites are located in close proximity to Troy Dry Lake, and the other is in the lava fields southwest of the SEZ (Plog et al. 1989; Norwood 1980).

One of these sites, located on the edge of the Troy Dry Lake bed, is a multi-component site consisting of a prehistoric lithic scatter, ground stone fragment, and two projectile points, and historic railroad camp structures, with associated glass, metal, ceramics, and building materials. This site could provide valuable information that has not been collected about historic railroad camps, as few camps have been analyzed in the Mojave Desert region. Another multi-component site, located southeast of Troy Dry Lake below Newberry Cave, consists of a prehistoric artifact scatter and an historic trash scatter and buildings constructed of homemade bricks. The prehistoric scatter is made up of lithic flakes, projectile points, cores, bifaces, scrapers, ground stone, and ceramics. The historic component consists of porcelain, ceramics, hand-blown and mold-blown bottle glass, magnesia glass, and metal and shell buttons, along with the aforementioned structure. The historic component could provide critical information related to settlement patterns, living conditions, and possibly trade routes among various ethnic groups that inhabited the Mojave Desert in historic times. The prehistoric component is valuable because analysis of the lithic material could serve to indicate variation in the manufacture of lithic material compared to other archaeological assemblages in the region (Plog et al. 1989).

The dune area of Troy Dry Lake houses one of the other potentially eligible sites, a prehistoric artifact scatter consisting of lithic flakes, ceramics, and fire-affected rock that may be the remains of a hearth. The location of this site suggests that those who occupied it used the resources of the lake environment, the value of the site being in the potential of the assemblage to indicate prehistoric environmental exploitation and to contribute to the overall chronological sequence of the region. The other site with potential eligibility for listing in the NRHP is a vast (24 acres [0.1 km^2]) lithic scatter consisting of over 980 artifacts, which, if analyzed, could contribute to the regional picture of lithic production and specialization and to the chronological sequence as determined by lithic material (Plog et al. 1989).

A rock shelter, located southwest of the SEZ in the lava fields, is also a potential NRHP site. The site consists of lithic flakes and there is potential for subsurface remains to be present.

The possibility of subsurface material could indicate cultural and temporal sequences and contexts and lends to the site's potential NRHP inclusion (Norwood 1980).

The BLM has designated several locations within relatively close proximity to the proposed Pisgah SEZ as ACECs because of their significant cultural value. These include the Rodman Mountains Cultural Area, 6 mi (10 km) to the south, known for its petroglyph panels; the Calico Early Man Site, 12 mi (19 km) to the northwest, and the Mesquite Hills/Crucero ACEC, 18 mi (29 km) to the northeast, for their prehistoric resources; and the Manix ACEC, 6 mi (10 km) north of the SEZ, for its paleontological and cultural resources. The Rainbow Basin/Owl Canyon ACEC, 27 mi (44.5 km) to the northwest, includes prehistoric, geological and paleontological resources, and the Cronese Basin, 20 mi, (33 km) to the north, includes both cultural and wildlife resources.

National Register of Historic Places

There are no historic properties listed in the NRHP within the SEZ or within 5 mi (8 km) of the SEZ. However, as stated above, both U.S. 66 and the SCE transmission line are NRHP eligible, as are the four archaeological sites associated with Troy Dry Lake and the rock shelter.

9.3.17.2 Impacts

Direct impacts on significant cultural resources could occur in the proposed Pisgah SEZ; however, as stated in Section 9.3.17.1, further investigation is needed in a number of areas. A cultural resource survey of the entire area of potential effect (APE) of a proposed project would first need to be conducted to identify archaeological sites, historic structures and features, and traditional cultural properties, and an evaluation would need to follow to determine whether any are eligible for listing in the NRHP. Numerous sites, both prehistoric and historic, have been identified within the SEZ. Possible impacts from solar energy development on cultural resources that are encountered within the SEZ or along related ROWs, as well as general mitigation measures, are described in more detail in Section 5.15.

Programmatic design features to reduce water runoff and sedimentation would reduce the likelihood of indirect impacts resulting from erosion outside of the SEZ boundary on cultural resources (including along ROWs).

No new access roads or transmission lines have been assessed for the proposed Pisgah SEZ, assuming existing corridors would be used; impacts on cultural resources related to the creation of new corridors would be evaluated at the project-specific level if new road or transmission construction or line upgrades are to occur.

Because of the interconnectedness of the landscape in Native American cosmology, a change in one part affects the whole; thus damage to one part of an important cultural landscape would affect all of it. The proposed Pisgah SEZ is close to or within the important Mohave Trail travel corridor. It also includes archaeological evidence of repeated if intermittent use. To date, no culturally important geophysical features have been identified in the area surrounding Pisgah; however, it is possible that features will be identified during continued consultation with the Tribes. Native Americans have expressed concern over the visual impacts of development on segments of trails and features that have religious importance (Halmo 2003). Development that is visible from the trails may be considered intrusive. The Pisgah SEZ is not pristine wilderness; it is crossed by a major interstate highway, a railroad, pipelines, transmission lines, and other roads. However, the construction of an extensive solar energy facility would very likely have more visual impact on the landscape than already exists.

Native Americans have also expressed concern over other impacts likely to accompany development (Halmo 2003). The presence of an industrial facility and the associated increase in traffic and workers are likely to have a negative impact on the qualities that render a site sacred. An increase in the number of people in the area would increase the potential for damage to panels of rock art and the disturbance of burials and archaeological sites. While the development of the Pisgah SEZ would necessarily increase the number of people coming to and working in the SEZ, this impact should be greatest during the construction and decommissioning phases of a facility. The operation of a solar facility would require fewer personnel (see Section 9.3.19.2.2).

9.3.17.3 SEZ-Specific Design Features and Design Feature Effectiveness

Programmatic design features to mitigate adverse effects on significant cultural resources, such as avoidance of significant sites and features and cultural awareness training for the workforce, are provided in Appendix A, Section A.2.2.

SEZ-specific design features would be determined in consultation with the California SHPO and affected Tribes. Consultation efforts should include discussions on significant archaeological sites and traditional cultural properties and on sacred sites and trails with views of the proposed SEZ. SEZ-specific design features could include the following:

- Significant historic and prehistoric sites in the vicinity of Troy Lake should be avoided.

- Areas of significant prehistoric remains within the SEZ that are identified through the Calico Solar Power Project (to date an area including a 400-ft [122-m] buffer and in some instances fencing [BLM and CA SHPO 2010]) should be avoided.

9.3.18 Native American Concerns

Native Americans share many environmental and socioeconomic concerns with other ethnic groups. This section focuses on concerns that are specific to Native Americans and to which Native Americans bring a distinct perspective. For a discussion of issues of possible Native American concern shared with the population as a whole, several sections in this PEIS should be consulted. General topics of concern are addressed in Section 4.16. Specifically for the proposed Pisgah SEZ, Section 9.3.17 discusses archaeological sites, structures, landscapes, trails, and traditional cultural properties; Section 9.3.8 discusses mineral resources; Section 9.3.9.1.3 discusses water rights and water use; Section 9.3.10 discusses plant species; Section 9.3.11 discusses wildlife species, including wildlife migration patterns; Section 9.3.13 discusses air quality; Section 9.3.14 discusses visual resources; and Sections 9.3.19 and 9.3.20 discuss socioeconomics and environmental justice, respectively. Issues of human health and safety are discussed in Section 5.21.

The California Native American Heritage Commission (NAHC) has been consulted to determine which Tribes have traditional associations with the California SEZs. All federally recognized Tribes with traditional ties to the Pisgah SEZ have been contacted and given the opportunity to express their concerns regarding solar energy development. Table 9.3.18-1 lists the Tribes contacted with traditional ties to the SEZs in southeastern California. Appendix K

TABLE 9.3.18-1 Federally Recognized Tribes with Traditional Ties to the Southeastern California SEZs

Tribe	Location	State
Agua Caliente Band of Cahuilla Indians	Palm Springs	California
Cabazon Band of Cahuilla Mission Indians	Indio	California
Cahuilla Band of Mission Indians	Anza	California
Campo Kumeyaay Nation	Campo	California
Chemehuevi Indian Tribe	Havasu Lake	California
Cocopah Indian Tribe	Somerton	Arizona
Colorado River Indian Tribes	Parker	Arizona
Ewiiaapaayp Band of Kumeyaay Indians	Alpine	California
Fort Mojave Indian Tribe	Needles	California
La Posta Band of Kumeyaay Indians	Boulevard	California
Los Coyotes Band of Cahuilla & Cupeno Indians	Warm Springs	California
Manzanita Band of Kumeyaay Indians	Boulevard	California
Morongo Band of Mission Indians	Banning	California
Quechan Indian Tribe of the Fort Yuma Reservation	Yuma	Arizona
Salt River Pima-Maricopa Indian Community	Scottsdale	Arizona
San Manuel Band of Mission Indians	Patton	California
Soboba Band of Luiseño Indians	San Jacinto	California
Sycuan Band of the Kumeyaay Nation	El Cajon	California
Torres-Martinez Desert Cahuilla Indians	Thermal	California
Twenty-Nine Palms Band of Mission Indians	Coachella	California
Viejas Band of Kumeyaay Indians	Alpine	California

lists all federally recognized Tribes contacted for this PEIS. The concerns Native Americans have expressed about energy development projects are summarized in the next section. Their comments provide important insights into their concerns over energy development in the area.

9.3.18.1 Affected Environment

As discussed in Section 9.3.17.1.2, the territorial boundaries of the Tribes that inhabited the Mojave and Colorado Deserts appear to have been fluid over time. At times they overlapped, and where resources were abundant they were shared among the Tribes. The Pisgah SEZ includes the dry Troy Lake and an extensive lava flow. The eastern end of the SEZ is located 6.2 mi (10 km) southeast of the Mojave River, which until recently maintained an intermittent surface flow. A major traditional Native American travel corridor, the Mohave Trail, followed the river. Extensive artifact scatters along the eastern shore of Troy Lake and artifacts associated with a rock shelter in the lava flow about 1 mi (1.6 km) west of the SEZ indicate that the area was repeatedly, but intermittently, used by Native Americans. While ethnographic data for the area are scant, the SEZ appears to lie within the traditional use area of the Vanyume branch of the Serrano people (Knack 1980). The Vanyume were encountered along the Mojave River by the earliest Spanish explorers in the area (Kroeber 1925). However, as a major travel corridor it is likely that the area was regularly traversed by neighboring peoples, including the Mohave, the Chemehuevi, and the Kawaiisu. In the 1950s, the Indian Claims Commission found territorial boundaries in the area too difficult to differentiate and judged the area to be the common territory of the "Indians of California;" it is so shown on maps of judicially established Native American land claims (Royster 2008). The Indians of California category was created by Congress to accommodate the claims of California Native Americans who had lost their identity as distinct tribes, bands, or villages due to the arrival and policies of Euro-Americans (Indian Claims Commission 1958).

9.3.18.1.1 Territorial Boundaries

Vanyume—Serrano

The Pisgah SEZ lies just north of the area claimed for the Serrano before the Indian Claims Commission in the 1950s. The northern boundary of their claim ran from the Cajon Pass to Ludlow, California, in an irregular line (CSRI 2002). Following Kroeber (1925), most researchers have placed the linguistically related Vanyume bands in the area north of the Serrano (Bean and Smith 1978). The Vanyume were never a large group and had disappeared by the end of the nineteenth century, by which time any remnants of the Tribe had probably been absorbed with Serrano into the remaining "Mission Indian" communities.

Mohave

The territory claimed by the Mohave before the Indian Claims Commission extends from the Colorado River to the San Gabriel Mountains, and includes all of the Mojave Desert and the

Mojave River (CSRI 2002), thus including the SEZ. While the commission granted exclusive claim only to those portions located along Colorado River, the Mohave, known as travelers and traders, made use of the Mohave Trail along the Mojave River and very likely passed through the SEZ. Mohave descendants occupy the Fort Mojave Indian Reservation near Needles, California, and may be found on the reservation of the Colorado River Indian Tribes.

Chemehuevi

The Chemehuevi were eastern neighbors of the Vanyume, with whom they were on friendly terms. Their territorial claims extend as far west as the Bristol Mountains (CSRI 2002). As travelers and friends of the Vanyume, it is likely that they too were familiar with the Mohave Trail and the surrounding mountains and valleys, including the Pisgah SEZ. Chemehuevi descendants occupy the Chemehuevi Reservation and share the Colorado River Indian Tribes Reservation with the Mohave and other Tribes.

Kawaiisu

The Kawaiisu were kin-based bands who spoke a Southern Numic language and inhabited the southern slopes of the Sierra Nevada, with access to both San Joaquin Valley and Mojave Desert resources. Regarded as predominantly peaceful, they are thought to have ranged seasonally as far south as the Mojave River. Kawaiisu culture appears to have disappeared in the 1960s. Kawaiisu descendants are few and scattered across southern California (Goss 1966; Zigmond 1986).

9.3.18.1.2 Plant Resources

The plant resources utilized by Native Americans in the Mojave Desert tend to be sparse and widely distributed, making those resources that do exist more valuable. The regions surrounding the SEZ are too dry for unirrigated agriculture but support some of the many desert plants used by the Tribes (Knack 1980).

The plant communities observed at the Pisgah SEZ are discussed in Section 9.3.10. There are three major plant communities present on the SEZ: North American Warm Desert Playa, North American Warm Desert Volcanic Rockland, and Sonora-Mojave Creosotebush-White Bursage Desert Scrub. There are also smaller areas of North American Warm Desert Bedrock, Cliff, and Outcrop; Sonora-Mojave Mixed Salt Desert Scrub; and North American Warm Desert Active and Stabilized Dune plant communities (NatureServe 2008). The dominant plants across most of the SEZ appear to be creosotebush and bursage, with saltbush in the lakebed.

Native American populations have traditionally made use of hundreds of native plants. However, the plants that dominate the Mojave Desert, creosotebush, and bursage, are not edible. Creosote was used as medicinal herb and bursage not at all (Knack 1980). Table 9.3.18.1-1 lists plants often mentioned as important by Native Americans that were either observed at the Pisgah

TABLE 9.3.18.1-1 Plant Species Important to Native Americans Observed or Likely To Be Present in the Proposed Pisgah SEZ

Common Name	Scientific Name	Status
Food		
Beavertail Prickly Pear Cactus	*Opuntia basilaris*	Possible
Boxthorn	*Lycium* spp.	Possible
Buckwheat	*Eriogonum* spp.	Possible
Jumping Cholla	*Opuntia bigelovii*	Possible
Mesquite	*Prosopis* spp.	Possible
Rice Grass	*Orizopsis* spp.	Possible
Saltbush	*Atriplex* spp.	Observed
Medicine		
Creosotebush	*Larrea tridentata*	Observed
Mormon Tea	*Ephedra nevadensis*	Possible
Unspecified		
Brittlebush	*Encolia farinosa* sp.	Observed
Ocotillo	*Fouquieria splendnens*	Possible

Sources: Field visit; Lightfoot and Parrish (2009); NatureServe (2008).

SEZ or are possible members of the cover-type plant communities identified at the SEZ. In the table, plants are grouped by use category, but an individual plant is not necessarily confined to one category. The plants listed are the dominant species; however, other plants important to Native Americans could occur in the SEZ, depending on local conditions and the season.

Of the food plants, only saltbush was observed at the SEZ. Mesquite, among the most important food plants in the desert, could possibly exist on the stabilized dunes, but the SEZ is not prime mesquite habitat. Other possible food plants for these communities include beavertail cactus, buckwheat, boxthorn, and jumping cholla. Saltbush, rice grass, and buckwheat seeds can be harvested, processed, and eaten; beavertail cactus produces a prickly pear fruit; and the new growth of jumping cholla can be boiled and eaten (Knack 1980; Lightfoot and Parish 2009).

The proposed Pisgah SEZ includes other plants useful to Native Americans. The leaves of the dominant creosotebush are widely made into tea for medicinal purposes, as is a tea made from *Ephedra* spp., or Mormon tea (Lightfoot and Parish 2009). While some of the plant species present at the SEZ were used traditionally by Native Americans, they do not appear to be especially plentiful. Food sources in particular appear to be scant. It is likely that better sources of these plants existed elsewhere. When the Mojave River was flowing, other resources would have been available closer to its bed.

9.3.18.1.3 Other Resources

There is some potential for food species in or near the Pisgah SEZ, particularly when water is available in the Mojave River. The largest of these is the bighorn sheep that ranged through the surrounding mountains. Smaller game include black-tailed jackrabbits, desert cottontails, kangaroo rats, and desert wood rats. Gambel's quail and mourning doves, both snared by Native Americans, are also possible in this habitat (Knack 1980; Lightfoot and Parrish 2009). See Section 9.3.11 for a more detailed discussion of the wildlife present or likely in the SEZ. Table 9.3.18.1-2 provides a representative list of animals important to Native Americans likely to occur within the proposed Pisgah SEZ.

As long-time desert dwellers, Native Americans have a great appreciation for the importance of water in an arid environment. They have expressed concern over the use and availability of water for solar energy installations (Halmo 2003; Jackson 2009). One of the main concerns regarding past industrial developments planned for the region was the contamination of ground water (CSRI 1987).

TABLE 9.3.18.1-2 Animal Species used by Native Americans whose Range Includes the Proposed Pisgah SEZ

Common Name	Scientific Name	Status
Mammals		
Bats	Various species	All year
Badger	*Taxidea taxus*	All year
Bighorn sheep	*Ovis Canadensis*	All year
Black-tailed jack rabbit	*Lepus californicus*.	All year
Bobcat	*Lynx rufus*	All year
Coyote	*Canis latrans*	All year
Desert cottontail	*Silvilagus audubonii*	All year
Squirrels	*Spermophilus* sp. & *Ammospermophilus* sp.	All year
Woodrats	*Neotoma* spp.	All year
Birds		
Gambel's quail	*Callipepla gambelii*	All year
Greater roadrunner	*Geococcyx californiensus*	All year
Mourning dove	*Zenaida macrocura*	All year
Turkey vulture	*Cathartes aura*	Sommer
Reptiles		
Desert tortoise	*Gopherus Agassizii*	All year
Rattlesnakes	*Crotalus* spp.	All year

Sources: Lightfoot and Parrish (2009); Fowler (1986); Zigmund (1986).

In addition, Native Americans have expressed concern over ecological segmentation, that is, development that fragments animal habitat and does not provide corridors for movement. They would prefer that solar energy development take place on land that has already been disturbed, such as abandoned farmland, rather than on undisturbed ground (Jackson 2009).

9.3.18.2 Impacts

To date, no comments have been received from the Tribes specifically referencing the proposed Pisgah SEZ. However, general concerns regarding solar energy development in the deserts of southeastern California have been expressed. In a response letter, the Quechan Indian Tribe of Fort Yuma stresses the importance of evaluating impacts of development at a landscape scale (Jackson 2009).

The impacts that would be expected from solar energy development within the Pisgah SEZ on resources important to Native Americans fall into two major categories: impacts on the landscape and impacts on discrete localized resources.

Landscape-scale impacts are those caused by the presence of an industrial facility within a sacred or culturally important landscape that includes sacred geophysical features tied together by a network of trails. Impacts may be visual—the intrusion of an industrial feature in sacred space; or audible—noise from the construction, operation, or decommissioning of a facility detracting from the culturally important character of the site. As consultation with the Tribes continues and project-specific analyses are undertaken, it is possible that Native Americans will express concerns over potential visual, noise and other effects of solar energy development within the SEZ on a culturally important landscape. To date, no features of this type have been identified for the Pisgah SEZ. The Pisgah SEZ is already the site of modern development. A freeway (I-40), a railroad, energy pipelines, transmission lines, a substation, and other roads all cross the SEZ. The area is not pristine and may be considered already disturbed by the Tribes.

Localized effects are possible both within the SEZ and in adjacent areas. Within the SEZ these effects would include destroying or degrading important plant resources, destroying the habitat of and impeding the movement of culturally important animal species, and destroying archaeological sites and burials. Any ground-disturbing activity associated with the development within the SEZ has the potential for destruction of localized resources. Tribes consulted as part of environmental and cultural reviews for the planned Calico Solar Power Project, which lies partly within the proposed SEZ, found that significant prehistoric sites would be adversely affected by development of the solar facility. The design of the Calico facility was altered to avoid these resources (BLM and CA SHPO 2010). However, since utility-scale solar energy facilities cover large tracts of ground, it is unlikely that avoidance of all resources would be possible, even taking into account the implementation of programmatic design features. Programmatic design features (see Appendix A, Section A.2.2) assume that the necessary cultural surveys, site evaluations, and Tribal consultations will occur.

Some plants traditionally used by Native Americans grow within the proposed SEZ and would unavoidably be disturbed by the construction of a utility-scale solar power facility.

However, as discussed in Section 9.3.10, impacts on most plant communities are expected to be small in most cases, since these communities are widespread in the area. The cultural importance of impacts on specific stands must be determined through consultation with the affected Tribe(s). As discussed in Section 9.3.11, the affected animal species and habitat are widely distributed in the area. Impacts on these species are likely to be small as long as programmatic design features are implemented.

Implementation of programmatic design features, as discussed in Appendix A, Section A.2.2, should eliminate impacts on Tribes' reserved water rights and the potential for groundwater contamination issues.

Whether there are any issues relative to socioeconomics, environmental justice, or health and safety relative to Native American populations is yet to be determined.

9.3.18.3 SEZ-Specific Design Features and Design Feature Effectiveness

Programmatic design features to mitigate impacts of potential concern to Native Americans, such as avoidance of sacred sites, water sources, and tribally important plant and animal species, are provided in Appendix A, Section A.2.2.

The development of solar energy facilities in the state of California requires developers to follow CEC guidelines for interacting with Native Americans, in addition to federal requirements (CEC 2009a). Developers must obtain information from California's NAHC on the presence of Native American sacred sites in the project vicinity and a list of Native Americans who want to be contacted about proposed projects in the region. Table 9.3.18.3-1 lists the Tribes recommended for contact by the NAHC.

TABLE 9.3.18.3-1 Federally Recognized Tribes Listed by the NAHC to Contact Regarding the Proposed Pisgah SEZ

Tribe	Location	State
Agua Caliente Band of Cahuilla Indians	Palm Springs	California
Chemehuevi Indian Tribe	Havasu Lake	California
Colorado River Indian Tribes	Parker	Arizona
Cocopah Indian Tribe	Somerton	Arizona
Fort Mojave Indian Tribe	Needles	California
Morongo Band of Mission Indians	Banning	California
Quechan Indian Tribe of the Fort Yuma Reservation	Yuma	Arizona
San Manuel Band of Mission Indians	Patton	California
Torres-Martinez Desert Cahuilla Indians	Thermal	California
Twentynine Palms Band of Mission Indians	Coachella	California

Source: (Singleton 2010).

The need for and nature of SEZ-specific design features regarding potential issues of concern would be determined during government-to-government consultation with affected Tribes. The Quechan Tribe has suggested that the clustering of large solar energy facilities be avoided; that priority for development be given to lands that have already been disturbed by agricultural or military use; and that the feasibility of placing solar collectors on existing structures be considered, thus minimizing or avoiding the use of undisturbed land (Jackson 2009).

Mitigation of impacts on archaeological sites and traditional cultural properties is discussed in Section 9.3.17.3, in addition to the programmatic design features for historic properties discussed in Appendix A, Section A.2.2.

9.3.19 Socioeconomics

9.3.19.1 Affected Environment

This section describes current socioeconomic conditions and local community services within the ROI surrounding the proposed Pisgah SEZ. The ROI is a single-county area comprising San Bernardino County in California. It encompasses the area in which workers are expected to spend most of their salaries and in which a portion of site purchases and non-payroll expenditures from the construction, operation, and decommissioning phases of the proposed SEZ facility are expected to take place.

9.3.19.1.1 ROI Employment

In 2008, employment in the ROI stood at 806,434 (Table 9.3.19.1-1). Over the period between 1999 and 2008, the annual average employment growth rate in San Bernardino County was 1.2%, slightly higher than the average rate for California (0.9%).

In 2006, the service sector provided the highest percentage of employment in the ROI at 45.4%, followed by wholesale and retail trade with 21.1% (Table 9.3.19.1-2). Smaller employment shares were held by manufacturing (11.4%) and construction (7.7%).

9.3.19.1.2 ROI Unemployment

Over the period 1999 to 2008, the average unemployment rate in San Bernardino County was 5.6%, slightly lower than the average rate for California (5.8%) (Table 9.3.19.1-3). The unemployment rate for the first 10 months of 2009 (13.1%) contrasts with the rate for 2008 as a whole (8.0%). The average rate for California as a whole (11.6%) was also higher during this period than the corresponding average rate for 2008.

