9 AFFECTED ENVIRONMENT AND IMPACT ASSESSMENT FOR PROPOSED SOLAR ENERGY ZONES IN CALIFORNIA

9.1 IMPERIAL EAST

9.1.1 Background and Summary of Impacts

9.1.1.1 General Information

The proposed Imperial East solar energy zone (SEZ) has a total area of 5,722 acres (23.2 km^2) and is located in Imperial County in southeastern California, near the United States–Mexico border (Figure 9.1.1.1-1). In 2008, the Imperial County population was 180,493, while the two-county region—Imperial County and Yuma County, Arizona—surrounding the SEZ had a total population of 387,798. Calexico (38,344) is located about 15 mi (24 km) to the west along State Route 98, and El Centro (40,083) lies 19 mi (31 km) to the west along Interstate 8 (I-8) in Imperial County. I-8 runs east–west along the northeast edge of the proposed SEZ, while State Route 98, a two-lane highway, passes through the southern edge. San Diego lies 120 mi (194 km) to the west, and Yuma, 29 mi (47 km) to the east via I-8. A branch line of the Union Pacific Railroad (UP) serves Calexico and El Centro. Four small public airports lie within 34 mi (55 km) of the proposed SEZ.

A 115-kV transmission line intersects the southwest corner of the SEZ, and a 500-kV line is located about 0.4 mi (0.6 km) to the south, running east–west. It is assumed that the existing 115-kV transmission line could potentially provide access from the SEZ to the transmission grid (see Section 9.1.1.2).

As of February 2010, two solar project applications were pending in the SEZ (Resseguie 2010). Active pending solar lease applications within the SEZ are described in Section 9.1.22 and are shown in Figure 9.1.22.2-1; the entire SEZ area is included in the lease application areas. There is an operating geothermal plant about 3 mi (2.4 km) northwest of the SEZ.

The proposed Imperial East SEZ lies in the East Mesa, which consists of gravel flats within the California Desert Conservation Area (CDCA) within the Sonoran Desert. Surface elevations range from 75 to 120 ft (22.9 to 36.6 m). Scrubland vegetation reflects the arid climate, which produces an annual average rainfall of about 3 to 4 in. (7.6 to 10.2 cm). The Imperial Valley groundwater basin underlies the area. The All-American Canal runs parallel to the southern boundary of the SEZ, about 0.3 mi (0.5 km) from the boundary. Two hydropower facilities exist along the canal, along with associated dams and substations. Little commercial or industrial activity exists in the surrounding area, while agricultural areas lie about 3 mi (5 km) to the west of the SEZ, across the border in Mexico. The Lake Cahuilla Area of Critical Environmental Concern (ACEC), protected for its prehistoric resources, is located adjacent to the western boundary of the SEZ. The East Mesa ACEC, protected for both wildlife habitat and prehistoric resources, is located on the northeast boundary. The Imperial Sand Dunes Recreation