TABLE 9.3.19.1-1 ROI Employment in the Proposed Pisgah SEZ

Location	1999	2008	Average Annual Growth Rate, 1999–2008 (%)
San Bernardino County	712,624	806,434	1.2
California	15,566,900	17,059,574	0.9

Sources: U.S Department of Labor (2009a,b).

TABLE 9.3.19.1-2 ROI Employment in the Proposed Pisgah SEZ by Sector, 2006[a]

Industry	San Bernardino County	% of Total
Agriculture[a]	5,143	0.9
Mining	846	0.1
Construction	45,700	7.7
Manufacturing	67,306	11.4
Transportation and public utilities	49,871	8.5
Wholesale and retail trade	124,321	21.1
Finance, insurance, and real estate	28,760	4.9
Services	267,674	45.4
Other	46	0.0
Total	589,803	

[a] Agricultural employment includes 2007 data for hired farmworkers.

Sources: U.S. Bureau of the Census (2009a); USDA (2009).

TABLE 9.3.19.1-3 ROI Unemployment Rates for the Proposed Pisgah SEZ (%)

Location	1999–2008	2008	2009[a]
San Bernardino County	5.6	8.0	13.1
California	5.8	7.2	11.6

[a] Rates for 2009 are the average for January through November.

Sources: U.S. Department of Labor (2009a–c).

9.3.19.1.3 ROI Urban Population

The population of San Bernardino County in 2008 was 80% urban, with the majority of urban areas located in the western portion of the county. The largest of these, San Bernardino, had an estimated 2008 population of 198,014; other large cities in the western portion of the county include Fontana (186,869), Ontario (170,947), Rancho Cucamonga (170,057), and Victorville (109,313) (Table 9.3.19.1-4). In addition, there are eight cities in the county with a 2008 population of between 50,000 and 99,999 persons. All these cities are part of the larger urban region that includes Los Angeles, Riverside, and San Bernardino, and most are more than 70 mi (113 km) from the site of the proposed SEZ.

TABLE 9.3.19.1-4 ROI Urban Population and Income for the Proposed Pisgah SEZ

	Population			Median Household Income ($ 2008)		
City	2000	2008	Average Annual Growth Rate, 2000–2008 (%)	1999	2006–2008	Average Annual Growth Rate, 1999 and 2006–2008 (%)[a]
San Bernardino	185,401	198,014	0.8	40,093	40,764	0.2
Fontana	128,929	186,869	4.7	58,945	62,914	0.7
Ontario	158,007	170,947	1.0	54,658	57,184	0.5
Rancho Cucamonga	127,743	170,057	3.6	78,450	79,455	0.1
Victorville	64,029	109,313	6.9	46,591	52,507	1.3
Rialto	91,873	98,376	0.9	53,115	50,000	–0.7
Hesperia	62,582	85,236	3.9	51,759	48,160	–0.8
Chino	67,168	82,435	2.6	71,330	72,373	0.2
Chino Hills	66,787	73,527	1.2	100,908	103,706	0.3
Upland	68,393	71,760	0.6	62,746	67,803	0.9
Redlands	63,591	69,394	1.1	62,000	65,539	0.6
Highland	44,605	50,870	1.7	53,084	60,963	1.5
Colton	47,662	50,333	0.7	46,063	46,411	0.1
Montclair	33,049	36,231	1.2	52,527	58,094	1.1
Twentynine Palms	28,854	33,354	1.8	40,142	43,447	0.9
Adelanto	18,130	28,330	5.7	40,678	41,875	0.3
Barstow	21,119	24,392	1.8	45,152	48,042	0.7
Loma Linda	18,681	21,515	1.8	49,188	55,091	1.3
Yucca Valley	16,865	20,290	2.3	39,166	45,298	1.6
Grand Terrace	11,626	12,160	0.6	69,074	NA	NA
Big Bear Lake	5,438	6,102	1.5	44,351	NA	NA
Needles	4,830	5,293	1.2	33,614	NA	NA

[a] Data are averages for the period 2006–2008.

Source: U.S. Bureau of the Census (2009b-d).

Population growth rates among the larger cities in the county have varied over the period of 2000 to 2008. Victorville grew at an annual rate of 6.9% during this period, with higher than average growth also experienced in Fontana (4.7%), Hesperia (3.9%), and Rancho Cucamonga (3.6%). The cities of Rialto (0.9%), San Bernardino (0.8%), Colton (0.7%), and Upland (0.6%), all experienced growth rates of less than 1% between 2000 and 2008.

Elsewhere in the county, to the east of the San Bernardino area, within 40 mi (64 km) of the site of the proposed SEZ, there are a number of smaller cities. Twentynine Palms (2008 population of 33,354) and Yucca Valley (20,290) are located on the perimeter of the Twentynine Palms Marine Corps base and the Joshua Tree National Monument, and are primarily retail centers, while Barstow (24,392) is a rail and road transportation and retail center.

Population growth in these cities between 2000 and 2008 has been low, with annual growth rates of 2.3% in Yucca Valley and 1.8% in Twentynine Palms. The smallest city in the county, Needles (5,293), is located on the Colorado River, more than 100 mi (161 km) from the proposed SEZ location, and also had a relatively low population growth rate (1.2%) between 2000 and 2008.

9.3.19.1.4 ROI Urban Income

Median household incomes varied considerably across cities in the county. A number of cities in western San Bernardino County, Chino Hills ($103,706), Rancho Cucamonga ($79,455), Chino ($72,373), Upland ($67,803) Redlands ($65,539), and Fontana ($62,914) had median incomes in 2006 to 2008 that were higher than the average for the state ($61,154) (Table 9.3.19.1-4). A number of cities in the western portion of the county had relatively low median household incomes, notably San Bernardino ($40,764), Adelanto ($41,875), Colton ($46,411), and Hesperia ($48,160).

Among the cities in the western part of the county, median income growth rates between 1999 and 2006 to 2008 were highest in Highland (1.5%), Victorville (1.3%), Loma Linda (1.3%), and Montclair (1.1%), with annual growth rates of less than 1% elsewhere. Hesperia (−0.8%) and Rialto (−0.7%) had negative growth rates between 1999 and 2006 to 2008. The average median household income growth rate for the state as a whole over this period was less than 0.1%.

Elsewhere in the county, Barstow ($48,042) and Yucca Valley ($45,298) both had median household incomes less than the state average between 2006 and 2008. Median income in Needles in 2000 was $33,614. Growth rates in these cities over the period 1999 and 2006 to 2008 varied from 1.6% in Yucca Valley to 0.9% in Twentynine Palms.

9.3.19.1.5 ROI Population

Table 9.3.19.1-5 presents recent and projected populations in San Bernardino County and in the state as a whole. Population in the county stood at 2,004,914 in 2008, having grown at an average annual rate of 2.0% since 2000. Population growth in the county was higher than that for California (1.5%) over the same period. The county population is expected to increase to 2,619,128 by 2021 and to 2,694,641 by 2023.

9.3.19.1.6 ROI Income

Personal income in San Bernardino County stood at $58.1 billion in 2007 and has grown at an annual average rate of 2.8% over the period 1998 to 2007 (Table 9.3.19.1-6). Personal income per capita in the county also rose over the same period at a rate of 0.8%, increasing from $26,797 to $29,132. The personal income growth rate in the county was higher than the state rate (2.5%), but per capita income growth rate was slightly lower in the county than in California as a whole (1.1%).

TABLE 9.3.19.1-5 ROI Population for the Proposed Pisgah SEZ

Location	2000	2008	Average Annual Growth Rate, 2000–2008 (%)	2021	2023
San Bernardino County	1,721,942	2,004,914	2.0	2,619,128	2,694,641
California	33,871,648	38,129,628	1.5	44,646,420	45,667,413

Sources: U.S. Bureau of the Census (2009e-f); California Department of Finance (2010).

TABLE 9.3.19.1-6 ROI Personal Income for the Proposed Pisgah SEZ

Location	1998	2007	Average Annual Growth Rate, 1998–2007 (%)
San Bernardino County			
Total income[a]	44.1	58.1	2.8
Per capita income	26,797	29,132	0.8
California			
Total income[a]	1,231.7	1,573.6	2.5
Per capita income	37,339	41,821	1.1

[a] Unless indicated otherwise, values are reported in $ billion 2008.

Sources: U.S. Department of Commerce (2009); U.S. Bureau of Census (2009e-f).

Median household income in San Bernardino County stood at $56,575 (U.S. Bureau of the Census 2009d).

9.3.19.1.7 ROI Housing

In 2007, more than 679,169 housing units were located in San Bernardino County (Table 9.3.19.1-7). Owner-occupied units compose approximately 65% of the occupied units in the count, with rental housing making up 35% of the total. The vacancy rate in 2007 was 13.3%, and 5.3% of housing units were used for seasonal or recreational purposes. There were 90,111

TABLE 9.3.19.1-7 ROI Housing Characteristics for the Proposed Pisgah SEZ

Parameter	2000	2007[a]
San Bernardino County		
Owner-occupied	340,933	381,697
Rental	187,661	207,361
Vacant units	72,775	90,111
Seasonal and recreational use	31,657	NA
Total units	601,369	679,169

[a] 2007 data for number of owner-occupied, rental, and vacant units for Colorado counties are not available; data are based on 2007 total housing units and 2000 data on housing tenure.

[b] NA = data not available.

Sources: U.S. Bureau of the Census (2009h-j).

vacant housing units in the county in 2007, of which 31,721 are estimated to be rental units that would be available to construction workers. There were 31,657 units in seasonal, recreational, or occasional use at the time of the 2000 Census.

Housing stock in San Bernardino County grew at an annual rate of 1.8% over the period 2000 to 2007, with 77,800 new units added to the existing housing stock in the county (Table 9.3.19.1-7).

The median value of owner-occupied housing in San Bernardino County in 2008 was $366,600 (U.S. Bureau of the Census 2009g).

9.3.19.1.8 ROI Local Government Organizations

The various local and county government organizations in San Bernardino County are listed in Table 9.3.19.1-8. In addition, there are three tribal governments located in the county; members of other tribal groups are located in the state, but their tribal governments are located in adjacent states.

9.3.19.1.9 ROI Community and Social Services

This section describes educational, health care, law enforcement, and firefighting resources in the ROI.

TABLE 9.3.19.1-8 ROI Local Government Organizations and Social Institutions Associated with the Proposed Pisgah SEZ

Governments	
City	
City of Adelanto	City of Montclair
Town of Apple Valley	City of Needles
City of Barstow	City of Ontario
City of Big Bear Lake	City of Rancho Cucamonga
City of Chino	City of Redlands
City of Chino Hills	City of Rialto
City of Colton	City of San Bernardino
City of Fontana	City of Twentynine Palms
City of Grand Terrace	City of Upland
City of Hesperia	City of Victorville
City of Highland	Town of Yucca Valley
City of Loma Linda	
County	
San Bernardino County	
Tribal	
Chemehuevi Indian Tribe of the Chemehuevi Reservation, California	
San Manuel Band of Serrano Mission Indians of the San Manuel Reservation, California	
Twentynine Palms Band of Mission Indians of California	

Sources: U.S. Bureau of the Census (2009b); U.S. Department of Interior (2010).

Schools

In 2007, the single-county ROI had a total of 542 public and private elementary, middle, and high schools (NCES 2009). Table 9.3.19.1-9 provides summary statistics for enrollment and educational staffing and two indices of educational quality—student-teacher ratios and levels of service (number of teachers per 1,000 population). The student-teacher ratio in San Bernardino County was 24.3, while the level of service was 8.8.

TABLE 9.3.19.1-9 ROI School District Data for the Proposed Pisgah SEZ, 2007

Location	Number of Students	Number of Teachers	Student-Teacher Ratio	Level of Service[a]
San Bernardino County	427,603	17,568	24.3	8.8

[a] Number of teachers per 1,000 population.

Source: NCES (2009).

Health Care

There were 4,176 physicians in San Bernardino County in 2007, and the number of doctors per 1,000 population was 2.1 (Table 9.3.19.1-10).

Public Safety

Several state, county, and local police departments provide law enforcement in the ROI (Table 9.3.19.1-11). San Bernardino County has 1,783 officers and would provide law enforcement services to the SEZ. Currently, there are 1,293 professional firefighters in the county (Table 9.3.19.1-11). Levels of service are 0.9 per 1,000 population for police protection and 0.6 for fire services.

TABLE 9.3.19.1-10 Physicians in the Proposed Pisgah SEZ ROI, 2007

Location	Number of Primary Care Physicians	Level of Service[a]
San Bernardino County	4,176	2.1

[a] Number of physicians per 1,000 population.

Source: AMA (2009).

TABLE 9.3.19.1-11 Public Safety Employment in the Proposed Pisgah SEZ ROI

Location	Number of Police Officers[a]	Level of Service[b]	Number of Firefighters[c]	Level of Service
San Bernardino County	1,783	0.9	1,293	0.6

[a] 2007 data.

[b] Number per 1,000 population.

[c] 2008 data; number does not include volunteers.

Sources: U.S. Department of Justice (2008b); Fire Departments Network (2009).

9.3.19.1.10 ROI Social Structure Change

Community social structures and other forms of social organization within the ROI are related to various factors, including historical development, major economic activities and sources of employment, income levels, race and ethnicity, and forms of local political organization. Although an analysis of the character of community social structures is beyond the scope of the current programmatic analysis, project-level NEPA analyses would include a description of ROI social structures, contributing factors, their uniqueness, and consequently, the susceptibility of local communities to various forms of social disruption and social change.

Various energy development studies have suggested that once the annual growth in population is between 5 and 15% in smaller rural communities, alcoholism, depression, suicide, social conflict, divorce, and delinquency will increase, and levels of community satisfaction will decrease (BLM 1980, 1983, 1996). Tables 9.3.19.1-12 and 9.3.19.1-13 present data for a number of indicators of social change, including violent crime and property crime rates, alcoholism and illicit drug use, and mental health and divorce, that might be used to indicate social change.

Violent crime in San Bernardino County in 2007 stood at 4.6 per 1,000 population (Table 9.3.19.1-12), while the property-related crime rate was 29.6, producing an overall crime rate of 34.2.

Other measures of social change—alcoholism, illicit drug use, and mental health—are not available at the county level, and thus are presented for the SAMHSA region in which the ROI is located (Table 9.3.19.1-13).

TABLE 9.3.19.1-12 County and ROI Crime Rates in the Proposed Pisgah SEZ ROI[a]

	Violent Crime[b]		Property Crime[c]		All Crime	
	Offenses	Rate	Offenses	Rate	Offenses	Rate
San Bernardino County	9,657	4.6	61,713	29.6	71,370	34.2
California	185,173	7.8	1,080,747	45.6	1,265,920	53.4

[a] Rates are the number of crimes per 1,000 population.

[b] Violent crime includes murder and non-negligent manslaughter, forcible rape, robbery, and aggravated assault.

[c] Property crime includes burglary, larceny, theft, motor vehicle theft, and arson.

Sources: U.S. Department of Justice (2009a,b).

TABLE 9.3.19.1-13 Alcoholism, Drug Use, Mental Health, and Divorce in the Proposed Pisgah SEZ ROI[a]

Geographic Area	Alcoholism	Illicit Drug Use	Mental Health[b]	Divorce[c]
California Region 12 (includes San Bernardino County)	7.1	2.6	8.8	–[d]
California	8.1	3.1	8.5	4.3

[a] Data for alcoholism and drug use represent % of the population over 12 years of age with dependence on or abuse of alcohol, illicit drugs. Data are averages for 2004 to 2006.

[b] Data for mental health represent % of the population over 18 years of age suffering from serious psychological distress. Data are averages for 2002 to 2004.

[c] Divorce rates are the number of divorces per 1,000 population. Data are for 1990.

[d] A dash indicates data not available.

Sources: SAMHSA (2009); CDC (2009).

9.3.19.1.11 ROI Recreation

Various areas in the vicinity of the proposed SEZ are used for recreational purposes, with natural, ecological, and cultural resources in the ROI attracting visitors for a range of activities, including hunting, fishing, boating, canoeing, wildlife watching, camping, hiking, horseback riding, mountain climbing, and sightseeing. These areas are discussed in Section 9.3.5.

Because the number of visitors using state and federal lands for recreational activities is not available from the various administering agencies, the value of recreational resources in these areas, based solely on the number of recorded visitors, is likely to be an underestimation. In addition to visitation rates, the economic valuation of certain natural resources can also be assessed in terms of the potential recreational destination for current and future users, that is, their nonmarket value (see Section 5.17.1.1.1).

Another method is to estimate the economic impact of the various recreational activities supported by natural resources on public land in the vicinity of the proposed solar development, by identifying sectors in the economy in which expenditures on recreational activities occur. Not all activities in these sectors are directly related to recreation on state and federal lands, with some activity occurring on private land (e.g., dude ranches, golf courses, bowling alleys, and movie theaters). Expenditures associated with recreational activities form an important part of the economy of the ROI. In 2007, 66,139 people were employed in San Bernardino County in the various sectors identified as recreation, constituting 8.0% of total ROI employment (Table 9.3.19.1-14). Recreation spending also produced almost $1,503 million in income in the ROI in 2007. The primary sources of recreation-related employment were eating and drinking places.

TABLE 9.3.19.1-14 ROI Recreation Sector Activity for the Proposed Pisgah SEZ, 2007

Activity	Employment[b]	Income ($ million)
Amusement and recreation services	1,934	48.6
Automotive rental	1,554	85.4
Eating and drinking places	50,763	941.6
Hotels and lodging places	2,769	75.5
Museums and historic sites	134	5.5
Recreational vehicle parks and campsites	787	22.8
Scenic tours	4,469	246.5
Sporting goods retailers	3,729	77.4
Total ROI	66,139	1,503

Source: MIG, Inc. (2009).

9.3.19.2 Impacts

The following analysis begins with a description of the common impacts of solar development, including common impacts on recreation and on social change. These impacts would occur regardless of the solar technology developed in the SEZ. The impacts of developments employing various solar energy technologies are analyzed in detail in subsequent sections.

9.3.19.2.1 Common Impacts

Construction and operation of a solar energy facility at the proposed Pisgah SEZ would produce direct and indirect economic impacts. Direct impacts would occur as a result of expenditures on wages and salaries, procurement of goods and services required for project construction and operation, and the collection of state sales and income taxes. Indirect impacts would occur as project wages and salaries, procurement expenditures, and tax revenues subsequently circulate through the economy of each state, thereby creating additional employment, income, and tax revenues. Facility construction and operation would also require in-migration of workers and their families into the ROI surrounding the site, which would affect population, rental housing, health service employment, and public safety employment. Socioeconomic impacts common to all utility-scale solar energy developments are discussed in detail in Section 5.17. These impacts will be minimized through the implementation of programmatic design features described in Appendix A, Section A.2.2.

Recreation Impacts

Estimating the impact of solar facilities on recreation is problematic because it is not clear how solar development in the SEZ would affect recreational visitation and the value of recreational resources for potential or future visits (See Section 5.17.1.2.3). While it is clear that some land in the ROI would no longer be accessible for recreation, the majority of popular recreational locations would be precluded from solar development. It is also possible that solar facilities in the ROI would be visible from popular recreation locations, and that construction workers residing temporarily in the ROI would occupy accommodation otherwise used for recreational visits, thus reducing visitation and consequently affecting the economy of the ROI.

Social Change

Although an extensive literature in sociology documents the most significant components of social change in energy boomtowns, the nature and magnitude of the social impact of energy developments in small rural communities are still unclear (see Section 5.17.1.1.4). While some degree of social disruption is likely to accompany large-scale in-migration during the boom phase, there is insufficient evidence to predict the extent to which specific communities are likely to be affected, which population groups within each community are likely to be most affected, and the extent to which social disruption is likely to persist beyond the end of the boom period (Smith et al. 2001). Accordingly, because of the lack of adequate social baseline data, it has been suggested that social disruption is likely to occur once an arbitrary population growth rate associated with solar energy development projects has been reached, with an annual rate of between 5 and 10% growth in population assumed to result in a breakdown in social structures, with a consequent increase in alcoholism, depression, suicide, social conflict, divorce, delinquency, and deterioration in levels of community satisfaction (BLM 1980, 1983, 1996).

In overall terms, the in-migration of workers and their families into the ROI would represent an increase of less than 0.1% in county population during construction of the trough technology, with smaller increases for the power tower, dish engine, and PV technologies, and during the operation of each technology. While it is possible that some construction and operations workers will choose to locate in communities closer to the SEZ, the insufficient range of housing choices to suit all solar occupations and lack of available housing in smaller rural communities in the ROI to accommodate all in-migrating workers and families, make it likely that many workers will commute to the SEZ from larger communities elsewhere in the ROI, thereby reducing the potential impact of solar development on social change. Regardless of the pace of population growth associated with the commercial development of solar resources, and the likely residential location of in-migrating workers and families in communities some distance from the SEZ itself, the number of new residents from outside the ROI is likely to lead to some demographic and social change in small rural communities in the ROI. Communities hosting solar development are likely to be required to adapt to a different quality of life, with a transition away from a more traditional lifestyle involving ranching and taking place in small, isolated, close-knit, homogenous communities with a strong orientation toward personal and family relationships, toward a more urban lifestyle, with increasing cultural and ethnic diversity, and increasing dependence on formal social relationships within the community.

9.3.19.2.2 Technology-Specific Impacts

The economic impacts of solar energy development in the proposed SEZ were measured in terms of employment, income, state tax revenues (sales and income), population in-migration, housing, and community service employment (education, health, and public safety). More information on the data and methods used in the analysis are provided in Appendix M.

The assessment of the impact of the construction and operation of each technology was based on SEZ acreage, assuming 80% of the area could be developed. To capture a range of possible impacts, solar facility size was estimated on the basis of the land requirements of various solar technologies, assuming that 9 acres/MW (0.04 km^2/MW) would be required for power tower, dish engine, and PV technologies, and 5 acres/MW (0.02 km^2/MW) for solar trough technologies. Impacts of multiple facilities employing a given technology at each SEZ were assumed to be the same as impacts for a single facility with the same total capacity. Construction impacts were assessed for a representative peak year of construction, assumed to be 2021 for each technology. Construction impacts assumed that a maximum of two projects could be constructed within a given year, with a corresponding maximum land disturbance of up to 6,000 acres (12 km^2). For operations impacts, a representative first year of operations was assumed to be 2023 for each technology. The years of construction and operations were selected as representative of the entire 20-year study period because they are the approximate midpoint; construction and operations could begin earlier.

Solar Trough

Construction. Total construction employment impacts in the ROI (including direct and indirect impacts) from the use of solar trough technologies would be up to 10,667 jobs (Table 9.3.19.2-2). Construction activities would constitute 1.1% of total ROI employment. A solar development would also produce $870.6 million in income. Direct sales taxes would be $27.5 million, with direct income taxes of $12.6 million.

Given the scale of construction activities and the likelihood of local worker availability in the required occupational categories, construction of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 1,486 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodation (hotels, motels, and mobile home parks) would mean that the impact of solar facility construction on the number of vacant rental housing units is not expected to be large, with 743 rental units expected to be occupied in the ROI. This occupancy rate would represent 1.8% of the vacant rental units expected to be available in the ROI.

In addition to the potential impact on housing markets, in-migration would also affect community service employment (education, health, and public safety). An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, 14 new teachers, 3 physicians, and 2 public safety employees (career firefighters and uniformed police officers) would be required in the ROI. These increases would represent 0.1% of total ROI employment expected in these occupations.

Operations. Total operations employment impacts in the ROI (including direct and indirect impacts) of a build-out using solar trough technologies would be 1,385 jobs (Table 9.3.19.2-2). Such a solar facility would also produce $60.6 million in income. Direct sales taxes would be $0.4 million, with direct income taxes of $1.3 million. Based on fees established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010a), acreage rental payments would be $3.0 million, and solar generating capacity payments would total at least $25.2 million.

Given the likelihood of local worker availability in the required occupational categories, operation of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 106 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodation (hotels, motels, and mobile home parks) would mean that the impact of solar facility operation on the number of vacant owner-occupied housing units is not expected to be large, with 96 owner-occupied units expected to be occupied in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service (health, education, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the provision of these services in the ROI. Accordingly, one new teacher would be required in the ROI.

Power Tower

Construction. Total construction employment impacts in the ROI (including direct and indirect impacts) from the use of power tower technologies would be up to 4,249 jobs (Table 9.3.19.2-3). Construction activities would constitute 0.4% of total ROI employment. Such a solar facility would also produce $346.7 million in income. Direct sales taxes would be $10.9 million, with direct income taxes of $5.0 million.