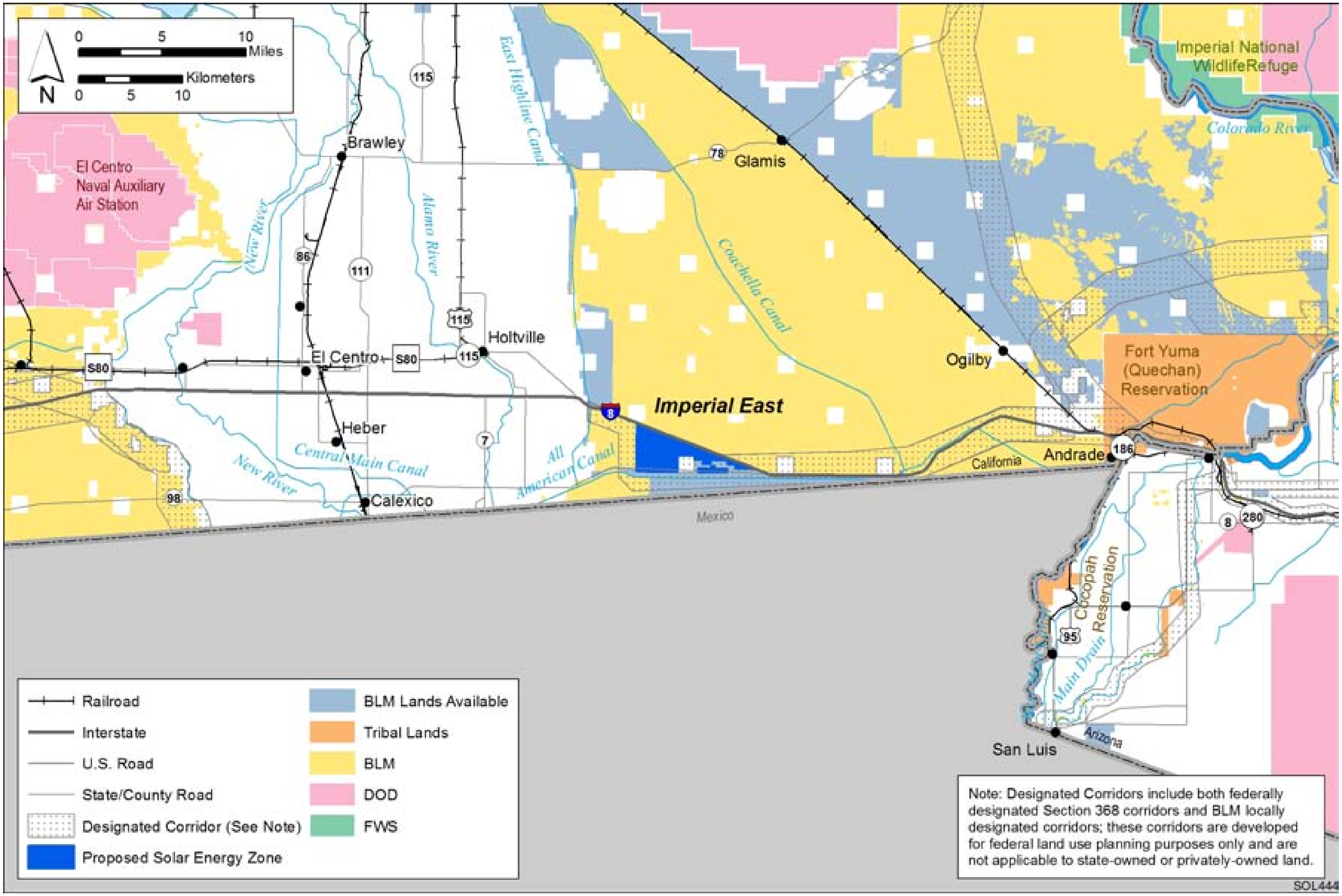

FIGURE 9.1.1.1-1 Proposed Imperial East SEZ

Area (ISDRA) and National Natural Landmark (NNL), with its northern section protected in the North Algodones ACEC and Wilderness Area (WA), is located approximately 8 mi (12.9 km) east–northeast of the SEZ; this is the largest mass of sand dunes in California (BLM 2010a).

The proposed Imperial East SEZ and other relevant information are shown in Figure 9.1.1.1-1. 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 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, Areas of Critical Environmental Concern (ACECs), Special Recreation Management Areas (SRMAs), and National Landscape Conservation System (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 Imperial East 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 Imperial East SEZ encompassed 12,830 acres (52 km^2). Subsequent to the study area scoping period, the Imperial East boundaries were changed substantially to exclude lands along the All-American Canal that are currently administered by the U.S. Bureau of Reclamation (BOR). The revised SEZ is approximately 7,108 acres (29 km^2) smaller than the original SEZ area as published in June 2009.

9.1.1.2 Development Assumptions for the Impact Analysis

Maximum development of the proposed Imperial East SEZ was assumed to be 80% of the total SEZ area over a period of 20 years, a maximum of 4,578 acres (18.5 km^2). These values are shown in Table 9.1.1.2-1, along with other development assumptions. Full development of the Imperial East SEZ would allow development of facilities with an estimated total of 509 MW of electrical power capacity if power tower, dish engine, or photovoltaic (PV) technologies were used, assuming 9 acres/MW (0.04 km^2/MW) of land required, and an estimated 916 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 line is a 115-kV line adjacent to the SEZ. It is possible that this existing line could be used to provide access from the SEZ to the transmission grid, but the 115-kV capacity of that line would be inadequate for 509 to 916 MW of new capacity (note: a 500-kV line can accommodate approximately the load of one 700-MW facility). At full build-out capacity, it is clear that new transmission lines and/or upgrades of existing transmission lines would be required to bring electricity from the proposed Imperial East 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

TABLE 9.1.1.2-1 Proposed Imperial East 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]
5,722 acres and 4,578 acres[a]	509 MW[b] 916 MW[c]	Adjacent (State Route 98)	Within SEZ, and 1151 kV	0 acres and 0 acres	Crosses 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 2-mi (3.2-km) wide energy corridor crosses the SEZ.

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.

For the purposes of analysis in this PEIS, it was assumed that the existing 115-kV transmission line that intersects the southwest corner of the 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 line was assumed, without additional information on whether this line would be available 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 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 Imperial East SEZ should be adequate to support construction and operation of solar facilities, because State Route 98 passes along the southern edge of the SEZ (although I-8 also runs along the northern boundary of the SEZ, no access to the SEZ from the interstate is available). Because of the site access provided by State Route 98, no additional road construction outside of the SEZ is assumed to be required to support solar development.

9.1.1.3 Summary of Major Impacts and SEZ-Specific Design Features

In this section, the impacts and SEZ-specific design features assessed in Sections 9.1.2 through 9.1.21 for the proposed Imperial East SEZ are summarized in tabular form. Table 9.1.1.3-1 is a comprehensive list of the impacts discussed in these sections; the reader may reference the applicable sections for detailed support of the impact assessment. Section 9.1.22 discusses potential cumulative impacts from solar energy development in the proposed SEZ.

Only those design features specific to the Imperial East SEZ are included in Sections 9.1.2 through 9.1.21 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.

TABLE 9.1.1.3-1 Summary of Impacts of Solar Energy Development within the Proposed Imperial East SEZ and SEZ-Specific Design Features[a]

Resource Area	Environmental Impacts—Proposed Imperial East 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 4,578 acres (18.5 km^2) and would establish a large industrial area that would exclude many existing and potential uses of the land, perhaps in perpetuity. Since the SEZ is largely undeveloped and rural, utility-scale solar energy development would be a new and discordant land use to the area.	None.
	640 acres (2.6 km^2) of private land and approximately 980 acres (4 km^2) of BOR land located within or adjacent to the exterior boundaries of the SEZ, with land owner agreement, could be developed in the same or a complementary manner as the public lands.	None.
	A designated Section 368 energy corridor covers about 80% of the SEZ, potentially leaving less than 1,000 acres (4 km^2) available for solar development. Because of technical constraints, solar development could not occur under electrical transmission lines or over pipelines; thus it appears that either the transmission corridor would have to be modified or solar development precluded within the transmission corridor.	None.
Specially Designated Areas and Lands with Wilderness Characteristics	Lake Cahuilla ACECs C and D could be exposed to additional human traffic, resulting in an increased risk of loss of prehistoric resources.	Once construction of solar energy facilities begins, the BLM would monitor to determine whether increases in traffic in the ACECs occurs and whether additional management measures are required to protect the resources in these areas.
Rangeland Resources: Livestock Grazing	None.	None.
Rangeland Resources: Wild Horses and Burros	None.	None.

1

TABLE 9.1.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Imperial East SEZ	SEZ-Specific Design Features
Recreation	Recreational users would be excluded from the SEZ.	None.
Military and Civilian Aviation	The development of any solar energy or transmission facilities that encroach into the airspace of MTRs/SUAs would create safety issues and could conflict with military training activities.	None.
	Power tower facilities could pose some hazard to the operation of the Mexicali Airport in Mexico.	Should power tower facilities be proposed for the SEZ, coordination across the international border should be required to ensure that there is no airspace management concern associated with the Mexicali Airport.
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).	None.
Minerals (fluids, solids, and geothermal resources)	About 60% of the SEZ is included within a KGRA. Designation of the SEZ would prevent surface occupancy to develop geothermal resources in the KGRA.	To protect the option for geothermal leasing under solar energy facilities, ROW authorizations for solar energy facilities should specifically note the potential for geothermal leasing with no surface occupancy stipulations.

TABLE 9.1.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Imperial East SEZ	SEZ-Specific Design Features
Water Resources	Ground-disturbance activities (affecting 35 to 52% of the total area in the peak construction year) could affect surface water quality due to surface runoff, sediment erosion, and contaminant spills.	Water resource analysis indicates that wet-cooling options would not be feasible. Other technologies should incorporate water conservation measures.
	Construction activities may require up to 2,074 ac-ft (2.6 million m^3) of water during peak construction year. Construction activities would generate as much as 74 ac-ft (91,300 m^3) of sanitary wastewater.	Land disturbance activities should avoid impacts in the vicinity of the existing and mitigation wetlands located along the southern boundary of the site.
	Assuming full development of the SEZ, the following amounts of water would be used during operations: • For parabolic trough facilities (916-MW capacity), 654 to 1,387 ac-ft/yr (806,700 to 1.7 million m^3/yr) for dry-cooled systems; and 4,591 to 13,746 ac-ft/yr (5.7 million to 17 million m^3/yr) for wet-cooled systems; • For power tower facilities (509-MW capacity), 362 to 769 ac-ft/yr (446,500 to 948,500 m^3/yr) for dry-cooled systems; and 2,549 to 7,635 ac-ft/yr (3.1 million to 9.4 million m^3/yr) for wet-cooled systems; • For dish engine facilities (509-MW capacity), 260 ac-ft/yr (320,700 million m^3/yr); and • For PV facilities (509-MW capacity), 26 ac-ft/yr (312,100 million m^3/yr). Assuming full development of the SEZ, operations would generate up to 13 ac-ft/yr (16,000 million m^3/yr) of sanitary wastewater and up to 260 ac-ft/yr (320,700 million m^3/yr) of blowdown water.	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). The groundwater-permitting process should be in compliance with the Imperial County groundwater ordinance. Groundwater monitoring and production wells should be constructed in accordance with standards set forth by the State of California and Imperial County.