Given the scale of construction activities and the likelihood of local worker availability in the required occupational categories, construction of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 592 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodation (hotels, motels, and mobile home parks) would mean that the impact of solar facility construction on the number of vacant rental housing units is not expected to be large, with 296 rental units expected to be occupied in the ROI. This occupancy rate would represent 0.7% of the vacant rental units expected to be available in the ROI.

TABLE 9.3.19.2-2 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed Pisgah SEZ with Trough Facilities[a]

Parameter	Maximum Annual Construction Impacts	Operations Impacts
Employment (no.)		
Direct	3,488	835
Total	10,667	1,385
Income[b]		
Total	870.6	60.6
Direct state taxes[b]		
Sales	27.5	0.4
Income	12.6	1.3
BLM payments ($ million 2008)		
Rental	NA[c]	3.0
Capacity[d]	NA	25.2
In-migrants (no.)	1,486	106
Vacant housing[e] (no.)	743	96
Local community service employment		
Teachers (no.)	14	1
Physicians (no.)	3	0
Public safety (no.)	2	0

[a] Construction impacts are based on the development at the site in a single year; it was assumed that several facilities with a combined capacity of up to 1,200 MW (corresponding to 6,000 acres [24 km^2] of land disturbance) could be built. Operations impacts were based on full build-out of the site, producing a total output of 3,832 MW.

[b] Unless indicated otherwise, values are reported in $ million 2008.

[c] NA = not applicable.

[d] The BLM annual capacity payment was based on a fee of $6,570 per MW, established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010a), assuming a solar facility with no storage capability, and full build-out of the site. Projects with three or more hours of storage would generate higher payments, based on a fee of $7,884 per MW.

[e] Construction activities would affect vacant rental housing; operations activities would affect vacant owner-occupied housing.

TABLE 9.3.19.2-3 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed Pisgah SEZ with Power Tower Facilities[a]

Parameter	Construction	Operations
Employment (no.)		
Direct	1,389	431
Total	4,249	601
Income[b]		
Total	346.7	24.6
Direct state taxes[b]		
Sales	10.9	<0.1
Income	5.0	0.7
BLM payments ($ million 2008)		
Rental	NA[c]	3.0
Capacity[d]	NA	14.0
In-migrants (no.)	592	55
Vacant housing[e] (no.)	296	49
Local community service employment		
Teachers (no.)	6	1
Physicians (no.)	1	0
Public safety (no.)	1	0

[a] Construction impacts are based on the development at the site in a single year; it was assumed that several facilities with a combined capacity of up to 667 MW (corresponding to 6,000 acres [24 km^2] of land disturbance) could be built. Operations impacts were based on full build-out of the site, producing a total output of 2,129 MW.

[b] Unless indicated otherwise, values are reported in $ million 2008.

[c] NA = not applicable.

[d] The BLM annual capacity payment was based on a fee of $6,570 per MW, established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010a), assuming a solar facility with no storage capability, and full build-out of the site. Projects with three or more hours of storage would generate higher payments, based on a fee of $7,884 per MW.

[e] Construction activities would affect vacant rental housing; operations activities would affect vacant owner-occupied housing.

In addition to the potential impact on housing markets, in-migration would affect community service (education, health, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, six new teachers, one physician, and one public safety employee would be required in the ROI. These increases would represent less than 0.1% of total ROI employment expected in these occupations.

Operations. Total operations employment impacts in the ROI (including direct and indirect impacts) of a build-out using power tower technologies would be 601 jobs (Table 9.3.19.2-3). Such a solar development would also produce $24.6 million in income. Direct sales taxes would be less than $0.1 million, with direct income taxes of $0.7 million. Based on fees established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010a), acreage rental payments would be $3.0 million, and solar generating capacity payments would total at least $14.0 million.

Given the likelihood of local worker availability in the required occupational categories, operation of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 55 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodation (hotels, motels and mobile home parks) would mean that the impact of solar facility operation on the number of vacant owner-occupied housing units is not expected to be large, with 49 owner-occupied units expected to be required in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service (education, health, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, one new teacher would be required in the ROI.

Dish Engine

Construction. Total construction employment impacts in the ROI (including direct and indirect impacts) from the use of dish engine technologies would be up to 1,727 jobs (Table 9.3.19.2-4). Construction activities would constitute 0.1% of total ROI employment. Such a solar facility would also produce $141.0 million in income. Direct sales taxes would be $4.5 million, with direct income taxes of $2.0 million.

Given the scale of construction activities and the likelihood of local worker availability in the required occupational categories, construction of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 241 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodation (hotels, motels, and mobile home parks) would mean that the impact of solar facility construction on the number of vacant rental housing units is not expected to be large,

TABLE 9.3.19.2-4 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed Pisgah SEZ with Dish Engine Facilities[a]

Parameter	Construction	Operations
Employment (no.)		
Direct	565	419
Total	1,727	584
Income[b]		
Total	141.0	23.9
Direct state taxes[b]		
Sales	4.5	<0.1
Income	2.0	0.7
BLM payments ($ million 2008)		
Rental	NA[c]	3.0
Capacity[d]	NA	14.0
In-migrants (no.)	241	53
Vacant housing[e] (no.)	120	48
Local community service employment		
Teachers (no.)	2	1
Physicians (no.)	0	0
Public safety (no.)	0	0

[a] Construction impacts are based on the development at the site in a single year; it was assumed that several facilities with a combined capacity of up to 667 MW (corresponding to 6,000 acres [24 km^2] of land disturbance) could be built. Operations impacts were based on total development of the site, producing a total output of 2,129 MW.

[b] Unless indicated otherwise, values are reported in $ million 2008.

[c] NA = not applicable.

[d] The BLM annual capacity payment was based on a fee of $6,570 per MW, established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010a), assuming a solar facility with no storage capability, and full build-out of the site. Projects with three or more hours of storage would generate higher payments, based on a fee of $7,884 per MW.

[e] Construction activities would affect vacant rental housing; operations activities would affect vacant owner-occupied housing.

with 120 rental units expected to be occupied in the ROI. This occupancy rate would represent 0.3% of the vacant rental units expected to be available in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service (education, health, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, two new teachers would be required in the ROI. This increase would represent less than 0.1% of total ROI employment expected in this occupation.

Operations. Total operations employment impacts in the ROI (including direct and indirect impacts) of a build-out using dish engine technologies would be 584 jobs (Table 9.3.19.2-4). Such a solar development would also produce $23.9 million in income. Direct sales taxes would be less than $0.1 million, with direct income taxes of $0.7 million. Based on fees established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010a), acreage rental payments would be $3.0 million, and solar generating capacity payments would total at least $14.0 million.

Given the likelihood of local worker availability in the required occupational categories, operation of a dish engine solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 53 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodation (hotels, motels, and mobile home parks) would mean that the impact of solar facility operation on the number of vacant owner-occupied housing units is not expected to be large, with 48 owner-occupied units expected to be required in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service employment (education, health, and public safety). An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, one new teacher would be required in the ROI.

Photovoltaic

Construction. Total construction employment impacts in the ROI (including direct and indirect impacts) using PV technologies would be up to 806 jobs (Table 9.3.19.2-5). Construction activities would constitute 0.1 % of total ROI employment. Such a solar development would also produce $65.7 million in income. Direct sales taxes would be $2.1 million, with direct income taxes of $1.0 million.

Given the scale of construction activities and the likelihood of local worker availability in the required occupational categories, construction of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 112 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary

TABLE 9.3.19.2-5 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed Pisgah SEZ with PV Facilities[a]

Parameter	Construction	Operations
Employment (no.)		
Direct	263	42
Total	806	58
Income[b]		
Total	65.7	2.4
Direct state taxes[b]		
Sales	2.1	<0.1
Income	1.0	<0.1
BLM payments ($ million 2008)		
Rental	NA[c]	3.0
Capacity[d]	NA	11.2
In-migrants (no.)	112	5
Vacant housing[e] (no.)	56	5
Local community service employment		
Teachers (no.)	1	0
Physicians (no.)	0	0
Public safety (no.)	0	0

a Construction impacts are based on the development at the site in a single year; it was assumed that several facilities with a combined capacity of up to 667 MW (corresponding to 6,000 acres [24 km^2] of land disturbance) could be built. Operations impacts were based on full build-out of the site, producing a total output of 2,129 MW.

b Unless indicated otherwise, values are reported in $ million 2008.

c NA = not applicable.

d The BLM annual capacity payment was based on a fee of $5,256 per MW, established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010a), assuming full build-out of the site.

e Construction activities would affect vacant rental housing; operations activities would affect owner-occupied housing.

accommodation (hotels, motels, and mobile home parks) would mean that the impact of solar facility construction on the number of vacant rental housing units is not expected to be large, with 56 rental units expected to be occupied in the ROI. This occupancy rate would represent 0.1% of the vacant rental units expected to be available in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service (education, health, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, 1 new teacher would be required in the ROI. This increase would represent less than 0.1% of total ROI employment expected in this occupation.

Operations. Total operations employment impacts in the ROI (including direct and indirect impacts) of a build-out using PV technologies would be 58 jobs (Table 9.3.19.2-5). Such a solar development would also produce $2.4 million in income. Direct sales taxes would be less than $0.1 million, with direct income taxes of less than $0.1 million. Based on fees established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010a), acreage rental payments would be $3.0 million, and solar generating capacity payments would total at least $11.2 million.

Given the likelihood of local worker availability in the required occupational categories, operation of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 5 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodation (hotels, motels, and mobile home parks) would mean that the impact of solar facility operation on the number of vacant owner-occupied housing units is not expected to be large, with 5 owner-occupied units expected to be required in the ROI.

No new community service employment would be required to meet existing levels of service in the ROI.

9.3.19.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features addressing socioeconomic impacts have been identified for the proposed Pisgah SEZ. Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program, would reduce the potential for socioeconomic impacts during all project phases.

This page intentionally left blank.

9.3.20 Environmental Justice

9.3.20.1 Affected Environment

E.O. 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations" (*Federal Register*, Vol. 59, page 7629, Feb. 11, 1994), formally requires federal agencies to incorporate environmental justice as part of their missions. Specifically, it directs them to address, as appropriate, any disproportionately high and adverse human health or environmental effects of their actions, programs, or policies on minority and low-income populations.

The analysis of the impacts of solar energy projects on environmental justice issues follows guidelines described in the CEQ's *Environmental Justice Guidance under the National Environmental Policy Act* (CEQ 1997). The analysis method has three parts: (1) a description of the geographic distribution of low-income and minority populations in the affected area is undertaken; (2) an assessment is conducted to determine whether the impacts of construction and operation would produce impacts that are high and adverse; and (3) if impacts are high and adverse, a determination is made as to whether these impacts disproportionately affect minority and low-income populations.

Construction and operation of solar energy projects in the proposed SEZ could affect environmental justice if any adverse health and environmental impacts resulting from either phase of development are significantly high, and if these impacts would disproportionately affect minority and low-income populations. If the analysis determines that health and environmental impacts are not significant, there can be no disproportionate impacts on minority and low-income populations. In the event impacts are significant, disproportionality would be determined by comparing the proximity of any high and adverse impacts with the location of low-income and minority populations.

The analysis of environmental justice issues associated with the development of solar facilities considered impacts within the SEZ and an associated 50-mi (80-km) radius around the boundary of the SEZ. A description of the geographic distribution of minority and low-income groups in the affected area was based on demographic data from the 2000 Census (U.S. Bureau of the Census 2009k,l). The following definitions were used to define minority and low-income population groups:

- **Minority**. Persons are included in the minority category if they identify themselves as belonging to any of the following racial groups: (1) Hispanic, (2) Black (not of Hispanic origin) or African American, (3) American Indian or Alaska Native, (4) Asian, or (5) Native Hawaiian or Other Pacific Islander.

  Beginning with the 2000 Census, where appropriate, the census form allows individuals to designate multiple population group categories to reflect their ethnic or racial origin. In addition, persons who classify themselves as being of multiple racial origins may choose up to six racial groups as the basis of their racial origins. The term minority includes all persons, including those classifying themselves in multiple racial categories, except those who classify themselves as not of Hispanic origin and as White or "Other Race" (U.S. Bureau of the Census 2009k).

The CEQ guidance proposed that minority populations should be identified where either (1) the minority population of the affected area exceeds 50%, or (2) the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis.

The PEIS applies both criteria in using the Census Bureau data for census block groups, wherein consideration is given to the minority population that is both greater than 50% and 20 percentage points higher than in the state (the reference geographic unit).

- **Low-Income**. Individuals who fall below the poverty line. The poverty line takes into account family size and age of individuals in the family. In 1999, for example, the poverty line for a family of five with three children below the age of 18 was $19,882. For any given family below the poverty line, all family members are considered as being below the poverty line for the purposes of analysis (U.S. Bureau of the Census 2009l).

The data in Table 9.3.20.1-1 show the minority and low-income composition of total population located in the proposed SEZ based on 2000 Census data and CEQ Guidelines. Individuals identifying themselves as Hispanic or Latino are included in the table as a separate entry. However, because Hispanics can be of any race, this number also includes individuals identifying themselves as being part of one or more of the population groups listed in the table.

A large number of minority and low-income individuals are located in the 50-mi (80-km) area around the boundary of the SEZ. Within the 50-mi (80-km) radius, 37.8% of the population is classified as minority, while 16.7% is classified as low-income. However, the number of minority individuals does not exceed 50% of the total population in the area, and the number of minority individuals does not exceed the state average by 20 percentage points or more, meaning that there is no minority population in the SEZ area based on 2000 Census data and CEQ guidelines. The number of low-income individuals does not exceed the state average by 20 percentage points or more, and does not exceed 50% of the total population in the area, meaning that there are no low-income populations in the SEZ.

Figures 9.3.20.1-1 and 9.3.20.1-2 show the locations of the minority and low-income population groups within the 50-mi (80-km) radius around the boundary of the SEZ.

Within the 50-mi (80-km) radius around the SEZ, more than 50% of the population is classified as minority in block groups located in the City of Barstow and to the northwest of the city, in the city of San Bernardino and vicinity, to the northeast of the SEZ, and to the south of the SEZ associated with the Morongo Indian Reservation. Block groups with minority

TABLE 9.3.20.1-1 Minority and Low-Income Populations within the 50-mi (80-km) Radius Surrounding the Proposed Pisgah SEZ

Parameter	California
Total population	354,336
White, non-Hispanic	220,502
Hispanic or Latino	85,617
Non-Hispanic or Latino minorities	48,217
One race	37,623
Black or African American	25,136
American Indian or Alaskan Native	3,422
Asian	7,276
Native Hawaiian or Other Pacific Islander	1,116
Some other race	673
Two or more races	10,594
Total minority	133,834
Low-income	56,533
Percent minority	37.8
State percent minority	40.5
Percent low-income	16.7
State percent low-income	14.2

Source: U.S Bureau of the Census (2009k,l).

populations more than 20 percentage points higher than the state average are located in the City of Barstow and in the City of San Bernardino and vicinity.

Census block groups within the 50-mi (80-km) radius where the low-income population is more than 20 percentage points higher than the state average are located in the City of Barstow and in the City of San Bernardino, and in the vicinity of San Bernardino. Additional block groups with low-income populations are located to the southeast, and to the northwest of Barstow, and in the vicinity of Twentynine Palms. Block groups with more than 50% of the population classified as low-income are located in the Cities of Barstow and San Bernardino, and to the southeast of the SEZ, east of the Twentynine Palms military base.

9.3.20.2 Impacts

Environmental justice concerns common to all utility-scale solar energy developments are described in detail in Section 5.18. These impacts will be minimized through the

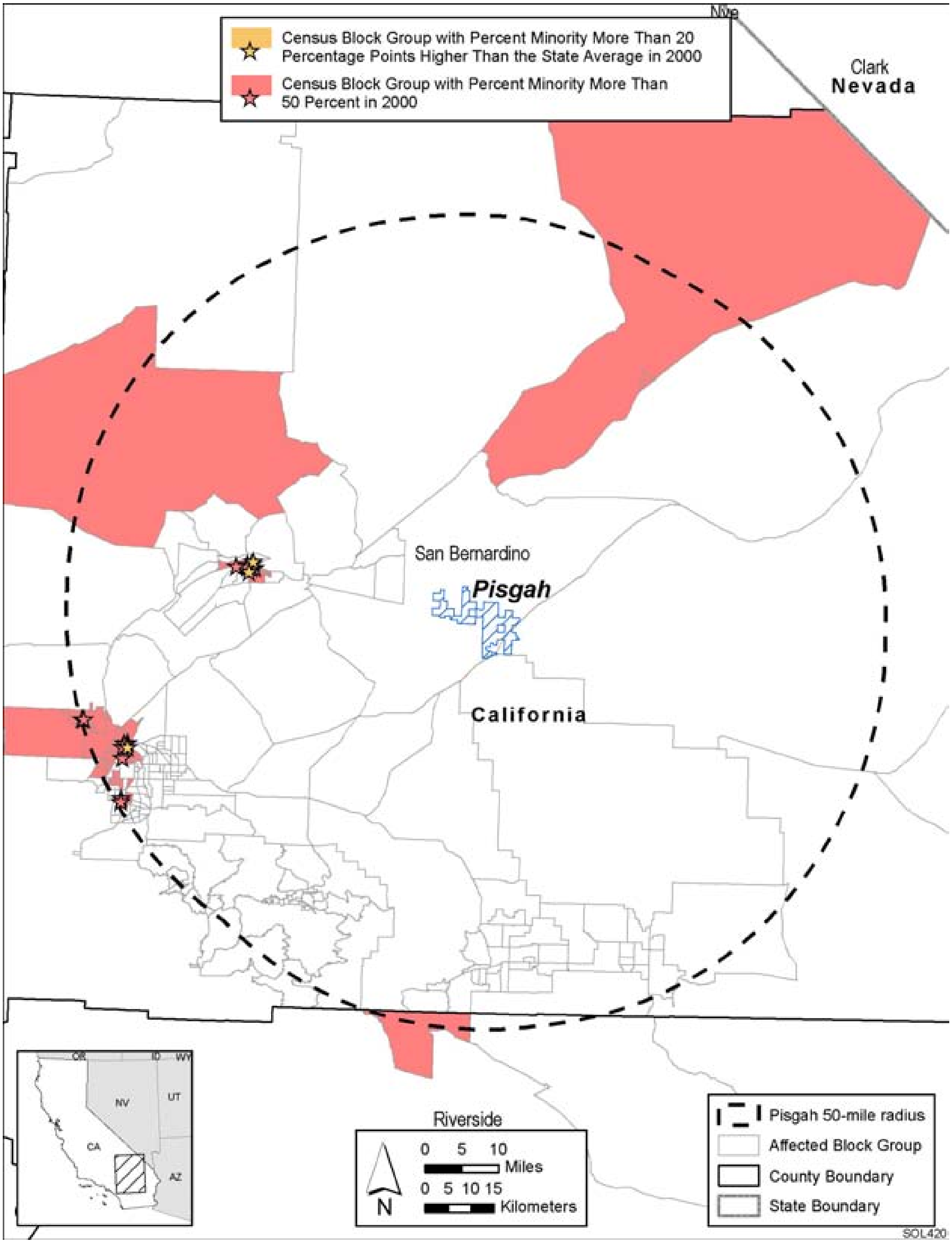

FIGURE 9.3.20.1-1 Minority Population Groups within the 50-mi (80-km) Radius Surrounding the Proposed Pisgah SEZ

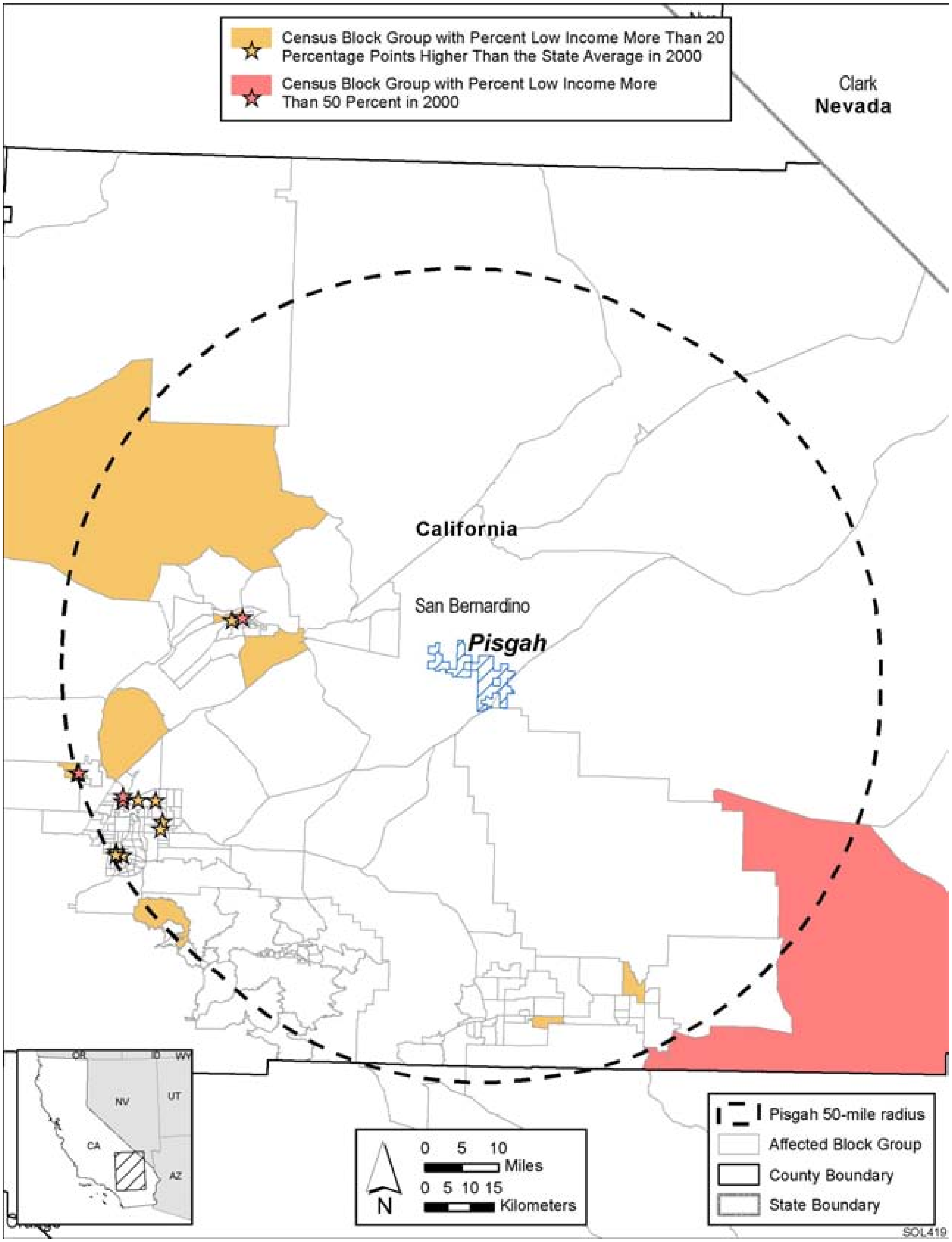

FIGURE 9.3.20.1-2 Low-Income Population Groups within the 50-mi (80-km) Radius Surrounding the Proposed Pisgah SEZ

implementation of programmatic design features described in Appendix A, Section A.2.2, which address the underlying environmental impacts contributing to the concerns. The potentially relevant environmental impacts associated with solar development within the proposed Pisgah SEZ include noise and dust during the construction of solar facilities; noise and EMF effects associated with solar project operations; the visual impacts of solar generation and auxiliary facilities, including transmission lines; access to land used for economic, cultural, or religious purposes; and effects on property values as areas of concern that might potentially affect minority and low-income populations. Minority populations have been identified within 50 mi (80 km) of the proposed Pisgah SEZ; low-income populations are also present (Section 9.3.20.1).

Potential impacts on low-income and minority populations could be incurred as a result of the construction and operation of solar facilities involving each of the four technologies. Although impacts are likely to be small, there are minority populations defined by CEQ guidelines (Section 9.3.20.1) within the 50-mi (80-km) radius around the boundary of the SEZ, meaning that any adverse impacts of solar projects could disproportionately affect minority populations. Because there are also low-income populations within the 50-mi (80-km) radius, according to CEQ guidelines, there could also be impacts on low-income populations.

9.3.20.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features addressing environmental justice impacts have been identified for the proposed Pisgah SEZ. Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program, would reduce the potential for environmental justice impacts during all project phases.