TABLE 9.1.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Imperial East SEZ	SEZ-Specific Design Features
Water Resources *(Cont.)*	Runoff of water and sediments from the proposed SEZ could adversely affect the existing wetlands along the AAC and the mitigation wetlands associated with the AAC lining project. High TDS values of groundwater could produce water that is nonpotable and corrosive to infrastructure.	Stormwater management plans and BMPs should comply with standards developed by the California Stormwater Quality Association. Water for potable uses should meet or be treated to meet the water quality standards of the California Safe Drinking Water Act.
Vegetation[b]	Up to 80% of the SEZ (4,578 acres [18.5 km^2]) would be cleared of vegetation; dune habitats would likely be affected; re-establishment of plant communities in disturbed areas would likely be very difficult because of the arid conditions. Noxious weeds could become established in disturbed areas and colonize adjacent undisturbed habitats, thus reducing restoration success and potentially resulting in widespread habitat degradation. Grading could result in direct impacts on the wetlands within the SEZ and could potentially alter wetland plant communities and affect wetland function. In addition, project-related reductions in groundwater inflows to wetlands inside and outside the SEZ could alter wetland hydrologic characteristics and plant communities.	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 Sonoran Desert habitats, such as desert scrub and dunes, and minimize the potential for the spread of invasive species. Invasive species control should focus on biological and mechanical methods where possible to reduce the use of herbicides. Wetland, riparian habitats, and desert dry washes that occur primarily within the western and southern portions of the SEZ, and sand dune habitats and sand transport areas, primarily in the northern and eastern portions of the SEZ, should be avoided to the extent practicable, and any impacts minimized or mitigated. A buffer area should be maintained around wetlands, riparian areas, and dry washes to reduce the potential for impacts on wetlands on or near the SEZ. Appropriate engineering controls should be used to minimize impacts on these areas resulting from surface water runoff, erosion, sedimentation, altered

TABLE 9.1.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Imperial East SEZ	SEZ-Specific Design Features
Vegetation[b] *(Cont.)*		hydrology, accidental spills, or fugitive dust deposition to these habitats. Appropriate buffers and engineering controls would be determined through agency consultation. An appropriate buffer shall be maintained between project impacts and the wetland south of the Imperial Valley SEZ to ensure all impacts from construction, operations, and maintenance of solar facilities do not impair the current functions and values associated with wetland resource, including habitat support for sensitive species. Groundwater withdrawals should be limited to reduce the potential for indirect impacts on wetland habitats that are associated with groundwater discharge, such as the wetlands near the AAC and EHC.
Wildlife: Amphibians and Reptiles[b]	The red-spotted toad is the main amphibian expected to occur within the Imperial East SEZ, but its occurrence within the SEZ would be spatially limited. Several other amphibian species could inhabit the AAC immediately south of the SEZ and the EHC located about 2.8 mi (4.5 km) west of the SEZ. These species, which include the bullfrog, Colorado River toad, Rio Grande leopard frog, and Woodhouse's toad, would not be expected to occur within the SEZ. Twenty-seven reptile species (the desert tortoise, which is a federally listed species; 12 lizards; and 14 snakes) could occur within the SEZ. Direct impacts on amphibian and reptile species from SEZ development would be small. With implementation of proposed design features, indirect impacts would be expected to be negligible.	The potential for indirect impacts on several amphibian species could be reduced by maximizing the distance between solar energy development and the All-American Canal. Avoid wetlands located along the southern boundary of the SEZ, including those that are planned to be created or enhanced in the area.

TABLE 9.1.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Imperial East SEZ	SEZ-Specific Design Features
Wildlife: Birds[b]	Nearly 90 species of birds have a range that encompasses the SEZ. However, habitats for about 40 of these species either do not occur on or are limited within the SEZ (e.g., habitat for waterfowl and wading birds). Direct impacts from habitat disturbance and long-term habitat reduction/ fragmentation would be small. Other impacts on birds could result from collision with vehicles and buildings, 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.	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: ash-throated flycatcher, black-tailed gnatcatcher, black-throated sparrow, burrowing owl, common raven, Costa's hummingbird, crissal thrasher, 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. Wetland habitats along the southern boundary of the SEZ boundary should be avoided to the extent practicable. 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.

TABLE 9.1.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Imperial East SEZ	SEZ-Specific Design Features
Wildlife: Birds[b] *(Cont.)*		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.
Wildlife: Mammals[b]	The bighorn sheep (a BLM sensitive species discussed below with the special status species) and mule deer are the only big game species whose ranges encompass the SEZ. The potential impacts on the mule deer are expected to be small. It is unlikely that impacts from solar energy development within the SEZ would represent an actual loss of occupied habitat for the mule deer, although direct impacts could occur to about 0.3% of potentially suitable habitat within the SEZ region. Direct impacts on small game, furbearers, and small mammals on the SEZ from habitat disturbance and long-term habitat reduction/fragmentation would be small, as 0.4% or less of potentially suitable habitats identified for the species would occur. Larger areas of suitable habitat for these species occur within the area of potential indirect effects immediately outside the SEZ.	Ensure that solar project development does not prevent mule deer free access to the unlined section of the All-American Canal.
Aquatic Biota[b]	No permanent water bodies or streams are present within the boundaries of the Imperial East SEZ. The wetlands and dry lakes present within the SEZ and the man-made AAC and EHC within the area of potential indirect effects could be affected by runoff of water and sediment from the SEZ.	None.

TABLE 9.1.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Imperial East SEZ	SEZ-Specific Design Features
Special Status Species[b]	Potentially suitable habitat for 35 special status species occurs in the affected area of the Imperial East SEZ. For all special status species, less than 1% of the potentially suitable habitat in the region would be directly affected by development.	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 on 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 uses 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 sand dunes and sand transport systems, desert riparian, wash, and wetland habitats should be avoided or minimized to the extent practicable. Avoiding or minimizing disturbance of these habitats could reduce impacts on 30 special status species. As California fully protected species, direct and indirect impacts on the California black rail and Yuma clapper rail should be completely avoided. This includes the complete avoidance of occupied and potentially suitable wetlands on and in the vicinity of the SEZ (particularly those seepage wetlands and enhanced wetlands associated with the All-American Canal). Consultations with the CDFG are required to address the potential for impacts on these species as required under the CESA.