9.3.21 Transportation

The proposed Pisgah SEZ is accessible by road and rail. An interstate highway and a rail line pass through the SEZ. Three small airports are located within 62 mi (100 km) of the SEZ. General transportation considerations and impacts are discussed in Sections 3.4 and 5.19, respectively.

9.3.21.1 Affected Environment

I-40 passes along the southern edge of and then through the Pisgah SEZ, as shown in Figure 9.3.21.1-1. The town of Barstow is located about 25 mi (40 km) to the west of the SEZ along I-40. I-40 terminates in Barstow where it joins I-15, which travels from the southwest to the northeast. From Barstow, the Los Angeles area is about 70 mi (113 km) to the southwest on I-15, and Las Vegas is about 155 mi (249 km) to the northeast. To the east of the SEZ, I-40 continues on through Needles, California, approximately 105 mi (169 km) away. Access to the SEZ from I-40 is available from exits at Fort Cady Road (to the west of the SEZ), Hector Road (midway through the SEZ), and Pisgah Crater Road (at the eastern end of the SEZ). The National Trails Highway (historic U.S. 66) also passes through the SEZ as it runs south of and parallel to I-40. Hector Road runs north-south through the middle of the SEZ. North of the I-40 interchange, Hector Road becomes a dirt/gravel road. A number of other local dirt roads cross the SEZ, including those that run parallel to the railroad tracks. The AADT value for I-40 at Hector Road in 2008 was 12,500 (Caltrans 2009a), with approximately 260 vehicles a day exiting onto Hector Road and about 200 vehicles a day entering I-40 from Hector Road (Caltrans 2009b). Annual average traffic volumes along I-15, I-40, and state roads near Barstow for 2008 are provided in Table 9.3.21.1-1. Figure 9.3.21-1 also shows the designated open OHV routes in the proposed Pisgah SEZ. These routes were designated under the CDCA Plan (BLM 1999).

The BNSF Railway serves the area (BNSF 2005). Local stops are in Newberry, Hector, and Pisgah (BNSF 2010). To the west of the SEZ, the BNSF railroad passes through Barstow where it splits, with one line going north to the San Francisco area and the other branch going south to the Los Angeles area. The UP Railroad is also nearby, with a connection to the BNSF Railroad between Barstow and Newberry at Daggett to the west of the proposed Pisgah SEZ. From that interchange, the UP Railroad travels to the northeast and passes through Yermo on its way Las Vegas (UPR 2009).

Three small public airports are within a driving distance of approximately 62 mi (100 km) of the Pisgah SEZ. The nearest public airport is the Barstow-Daggett Airport, which is 12 mi (19 km) to the west of the Pisgah SEZ along I-40. The airport is owned by the County of San Bernardino and has two asphalt runways that are in good condition; they are 5,123- and 6,402-ft (1,561- and 1,951-m) long (FAA 2009). The County of San Bernardino also operates the Apple Valley Airport that is located about 30 mi (48 km) south of Barstow near I-15, a driving distance of approximately 56 mi (90 km) from the Pisgah SEZ. The Apple Valley Airport has two asphalt runways in good condition; they are 4,099- and 6,498-ft (1,249- and 1,981-m) long (FAA 2009). Scheduled commercial passenger service is not available at either the Barstow-Daggett or Apple Valley Airports.

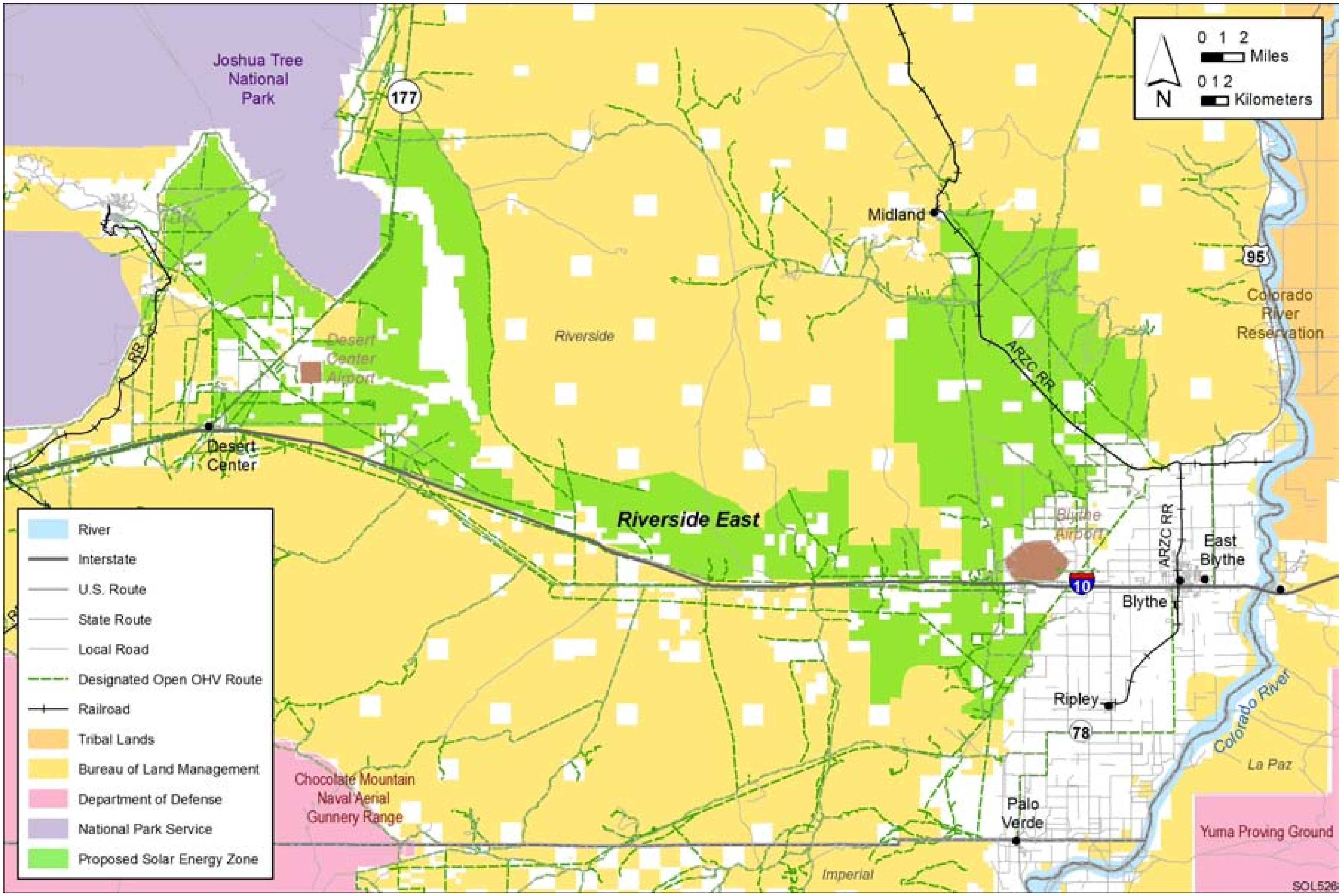

FIGURE 9.3.21.1-1 Local Transportation Network Serving the Proposed Pisgah SEZ

TABLE 9.3.21.1-1 AADT on Major Roads near the Proposed Pisgah SEZ, 2008

Road	General Direction	Location	AADT (Vehicles)
I-15	Southwest–Northeast	Southwest of junction State Route 58	57,000
		Northeast of junction State Route 58	70,000
		West of junction State Route 247	69,000
		East of junction State Route 247	64,000
		West of Yermo/Calico Road interchange	40,000
		East of Yermo/Calico Road interchange	37,500
I-40	East–West	Junction I-15	18,000
		A Street exit (Daggett)	14,000
		Newberry Road exit	12,600
		Fort Cady Road exit (west of Pisgah SEZ)	12,600
		Hector Road exit (at Pisgah SEZ)	12,500
		Crucero Road exit (east of Pisgah SEZ)	11,900
State Route 58	East–West	Junction I-15	11,500
		West of Lenwood Road	10,600
		East of Lenwood Road	11,000
State Route 247	North–South	Junction I-15	18,700
		North of Stoddard Wells Road	1,800
		South of Stoddard Wells Road	2,200

Source: Caltrans (2009a).

A third airport, the Southern California Logistics Airport, is located at the site of the former George Air Force Base in Victorville, California, approximately 62 mi (100 km) from the Pisgah SEZ. Redevelopment of the base, now leased from the U.S. Air Force, is being undertaken by the City of Victorville and a private corporation (Global Access 2010). A multimodal transportation hub with associated commercial development is envisaged, and the overall complex is named Global Access. Along with the airport and its two asphalt/concrete runways, which are 9,138- and 15,050-ft (2,785- and 4,587-m) long, Global Access includes service by two railroads (BNSF and UP) and intermodal facilities. In 2008, 10,006 passengers departed and 6,126 arrived at the airport, while 250 lb (113 kg) of freight departed and 354,715 lb (160,870 kg) arrived at the airport (BTS 2009).

9.3.21.2 Impacts

As discussed in Section 5.19, primary transportation impacts are anticipated to be from commuting worker traffic. I-40 and the National Trails Highway provide a regional traffic corridor that would experience small impacts for single projects that may have up to 1,000 daily workers, with an additional 2,000 vehicle trips per day (maximum). Such an increase is approximately 15% of the current traffic on I-40 alone, as summarized in Table 9.3.21.1-1, which provides the available AADT values for routes in the vicinity of the SEZ. However, the exits on I-40 might experience moderate impacts with some congestion. Local road improvements would be necessary in any portion of the SEZ that might be developed near the I-40 exits and along the National Trails Highway so as not to overwhelm the local roads near any site access point(s).

Solar development within the SEZ would affect public access along OHV routes designated open and available for public use. There are routes designated as open within the proposed SEZ. Such open routes crossing areas granted ROWs for solar facilities would be re-designated as closed (see Section 5.5.1 for more details on how routes coinciding with proposed solar facilities would be treated).

Should two large projects with approximately 1,000 daily workers each be under development simultaneously, an additional 4,000 vehicle trips per day (maximum) could be added to I-40 in the vicinity of the SEZ, assuming ride-sharing is not implemented. This would be about a 30% increase in the current average daily traffic level on I-40 near the SEZ and could have moderate impacts on traffic flow during peak commuter times. The extent of the problem would depend on the relative locations of the projects within the SEZ, where the worker populations originate, and the work schedules. The affected exits on I-40 would experience moderate impacts with some congestion. The National Trails Highway could also experience moderate congestion impacts dependent on the location of the solar projects in the SEZ and the percentage of commuter traffic using the highway. Local road improvements would be necessary in any portion of the SEZ near I-40 that might be developed so as not to overwhelm the local roads near any site access point(s).

9.3.21.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features have been identified related to impacts on transportation systems around the Pisgah SEZ. The programmatic design features discussed in Appendix A, Section A.2.2, including local road improvements, multiple site access locations, staggered work schedules, and ride sharing, would all provide some relief to traffic congestion on local roads leading to the site. Depending on the location of the proposed solar facility within the SEZ, more specific access locations and local road improvements would be implemented.

9.3.22 Cumulative Impacts

The analysis presented in this section addresses the potential cumulative impacts in the vicinity of the proposed Pisgah SEZ in San Bernardino County, California. The CEQ guidelines for implementing NEPA define cumulative impacts as environmental impacts resulting from the incremental impacts of an action when added to other past, present, and reasonably foreseeable future actions (40 CFR 1508.7). The impacts of other actions are considered without regard to the agency (federal or nonfederal), organization, or person that undertakes them. The time frame of this cumulative impacts assessment could appropriately include activities that would occur up to 20 years in the future (the general time frame for PEIS analyses), but little or no information is available for projects that could occur more than 5 to 10 years in the future.

The nearest population center is the small community of Newberry Springs, located near the western boundary of the SEZ. The area around the proposed Pisgah SEZ is mostly open rangeland. The BLM GeoCommunicator Database contained no records of agricultural crop production in the SEZ or adjacent to the SEZ boundary. Some irrigated agricultural land occurs about 10 mi (16 km) west of the SEZ. The southern border of the SEZ abuts the northwest corner of the U.S. Marine Corps Air Ground Combat Center. The Rodman Mountains WA and Newberry Mountains WA are located south of I-40, about 10 mi (16 km) southwest and south of the SEZ. A designated energy corridor (No. 27-41) extends through the SEZ, mostly paralleling I-40 in an east–west direction. Two grazing allotments occur in the area. The Ord Mountain allotment is located about 10 to 20 mi (16 to 32 km) southwest of the SEZ. The southwestern portion of the Cady Mountain allotment overlaps most of the Pisgah SEZ north of I-40. The geographic extent of the cumulative impacts analysis for potentially affected resources near the Pisgah SEZ is identified in Section 9.3.22.1. An overview of ongoing and reasonably foreseeable future actions is presented in Section 9.3.22.2. General trends in population growth, energy demand, water availability, and climate change are discussed in Section 9.3.22.3. Cumulative impacts for each resource area are discussed in Section 9.3.22.4.

9.3.22.1 Geographic Extent of the Cumulative Impacts Analysis

The geographic extent of the cumulative impacts analysis for potentially affected resources evaluated near the Pisgah SEZ is provided in Table 9.3.22.1-1. These geographic areas define the boundaries encompassing potentially affected resources. Their extent may vary on the basis of the nature of the resource being evaluated and the distance at which an impact may occur (thus, for example, the evaluation of air quality may have a greater regional extent of impact than that of visual values). Most of the lands around the SEZ are administered by the BLM, the NPS, or the DoD. The BLM administers approximately 42% of the lands within a 50-mi (80-km) radius of the SEZ.

TABLE 9.3.22.1-1 Geographic Extent of the Cumulative Impacts Analysis by Resource Area: Proposed Pisgah SEZ

Resource Area	Geographic Extent
Land Use	Western San Bernardino County
Specially Designated Areas and Lands with Wilderness Characteristics	Western San Bernardino County
Rangeland Resources	Western San Bernardino County
Recreation	Western San Bernardino County
Military and Civilian Aviation	Western and central San Bernardino County
Soil Resources	Areas within and adjacent to the Pisgah SEZ
Minerals	Western San Bernardino County
Water Resources	
Surface Water	Mojave River, Troy Lake, Lavic Lake, ephemeral drainages in the Mojave Valley and the Lavic Valley
Groundwater	Lavic Valley Groundwater Basin, Lower Mojave River Valley Groundwater Basin
Air Quality and Climate	A 31-mi (50-km) radius from the center of the Pisgah SEZ within the Mojave Desert Air Basin
Vegetation, Wildlife and Aquatic Biota, Special Status Species	A 50-mi (80-km) radius from the center of the Pisgah SEZ
Visual Resources	Viewshed within a 25-mi (40-km) radius of the Pisgah SEZ
Acoustic Environment (noise)	Areas adjacent to the Pisgah SEZ
Paleontological Resources	Areas within and adjacent to the Pisgah SEZ
Cultural Resources	Areas within and adjacent to the Pisgah SEZ for archaeological sites; viewshed within a 25-mi (40-km) radius of the Pisgah SEZ for other properties, such as traditional cultural properties
Native American Concerns	Areas within and adjacent to the Pisgah SEZ and viewshed within a 25-mi (40-km) radius of the proposed Pisgah SEZ
Socioeconomics	A 50-mi (80-km) radius from the center of the Pisgah SEZ
Environmental Justice	A 50-mi (80-km) radius from the center of the Pisgah SEZ
Transportation	I-15 and I-40

9.3.22.2 Overview of Ongoing and Reasonably Foreseeable Future Actions

The future actions described below are those that are "reasonably foreseeable;" that is, they have already occurred, are ongoing, are funded for future implementation, or are included in firm near-term plans. Types of proposals with firm near-term plans include:

- Proposals for which NEPA documents are in preparation or finalized;
- Proposals in a detailed design phase;
- Proposals listed in formal NOIs published in the Federal Register or state publications;
- Proposals for which enabling legislations has been passed; and
- Proposals that have been submitted to federal, state, or county regulators to begin a permitting process.

Projects in the bidding or research phase or that have been put on hold were not included in the cumulative impact analysis.

The reasonably foreseeable future actions described below are grouped into two categories: those that relate to (1) energy production and distribution, including potential solar energy projects under the proposed action (Section 9.3.22.2.1), and (2) other actions, including those related to mining and mineral processing, grazing management, transportation, recreation, water management, and conservation (Section 9.3.22.2.2. Together, these actions have the potential to affect human and environmental receptors within western San Bernardino County over the next 20 years.

9.3.22.2.1 Energy Production and Distribution

Reasonably foreseeable future actions related to energy production and distribution within 50 mi (80 km) of the center of the Pisgah SEZ are described in the following sections. That area is entirely within San Bernardino County. Future renewable energy facilities are expected to be the main contributors to potential future impacts in this area because of favorable conditions in the area for their development, large acreages required, and potentially large quantities of water used. The area is otherwise largely undeveloped and would be expected to remain so in the absence of renewable energy development. Thus, this analysis focuses on renewable energy facilities and any other foreseeable large energy projects nominally covering 500 acres (2 km^2) or more or requiring amounts of water on the scale of utility-scale CSP. Figure 9.3.22.2-1 shows the approximate locations of the key projects.

Renewable Energy Development

Several recent executive and legislative actions in California have addressed renewable energy development within the state. In November 2008, Governor Schwarzenegger signed E.O. S-14-08 to streamline California's renewable energy project approval process and increase the state's RPS to the most aggressive in the nation—at 33% renewable power by 2020. On September 15, 2009, the governor issued a second E.O., now requiring that 33% of all electrical energy produced in the state be from renewable energy sources by the year 2020. The E.O. directed the CARB to adopt regulations increasing California's RPS to 33% by 2020.

In 2009, the California legislature drafted bills that would cause 33% of electrical energy production to come from renewable sources. On October 12, 2009, Governor Schwarzenegger vetoed two bills from the California Legislature on electrical energy generated by renewable sources in favor of an alternative plan that would remove limits on the amount of renewable power utilities could buy from other states (African American Environmentalist Association 2009).

Solar Energy. Table 9.3.22.2-1 lists three foreseeable solar energy projects on public land, the so-called fast-track projects—SES One (two phases—CACAs 49537 and 49539) and Chevron Energy Solutions (Lucerne) Solar Project (CACA 49561). Fast-track projects are projects on public lands for which the environmental review and public participation process is underway and the ROW applications could be approved by December 2010 (BLM 2010d). The locations of the fast-track projects are shown in Figure 9.3.22.2-1. Other, more numerous, pending regular-track ROW applications shown in the figure are discussed collectively at the end of this section.

- *Solar One Project—SES Solar #3 and SES Solar #6 (CACAs 49537 and 49539).* The proposed Solar One project would be constructed on an approximate 8,600-acre (35-km^2) site in San Bernardino County, California, within the proposed Pisgah SEZ. Construction of the 850-MW project is planned to begin in late 2010 if the project is approved by the CEC and ROW grants are issued by the BLM. Construction would take approximately 40 months to complete. The primary equipment for the generating facility would include the 25-kW Stirling solar dish systems (referred to as SunCatchers).

  The facility would be built in two phases and would be expected to operate for approximately 20 years based on the Power Purchase Agreement signed by SES with Southern California Edison (SCE). The first phase would consist of up to 20,000 SunCatchers configured in 334 units and have a net nominal generating capacity of 500 MW on 5,838 acres (24 km^2) of federal lands. The second phase would consist of approximately 14,000 SunCatchers configured in 233 units with a net generating capacity of 350 MW on 2,392 acres (9.7 km^2) of federal lands (BLM 2010d).

TABLE 9.3.22.2-1 Reasonably Foreseeable Future Actions Related to Energy Development and Distribution and Other Major Actions near the Proposed Pisgah SEZ[a]

Description	Status	Resources Affected	Primary Impact Location
Fast-Track Solar Energy Projects on BLM-Administered Land			
SES Solar Three, (Calico Solar Project SES One), (CACA-49537); 350 MW CSP dish engine facility; 3,392 total acres (14 km^2)	NOI to prepare an EIS/SA issued on June 8,2009; Draft EIS/SA issued April 19, 2010	Land use, visual, terrestrial habitats, wildlife, groundwater	Within the Pisgah SEZ
SES Solar Six (SES One) (CACA-49539); 500 MW CSP/Dish Engine facility; 5,212 total acres (21 km^2)	Application received March 14, 2007	Land use, visual, terrestrial habitats, wildlife, groundwater	Within the Pisgah SEZ
Chevron Energy Solutions (Lucerne) Solar (CACA 49561); 45 MW PV solar; 516 total acres (2 km^2)	Notice of Availability of Draft EIS/SA issued Feb. 5, 2010	Land use, visual, terrestrial habitats, wildlife, groundwater	About 30 mi (48 km) south of the Pisgah SEZ
Other Reasonably Foreseeable Solar and Hybrid Energy Projects			
Mohave Solar Power Project (CEC licensing case 09-AFC[b]-5); 250 MW parabolic trough facility; 1,765 acres (7 km^2)	Application for Certification filed with CEC Aug. 2009	Land use, visual, terrestrial habitats, wildlife, groundwater	About 40 mi (64 km) west-northwest of the Pisgah SEZ
Victorville 2 Hybrid Power Project; 563 MW; combination of natural-gas fired turbines and parabolic solar-thermal collectors; about 400 acres (1.6 km^2)	Commercial operation planned by summer of 2010	Land use, visual, visual, terrestrial habitats, wildlife, groundwater	40 to 50 mi (72 to 80 km) southwest of the Pisgah SEZ
Wind Energy Projects			
Granite Mountain Wind Energy; (CACA 48254); 73 MW 1,968 acres BLM lands, 670 acres (2.7 km^2) private lands	Draft EIS schedule delayed	Land use, visual, terrestrial habitats, wildlife	6 mi (10 km) east at Apple Valley in Granite Mountains, about 35 to 40 mi (56 to 64 km) southwest of Pisgah SEZ
Daggett Ridge Wind Energy Project (CACA 49575); 82.5 MW; 1,576 acres BLM lands, 380 private lands	Three-month delay requested in Sept. 2010 to study risks to the golden eagle	Land use, visual, terrestrial habitats, wildlife	20 mi (32 km) west of the Pisgah SEZ

TABLE 9.3.22.2-1 (Cont.)

Description	Status	Resources Affected	Primary Impact Location
Other Projects			
CalNev Oil Pipeline Expansion Project; reconstruction of existing oil pipeline to increase pipe to 16-in. (41-cm) diameter	Pending	Disturbed areas, terrestrial habitats along existing pipeline ROW	Extends along 233-mi (375-km) corridor from North Colton terminal in Santa Barbara County through the project area along I-15 from Barstow to Las Vegas

[a] Projects in later stages of development.

[b] AFC = application for certification.

Related structures for the project would include the construction of a new 230-kV substation located approximately in the center of the project site. This new substation would be connected to the existing SCE Pisgah Substation adjacent to the project site via approximately 2 mi (3 km) of single-circuit, 230-kV transmission line. In addition, the proposed project would require the SCE to expand and upgrade the existing 230-kV SCE Pisgah Substation to support the increase in voltage to 500 kV, loop the Eldorado-Lugo 500-kV line into the SCE Pisgah Substation, and demolish 65 mi (105 km) of the existing Lugo-Pisgah No. 2 230-kV transmission and replace it with towers and conductor (BLM 2010d).

A draft EIS/SA has been prepared, and the BLM issued a Notice of Availability of the document on April 2, 2010, that started a 90-day public review period (BLM 2010c).

- Chevron *Energy Solutions (Lucerne) Solar Project (CACA 49561).* Chevron Energy Solutions has requested a 516-acre (2-km^2) ROW authorization to construct and operate a 45-MW solar PV project and connect it to an existing Southern California Edison 33-kV transmission line on public lands located approximately 8 mi (13 km) east of Lucerne Valley in San Bernardino County. The proposed project would include a solar array, switchyard, a control and maintenance building, and parking area. A Notice of Availability (NOA) of the Draft EIS was published by the BLM on February 5, 2010 (BLM 2010e). The draft EIS also includes a proposed amendment to the CDCA Plan. The proposed site is located about 30 mi (48 km) south of the Pisgah SEZ.

Pending Solar ROW Applications on BLM-Administered Lands. In addition to the fast-track solar projects described above, there are a number of regular-track applications for

FIGURE 9.3.22.2-1 Locations of Renewable Energy Proposals on Public Land within a 50-mi (80-km) Radius of the Proposed Pisgah SEZ

solar project ROWs that have been submitted to the BLM for projects that would be located within 50 mi (80 km) of the SEZ. Table 9.3.22.2-2 provides a list of these other solar projects that had pending applications submitted to the BLM as of March 2010. Figure 9.3.22.2-1 shows the locations of these applications.

Within 50 mi (80 km) of the proposed Pisgah SEZ, there are 17 active solar applications, including the three fast-track projects described above. Within the boundaries of the Pisgah SEZ, there are two fast-track projects but no other applications. Four of the applications within a 50-mi (80-km) radius of the Pisgah SEZ are administered through the Needles Field Office; the rest are administered through the Barstow Field Office.

The likelihood of any of the regular-track ROW application projects actually being developed is uncertain, but is generally assumed to be less than that for fast-track applications. The projects are all listed in Table 9.3.22.2-2 for completeness and as an indication of the level of interest in development of solar energy in the region. Some number of these applications would be expected to result in actual projects. Thus, the cumulative impacts of these potential projects are analyzed in their aggregate effects.

Other Reasonably Foreseeable Solar and Hybrid Energy Projects Not on BLM Lands. The following paragraphs describe other reasonably foreseeable solar and hybrid energy projects in the vicinity of the Pisgah SEZ but not on BLM lands.

- Mohave *Solar Power Project (CEC licensing case 09-AFC-5).* The project is a solar electric generating facility proposed on about 1,765 acres (7.1 km^2) in unincorporated San Bernardino County. The site is about 40 mi (64 km) west-northwest of the Pisgah SEZ. The project would use parabolic trough technology and would have a combined nominal electrical output of 250 MW from twin, independently operable solar fields (Abengoa Solar, Inc. 2009). When the Application for Certification (AFC) was filed with the CEC in August 2009, Abengoa Solar planned for the project to commence commercial operation by the winter of 2012.

  The project is proposing interconnection to the Kramer-Cool Water 230-kV transmission line, which is owned by the SCE and located adjacent to the southern border of the project. The project would use wet-cooling towers for power plant cooling. Water for cooling tower makeup, process water makeup, other industrial uses, and potable uses would be supplied from groundwater wells. A packaged water treatment system would be used to treat the water to meet potable standards. A sanitary septic system and on-site leach field would be used to dispose of sanitary wastewater. Project cooling water blowdown would be piped to lined, on-site evaporation ponds for each plant area.

- Victorville *2 Hybrid Power Project.* In 2007, the City of Victorville submitted an AFC to construct and operate the Victorville 2 Hybrid Power Project (Victorville 2), a hybrid of natural gas–fired combined-cycle generating

TABLE 9.3.22.2-2 Pending Renewable Energy Project ROW Applications on BLM-Administered Land within 50 mi (80 km) of the Pisgah SEZ

Serial No.	Project Name	Application Received	Size (acres[a])	MW	Technology	Field Office
Solar Applications						
CACA 48741	Solar Investments, LLC	Jan. 18, 2007	8,384	800	CSP	Barstow
CACA 48742	Solar Investments, LLC	Jan. 18, 2007	10,611	1,000	CSP	Barstow
CACA 48818	First Solar (Desert Opal)	Feb. 26, 2007	15,824	1,205	PV	Barstow
CACA 48875	Dpt. Broadwell Lake, LLC	Jan. 24, 2007	8,625	500	CSP	Barstow
CACA 49004	Boulevard Associates, LLC	May 14, 2007	13,528	1,000	CSP	Needles
CACA 49424	Solel, Inc.	July 23, 2007	7,453	600	CSP	Barstow
CACA 49431	Boulevard Associates, LLC	Sept. 21, 2007	10,199	1,000	CSP	Needles
CACA 49432	PG&E	Sept. 24, 2007	5,315	800	Undecided	Needles
CACA 49537	SES Solar Three, LLC (SES One)	March 14, 2007	3,392	350	CSP/Dish engine	Barstow
CACA 49539	SES Solar Six, LLC (SES One)	March 14, 2007	5,212	500	CSP/Dish engine	Barstow
CACA 49561	Chevron Energy Solutions Co. (Lucerne)	Dec. 7, 2007	518	45	PV	Barstow
CACA 49584	Solenergis, LLC	Dec. 18, 2007	7,995	350	PV	Barstow
CACA 49585	Enxco Development, Inc.	Dec. 12, 2007	3,710	1,000	CSP	Barstow
CACA 50150	Solel, Inc. (Johnson Valley)	March 10, 2008	1,800	500	CSP/trough	Barstow
Wind Applications						
Pending Wind Site Testing						
CACA 48287	Renewergy, LLC	July 26, 2006	7,760	–[c]	Wind	Needles
CACA 49052	Atlas Gas REP	May 24, 2007	9,170	–	Wind	Barstow
CACA 49053	Alta Gas REP	May 24, 2007	1,398	–	Wind	Barstow
CACA 49881	AES Wind Generation, Inc.	–	800	–	Wind	Barstow
CACA 50711	Padoma Wind Power, LLC	March 17, 2009	23,829	–	Wind	Barstow
CACA 50896	AES Seawest, Inc.	–	1,643	–	Wind	Barstow
CACA 51767	Del Sur Wind Energy, LLC	March 24, 2010	3,849	–	Wind	Barstow
CACA 51772	Del Sur Wind Energy, LLC	March 24, 2010	21,977	–	Wind	Barstow
CACA 52148	–	–	–	–	Wind	–
CACA 52188	–	–	–	–	Wind	–

TABLE 9.3.22.2-2 (Cont.)

Serial No.	Project Name	Application Received	Size (acres[a])	MW	Technology	Field Office
Wind Applications (Cont.)						
Authorized Wind Site Testing		**Application last authorized**				
CACA 43088	AES Seawest, Inc.	Dec. 17, 2004	4,231	–	Wind	Barstow
CACA 44975	Granite Wind, LLC	Sept. 24, 2009	1,968	–	Wind	Barstow
CACA 46803	Horizon Wind Energy	Feb. 9, 2006	4,479	–	Wind	Barstow
CACA 46881	AES Wind Generation, Inc.	Aug. 26, 2005	2,929	–	Wind	Barstow
CACA 47043	West Fry Wind Energy, LLC	Aug. 2, 2005	2,449	–	Wind	Barstow
CACA 47455	Pacific Wind Development LLC, (Iberdrola)	Dec. 29, 2009	6,623	–	Wind	Barstow
CACA 48472	Powers Partners SW (enXco)	Sept. 25, 2009	10,240	–	Wind	Barstow
CACA 48667	Oak Creek Energy	Aug. 11, 2006	25,600	–	Wind	Needles
CACA 48689	Renewergy, LLC, Sierra Renewables, LLC	Jan. 9, 2007	4,046	–	Wind	Barstow
CACA 49202	Verde Resources, Inc (Western Wind)	April 3, 2009	3,295	–	Wind	Barstow
CACA 49204	Horizon Wind Energy	July 19, 2007	24,390	–	Wind	Barstow
CACA 49255	EC&R West, LLC (Airtricity, Inc.)	Jan. 14, 2010	14,080	–	Wind	Barstow
Pending Wind Development Facility						
CACA 48902	West Fry Wind, LLC (FPL Energy)	March 29, 2007	3,248	34	Wind	Barstow
CACA 50612	AES Wind Generation, Inc.	Dec. 29, 2008	4,168	–	Wind	Barstow
CACA 51581	Pacific Wind (Iberdrola)	Dec. 29, 2009	6,630	–	Wind	Barstow
CACA 51605	Horizon Wind Energy	Dec. 29, 2009	150	–	Wind	Barstow

[a] Information taken from pending and authorized wind energy projects listed on BLM California Desert District Web site (BLM 2009g) and downloaded from *GeoCommunicator* (BLM and USFS 2010c). Total 14 Solar acres = 102,566 Total Solar MW = 9,650; total wind acres and MW not available.

[b] To convert acres to km^2, multiply by 0.004047.

[c] A dash indicates data not available.

equipment integrated with solar thermal generating equipment, in the City of Victorville, San Bernardino County (CEC 2009b). The proposed project would have a net electrical output of 563 MW, with construction planned to begin in summer of 2008 and commercial operation planned by summer of 2010.

Primary equipment for the generating facility would include two natural gas–fired combustion turbine-generators (CTGs) rated at 154 MW each, two heat recovery steam generators (HRSGs), one steam turbine-generator (STG) rated at 268 MW, and 250 acres (1 km^2) of parabolic solar-thermal collectors with associated heat transfer equipment. The solar-thermal collectors would contribute up to 50 MW of the STG's 268 MW output. Construction of the proposed plant would require three areas totaling 388 acres (1.6 km^2) located immediately north of the Southern California Logistics Airport. The project site is about 45 to 50 mi (72 to 80 km) SW of the Pisgah SEZ (CEC 2009b).

The proposed Victorville 2 facility would connect via a single-circuit, three-phase 230-kV transmission line to the power grid through SCE's existing Victor Substation, located approximately 10 mi (16 km) south-southwest of the proposed project site. Natural gas would be delivered to the project through an existing 24-in (61-cm) diameter natural gas pipeline. About 3,150 ac-ft/yr (0.4 million m^3/yr) of reclaimed water supplied via a new 1.5-mi (2.4-km) long, 14-in. (35.6-cm) diameter pipeline from a treatment plant southeast of the proposed site would be used for process water. Potable water would be supplied by a new on-site well. Process wastewater would be treated using a zero liquid discharge system. Sanitary waste would be sent to a treatment plant in a new 1.25-mi (2-km) sanitary wastewater line.

Wind Energy. The following paragraphs briefly describe two reasonably foreseeable wind energy developments and provide an indication of the number of other pending wind ROW applications for locations within 50 mi (80 km) of the Pisgah SEZ.

- *Granite* Mountain *Wind Energy Project (CACA 48254).* In September 2009, the BLM announced that it was developing a joint Environmental Impact Statement/Environmental Impact Report (EIS/EIR) and plan amendment with the County of San Bernardino for the development and operation of a wind energy project on 1,968 acres (8 km^2) of BLM-administered land and 670 acres (2.7 km^2) of private lands in the Granite Mountains, about 6 mi (10 km) east of the Apple Valley town limits, in San Bernardino County (BLM 2009e). The proposed site is 35 to 40 mi (56 to 64 km) southwest of the Pisgah SEZ.

  The project would consist of up to 28 Siemens (or similar) 2.3-MW wind turbine generators, a main access road from the east (off Johnson Road), other internal access roads, pad-mounted transformers, an underground electrical collection system, a project substation, overhead transmission line, an interconnection to the existing SCE's Pisgah No. 1 230-kV transmission line, an operations and maintenance building, two meteorological towers, a temporary office, and a temporary staging area. The project would be located on about 1,970 acres (8 km^2) of public lands administered by the Barstow Field Office of the BLM and 670 acres (2.7 km^2) of privately owned land under county land use jurisdiction (BLM 2009e). The Granite Mountain Wind Energy Project is one of the fast-track projects for review/approval by the BLM and the CEC. On April 2, 2010, a NOA of the Draft EIS was published in the *Federal Register* (BLM 2010f).

- *Daggett Ridge Wind Energy Project (CACA 49575).* The proposed fast-track project would be comprised of 33 GE, or similar, 2.5-MW wind turbine generators, a substation, an overhead transmission line, an interconnection to the existing Southern California Edison 115-kV transmission line, and other structures. Construction of the the project would take 9 to 11 months. The project would be located 11 mi (18 km) southeast of Barstow and 5 mi (8 km) southwest of Daggett in San Bernardino County.

- *Other Wind Energy Projects.* The BLM has received numerous applications for right-of-way grants for wind energy projects that, if developed, would be within 50 mi (80 km) of the proposed Pisgah SEZ. These ROW applications include as many as 10 pending authorizations of wind site testing, 12 authorized for wind site testing, and 4 pending wind development facilities. Most of the applications are the responsibility of the BLM Barstow Field Office (BLM 2010b). Many of the projects are in the early planning stages and were first submitted to the BLM for review and approval between 2004 and 2007. Many of these projects may not be developed because of lack of financing or approval constraints. Eight wind testing projects are pending approval by the BLM Needles Field Office, two of which would be located in the Bristol Mountains about 30 to 35 mi (48 to 56 km) east of the proposed Pisgah SEZ (BLM 2009d).

Transmission and Distribution. No new transmission lines are planned that would cross the proposed Pisgah SEZ. Transmission line connections to existing lines or new line upgrades for projects within the geographic extent of effects are included with the specific project descriptions.

9.3.22.2.2 Other Actions

Other Foreseeable Actions

CalNev Oil Pipeline Expansion Project. Calnev Pipe Line, LLC, has applied for a ROW on public lands to expand and reconstruct 233 mi (375 km) of pipeline in California and Nevada. The existing CalNev system delivers petroleum products to the Las Vegas area through two existing pipelines from the North Colton terminal in Colton, California, to Bracken Junction in Las Vegas, Nevada.

The project would include construction, operation, and maintenance of a new 16-in. (41-cm) diameter pipeline from Colton to Las Vegas; new pumps, an electrical substation, and other ancillary facilities to increase pumping at Colton; a new pump station, electrical substation, and ancillary facilities at Baker; and new or modified connections to existing laterals. Pipeline construction was anticipated to occur over 12 months and was anticipated to begin in late 2009 or early 2010.

The County of San Bernardino is the lead agency for conducting an environmental review of the project. A Notice of Intent to prepare a draft EIS and draft EIR was issued in March 2007 (SBC 2008).

9.3.22.3 General Trends

9.3.22.3.1 Population Growth

Table 9.3.22.3-1 presents recent and projected populations in San Bernardino County and in the state as a whole. Population in the county stood at 2,086,465 in 2008, having grown at an average annual rate of 2.4% since 2000. Population growth in the county was higher than that for

TABLE 9.3.22.3-1 ROI Population for the Proposed Pisgah SEZ

Location	2000	2008	Average Annual Growth Rate, 2000–2008 (%)	2021	2023
San Bernardino County	1,721,942	2,086,465	2.4	2,619,128	2,694,641
California	34,105,437	38,129,628	1.4	44,646,420	45,667,413

Sources: U.S. Bureau of the Census (2009c); California Department of Finance (2010).

California as a whole (1.4%) over the same period. The county population is expected to increase to 2,619,128 by 2021 and to 2,694,641 by 2023 (California Department of Finance 2010).

9.3.22.3.2 Energy Demand

The growth in energy demand is related to population growth through increases in housing, commercial floorspace, transportation, manufacturing, and services. Given that population growth is expected in Imperial, Riverside, and San Bernardino Counties between 2006 and 2016, an increase in energy demand is also expected. However, the EIA projects a decline in per-capita energy use through 2030, mainly because of improvements in energy efficiency and the high cost of oil throughout the projection period. Primary energy consumption in the United States between 2007 and 2030 is expected to grow by about 0.5% each year, with the fastest growth projected for the commercial sector (EIA 2009).

9.3.22.3.3 Water Availability

The proposed Pisgah SEZ is located within the Mojave Desert, which is characterized by extreme daily temperature ranges with low precipitation and humidity (CDWR 2009); annual precipitation is between 4 and 6 in./yr (10 and 15 cm/yr) (MWA 2004; Mathany and Belitz 2008).

The primary surface-water features within the SEZ are several ephemeral drainages coming off the Cady Mountains and the Lava Bed Mountains that drain toward the Troy Lake area. Troy Lake is a dry lake consisting of playa and dune sediments that covers approximately 3,500 acres (14 km^2); approximately 1,550 acres (6 km^2) of this dry lake is within the boundaries of the SEZ. In addition, the Lavic Lake dry lakebed is located 5 mi (8 km) to the southeast.

The Mojave River is an intermittent river that flows into the Mojave Desert. The reach of the Mojave River that is closest to the SEZ is located 7 mi (11 km) to the north and is typically dry at the surface except during large rainfall events (Lines 1996). No wetlands have been identified within the SEZ according to the NWI (USFWS 2009a).

The SEZ is located within two groundwater basins: Lavic Valley and Lower Mojave River Valley. The Pisgah Fault is suspected to act as a groundwater barrier (CDWR 2003) that separates the two groundwater basins. There are two primary aquifers of the Mojave River: the floodplain and regional aquifers. The floodplain aquifer consists of highly permeable deposits of sand and gravel on the order of 200 ft (60 m) in thickness and extends into the SEZ to include Troy Lake. The regional aquifer consists of unconsolidated to partially consolidated sand, silt, and gravel deposits up to 2,000 ft (610 m) in thickness (Stamos et al. 2001; Izbicki 2004).

Seepage from the Mojave River is the primary recharge source for the floodplain and regional aquifers of the Lower Mojave groundwater basin. Additional recharge comes from direct precipitation, percolation of runoff from surrounding mountains, irrigation returns, and artificial recharge (CDWR 2003). Estimates of recharge vary depending upon the time frame examined, with the average annual recharge to the Lower Mojave Valley groundwater basin estimated to range from 7,400 ac-ft/yr (9 million m^3/yr) to 15,914 ac-ft/yr (19.6 million m^3/yr) for the analysis periods of 1931 to 1990 and 1937 to 1961, respectively (Stamos et al. 2001). Estimates of recharge for the Lavic Valley groundwater basin are not as well quantified because of the lack of development in this region. The natural recharge is estimated to be approximately 300 ac-ft/yr (0.4 million m^3/yr) for the Lavic Valley region (CDWR 2003).

Groundwater discharge by evapotranspiration and underflow is estimated to be approximately 1,000 ac-ft/yr (1.2 million m^3/yr) each for the Lower Mojave Valley groundwater basin on the basis of a groundwater model for 1994 conditions (Stamos et al. 2001). Groundwater discharge processes have not been quantified in the Lavic Valley groundwater basin.

Groundwater withdrawals in the Lower Mojave Valley groundwater basin have been primarily used to support agriculture dating back to the early 1900s. In 1931, groundwater withdrawals were approximately 5,000 ac-ft/yr (6.1 million m^3/yr); they quickly rose to around 50,000 ac-ft/yr (61.7 million m^3/yr) in the mid-1960s and reached a maximum of 60,000 ac-ft/yr (74 million m^3/yr) in the mid-1990s (Stamos et al. 2001). Groundwater withdrawals are currently limited to less than 40,000 ac-ft/yr (49 million m^3/yr), and this limit is decreasing because of groundwater management by adjudication (MWA 2009; see Section 9.3.9.1.3 for further details).

Groundwater well yields range from 80 to 140 gpm (303 to 530 L/min) in the Lavic Valley groundwater basin and from 10 to 2,700 gpm (38 to 10,220 L/min), with an average of 480 gpm (1817 L/min) in the Lower Mojave groundwater basin (CDWR 2003).

Evidence of groundwater overdraft with decreasing groundwater elevations has been recognized in the Mojave River region since the mid-1950s (MWA 2004). Groundwater surface elevations have declined at rates ranging from 0.8 to 1.3 ft/yr (0.2 to 0.4 m/yr) over the past decade near Troy Lake and are currently around 60 ft (18 m) below the surface (USGS 2009; well numbers 344956116352901, 345001116381701, 345053116344701, 345104116384002, 345109116332401, and 345142116332601). In other portions of the Lower Mojave Valley groundwater basin, groundwater levels currently range between 120 and 160 ft (37 and 49 m) below the surface (MWA 2009).

In 2005, water withdrawals from surface waters and groundwater in San Bernardino County were 656,900 ac-ft/yr (860 million m^3/yr), of which 57% came from surface waters and 43% came from groundwater. The largest water use category was municipal and domestic supply, at 427,100 ac-ft/yr (527 million m^3/yr). However, the majority of this water is used in the larger cities located in the southwestern portion of San Bernardino County. Agricultural water uses accounted for 167,000 ac-ft/yr (206 million m^3/yr), while industrial and thermoelectric water uses accounted for 29,150 and 33,630 ac-ft/yr (36 million and 41 million m^3/yr), respectively (Kenny et al. 2009). Consumptive water use in the rural areas near the proposed SEZ totaled 26,400 ac-ft/yr (32.5 million m^3/yr) in 2001, with 58% for agricultural use, 24% for industrial use, and 9% each for municipal and recreational uses (MWA 2004; Baja region).

9.3.22.3.4 Climate Change

Global warming continues to affect many desert areas in the Southwest with increased temperatures and prolonged drought during the past 20 to 30 years. A report on global climate change in the United States prepared on behalf of the National Science and Technology Council by the U. S. Global Research Program (GCRP 2009) documents current temperature and precipitation conditions and historic trends, and projects impacts during the remainder of GHG emissions. The report summarizes the science of climate change and the recent and future impacts of climate change on the United States. The following excerpts from that report indicate there has been a trend for increasing global temperature and decrease in annual precipitation in desert regions:

- Average temperature in the U.S. increased more than 2ºF (1.1ºC) over the period of 1957 to 2007.

- Southern areas, particularly desert regions of southern Arizona and southeastern California, have experienced longer drought and are projected to have more severe periods of drought during the remainder of the twenty-first century. Much of the Southwest has experienced drought conditions since 1999. This period represents the most severe drought in 110 years.

- The incidence of wildfires in the western United States has increased in recent decades, partly because of increased drought.

- Temperature increases in the next 20 to 30 years are expected to be strongly correlated with past emissions of heat-trapping gases, such as CO_2 and methane.

- Many extreme weather events have increased both in frequency and intensity during the last 40 to 50 years. Precipitation and runoff are expected to decrease in the Southwest in spring and summer based on current data and anticipated temperature increases. Water use will increase over the next several decades as the population of southern California grows, resulting in tradeoffs between competing uses.

- Climate project models also show a 10 to 20% decline in runoff in California and Nevada for the period 2041 to 2060 compared with data from 1901 to 1970 used as a baseline.

- In the Southwest, average temperatures increased about 1.5ºF (0.8ºC) in 2000 compared with a baseline period of 1960 to 1979. By the year 2020, temperatures are projected to rise 2 to 3ºF (1.1 to 1.7ºC) above the 1960 to 1979 baseline.

Increased global temperatures from GHG emissions will likely continue to exacerbate drought in the southern California deserts. The State of California has prepared several reports on climate change impact predictions through the remainder of the twenty-first century. Those reports address topics such as economics, ecosystems, water use/availability, impacts on Santa Ana winds, agriculture, timber production, and snowpack. The California climate change portal Web site (http://www.climatechange.ca.gov/publications/cat/index.html) lists the Climate Action Team reports that are submitted to the governor and state legislature. These reports are included as final papers of the CEC's Public Interest Energy Research Program.

9.3.22.4 Cumulative Impacts on Resources

This section addresses potential cumulative impacts in the proposed Pisgah SEZ on the basis of the following assumptions: (1) because of the relatively large size of the proposed SEZ (more than 10,000 acres [40.5 km^2] but less than 30,000 acres [121 km^2]), as many as two projects could be constructed at a time, and (2) maximum total disturbance over 20 years would be about 19,160 acres (345 km^2) (80% of the entire proposed SEZ). For analysis, it is also assumed that no more than 3,000 acres (12.1 km^2) would be disturbed per project annually and 250 acres (1.01 km^2) monthly on the basis of construction schedules planned in current applications. Two existing high-capacity transmission lines (230 and 500 kV) run through the SEZ; therefore, for this analysis, the impacts of construction and operation of new transmission were not assessed. Regarding site access, because I-40 runs from east to west through the SEZ, no major road construction activities outside of the SEZ would be needed for development to occur in the SEZ.

Cumulative impacts in each resource area that would result from the construction, operation, and decommissioning of solar energy development projects within the proposed SEZ when added to other past, present, and reasonably foreseeable future actions described in the previous section are discussed below. At this stage of development, because of the uncertainties of the future projects in terms of location within the proposed SEZ, size, number, and the types of technology that would be employed, the impacts are discussed qualitatively or semi-quantitatively, with ranges given as appropriate. More detailed analyses of cumulative impacts would be performed in the environmental reviews for the specific projects in relation to all other existing and proposed projects in the geographic areas.

9.3.22.4.1 Lands and Realty

The area covered by the proposed Pisgah SEZ is a rural and largely undeveloped portion of the western Mojave Desert region. The SEZ consists only of BLM-administered public lands that interface private lands in the area. About 380 acres (1.5 km^2) of state land border the SEZ. There are numerous existing ROW authorizations in the SEZ (Section 9.3.2.1), including I-40, a railroad line, a fiber optic line, four large transmission lines, an electrical substation, four pipelines, and a county road that provides access to a mine surrounded by the SEZ. A Section 368 designated energy corridor roughly follows the route of I-40 trough the SEZ.