TABLE 9.1.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Imperial East SEZ	SEZ-Specific Design Features
Special Status Species[b] *(Cont.)*		Consultations with the USFWS and the CDFG should be conducted to address the potential for impacts on the Yuma clapper rail a species listed as endangered 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 to determine any addition mitigation requirements beyond those already afforded to the Yuma clapper rail as a California fully protected species. . Coordination with the USFWS and CDFG should be conducted to address the potential for impacts on the flat-tailed horned lizard, a species that is proposed for listing under the ESA. Coordination would identify an appropriate survey protocol, avoidance measures, and, potentially, translocation or compensatory mitigation (if necessary). 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 on consultation with the USFWS and CDFG.

TABLE 9.1.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Imperial East 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 possible during construction; higher concentrations would be limited to the immediate area surrounding the SEZ boundary and would decrease quickly with distance. Modeling indicates that Class I PSD PM_{10} increments at the nearest federal Class I area (Joshua Tree NP), located about 69 mi (111 km) from the SEZ, would not be exceeded. Construction emissions from the engine exhaust from heavy equipment and vehicles could cause impacts on air-quality-related values (e.g., visibility and acid deposition), but such impacts would be temporary. *Operations*: Positive impacts due to avoided emission of air pollutants from combustion-related power generation: 0.8 to 1.5% of total emissions of SO_2, NO_x, Hg, and CO_2 from electric power systems in the state of California avoided (up to 205 tons/yr of SO_2, 337 tons/yr of NO_x, 0.003 tons/yr Hg, and 797,000 tons/yr CO_2).	None.
Visual Resources	The SEZ is in an area of low scenic quality, with numerous cultural disturbances already present. 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. The residents nearest to the SEZ could be subjected to large visual impacts from solar energy development within the SEZ. Large visual impacts on the SEZ and surrounding lands within the SEZ viewshed due to major modification of the character of the existing landscape. Utility-scale solar energy development within the proposed Imperial East SEZ is unlikely to cause even moderate visual impacts on highly sensitive visual resource areas, the closest of which is more than 15 mi (24 km) from the SEZ. The closest community is beyond 10 mi (16 km) from the SEZ and is likely to experience minimal visual impacts from solar development within the SEZ.	None.

TABLE 9.1.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Imperial East SEZ	SEZ-Specific Design Features
Visual Resources *(Cont.)*	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. Approximately 50 mi (80 km) of the auto tour route of the Juan Baptista de Anza Historic Trail is within the 25-mi (40-km) SEZ viewshed. More than 4 mi (6 km) of auto tour route is within the SEZ. Strong visual contrasts could be observed within and near the SEZ by travelers on the auto tour route. Approximately 52 mi (84 km) of I-8 is within the 25-mi (40-km) SEZ viewshed. Almost 8 mi (13 km) of I-8 abuts the SEZ. Strong visual contrasts could be observed within and near the SEZ by travelers on I-8. Approximately 33 mi (53 km) of State Route 98 is within the 25-mi (40-km) SEZ viewshed. More than 4 mi (6 km) of State Route 98 is within the SEZ. Strong visual contrasts could be observed within and near the SEZ by travelers on State Route 98. The communities of Holtville, Calexico, Heber, El Centro, and Imperial are located within the 5 to 25 mi (8 to 40 km) viewshed of the SEZ, although slight variations in topography and vegetation provide some screening. Visual impacts on these communities would be expected to be minimal.	

TABLE 9.1.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Imperial East SEZ	SEZ-Specific Design Features
Acoustic Environment	*Construction*: Estimated noise levels at the nearest residences located near the southwestern boundary (500 ft [150 m] from the SEZ boundary) would be about 69 dBA, well above the estimated background level of 50 dBA but below the Imperial County regulation of 75 dBA L_{eq} for construction noise. In addition, an estimated 65 dBA as L_{dn} at this location is well above the EPA guideline of 55 dBA for residential areas. *Operations*: Noise levels at the nearest residences from a parabolic trough or power tower facility would be about 50 dBA, which is equivalent to the estimated background level and the Imperial County regulation of 50 dBA daytime L_{eq}. If the operation were limited to daytime, 12 hours only, a noise level of about 52 dBA L_{dn} would be estimated for the nearest residences, which is below the EPA guidelines of 55 dBA L_{dn} for residential areas. However, in the case of 6-hour TES, the estimated nighttime sound level at the nearest residences would be 60 dBA L_{eq}, which is higher than the Imperial County regulation of 45 dBA nighttime L_{eq}. The combined day-night noise is estimated to be about 61 dBA as 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 54 dBA L_{eq} at the nearest residences would be higher than the Imperial County regulation of 50 dBA daytime L_{eq}. On the basis of 12-hour daytime operation, the estimated 54 dBA L_{dn} at these residences would be just below the EPA guideline of 55 dBA L_{dn} for residential areas.	Noise levels from cooling systems equipped with TES should be managed so that levels at the nearest residences to the southwest 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 Imperial East SEZ should be located more than 1 to 2 mi (1.6 to 3 km) from nearby residences located southwest of the SEZ (i.e., the facilities should be located in the central or eastern portion of the proposed SEZ). Direct noise control measures applied to individual dish engine systems could also be used to reduce noise impacts at nearby residences.
Paleontological Resources	The potential for impacts on significant paleontological resources at the Imperial East SEZ is unknown, and a preliminary PFYC of Class 3b has been assigned. A more detailed investigation of the local geological deposits of the SEZ, and their location and potential depth is needed.	The need for and the nature of any SEZ-specific design features would depend on findings of paleontological surveys.

TABLE 9.1.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Imperial East SEZ	SEZ-Specific Design Features
Cultural Resources	Direct impacts on significant cultural resources could occur during site preparation and construction activities in the proposed SEZ; however, a cultural resource survey of the entire area of potential effect would first be required to identify archaeological sites, historic structures and features, and traditional cultural properties, and an evaluation would follow to determine whether any are eligible for listing in the NRHP. The SEZ is located just north of an area previously identified as having a high density of prehistoric and historic resources. It is also located very near to the Lake Cahuilla ACECs identified for their cultural values. At least two burials have been identified by the Native American Heritage Commission as being in or near the SEZ, indicating the possibility of others in the vicinity. The Yuma-San Diego Trail, connecting Pilot Knob with the Yuha Basin, also runs through the vicinity of the SEZ. Although few sites have been identified to date within the SEZ, impacts on cultural resources within the SEZ are likely to result from solar energy development.	Design features specific to the SEZ would be determined through consultation with the California SHPO and affected Tribes. Because of the possibility of burials in the vicinity of the proposed Imperial East SEZ and its location along the Yuma-San Diego Trail, it is recommended that for surveys conducted in the SEZ consideration be given to include Native American representatives in the development of survey designs and historic property treatment and monitoring plans.
Native American Concerns	It is possible that there will be Native American concerns about the potential for burials within the SEZ and visual impacts on landscape features, such as Pilot Knob, Picacho Peak, and Yuha Basin. The potential for impacts on the Yuma-San Diego Trail may also be of concern. 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 regarding potential issues of concern, such as burials, Yuma-San Diego Trail, and Pilot Knob, would be determined during government-to-government consultation with affected Tribes.
Socioeconomics	*Construction:* 209 to 2,769 total jobs; $12.1 million to $159.9 million income in ROI. *Operations:* 13 to 288 annual total jobs; $0.4 million to $9.8 million annual income in the ROI.	None.

TABLE 9.1.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Imperial East SEZ	SEZ-Specific Design Features
Environmental Justice	Potential impacts on minority populations could be incurred as a result of the construction and operation of solar development. Although impacts are likely to be small, there are minority populations, as defined by CEQ guidelines, within the 50-mi (80-km) radius around the boundary of the SEZ; thus any adverse impacts of solar projects could disproportionately affect minority populations. Because there are no low-income populations within the 50-mi (80-km) radius, according to CEQ guidelines, there would be no impacts on low-income populations.	None.
Transportation	The primary transportation impacts are anticipated to be from commuting worker traffic. California State Route 98 provides a regional traffic corridor that could experience moderate impacts for single projects that may have up to 1,000 daily workers, with an additional 2,000 vehicle trips per day (maximum).	None.

Abbreviations: AAC = All-American Canal; AAQS = ambient air quality standards; ACEC = Area of Critical Environmental Concern; BLM = Bureau of Land Management; BMP = best management practice; CDFG = California Department of Fish and Game; CEQ = Council on Environmental Quality; CESA= California Endangered Species Act; CO_2 = carbon dioxide; DoD = U.S. Department of Defense; EHC = East Highline Canal; EPA = U.S. Environmental Protection Agency; ESA = Endangered Species Act; Hg = mercury; KGRA = known geothermal resource area; L_{dn} = day-night average sound level; L_{eq} = equivalent sound pressure level; MTR = military training route; NO_x = nitrogen oxides; NP = National Park; 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; ROI = region of influence; ROW = right-of-way; SEZ = solar energy zone; SHPO = State Historic Preservation Office; SO_2 = sulfur dioxide; SUA = Special Use Airspace; TDS = total dissolved solids concentrations; TES = thermal energy storage; USFWS = U.S. Fish and Wildlife Service; VRM = visual resource management; WA = Wilderness 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 Imperial East SEZ.

[b] The scientific names of all plants, wildlife, aquatic biota, and special statute species are provided in Sections 9.1.10 through 9.1.12.