Development of the SEZ would introduce a new and discordant land use into an area that is largely rural. In addition, numerous other renewable energy projects are proposed within a

50-mi (80-km) radius of the Pisgah SEZ. As shown in Table 9.3.22.2-2 and Figure 9.3.22.2-1, as many as 14 other solar projects and 26 wind projects have been authorized or have pending applications within this distance. ROW applications totaling more than 9,000 acres (36 km^2) are in place for three fast-track solar proposals, two of which lie within the proposed SEZ (Section 9.3.22.2.1). A far larger area could ultimately be developed for renewable energy projects. As a result of the potential and likely development of other renewable energy projects and accompanying transmission lines, roads, and other infrastructure within the geographic extent of effects, the character of a large portion of the California Desert could be dramatically changed. The contribution to cumulative impacts of utility-scale solar projects on public lands on and around the Pisgah SEZ could be significant, particularly if the SEZ is fully developed with solar projects. Development of the public lands for solar energy production may also result in similar development on the state and private lands in the immediate vicinity of the SEZ.

Construction of utility-scale solar energy facilities within the SEZ would preclude use of those areas occupied by the solar energy facilities for other purposes. The areas that would be occupied by the solar facilities would be fenced, and access to those areas by both the general public and wildlife would be eliminated.

9.3.22.4.2 Specially Designated Areas and Lands with Wilderness Characteristics

The proposed Pisgah SEZ is surrounded by areas of high wilderness and scenic value, including four designated WAs, a WSA, and numerous ACECs with a potential view of the SEZ within 25 mi (40 km) (Section 9.3.3.1). The Pisgah ACEC is located along the eastern boundary of the SEZ, and the Ord-Rodman DWMA is located along the southwestern boundary, while other ACECs lie nearby. Construction of utility-scale solar energy facilities within the SEZ in combination with potential development of other renewable energy projects and associated infrastructure would contribute to the adverse visual impacts on these specially designated areas. Development of the SEZ, especially full development, would be a dominant factor in the viewshed from large portions of these specially designated areas.

Solar development of the proposed Pisgah SEZ, together with that within the geographic extent of effects, would combine to adversely affect wilderness values in the nearby WAs. The I-40 corridor to the east and west of the Pisgah SEZ, in particular, has a large number of pending wind and solar applications that may result in cumulative effects on sensitive areas in those regions.

9.3.22.4.3 Rangeland Resources

The SEZ includes only one grazing allotment, which is being relinquished. Since there would be no effect on livestock grazing, solar development of the area would not contribute to any cumulative effects on livestock grazing. Likewise, since the SEZ is not located within or near either an HA or HMA, there would be no contribution to any adverse effects on wild horses or burros.

9.3.22.4.4 Recreation

The proposed Pisgah SEZ is flat and is of a type and quality that generally does not attract recreational users. However, access into the area is easy, and low levels of recreational use would occur, including backcountry driving, rockhounding, and seasonal nature hikes. It is anticipated there would not be a significant loss of recreational use caused by development of the Pisgah SEZ, although some users would be displaced.

When SEZ development is considered in combination with other potential renewable energy development within the region, the potential would exist for cumulative visual impacts on recreational users of the specially designated areas surrounding the SEZ (Section 9.3.22.4.2) and for users who enjoy backcountry driving. There is substantial potential for loss of wilderness and scenic values throughout the California Desert wherever solar and wind energy development encroaches on wilderness or on other currently undeveloped areas. The overall cumulative impacts on recreational use associated with the loss of wilderness values and general open desert scenery also could be large. While the effects cannot be quantified, desert users might avoid areas dominated by industrial-type solar facilities. This could result in a fundamental change in the way the California Desert has been traditionally used.

9.3.22.4.5 Military and Civilian Aviation

The proposed Pisgah SEZ is completely blanketed under eight MTRs, which are part of a very large, interconnected system of training routes throughout the southwest. The development of any solar energy or transmission facilities that encroach into the airspace of MTRs could create safety issues and could conflict with military training activities. While advance consultation with the DoD is required prior to approval of activities that could adversely affect the use of the MTRs, the military has indicated that solar development on portions of the Pisgah SEZ is compatible with its existing uses regardless of the proposed heights of solar facilities, while other portions should have height limits, and some areas may be incompatible with existing military use. Potential solar development occurring throughout the region, which is currently undeveloped, could result in cumulative effects on the larger system of MTRs. Such effects would be limited by mitigations developed in consultation with the military. With potential solar development occurring throughout the region, not just in SEZs, maintaining a large-picture view of the overall effects on the system of MTRs will be necessary to avoid cumulative effects. Potential effects on military use of military airspace could be limited by mitigation developed in consultation with the military.

9.3.22.4.6 Soil Resources

Ground-disturbing activities (e.g., grading, excavating, and drilling) during the construction phase of a solar project, including any associated transmission lines, would contribute to the soil loss due to erosion. Construction of new roads within the SEZ or improvements to existing roads would also contribute to soil erosion. During construction, operations, and decommissioning of the solar facilities, worker travel and other road use would also contribute to soil loss. These losses would be in addition to losses occurring as a result of disturbance caused by other users in the area, including the potential construction of several other renewable energy facilities, and recreational users, such as off-road vehicle enthusiasts. As discussed in Section 9.3.7.3, programmatic design features would be employed to minimize erosion and loss of soil during the construction, operation, and decommissioning phases of the solar facilities and any associated transmission lines. Landscaping of solar energy facility areas could alter drainage patterns and lead to increased siltation of surface-water streambeds, in addition to that caused by other development activities. Even with the expected design features in place, cumulative impacts from the disturbance of several large sites and connecting linear facilities in the vicinity could be significant.

9.3.22.4.7 Minerals (Fluids, Solids, and Geothermal Resources)

Currently, there are 103 mining claims (lode, placer, and millsite) within the proposed Pisgah SEZ, most of which are located in the southern portion of the SEZ south of I-40. There are no oil and gas or geothermal leases within the proposed SEZ, while the area remains open for discretionary mineral leasing.

Existing mining claims would preclude solar energy development and could prevent solar development in some areas as long as they are in place. Where solar development can proceed, there would be no expected loss of mineral production. The cumulative effects of future renewable energy development on mineral production within the geographic extent of effects is similarly expected to be small, as existing claims would not be affected.

9.3.22.4.8 Water Resources

The water requirements for development and operation of various utility-scale solar energy technologies on the proposed SEZ are described in Sections 9.3.9.2. If the SEZ were fully developed over 80% of its available land area, the amount of water needed during the peak construction year for the various solar technologies evaluated would be 1,745 to 2,566 ac-ft (2,200 to 3,200 thousand m^3). The amount of water needed during decommissioning would be similar to or less than the amount used during construction. During operations, the amount of water needed for all solar technologies evaluated would range from 108 to 57,500 ac-ft/yr (0.13 to 71 million m^3/yr), with PV representing the lower end of this range. Since the availability of groundwater (the primary water resource available to solar energy facilities in the SEZ) is limited, it would not be feasible to obtain the upper end of the water requirements range.

The levels of water use needed for build-out with wet cooling are clearly not feasible for the water resources available in the region. In areas of the SEZ that would draw groundwater from the Lavic Valley basin, about 80% of the SEZ, only PV would be sustainable under roughly estimated recharge rates of only about 300 ac-ft/yr (0.37 million m^3/yr) (Section 9.3.9.2.2).

Currently two fast-track applications for development of a solar energy project within the Pisgah SEZ are pending (Table 9.3.22.2-2). Considering technology-specific water use rates

(Section 9.3.9) and assuming dish-engine technology, such a facility could require up to 60,000 ac-ft/yr (74 million m^3/yr) if wet cooled, or 430 ac-ft/yr (0.53 million m^3/yr). This use rate could be sustainable even in the Lavic Valley basin, assuming the application of water conservation measures.

The development of the third fast-track solar project within the geographic extent of effects, CACA 49561, a proposed 45-MW PV facility about 30 mi (48 km^2) southwest of the SEZ (Section 9.3.22.2.1), would draw minimal water and not contribute to cumulative impacts. However, the several pending solar energy project proposals for locations on or within a few miles east and southeast of the SEZ (Figure 9.3.22.2-1), if approved, could draw from the Lavic Valley groundwater basin and thus contribute to cumulative impacts within the SEZ. Therefore, cumulative impacts on groundwater basins underlying the Pisgah SEZ from currently foreseeable projects within the geographic extent of effects could be moderate.

With respect to wastewaters, the small quantities of sanitary wastewater that would be generated during the construction and operation of utility-scale solar energy facilities within the Pisgah SEZ in combination with similarly small volumes from other foreseeable projects would not be expected to strain available sanitary wastewater treatment facilities in the general area of the SEZ. Blowdown water from cooling towers for wet-cooled technologies would be treated within a project site (e.g., in settling ponds) and injected into the ground, released to surface water bodies, or reused, and thus would not contribute cumulative impacts to any nearby treatment systems.

9.3.22.4.9 Vegetation

The proposed Pisgah SEZ is located within the Mojave Basin and Range ecoregion, which primarily supports creosotebush (*Larrea tridentata*) habitats. Annual precipitation in the Mojave Desert occurs primarily in winter and averages only about 4.1 in. (105 mm) in the area of the SEZ. No wetlands occur within the SEZ or within the 5-mi (8-km) area of indirect effects. Troy Lake, a dry lakebed located in the western portion of Pisgah, occasionally holds shallow surface water and is sparsely vegetated. Troy Lake is primarily classified as North American Warm Desert Playa. If utility-scale solar energy projects were to be constructed within the SEZ, all vegetation within the footprints of the facilities would likely be removed during land-clearing and land-grading operations.

Numerous other renewable energy projects are proposed within a 50-mi (80-km) radius of the proposed Pisgah SEZ. As many as 14 other solar projects and 26 wind projects have authorized or pending applications within this distance. ROW applications totaling more than 9,000 acres (36 km^2) are in place for three fast-track solar proposals, two of which lie within the proposed SEZ (Section 9.3.22.2.1). Depending on the actual development of renewable energy projects within and outside the SEZ and accompanying transmission lines, roads, and other infrastructure within the geographic extent of effects, cumulative impacts on certain cover types could occur, particularly those that favor the creosote flats, which are suitable for solar facilities. Rare and sensitive cover types present in the SEZ might also be affected cumulatively, including Inter-Mountain Basins Shale Badland and North American Warm Desert Pavement. Other, less common, potentially affected cover types include North American Warm Desert Volcanic Rockland and North American Warm Desert Playa. In addition, groundwater withdrawals near Troy Lake playa could further deplete the Lower Mojave Valley regional groundwater system and affect discharges at springs and seeps along the Mojave River that support riparian habitats, which could cumulatively degrade these habitats.

In addition, the cumulative effects of fugitive dust generated during the construction of solar facilities along with other activities in the area, such as transportation and recreation, could increase the dust loading in habitats outside a solar project area, which could result in reduced productivity or changes in plant community composition. Programmatic design features would be implemented to reduce the impacts from solar energy projects and thus reduce the overall cumulative impacts on plant communities and habitats.

9.3.22.4.10 Wildlife and Aquatic Biota

As many as 166 species of wildlife, including amphibians (1 species), reptiles (30 species), birds (100 species), and mammals (35 species), occur in and around the proposed Pisgah SEZ (Section 9.3.11). The construction of utility-scale solar energy projects in the SEZ and of any associated transmission lines and roads in or near the SEZ would have impacts on wildlife through habitat disturbance (i.e., habitat reduction, fragmentation, and alteration), wildlife disturbance, loss of connectivity between natural areas (e.g., habitat fragmentation and blockage of dispersal corridors for bighorn sheep and desert tortoise), and wildlife injury or mortality. In general, affected species that have broad distributions and occur in a variety of habitats would be less affected than species with a narrowly defined habitat within a restricted area. Programmatic design features include pre-disturbance biological surveys to identify key habitat areas used by wildlife, followed by avoidance or minimization of disturbance to those habitats (e.g., avoiding development in Homer Wash).

As many as 14 other solar projects and 26 wind projects have authorized or pending applications within 50 mi (80 km) of the SEZ. ROW applications totaling more than 9,000 acres (36 km^2) are in place for three fast-track solar proposals, two of which lie within the proposed SEZ (Section 9.3.22.2.1). Depending on the actual development of renewable energy projects within and outside the SEZ and of accompanying transmission lines, roads, and other infrastructure within the geographic extent of effects, cumulative impacts on some wildlife species could be significant, particularly those with habitats or migratory routes in the basin flats, which are suitable for solar facilities.

While many of the wildlife species have extensive habitat available within the affected counties, where projects are closely spaced, the cumulative impact on a particular species could be moderate to large. Current applications for solar and wind projects are mainly clustered along the I-40 corridor, where cumulative impacts would be greatest. Programmatic design features would be used to reduce the impacts from solar energy projects and thus reduce the overall cumulative impacts on wildlife. However, even with mitigations in place, cumulative impacts could be moderate within the geographic extent of effects.

Because no wetlands are present within the proposed SEZ or within a 5-mi (8-km) radius of indirect effects, and Troy Lake is normally dry, no aquatic biota are present within the SEZ. Thus, there would be no cumulative impacts on aquatic biota and habitats resulting from solar development within the SEZ. Increased future demand on groundwater for multiple uses, including solar power development within the SEZ, could affect surface-water levels outside of the SEZ, including the Mojave River, and cumulatively affect aquatic organisms in those water bodies.

9.3.22.4.11 Special Status Species (Threatened, Endangered, Sensitive, and Rare Species)

Seven special status species are known to occur within the affected area of the proposed Pisgah SEZ: desert tortoise, which is listed as threatened under the ESA and CESA; white-margined beardtongue, Mojave fringe-toed lizard, Bendire's thrasher, and Nelson's bighorn sheep, which are BLM-designated sensitive species; and Emory's crucifixion-thorn and small-flowered androstephium, which are considered rare species. Numerous additional species occurring on or in the vicinity of the SEZ are listed as threatened or endangered by the State of California or are listed as a sensitive species by the BLM. Programmatic design features that could be used to reduce or eliminate the potential for cumulative effects on these species from the construction and operation of utility-scale solar energy projects within the geographic extent of effects include avoidance of habitat, translocation of individuals, and minimization of erosion, sedimentation, and dust deposition.

Numerous reasonably foreseeable future actions could occur within the geographic extent of effects of the proposed Pisgah SEZ, including as many as 14 other solar projects and 26 wind projects, which have authorized or pending applications within this distance. Three fast-track solar proposals covering more than 9,000 acres (36 km^2) lie with the geographic extent of effects, and two of these lie within the SEZ. Many or all of the special status species found within the proposed Pisgah SEZ are also likely to be present at the locations of other renewable energy projects, particularly solar projects located in creosote flats. However, projects in these and other areas would employ design features to reduce or eliminate the impacts on protected species as required by the ESA and other applicable federal and state laws and regulations.

Depending on the number and size of other projects that will actually be built in the next 20 to 30 years within the geographic extent of effects, there could be cumulative impacts on protected species due to habitat destruction and overall development and fragmentation of the area. Habitats that are particularly at risk are those in basin flats suited for solar development. In particular, the functioning of the Chemehuevi DWMA could be cumulatively affected with respect to connectivity, control of desert tortoise disease, and predation. Together, several new solar facilities and the other associated actions would have a cumulative impact on wildlife. Where projects are closely spaced, particularly along the I-40 corridor, moderate cumulative impact on a particular species could occur.

9.3.22.4.12 Air Quality and Climate

While solar energy generates minimal emissions compared with fossil fuel–generated energy, the site preparation and construction activities associated with solar energy facilities would produce some emissions, mainly particulate matter (fugitive dust) and engine exhaust emissions from construction equipment and vehicles. When these emissions are combined with those from other projects near solar energy facilities or when they are added to natural dust generated by winds and wind erosion, the air quality in the general vicinity of the projects could be temporarily degraded. For example, particulate matter (dust) concentration at or near the SEZ boundaries could at times exceed state or federal ambient air quality standards. Generation of dust from construction activities can be partially controlled by implementing aggressive dust control measures, such as increased watering frequency or road paving or treatment, and/or sound practices such as minimizing activities under unfavorable meteorological conditions.

Numerous other renewable energy projects are proposed or planned within the air basin shared by Pisgah (Section 9.3.22.2.1 and Figure 9.3.22.2-1). Three fast-track solar proposals covering more than 9,000 acres (36 km^2) lie with the geographic extent of effects, two within the SEZ, while a total of 14 solar and 26 wind proposals have authorized or pending applications within 50 mi (80 km) of the proposed Pisgah SEZ. The fast-track projects could have overlapping construction schedules, since they would be expected to be constructed roughly in 2011 to 2013. These projects, in combination with others with pending applications, could produce periods of elevated particulate matter and engine exhaust emissions in the affected area. Due to predominant westerly winds (more than 70% of the time), potential impacts on residences and communities, which are mainly upwind of the SEZ, would be relatively small.

Over the long term and across the region, the development of solar energy may have beneficial cumulative impacts on the air quality and atmospheric values in southern California by offsetting the need for energy production with fossil fuels, which result in higher levels of emissions. As discussed in Section 9.3.13, air emissions from operating solar energy facilities are relatively minor, while the displacement of criteria air pollutants, VOCs, TAPs, and GHG emissions currently produced from fossil fuels could be relative large. For example, if the Pisgah SEZ were fully developed (80% of its acreage) with solar facilities, the quantity of pollutants avoided could be as large as 6.3% of all emissions from the current electric power systems in California (Section 9.3.13.2.2).

9.3.22.4.13 Visual Resources

The proposed Pisgah SEZ is located within the east–west trending Mojave Valley, which is relatively flat and is characterized by wide open views. Generally good air quality allows visibility for 50 mi (80 km) or more under favorable atmospheric conditions. The proposed SEZ site is a largely treeless plain, with the northeastern portion sloping upward toward the Cady Mountains; Pisgah Crater is located on the south border of the site. Surrounding mountain ranges generally block views to and from neighboring valleys, while the view is more open to the east of the SEZ. Within the valley, views are afforded of the SEZ, the rest of the valley, and the surrounding mountains. The VRI classes for the SEZ are VRI Class II, indicating high relative visual values, Class III, indicating moderate relative visual values, and Class IV, indicating low relative visual values. The VRI values indicate moderate sensitivity associated with a moderate level of use, largely due to traffic on I-40 and U.S. Route 66, and a moderate level of public interest, due primarily to national interest in U.S. Route 66. Special area sensitivity is ascribed to the SEZ due to its inclusion within the CDCA. The site is also visible from several ACECs and in general is close to several other specially designated areas, indicating moderate visual sensitivity.

Development of utility-scale solar energy projects within the SEZ would contribute to the cumulative visual impacts in the general vicinity of the SEZ and in the Mohave Valley. However, the exact nature of the visual impacts and the design features that would be appropriate would depend on the specific project locations within the SEZ and on the solar technologies used. Such impacts and potential design features would be considered in visual analyses conducted for specific future projects. In general, large visual impacts on the SEZ would be expected to occur as a result of the construction, operation, and decommissioning of utility-scale solar energy projects. These impacts would be expected to involve major modification of the existing character of the landscape and would likely dominate the views for some nearby viewers. Additional impacts would occur as a result of the construction, operation, and decommissioning of related facilities, such as access roads and electric transmission lines.

Some lands outside the SEZ would also be subjected to visual impacts related to the construction, operation, and decommissioning of utility-scale solar energy development, due to the large size of such facilities, the large number of pending applications on public lands in the area, and the relatively flat, open nature of the proposed SEZ. Potential impacts would include night sky pollution, including increased skyglow, light spillage, and glare. Some of the affected lands outside the SEZ would include potentially sensitive scenic resource areas, including the four WAs, two WSAs, the Old Spanish National Historic Trail, and the CDCA. These sensitive visual resource areas would be subject to major to minimal visual impacts. Visual impacts resulting from solar energy development within the SEZ would be in addition to impacts caused by other potential projects in the area, such as other solar facilities on private lands, transmission lines, and other renewable energy facilities, including windmills. The presence of new facilities would normally be accompanied by increased numbers of workers in the area, traffic on local roadways, and support facilities, all of which would add to cumulative visual impacts.

As many as 14 solar and 26 wind projects have authorized or pending applications on public lands within 50 mi (80 km) of the SEZ. While the overall extent of cumulative effects of renewable energy development in the area would depend on the number of projects that are actually built, it may be concluded that the general visual character of the landscape could be transformed from primarily rural desert to more commercial-industrial in nature as a consequence of these developments. Because of the topography of the region, solar facilities, located in flat basins, would be visible at great distances from sensitive viewing locations in the surrounding mountains. Also, the developments would be located near major roads, thus the facilities would be viewable by motorists. However, some portions of major roads where solar energy facilities would be located are currently visually affected by transmission line corridors, towns, and other infrastructure, as well as the road system itself.

In addition to cumulative visual impacts associated with views of particular future facilities, as additional facilities are added, several projects might become visible from one location or in succession as viewers move through the landscape, for example, as viewers drive on local roads. In general, the new facilities would likely vary in appearance, and depending on the number and type of facilities, the resulting visual disharmony could exceed the visual absorption capability of the landscape and add significantly to the cumulative visual impact. Thus, the overall cumulative visual impacts in the region from solar and wind energy development would be significant.

9.3.22.4.14 Acoustic Environment

The areas around the proposed Pisgah SEZ and in San Bernardino County, in general, are relatively quiet. The existing noise sources include road traffic, railroad traffic, aircraft flyovers, agricultural activities, industrial activities including mining, and activities and events at nearby communities. During construction of solar energy facilities, construction equipment could increase the noise levels over short durations during the day. After the facilities are constructed and begin operating, there would be little or minor noise impacts for any of the technologies, except from solar dish engine facilities and from parabolic trough or power tower facilities using TES. It is possible that residents could be cumulatively affected by more than one solar or other development built in close proximity to the SEZ, particularly at night when noise is more discernable due to relatively low background levels. However, such cumulative impacts are unlikely due to the expected wide separation of facilities and the sparse population of the region.

9.3.22.4.15 Paleontological Resources

The potential for impacts on significant paleontological resources at the Pisgah SEZ in the Mojave Valley is unknown. The specific sites selected for future projects would be surveyed if determined to be necessary by the BLM, and any paleontological resources encountered would be avoided or mitigated to the extent possible. A similar process would be employed at other facilities constructed in the area, and no significant cumulative impacts on paleontological resources are expected.

9.3.22.4.16 Cultural Resources

Direct impacts on significant cultural resources during site preparation and construction activities could occur in the proposed Pisgah SEZ. However, further investigation would be needed, including a cultural resource survey of the entire area of potential effects to identify historic properties (i.e., cultural resources eligible for listing in the NHRP). It is possible that the development of utility-scale solar energy projects in the Pisgah SEZ and other projects likely to occur in the area could contribute cumulatively to cultural resource impacts. However, historic properties would be avoided or mitigated to the extent possible, in accordance with state and federal regulations. Similarly, through ongoing consultation with the California SHPO and appropriate Native American governments, it is likely that many adverse effects on significant resources in the area could be mitigated to some degree, although some visual impacts may not be mitigable to the satisfaction of all interested parties. The increment of adverse effects from solar energy development on the overall cumulative effect on cultural resources would depend on the nature of the resources affected, and could be significant.

9.3.22.4.17 Native American Concerns

Government-to-government consultation has been initiated with federally recognized Tribes whose traditional use areas include the Pisgah SEZ area in order to identify Tribal concerns regarding solar energy development within the SEZ. Among the concerns expressed by the Tribes regarding solar energy development in the California deserts is the impairment of culturally and religiously important landscapes, including adverse impacts on culturally important native plant and game species. It is likely that the development of utility-scale solar energy projects within the SEZ, when added to other potential projects likely to occur in the area, including renewable energy projects outside the SEZ, would contribute cumulatively to visual impacts on their traditional landscape and the destruction of other resources in the valley important to Native Americans. The Pisgah SEZ vicinity has experienced past impacts from highways, transmission lines, and other infrastructure along I-40. Continued government-to-government consultation with the area Tribes is necessary to effectively consider and address the cumulative impacts of solar energy development in the Pisgah SEZ on resources important to the Tribes.

9.3.22.4.18 Socioeconomics

Solar energy development projects in the proposed Pisgah SEZ could cumulatively contribute to socioeconomic effects in the immediate vicinity of the SEZs and in the surrounding multicounty ROI. The effects could be positive (e.g., creation of jobs and generation of extra income, increased revenues to local governmental organizations through additional taxes paid by the developers and workers) or negative (e.g., added strain on social institutions such as schools, law enforcement agencies, and health care facilities). Impacts from solar development would be most intense during facility construction, but of greatest duration during operations. Construction in the Pisgah SEZ and at other new projects in the area, including other renewable energy development, would temporarily increase the number of workers in the area needing housing and services. The number of workers involved in the construction of solar projects in the proposed Pisgah SEZ alone could range from about 260 to 3,500 in the peak construction year, depending on the technology being employed, with solar PV facilities at the low end and solar trough facilities at the high end. The total number of jobs created in the area could range from approximately 800 (solar PV) to as high as 10,700 (solar trough).

Cumulative socioeconomic effects in the ROI from construction of solar facilities would occur to the extent that multiple construction projects of any type were ongoing simultaneously. It is a reasonable expectation that this condition would occur within a 50-mi (80-km) radius of the SEZ occasionally over the solar development period of 20 years or more. Anticipated projects with advanced proposals, including three fast-track solar projects, could place a modest short-term strain on local resources in this sparsely populated area during the period 2011 to 2013, when a number of projects might be constructed.

Annual impacts during the operation of solar facilities would be less, but could last 20 to 30 years and could combine with those from other new projects in the area. The number of workers needed at the solar facilities within the SEZ would be in the range of 40 to 840, with approximately 60 to 1,400 total jobs created in the region, depending on the solar technologies used. Population increases resulting from renewable energy development within 50 mi (80 km) of the proposed Pisgah SEZ would contribute to general population growth experienced in the region in recent years. The overall socioeconomic impacts would be positive, through the creation of additional jobs and income. The negative impacts, including some short-term disruption of rural community quality of life, would not be considered large enough to require SEZ-specific design features.

9.3.22.4.19 Environmental Justice

Solar development within the proposed Pisgah SEZ could have impacts on minority and low-income populations within 50 mi (80 km) of the proposed Pisgah SEZ in California; however, such impacts are expected to be small, mainly from dust emissions during construction and potentially noise from some solar technologies during the operation of solar facilities (Section 9.3.20.2). Such impacts, however, would not be expected to contribute to cumulative impacts on minority and low-income populations, as they are generally of short duration and range.

9.3.22.4.20 Transportation

During construction activities, there could be up to 1,000 workers commuting to a single construction site at the SEZ. I-40 and the National Trails Highway would experience small impacts for single projects that may have up to 1,000 daily workers, with an additional 2,000 vehicle trips per day (maximum). Such an increase is approximately 15% of the current traffic on I-40 near the SEZ and could have small cumulative impacts in combination with existing traffic levels and increases from additional future projects in the area. Should two large projects with approximately 1,000 daily workers each be under development simultaneously, cumulative impacts on I-40 and other local roads could be moderate.

Local road improvements may be necessary near site access points. Any impacts during construction activities would be temporary. The impacts could be mitigated to some degree by having different work hours for projects within the SEZ. Traffic increases during operation would be reduced because of the lower number of workers needed to operate solar facilities and would have a smaller contribution to cumulative impacts.

9.3.23 References

Note to Reader: This list of references identifies Web pages and associated URLs where reference data were obtained for the analyses presented in this PEIS. It is likely that at the time of publication of this PEIS, some of these Web pages may no longer be available or their URL addresses may have changed. The original information has been retained and is available through the Public Information Docket for this PEIS.

Abengoa Solar, Inc., 2009, "Application for Certification Filed with the California Energy Commission to Construct and Operate the Mohave Solar Power Plant Project." Available at http://www.energy.ca.gov/sitingcases/abengoa/documents/applicant/afc/volume_01/2.0_Project_Description. Accessed Jan. 25, 2010.

AECOM (Architectural Engineering, Consulting, Operations and Maintenance), 2009, *Project Design Refinements*. Available at http://energy.ca.gov/sitingcases/beacon/documents/applicant/refinements/002_WEST1011185v2_Project_Design_Refinements.pdf. Accessed Sept. 2009.

African American Environmentalist Association, 2009, *Governor Schwarzenegger Vetoes AB 1404*. Available at http://aaenvironment.blogspot.com/2009/10/governor-schwarzeneggervetoes-ab-1404.html. Accessed Nov. 16, 2009.

Bassett, A.M., and D.H. Kupfer, 1964, *A Geologic Reconnaissance in the Southeastern Mojave Desert, California*, Special Report 83, California Division of Mines and Geology.

Beacon Solar, LLC, 2008, *Application for Certification for the Beacon Solar Energy Project*, submitted to the California Energy Commission, March. Available at http://www.energy.ca.gov/sitingcases/beacon/index.html.

Bean, L.J., and C.R. Smith, 1978, "Serrano," pp. 570–575 in *Handbook of North American Indians, Vol. 8, California,* R.F. Heizer (editor), Smithsonian Institution, Washington, D.C.

Beranek, L.L., 1988, *Noise and Vibration Control*, rev. ed., Institute of Noise Control Engineering, Washington, D.C.

Blaine, L., 2010, "Recreation Use, Pisgah SEZ," personal communication from Blaine (Bureau of Land Management, Barstow Field Office, Barstow, Colo.) to J. May (Argonne National Laboratory, Lakewood, Colo.), April 13.

BLM (Bureau of Land Management), 1980, *Green River–Hams Fork Draft Environmental Impact Statement: Coal*, Denver, Colo.

BLM, 1983, *Final Supplemental Environmental Impact Statement for the Prototype Oil Shale Leasing Program,* Colorado State Office, Denver, Colo., Jan.

BLM, 1984, *Visual Resource Management*, BLM Manual Handbook 8400, Release 8-24, U.S. Department of the Interior.

BLM, 1986a, *Visual Resource Inventory*, BLM Manual Handbook 8410-1, Release 8-28, U.S. Department of the Interior, Jan.

BLM, 1986b, *Visual Resource Contrast Rating*, BLM Manual Handbook 8431-1, Release 8-30, U.S. Department of the Interior, Jan.

BLM, 1996, *White River Resource Area Proposed Resource Management Plan and Final Environmental Impact Statement*, Colorado State Office, White River Resource Area, Craig District, Colo., June.

BLM, 1999, *The California Desert Conservation Area Plan, 1980 as Amended,* California Desert District Office, Riverside, Calif., Aug. 17.

BLM, 2001, *California Water Rights Fact Sheet*. Available at http://www.blm.gov/nstc/WaterLaws/california.html.

BLM, 2003, *California Desert Conservation Area Plan Amendment–Western Mojave Desert Off-Road Vehicle Designation Project*.

BLM, 2007a, *Potential Fossil Yield Classification (PFYC) System for Paleontological Resources on Public Lands*, Instruction Memorandum No. 2008-009, with attachments, Washington, D.C., Oct. 15.

BLM, 2008*, Assessment and Mitigation of Potential Impacts to Paleontological Resources*, Instruction Memorandum No. 2009-011, with attachments, Washington, D.C., Oct. 10.

BLM, 2009a, *Herd Management Areas California*, Washington, D.C. Available at http://www.blm.gov/pgdata/etc/medialib/blm/wo/Planning_and_Renewable_Resources/wild_horses_and_burros/statistics_and_maps/new_hma_state_maps.Par.22729.File.dat/HMA_California.pdf. Accessed Oct. 20, 2009.

BLM, 2009b, *HA and HMA Data through Fiscal Years 2005–2009*, Washington, D.C. Available at http://www.blm.gov/wo/st/en/prog/wild_horse_and_burro/wh_b_information_center/statistics_and_maps/ha_and_hma_data.html. Accessed Oct. 19, 2009.

BLM, 2009c, *GeoCommunicator—NILS National Integrated Land System Interactive Maps.* Available at http://www.geocommunicator.gov/GeoComm/index.shtm. Accessed Sept. 14, 2009, and April 13, 2010.

BLM, 2009d, *Rangeland Administration System*. Available at http://www.blm.gov/ras/index.htm. Last updated Aug. 24, 2009. Accessed March 16, 2010.

BLM, 2009e, *Granite Mountain Wind Energy Project Environmental Impact Statement, Environmental Impact Report, and Amendment to the California Desert Conservation Area Plan.* Available at http://www.blm.gov/ca/st/en/fo/barstow/granit_wind_energy.html. Accessed Jan. 27, 2010.

BLM, 2009f, "Pending and Authorized Wind Energy Applications," BLM California Desert District Web site. Available at http://www.blm.gov/pgdata/etc/medialib/blm/ca/pdf/pa/energy/wind.Par.9224.File.dat/Renew_Energy_2_09_wind.pdf. Accessed Feb. 16, 2010.

BLM, 2010a, *Solar Energy Interim Rental Policy,* U.S. Department of the Interior. Available at http://www.blm.gov/wo/st/en/info/regulations/Instruction_Memos and Bulletins/national instruction/2010/IM_2010-141.html.

BLM, 2010b, *BLM Database of Renewable Energy Projects in California*. Available at http://www.blm.gov/pgdata/etc/medialib/blm/ca/pdf/cdd/energy.Par.58144.File.dat/Renew_Energy_2_09_public.xls. Accessed Jan. 26, 2010.

BLM, 2010c, *Calico Solar (SES Solar One) Project Comment Period, Workshop and Informational Meeting Set*, BLM press release, April 2. Available at www.blm.gov/ca/st/en/info/CDD1051_calico_solar_meeting.html. Accessed May 4, 2010.

BLM, 2010d, "Notice of Intent to Prepare and Environmental Impact Statement/Staff Assessment and Land Use Plan Amendment for the SES Solar One Project, San Bernardino County, CA," *Federal Register*, Vol. 74, No. 108, pp. 27176–27178, June 8, 2009. Available at http://www.blm.gov/ca/st/en/info/fed_reg_archives/2009/june/Solar_One_NOI.print.html. Accessed Jan. 25, 2010.

BLM, 2010e, "Notice of Availability of the Draft Environmental Impact Statement for the Proposed Chevron Energy Solutions Lucerne Valley Solar Project, San Bernardino County, CA, and the Draft California Desert Conservation Area Plan Amendment," *Federal Register*, Vol. 75, No. 24, pp. 6057–6058, Feb. 5, 2010. Available at http://www.blm.gov/ca/st/en/info/fed_reg_archives/2010/02/ChevronLucernValleyNOA.html.

BLM, 2010f, "Notice of Availability of the Draft Granite Mountain Wind, LLC Wind Energy Generation Project Environmental Impact Statement/Environmental Impact Report, California, and the Draft California Desert Conservation Area Plan Amendment," *Federal Register*, Vol. 75, No. 63, pp. 16827–16828, April 2. Available at http://www.blm.gov/ca/st/en/info/fed_reg_archives/2010/04/granite_wind_NOA.html.

BLM, 2010g, "Wind Applications & Authorizations," BLM California Desert District Web site. Available at http://www.blm.gov/ca/st/en/prog/energy/wind.html. Accessed Oct. 7, 2010.

BLM, 2010h, *Visual Resource Inventory,* prepared for U.S. Department of the Interior Bureau of Land Management, Needles Field Office, Needles, Calif, Sept.

BLM and CA SHPO (The California State Historic Preservation Officer), 2010, *Programmatic Agreement among the Bureau of Land Management - California, the California Energy Commission, Calico Solar, LLC, and the California State Historic Preservation Officer, Regarding the Calico Solar Project – San Bernardino County, California,* Sept.

BLM and USFS, 2010a, *GeoCommunicator: Mining Map*. Available at http://www.geocommunicator.gov/GeoComm/index.shtm. Accessed Nov. 3, 2010.

BLM and USFS, 2010b, *GeoCommunicator: Energy Map*. Available at http://www.geocommunicator.gov/GeoComm/index.shtm. Accessed Nov. 3, 2010.

BNSF (Burlington Northern Santa Fe) Railway, 2005, "BNSF Railway California Operating Division," System Map for the California Operating Division. Available at http://www.bnsf.com/tools/reference/division_maps/div_ca.pdf. Accessed Dec. 10, 2009.

BNSF, 2010, "BNSF Revenue Station List," for the County of San Bernardino in California. Available at http://www.bnsf.com/bnsf.was6/refFilesStation/StationCentralController. Accessed April 1, 2010.

Bryant, W.A., and E.W. Hart, 2007, *Fault-Rupture Hazard Zones in California—Alquist-Priolo Earthquake Fault Zoning Act with Index to Earthquake Fault Zones Maps, Interim Revision*, California Geological Survey, California Department of Conservation.

Bryce, S.A., et al., 2003, "Ecoregions of Nevada," color poster with map, descriptive text, summary tables, and photographs, U.S. Geological Survey, Reston, Va.

BTS (Bureau of Transportation Statistics), 2009, *Air Carriers: T-100 Domestic Segment (All Carriers),* Research and Innovative Technology Administration, U.S. Department of Transportation. Available at http://www.transtats.bts.gov/Fields.asp?Table_ID=311. Accessed Feb. 28, 2010.

California Department of Finance, 2010, *Population Projections by Race and Ethnicity for California and Its Counties, 2000–2050*. Available at http://www.dof.ca.gov/research/demographic/reports/projections/p-1/documents/P-1%20Report%20Tables.xls.

CalPIF (California Partners in Flight), 2009, *The Desert Bird Conservation Plan: A Strategy for Protecting and Managing Desert Habitats and Associated Birds in California. Version 1.0*. Available at http://www.prbo.org/calpif/plans.html. Accessed March 3, 2010.

Caltrans (California Department of Transportation), 2009a, *Traffic Counts*, Traffic Data Branch. Available at http://traffic-counts.dot.ca.gov. Accessed Feb. 20, 2010.

Caltrans, 2009b, "2008 Ramp Volumes on the California State Freeway System, District 8 (Includes Counties: Riverside, San Bernardino)," Division of Traffic Operations, State of California Business, Transportation, and Housing Agency. Available at http://www.dot.ca.gov/hq/traffops/saferesr/trafdata/08ramps/D82008ramps.PDF. Accessed April 1, 2010.

CARB (California Air Resources Board), 2010a, *Greenhouse Gas Inventory Data–2000 to 2006*. Available at http://www.arb.ca.gov/cc/inventory/data/data.htm. Accessed March 15, 2010.

CARB, 2010b, *California Ambient Air Quality Standards (CAAQS).* Available at http://www.arb.ca.gov/research/aaqs/caaqs/caaqs.htm. Accessed March 15, 2010.

CARB, 2010c, *Area Designations 2010, Attachment C: Maps and Tables of Area Designations for State and National Ambient Air Quality Standards.* Available at http://www.arb.ca.gov/regact/2010/area10/area10.htm. Accessed March 16, 2010.

CASQA (California Stormwater Quality Association), 2003, *Stormwater Best Management Practice Handbook: Industrial and Commercial*, Menlo Park, Calif.

CDFG (California Department Fish and Game) 2008, *Life History Accounts and Range Maps—California Wildlife Habitat Relationships System*, Sacramento, Calif. Available at http://dfg.ca.gov/biogeodata/cwhr/cawildlife.aspx. Accessed Feb. 19, 2010.

CDFG, 2010a, California *Wildlife Habitat Relationships System (CWHRS).* Available at http://www.dfg.ca.gov/biogeodata/cwhr. Accessed March 4, 2010.

CDFG, 2010b, *California Natural Diversity Database (CNDDB)*. Available at http://www.dfg.ca.gov/biogeodata/cnddb. Accessed March 4, 2010.

CDFG, 2010c Lake and Streambed Alteration Program, Available at http://www.dfg.ca.gov/habcon/1600/. Accessed Sept. 27.

CDWR (California Department of Water Resources), 1991, *California Well Standards*, Bulletin 74-90, Supplement to CDWR, 1981, *Water Well Standards: State of California*, Bulletin 74-81.

CDWR, 2003, *California's Groundwater,* Bulletin 118, Update 2003. Available at http://www.water.ca.gov/groundwater/bulletin118/update2003.cfm.

CDWR, 2009, *California Water Plan 2009*. Available at http://www.waterplan.water.ca.gov/cwpu2009/index.cfm.

CDWR, 2010b, Awareness Floodplain Maps. Available at: http://www.water.ca.gov/floodmgmt/lrafmo/fmb/fes/awareness_floodplain_maps/. Accessed Oct. 6.

CEC (California Energy Commission), 2009a, *Best Management Practices and Guidance Manual: Desert Renewable Energy Projects*, CEC-700−2009-016-SD-REV, Renewable Energy Action Team (California Energy Commission, California Department of Fish and Game, U.S. Department of Interior Bureau of Land Management and Fish and Wildlife Service), Sacramento, Calif., Dec.

CEC 2009b, *Victorville 2 Hybrid Power Project Power Plant Licensing Case.* Available at http://www.energy.ca.gov/sitingcases/victorville2. Accessed Feb. 8, 2010.

CEQ (Council on Environmental Quality), 1997. Environmental Justice: Guidance under the National Environmental Policy Act. Executive Office of the President. Dec. 28. Available at http://ceq.hss.doe.gov/nepa/regs/ej/justice.pdf.

CGS, 2010, *Alquist-Priolo Fault Zones in Electronic Format – GIS Data Files*. Available at http://www.conservation.ca.gov/cgs/geologic-hazards/regulatory_hazard_zones/Pages/ap-cd.htm.aspx.

Chase, M.K., and G.R. Geupel, 2005, "The Use of Avian Focal Species for Conservation Planning in California," pp. 130–142 in *Bird Conservation Implementation and Integration in the Americas: Proceedings of the Third International Partners in Flight Conference, March 20–24, 2002, Asilomar, Calif.,* Vol. 1, Gen. Tech. Rep. PSW-GTR-191, C.J. Ralph and T.D. Rich (editors), U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station, Albany, Calif.

Chavez, R.A., 2010 (Bureau of Land Management, Barstow Field Office, Barstow, Calif.) to J. May (Argonne National Laboratory, Lakewood, Colo.), personal communication. "Information for Solar PEIS—Pisgah," March 4, 2010.

City of Barstow v. City of Adelanto, 1996, case number 208568, Superior Court, State of California.

Corwin, E.J., et al., 1991, "Earth Fissures, Urbanization and Litigation: A Case Study from the Temecula Area, Southwestern Riverside County, California," in *Land Subsidence*, proceedings for the Fourth International Symposium on Land Subsidence, IAHS Publication No. 200, May.

County of San Bernardino, 2009, *County of San Bernardino 2007 Development Guide*, Aug. 20. Available at http://www.co.san-bernardino.ca.us/landuseservices/DevCode/2007_Development_Code_08-20-09.pdf. Accessed April 8, 2010.

Cowherd, C., et al., 1988, *Control of Open Fugitive Dust Sources*, EPA 450/3-88-008, U.S. Environmental Protection Agency, Research Triangle Park, N.C.

CSC (Coastal Services Center), 2010, *Historical Hurricane Tracks*, National Oceanic and Atmospheric Administration (NOAA). Available at http//csc-s-maps-q.csc.noaa.gov/hurricanes. Accessed March 13, 2010.

CSRI (Cultural Systems Research, Inc.), 1987, *California Low-Level Radioactive Waste Disposal Project: Cultural Resources Surveying Ethnographic Resources Candidate Site Selection*, prepared by CSRI, Menlo Park, Calif., for US Ecology, Inc., Newport Beach, Calif.

CSRI, 2002, *The Native Americans of Joshua Tree National Park: An Ethnograhic Overview and Assessment Study*, prepared by CSRI, Menlo Park, Calif., for the National Park Service.

Desert Tortoise Council, 1994 (revised 1999), *Guidelines for Handling Desert Tortoises during Construction Projects*, Edward L. LaRue, Jr. (editor), Wrightwood, Calif.

Diefenbach, A.K., et al., 2009, *Chronology and References of Volcanic Eruptions and Selected Unrest in the United States, 1980-2008*, U.S. Geological Survey Open File Report 2009-1118.

DOE (U.S. Department of Energy), 2009, *Report to Congress, Concentrating Solar Power Commercial Application Study: Reducing Water Consumption of Concentrating Solar Power Electricity Generation,* Jan. 13.

DOE (U.S. Department of Energy), 2009, Jobs and Economic Development Impacts (JEDI) Model. U.S. Department of Energy, Energy Efficiency and Renewable Energy, July. Available at http://www.windpoweringamerica.gov/filter_detail.asp?itemid=707.

DOE and DOI (U.S. Department of Interior), 2008, *Programmatic Environmental Impact Statement, Designation of Energy Corridors on Federal Land in the 11 Western States,* DOE/EIS-0386, Nov. Available at http://corridoreis.anl.gov/documents/index.cfm.

Dohrenwend, J.S., et al., 1984, "K-Ar Dating of the Cima Volcanic Field, Eastern Mojave Desert, California—Late Cenozoic Volcanic History and Landscape Evolution," *Geology* 12(3):163–167.

Dokka, R.K., 1983, "Displacements on Late Cenozoic Strike-Slip Faults of the Central Mojave Desert, California," *Geology*, Vol. 11.

EIA (Energy Information Administration), 2009, *Annual Energy Outlook 2009 with Projections to 2030*, DOE/EIA-0383, March.

Eldred, K.M., 1982, "Standards and Criteria for Noise Control—An Overview," *Noise Control Engineering* 18(1):16–23.

Enzel, Y., et al., 2003, "Late Pleistocene lake along the Mojave River, southeast California," in *Paleoenvironments and Paleohydrology of the Mojave and Southern Great Basin Deserts*, Enzel, Y., S.G. Wells, and N. Lancaster, eds., Geological Society of America Special Paper 368.

EPA (U.S. Environmental Protection Agency), 1974, *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety*, EPA-550/9-74-004, Washington, D.C., March. Available at http://www.nonoise.org/library/levels74/levels74.htm. Accessed Nov. 17, 2008.

EPA, 2007, *Level III Ecoregions*, Western Ecology Division, Corvalis, Ore. Available at http://www.epa.gov/wed/pages/ecoregions/level_iii.htm. Accessed Oct. 2, 2008.

EPA, 2009a, *Energy CO_2 Emissions by State*. Available at http://www.epa.gov/climatechange/emissions/state_energyco2inv.html, last updated June 12, 2009. Accessed June 23, 2008.

EPA, 2009b, *Preferred/Recommended Models—AERMOD Modeling System.* Available at http://www.epa.gov/scram001/dispersion_prefrec.htm. Accessed Nov. 8, 2009.

EPA, 2009c, *eGRID.* Available at http://www.epa.gov/cleanenergy/energy-resources/egrid/index.html, last updated Oct. 16, 2008. Accessed Jan. 12, 2009.

EPA, 2010a, *National Ambient Air Quality Standards (NAAQS)*. Available at http://www.epa.gov/air/criteria.html, last updated June 3, 2010. Accessed June 4, 2010.

EPA, 2010b, *AirData: Access to Air Pollution Data.* Available at http://www.epa.gov/oar/data. Accessed March 14, 2010.

FAA (U.S. Federal Aviation Administration), 2009, *Airport Data (5010) & Contact Information, Information Current as of July 2, 2009*. Available at http://www.faa.gov/airports/airport_safety/airportdata_5010. Accessed Aug. 13, 2009.

FEMA (Federal Emergency Management Agency), 2009, *FEMA Map Service Center*. Available at http://www.fema.gov. Accessed Nov. 20, 2009.

Fire Departments Network, 2009. Fire Departments by State. Available at http://www.firedepartments.net/.

Fowler, C.S., 1986, "Subsistence," pp. 64-97 in *Handbook of North American Indians, Vol. 11, Great Basin,* W.L. D'Azevedo (editor), Smithsonian Institution, Washington, D.C.

Galloway, D. et al., 1999, *Land Subsidence in the United States*, U.S. Geological Survey, Circular 1182.

Garfinkel, A.P., and Schiffman, R.A., 1981, "Obsidian Studies at the Ming Ranch (CA-Ker-983)," in *Obsidian Dates, III: A Compendium of the Obsidian Hydration Determinations Made at the UCLA Obsidian Hydration Laboratory*, C.W. Meighan and G.S. Russell (editors), University of California, Institute of Archaeology, Bakersfield, Calif.

Gawarecki, S.J., 1968, *Infrared Survey of the Pisgah Crater Area, San Bernardino County, California – A Geologic Interpretation*, U.S. Geological Survey Open File Report 69-104, Oct.

GCRP (U.S. Global Change Research Program), 2009, *Global Climate Change Impacts in the United States,* T.R. Karl et al, (editors), Cambridge University Press, New York, N.Y. Available at www.globalchange.gov/usimpacts. Accessed Jan. 25, 2010.

Giffen, R., 2009, "Rangeland Management Web Mail," personal communication from Giffen (USDA Forest Service, Rangelands Management, Washington, D.C.) to W. Vinikour (Argonne National Laboratory, Argonne, Ill.), Sept. 22.

Global Access, 2010, "A Master Planned 8,500-Acre Multimodal Transportation Hub," Victorville, Calif. Available at http://www.logisticsairport.com/page.aspx. Accessed April 1, 2010.