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9.1.2 Lands and Realty

9.1.2.1 Affected Environment

The 5,722-acre (23-km^2) proposed Imperial East SEZ is contained within a triangle bordered by I-8 and State Route 98 on the north and south, respectively, and by Lake Cahuilla ACEC C on the west. While the SEZ is largely devoid of development, the area to the south of the SEZ is developed with several transmission lines, the All-American Canal and associated facilities, including two hydropower drop structures, and the international boundary fence. The canal, which originates at the Colorado River, is a major conduit for irrigation and the municipal water supply for the Imperial Valley. Although the SEZ consists only of BLM-administered public lands, there are about 980 acres (4 km^2) of Reclamation Withdrawn[1] lands and 640 acres (2.6 km^2) of private lands within the external boundaries of the SEZ that are not part of the SEZ. The area is rural in character.

There are several existing right-of-way (ROW) authorizations in the SEZ, including authorizations for I-8 and State Route 98, a fiber optic line, a communications site, one short segment of a 115-kV transmission line, and a short segment of road leading to a housing complex and substation facilities just south of the SEZ. Also, two double wood pole transmission lines parallel the western border of the SEZ within the adjacent ACEC.

A ROW issued to the Imperial Irrigation District (IID) covers all public lands within the SEZ. This ROW documents that the IID holds a public water reserve on all lands in the SEZ. The IID can sell water for solar development.

A 2-mi (3-km) wide Section 368 (of the Energy Policy Act of 2005) energy corridor covers about 80% of the SEZ. This corridor was designated as an outcome of the West-wide Energy Corridor PEIS (DOE and DOI 2008).

Currently, there are two applications for ROWs for solar facilities within the Imperial East SEZ. These applications cover all of the land within the SEZ.

9.1.2.2 Impacts

9.1.2.2.1 Construction and Operations

Development of the proposed Imperial East SEZ for utility-scale solar energy production would establish a large industrial area that would exclude many existing and potential uses of the land, perhaps in perpetuity. Since the SEZ is undeveloped and rural, utility-scale solar energy

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[1] The term "Reclamation Withdrawal" means withholding an area of public land from the operation of the public land laws for the purpose of reserving the land for the use of the BOR. In general, this means that the BOR has first priority for use of the land for BOR projects. Other uses of the land may sometimes be approved with the concurrence of the BOR.

development would be a new and discordant land use to the area. It also is possible that the 640 acres (2.6 km^2) of private land located within the external boundary of the SEZ could be developed in the same or a complementary manner as the public lands with the concurrence of the landowner. The 980 acres (4 km^2) of Reclamation Withdrawn lands within the external boundaries of the SEZ are not part of the SEZ and are not analyzed for solar development as a part of this PEIS. It is possible that these lands also could be developed with concurrence from the BOR.

Current ROW authorizations on the SEZ would not be affected by solar energy development since they are prior rights. Should the proposed SEZ be identified as an SEZ in the Record of Decision (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.

A designated Section 368 transmission corridor along I-8 covers 80% of the SEZ. It could limit future solar development to less than 1,000 acres (4 km^2) because to avoid technical or operational interference between transmission and solar energy facilities, solar energy facilities cannot be constructed under transmission lines or over pipelines. Because of the proximity to the international border and the East Mesa ACEC north of I-8, 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 existing public water reserve held by the IID, as documented in a ROW, would require close coordination with the district prior to development of on-site water supplies for solar energy facilities.

9.1.2.2.2 Transmission Facilities and Other Off-Site Infrastructure

An existing 115-kV transmission line intersects the southwest corner 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 site is good, and no new roads to the site would be required. Transmission lines and roads within the SEZ would be required to support development of solar energy facilities.

The existence of large transmission lines and an existing substation to the south but in near proximity to the SEZ provides additional options for connecting solar development to the regional grid. Access to these alternative facilities would cross land managed either by the BLM or the BOR, thus no private or state lands would be affected.

9.1.2.3 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 would be 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 any induced changes in land use on private and BOR lands.

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9.1.3 Specially Designated Areas and Lands with Wilderness Characteristics

9.1.3.1 Affected Environment

The Imperial East SEZ is located within the CDCA and the area is adjacent to several specially designated areas, including three ACECs. The SEZ is near the ISDRA and the Juan Bautista de Anza National Historic Trail (see Figure 9.1.3.1-1). The major resource values associated with the adjacent ACECs are cultural resources and wildlife habitat. There is a designated WA near the north end of the ISDRA.

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 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 values.

- 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 or 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.

- Class I (Intensive use). Its purpose 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 Imperial East SEZ is Class L. Guidelines contained in the CDCA Plan indicate that wind, solar, or geothermal electrical generation facilities could be allowed in Class L areas.