Goss, J.A., 1966, "Comments on Linguistics: Internal Diversity in Southern Numic," pp. 265-273, in *The Current Status of Anthropological Research in the Great Basin*, 1964. W.L. d'Azevedo et al. (editors), University of Nevada, Desert Research Institute Social Sciences and Humanities Publications 1, Reno, Nev.

Gutierrez, C. et al., 2010, *2010 State Geologic Map of California (Scale 1:750,000)*, California Geological Survey Geologic Data Map 2. Available at: http://www.consrv.ca.gov/cgs_history/Pages/2010_geologicmap.aspx. Accessed Oct. 4, 2010.

GVP (Global Volcanism Program), 2010, *Lavic Lake.* Available at http://www.volcano.si.edu/world/volcano.cfm?vnum=1203-19-&volpage=photos&photo=067054. Accessed March 25, 2010.

Halmo, D.B., 2003, *Blythe Energy Projects American Indian Ethnographic Assessment Study,* prepared by Halmo, Lake Havasu, Ariz., for Greystone Environmental Consultants, Inc., Sacramento, Calif.

Hanson, C.E., et al., 2006, *Transit Noise and Vibration Impact Assessment*, FTA-VA-90-1003-06, prepared by Harris Miller Miller & Hanson Inc., Burlington, Mass., for U.S. Department of Transportation, Federal Transit Administration, Washington, D.C., May. Available at http://www.fta.dot.gov/documents/FTA_Noise_and_Vibration_Manual.pdf.

Harter, R., 1992, "Lava Tubes of Pisgah, Southern California," in *Proceedings for the 6th International Symposium on Vulcanospeleology, Hilo Hawaii, August 1991*, G.T. Rea (editor), National Speleological Society.

Harter, T., 2003, *Water Well Design and Construction*, Publication 8086, FWQP Reference Sheet 11.3, University of California Division of Agriculture and Natural Resources.

Hill, D.P., et al., 1998, *Future Eruptions in California's Long Valley Area—What's Likely?*, Fact Sheet 073-97, U.S. Geological Survey, Nov.

Hill, D.P., et al., 2000, *Living with a Restless Caldera—Long Valley California*, Fact Sheet 108-96, Version 2.1, U.S. Geological Survey, May.

Indian Claims Commission, 1958, "Opinions of Commissioners: Separate Opinion of Chief Commissioner Witt, Jan. 28," *Decisions of the Indian Claims Commission, Vol. 6,* Oklahoma State University. Available at http://digital.library.okstate.edu/icc/index.html.

Izbicki, J.A., 2004, *Source and Movement of Ground Water in the Western Part of the Mojave Desert, Southern California, USA*, U.S. Geological Survey, Water Resources Investigations Report, 03-4313.

Jackson, M., Sr., 2009, "Quechan Indian Tribe's Comments on Programmatic Environmental Impact Statement for Solar Energy Development," letter from Jackson (President, Quechan Indian Tribe, Fort Yuma, Ariz.) to Argonne National Laboratory (Argonne, Ill.), Sept. 3.

Jones, T.L., and K.A. Klar (editors), 2007, *California Prehistory: Colonization, Culture, and Complexity*, AltaMira Press, Lanham, Md.

Kelly, I.T., and C.S. Fowler, 1986, "Southern Paiute," pp. 368–397 in *Handbook of North American Indians, Vol. 1,1 Great Basin*, Smithsonian Institution, Washington, D.C.

Kenny, J.F., et al., 2009, *Estimated Use of Water in the United States in 2005*, Circular 1344, U.S. Geological Survey, Available at http://pubs.usgs.gov/circ/1344. Accessed Jan. 4, 2010.

Knack, M., 1980, "Ethnographic Overview of the Amargosa-Mojave Basin Planning Units," pp. 135–192 in *A Cultural Resource Overview for the Amargosa–Mojave Basin Planning Units,* C.N. Warren et al., BLM, California Desert District, Riverside, Calif.

Kovach, R.L., 1974, *Source Mechanisms for Wilmington Oil Field, California, Subsidence Earthquakes*, Bulletin of the Seismological Society of America, Vol. 64, No. 3-1.

Kroeber, A.L., 1925, *Handbook of the California Indians, Bureau of American Ethnology Bulletin 78,* Smithsonian Institution, Washington, D.C.

Lee, J.M., et al., 1996, *Electrical and Biological Effects of Transmission Lines: A Review*, Bonneville Power Administration, Portland, Ore., Dec.

Lightfoot, K.G., and O. Parish, 2009, *California Indians and Their Environment: An Introduction, California Natural History Guides No. 96,* University of California Press, Berkeley, Calif.

Lines, G.C., 1996, *Ground-Water and Surface-Water Relations along the Mojave River, Southern California*, Water-Resources Investigations Report 95-4189, U.S. Geological Survey.

Lovich, J., and D. Bainbridge, 1999, "Anthropogenic Degradation of the Southern California 40 Desert Ecosystem and Prospects for Natural Recovery and Restoration," *Environmental* 41 *Management* 24(3):309–326.

Manci, K.M., et al., 1988, *Effects of Aircraft Noise and Sonic Booms on Domestic Animals and Wildlife: A Literature Synthesis*, NERC-88/29, U.S. Fish and Wildlife Service National Ecology Research Center, Ft. Collins, Colo.

Mathany, T.M., and K. Belitz, 2008, *Groundwater Quality Data in the Mojave Study Unit, 2008: Results from the California GAMA Program*, Data Series 440, U.S. Geological Survey.

Matti, J.C., and S.E. Carson, 1991, *Liquefaction Susceptibility in the San Bernardino Valley and Vicinity, Southern California—A Regional Evaluation*, Bulletin 1898, U.S. Geological Survey.

Miller, C.D., 1989, *Potential Hazards from Future Volcanic Eruptions in California*, Bulletin 1847, U.S. Geological Survey.

Miller, N.P., 2002, "Transportation Noise and Recreational Lands," in *Proceedings of Inter-Noise 2002*, Dearborn, Mich., Aug. 19–21. Available at http://www.hmmh.com/cmsdocuments/N011.pdf. Accessed Aug. 30, 2007.

Moratto, M.J., 1984, *California Archaeology*, Academic Press, Orlando, Fla.

MWA (Mojave Water Agency), 2004, *2004 Regional Water Management Plan*, Apple Valley, Calif.

MWA, 2008, *Presentation on Water Supply and Water Use Issues Affecting the Baja Subarea and the Proposed Free Production Allowance for Water Year 2008–09,* presented at Watermaster Ad Hoc Committee Meeting, March 10. Available at http://www.mojavewater.org/home/watermaster/watermasterDloadContent.aspx.

MWA, 2009, *Fifteenth Annual Report of the Mojave Basin Area Watermaster, Water Year 2007-08*, Mojave Water Agency, Apple Valley, Calif.

MWMA (Mojave Weed Management Area), 2002, *Mojave Weed Management Area Memorandum of Understanding*. Available at http://www.mojavewma.org/documents.php. Accessed March 13, 2010.

MWMA, 2008, *Mojave Weed Management Area Long Range Plan*, June 10. Available at http://www.mojavewma.org/documents.php. Accessed March 13, 2010.

National Research Council, 1996, *Alluvial Fan Flooding*, Committee on Alluvial Fan Flooding, Water Science and Technology Boar, and Commission on Geosciences, Environment, and Resources, National Academy Press, Washington, D.C.

NatureServe, 2008, *International Ecological Classification Standard: Terrestrial Ecological Classifications*, NatureServe Central Databases, Arlington, Va., data current as of July 17, 2009.

NatureServe, 2010, *NatureServe Explorer: An Online Encyclopedia of Life*. Available at http://www.natureserve.org/explorer/. Accessed March 4, 2010.

NCDC 2010a, *Integrated Surface Data (ISD), DS3505 Format*, database, Asheville, N.C. Available at ftp://ftp3.ncdc.noaa.gov/pub/data/noaa. Accessed Feb. 19, 2010.

NCDC, 2010b, *Climates of the States (CLIM60): Climate of California*, National Oceanic and Atmospheric Administration, Satellite and Information Service. Available at http://cdo.ncdc.noaa.gov/cgi-bin/climatenormals/climatenormals.pl. Accessed March 18, 2010.

NCDC, 2010c, *Storm Events*, National Oceanic and Atmospheric Administration, Satellite and Information Service. Available at http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~Storms. Accessed Oct. 16, 2010.

NCES (National Center for Education Statistics), 2009. Search for Public School Districts. U.S. Department of Education. Available at http://www.nces.ed.gov/ccd/districtsearch/.

Norwood, R.H., 1980, *Cultural Resource Survey for a portion of the Earp to Johnson Valley, California, Enduro Racecourse Route*, prepared for Bureau of Land Management, Riverside, Calif., by Regional Environmental Consultants, San Diego, Calif.

NRCS (National Resources Conversation Service), 2006, *Official Soil Series Descriptions*. Available at http://www2.ftw.nrcs.usda.gov. Accessed March 15, 2010.

NRCS, 2008, *Soil Survey Geographic (SSURGO) Database for San Bernardino County, California*. Available at: http://SoilDataMart.nrcs.usds.gov.

Nussear, K.E., et al., 2009, *Modeling Habitat for the Desert Tortoise (*Gopherus agassizii*) in the Mojave and Parts of the Sonoran Deserts of California, Nevada, Utah, and Arizona*, Open-File Report 2009-1102, U.S. Geological Survey.

Parker, R.B., 1963, *Recent Volcanism at Amboy Crater, San Bernardino County, California*, Special Report 76, California Division of Mines and Geology, San Francisco, Calif.

Planert, M., and J.S. Williams, 1995, *Ground Water Atlas of the United States: California, Nevada*, HA 730-B, U.S. Geological Survey. Available at http://pubs.usgs.gov/ha/ha730/ch_b/index.html.

Plog, F., et al. (editors), 1989, *Cultural Resources Report for the All American Pipeline Project: Santa Barbara, California to McCamey, Texas and Additional Areas to the East along the Central Pipeline Route in Texas,* prepared by New Mexico State University, for Continuum Corporation, Aug. 11.

Rogers, M., 1939, *Early Lithic Industries of the Lower Basin of the Colorado River and Adjacent Desert Areas*, San Diego Museum Papers No. 3.

Royster, J., 2008, "Indian Land Claims," pp. 28-37 in *Handbook of North American Indians, Vol. 2, Indians in Contemporary Society,* G.A. Bailey (editor), Smithsonian Institution, Washington, D.C.

Rymer, M.J., et al., 2002, "The Hector Mine, California, Earthquake of 16 October 1999: Introduction to the Special Issue," *Bulletin of the Seismological Society of America* 92 (4): 1154-1170.

SAMHSA (Substance Abuse and Mental Health Services Administration), 2009, *National Survey on Drug Use and Health, 2004, 2005 and 2006*, Office of Applied Studies, U.S. Department of Health and Human Services. Available at http://oas.samhsa.gov/substate2k8/StateFiles/TOC.htm#TopOfPage.

Sanborn Mapping, 2008, *GAP Ecological Systems*, *USGS Mapping Zones 12 and 13*, Portland, Ore., for the USGS GAP Program, Dec. Available at http://gapanalysis.nbii.gov/portal/community/GAP_Analysis_Program/Communities/Maps,_Data,_&_Reports/Find_Updated_GAP_Regional_Data.

SBC (Santa Barbara County), 2008, *Notice of Preparation of a Draft Environmental Impact Statement and a Draft Environmental Impact Report.* Available at http://www.co.san-bernardino.ca.us/landuseservices/Public%20Notices/NOP/NOPCalnev.pdf. Accessed Feb. 14, 2010.

SCEDC (Southern California Earthquake Data Center), 2010a, *1990-1999: Landers Earthquake 1992*. Available at http://www.data.scec.org/chrono_index/landersq.html. Accessed Nov. 4, 2010.

SCEDC, 2010b, *1990-1992: Hector Earthquake 1999*. Available at: http://www.data.scec.org/chrono_index/hectoreq.html. Accessed Nov. 4, 2010.

SES Solar Two, LLC, 2008, Application for Certification, submitted to the Bureau of Land Management, El Centro, Calif., and the California Energy Commission, Sacramento, Calif., June. Available at http://www.energy.ca.gov/sitingcases/solartwo/documents/applicant/afc/index.php. Accessed Oct. 1, 2008.

Shlemon, R.J., 1995, "Groundwater Rise and Hydrocollapse: Technical and Political Implications of 'Special Geologic Report Zones' in Riverside County, California, USA," in *Land Subsidence*, proceedings for the Fifth International Symposium on Land Subsidence, IAHS Publication No. 234, October.

Shumway, G.L., et al., 1980, *Desert Fever: An Overview of Mining in the California Desert Conservation Area*, prepared for the Bureau of Land Management, Riverside, Calif. Available at http://www.blm.gov/pgdata/etc/medialib/blm/ca/pdf/cdd/aml.Par.54155.File.dat/Desert%20Fever%20-%20History%20of%20Mining%20in%20the%20CDCA.pdf.

Singleton, D., 2010, "Request for a Sacred Lands File Search and Native American Contacts List for the 'Four Solar Study Areas (SESA)' Located in San Bernardino, Riverside and Imperial Counties," personal communication from Singleton (Native American Heritage Commission, Sacramento, Calif.) to B.T. Verhaaren (Argonne National Laboratory, Argonne, Ill.), April.

Smith, M. D., et al., 2001, "Growth, Decline, Stability and Disruption: A Longitudinal Analysis of Social Well-Being in Four Western Communities," Rural Sociology 66:425-450.

Smithsonian, 2010, *Global Volcanism Program—Lavic Lake Summary*, Smithsonian National Museum of Natural History. Available at http://www.volcano.si.edu/world/volcano.cfm?vnum=1203-19-. Accessed April 14, 2010.

Stamos, C.L., et al., 2001, *Simulation of Ground-Water Flow in the Mojave River Basin, California*, Water-Resources Investigations Report 01-4002, U.S. Geological Survey.

Stout, D., 2009, personal communication from Stout (Acting Assistant Director for Fisheries and Habitat Conservation, U.S. Fish and Wildlife Service,Washington, D.C.) to L. Jorgensen and L. Resseguie (Bureau of Land Management, Washington, D.C.), Sept. 14.

Sutton, M.Q., 1996, "The Current Status of Archaeological Research in the Mojave Desert," *Journal of California and Great Basin Archaeology* 18(2):221–257. Available at http://escholarship.org/uc/item/36z4d465?query=schaefer.

Treiman, J.J., 2003a, "Fault Number 122a, Pisgah-Bullion Fault Zone," in Quaternary Fault and Fold Database of the United States, U.S. Geological Survey. Available at http://earthquakes.usgs.gov/regional/qfaults. Accessed April 16, 2010.

Treiman, J.J., 2003b, *Fault Number 351, Lavic Lake Fault*, in *Quaternary Fault and Fold Database of the United States*, U.S. Geological Survey. Available at http://earthquakes.usgs.gov/regional/qfaults. Accessed April 16, 2010.

Turner, R.M., 1994, "Mohave Desertscrub," in *Biotic Communities: Southwestern United States and Northwestern Mexico*, D.E. Brown (editor), University of Utah Press, Salt Lake City, Utah.

UPR (Union Pacific Railroad), 2009, *Allowable Gross Weight Map*. Available at http://www.uprr.com/aboutup/maps/attachments/allow_gross_full.pdf. Accessed March 4, 2010.

U.S. Bureau of the Census, 2009a, *County Business Patterns, 2006*, Washington, D.C. Available at http://www.census.gov/ftp/pub/epcd/cbp/view/cbpview.html.

U.S. Bureau of the Census, 2009b, *GCT-T1, Population Estimates*. Available at http://factfinder.census.gov/.

U.S. Bureau of the Census, 2009c, *QT-P32, Income Distribution in 1999 of Households and Families: 2000, Census 2000 Summary File (SF 3) – Sample Data*. Available at http://factfinder.census.gov/.

U.S. Bureau of the Census, 2009d, *S1901, Income in the Past 12 Months, 2006–2008 American Community Survey 3-Year Estimates*. Available at http://factfinder.census.gov/.

U.S. Bureau of the Census, 2009e, *GCT-PH1, GCT-PH1, Population, Housing Units, Area, and Density: 2000, Census 2000 Summary File (SF 1) – 100-Percent Data*. Available at http://factfinder.census.gov/.

U.S. Bureau of the Census, 2009f, *T1, Population Estimates*. Available at http://factfinder.census.gov/.

U.S. Bureau of the Census, 2009g, *GCT2510, Median Housing Value of Owner-Occupied Housing Units (Dollars), 2006–2008 American Community Survey 3-Year Estimates*. Available at http://factfinder.census.gov/.

U.S. Bureau of the Census, 2009h, *QT-H1, General Housing Characteristics, 2000, Census 2000 Summary File 1 (SF 1) 100-Percent Data*. Available at http://factfinder.census.gov/.

U.S. Bureau of the Census, 2009i, *GCT-T9-R, Housing Units, 2008, Population Estimates*. Available at http://factfinder.census.gov/.

U.S. Bureau of the Census, 2009j, *S2504, Physical Housing Characteristics for Occupied Housing Units 2006–2008 American Community Survey 3-Year Estimates*. Available at http://factfinder.census.gov/.

U.S. Bureau of the Census, 2009k, *Census 2000 Summary File 1 (SF 1) 100-Percent Data*. Available at http://factfinder.census.gov/.

U.S. Bureau of the Census, 2009l, *Census 2000 Summary File 3 (SF 3) – Sample Data*. Available at http://factfinder.census.gov/.

U.S. Department of Agriculture, 2009, *2007 Census of Agriculture: California State and County Data, Volume 1*, Geographic Area Series, National Agricultural Statistics Service, Washington, DC. Available at http://www.agcensus.usda.gov/Publications/2007/Full_Report/Volume_1,_Chapter_2_County_Level/California/index.asp.

U.S. Department of Commerce, 2009, *Local Area Personal Income*, Bureau of Economic Analysis. Available at http://www.bea.doc.gov/bea/regional/reis/.

U.S. Department of the Interior, 2010, *Native American Consultation Database*, National NAGPRA Online Databases, National Park Service. Available at http://grants.cr.nps.gov/nacd/index.cfm.

U.S. Department of Justice, 2009a, "Table 8: Offences Known to Law Enforcement, by State and City," *2008 Crime in the United States,* Federal Bureau of Investigation, Criminal Justice Information Services Division. Available at http://www.fbi.gov/ucr/cius2008/data/table_08.html.

U.S. Department of Justice, 2008b, "Table 80: Full-time Law Enforcement Employees, by State by Metropolitan and Nonmetropolitan Counties, 2007," *2007 Crime in the United States*, Federal Bureau of Investigation, Criminal Justice Information Services Division, Sept. Available at http://www.fbi.gov/ucr/cius2007/data/table_80.html. Accessed June 17, 2010.

U.S. Department of Justice, 2009b, "Table 10: Offences Known to Law Enforcement, by State and by Metropolitan and Non-Metropolitan Counties," *2008 Crime in the United States*, Federal Bureau of Investigation, Criminal Justice Information Services Division. Available at http://www.fbi.gov/ucr/cius2008/data/table_10.html.

U.S. Department of Labor, 2009a, *Local Area Unemployment Statistics: States and selected areas: Employment status of the civilian noninstitutional population, 1976 to 2007, Annual averages*, Bureau of Labor Statistics. Available at http://www.bls.gov/lau/staadata.txt.

U.S. Department of Labor, 2009b, *Local Area Unemployment Statistics: Unemployment Rates for States*, Bureau of Labor Statistics. Available at http://www.bls.gov/web/laumstrk.htm.

U.S. Department of Labor, 2009c, *Local Area Unemployment Statistics: County Data*, Bureau of Labor Statistics. Available at http://www.bls.gov/lau/.

USFS (U.S. Forest Service), 1997, "Ecological Subregions of California: Section and Subsection Descriptions," in *Biological Assessment for the Preferred Alternative*, Publication R5-EM-T-005, S.R. Miles and C.B. Goudy (compilers), USDA Forest Service Pacific Southwest Region, San Francisco, Calif., Publication R5-EM-TP-005. Available at http://www.r5.fs.fed.us/ecoregions. Accessed April 11, 2010.

USFS, 2007, *Wild Horse and Burro Territories*, Rangelands, Washington, D.C. Available at http://www.fs.fed.us/rangelands/ecology/wildhorseburro// territories/index.shtml. Accessed Oct. 20, 2009.

USFWS (U.S. Fish and Wildlife Service), 1994, *Desert Tortoise (Mojave Population) Recovery Plan*, Portland, Ore.

USFWS, 2009a, *National Wetlands Inventory*, U.S. Department of the Interior, Washington, D.C. Available at http://www.fws.gov/wetlands.

USFWS, 2009b, *Mohave tui chub* (Gila bicolor mohavensis = Siphaletes bicolor mohavensis), *5-Year Review: Summary and Evaluation,* Ventura, Calif., Jan. 9.

USGS, 2004, *National Gap Analysis Program, Provisional Digital Land Cover Map for the Southwestern United States*, Version 1.0, RS/GIS Laboratory, College of Natural Resources, Utah State University. Available at http://earth.gis.usu.edu/swgap/landcover.html. Accessed March 15, 2010.

USGS, 2005, *National Gap Analysis Program, Southwest Regional GAP Analysis Project—Land Cover Descriptions*, RS/GIS Laboratory, College of Natural Resources, Utah State University. Available at http://earth.gis.usu.edu/swgap/legend_desc.html. Accessed March 15, 2010.

USGS, 2007, *National Gap Analysis Program, Digital Animal-Habitat Models for the Southwestern United States*, Version 1.0, Center for Applied Spatial Ecology, New Mexico Cooperative Fish and Wildlife Research Unit, New Mexico State University. Available at http://fws-nmcfwru.nmsu.edu/swregap/HabitatModels/default.htm. Accessed March 15, 2010.

USGS, 2008, *National Seismic Hazard Maps – Peak Horizontal Acceleration (%g) with 10% Probability of Exceedance in 50 Years (Interactive Map)*. Available at: http://gldims.cr.usgs.gov/nshmp2008/viewer.htm. Accessed Aug. 4, 2010.

USGS, 2009, *National Water Information System*. Available at http://wdr.water.usgs.gov/nwisgmap. Accessed Nov. 13.

USGS, 2010a, *National Biological Informatics Infrastructure (NBII)*, *California Regional Gap Analysis Project (CAReGAP)*. Available at http://gapanalysis.nbii.gov/portal/community/GAP_Analysis_Program/Communities/Maps,_Data,_&_Reports/Find_Updated_GAP_Regional_Data. Accessed March 4, 2010.

USGS, 2010b, *Water Resources of the United States—Hydrologic Unit Maps*. Available at http://water.usgs.gov/GIS/huc.html. Accessed April 12, 2010.

USGS, 2010c, *National Earthquake Information Center (NEIC) – Circular Area Database Search (within 100-km of the center of the proposed Fourmile East SEZ)*. Available at http://earthquake.usgs.gov/earthquakes/eqarchives/epic/epic_circ.php. Accessed Aug. 5, 2010.

USGS, 2010d, *Glossary of Terms on Earthquake Maps – Magnitude*. Available at: http://earthquake.usgs.gov/earthquakes/glossary.php#magnitude. Accessed Aug. 8, 2010.

USGS, 2010e, *Medicine Lake Vicinity: Medicine Lake Caldera, Lava Beds National Monument, and Glass Mountain Obsidian Flow and Domes*, Cascades Volcano Observatory, Vancouver, Washington. Available at http://vulcan.wr.usgs.gov/Volcanoes/MedicineLake/description_medicine_lake.html. Accessed Oct. 7, 2010.

USGS and CGS (California Geological Survey), 2009, *Quaternary Fault and Fold Database for the United States*. Available at http://earthquake.usgs.gov/regional/qfaults. Accessed Sept. 11, 2009.

von Till Warren, E., 1980, "History of the Amargosa-Mojave Basin," in *A Cultural Resource Overview for the Amargosa-Mojave Basin Planning Units*, E. Ritter (editor), prepared by University of Nevada, Las Vegas, Nev., for Bureau of Land Management, Riverside, Calif.

WRAP (Western Regional Air Partnership), 2009, *Emissions Data Management System (EDMS)*. Available at http://www.wrapedms.org/default.aspx. Accessed June 4, 2009.

WRCC (Western Regional Climate Center), 2010a, *Average Pan Evaporation Data by State*. Available at http://www.wrcc.dri.edu/htmlfiles/westevap.final.html. Accessed Jan. 19, 2010.

Zigmond, M.L., 1986, "Kawaiisu," pp. 398–411 in *Handbook of North American Indians*, *Vol. 11, Great Basin*, Smithsonian Institution, Washington, D.C.

This page intentionally left blank.