The ISDRA is the largest mass of sand dunes in the state. Formed by windblown sands of ancient Lake Cahuilla, the dune system extends for more than 40 mi (64 km) in a band averaging 5 mi (8 km) wide. Largely known as a favorite location for off-highway vehicle (OHV) enthusiasts, the dunes also offer scenery, opportunities for solitude, and a home to rare plants and

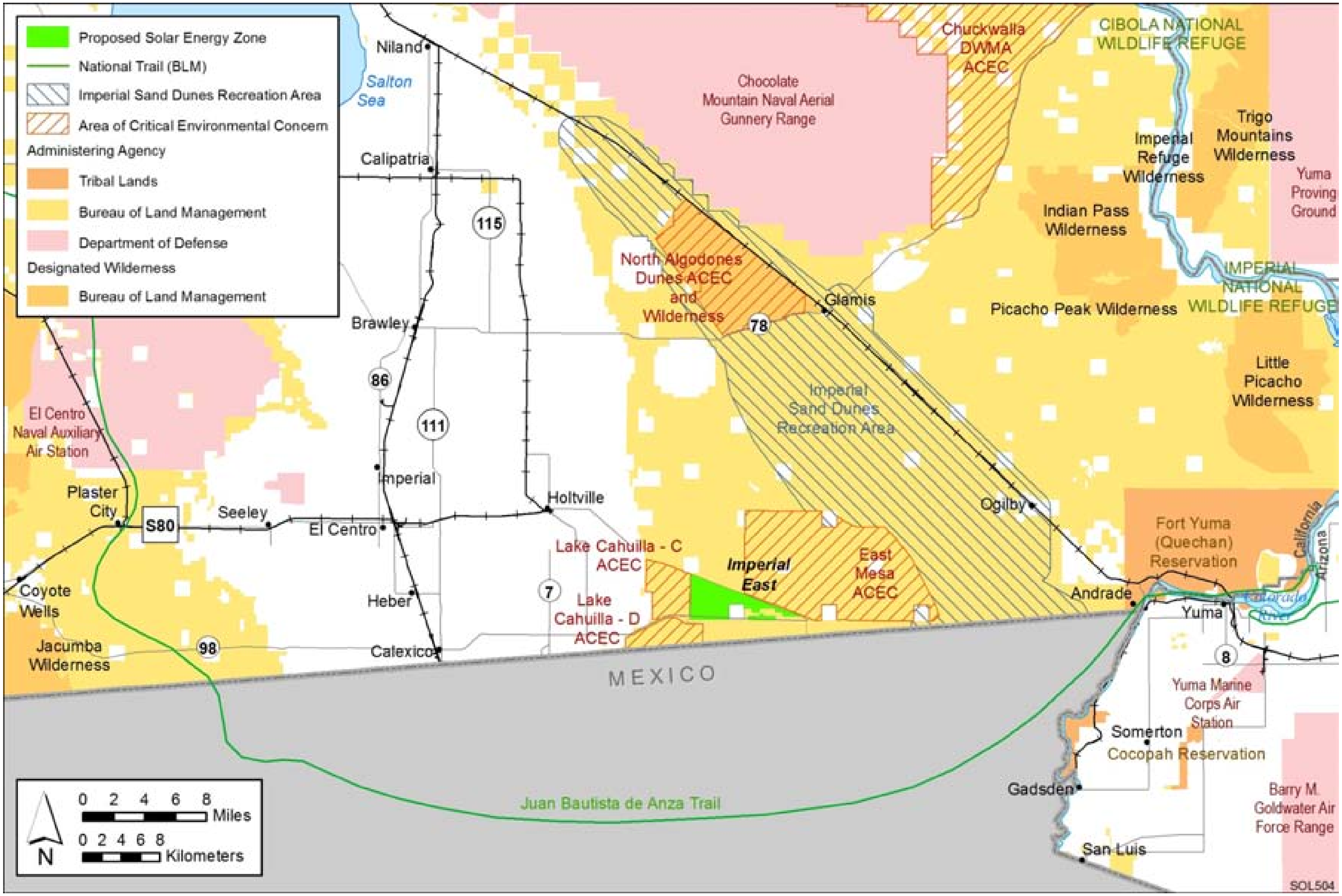

FIGURE 9.1.3.1-1 Specially Designated Areas in the Vicinity of the Proposed Imperial East SEZ

animals. The dune system consists of three areas: the northernmost area is the Mammoth Wash OHV open area and is about 22 mi (35 km) north of the SEZ; the North Algodones Dunes WA is south of Mammoth Wash and ranges from about 16 to 22 mi (26 to 35 km) from the SEZ; and the remainder of the area ranges from 10 to 22 mi (16 to 35 km) from the SEZ and stretches south from State Route 78 where the largest and most heavily used dunes are found. With some restrictions, these primary dunes may be traveled south toward the Mexican border (BLM 2010a).

There are four ACECs near the SEZ.[2] Lake Cahuilla ACECs C and D to the west of the SEZ were designated to protect prehistoric features associated with ancient Lake Cahuilla. The East Mesa ACEC, which is included within the larger East Mesa flat-tailed horned lizard Management Area, is just across I-8 from the SEZ and was designated to protect prehistoric resources and habitat of the flat-tailed horned lizard. The North Algodones Dunes ACEC, which is about 15 mi (24 km) north of the SEZ and which overlays most of the designated WA of the same name, was designated because of its outstanding scenic values.

The Juan Bautista de Anza National Historic Trail approaches to within about 17 mi (27 km) east of the SEZ, where it loops south into Mexico and then passes about 10 mi (16 km) south of the SEZ before turning north back into the United States about 20 mi (32 km) west of the SEZ. The trail then heads north and northwest. There is an auto tour route in the United States that follows much of the route of the National Historic Trail, but in the area where the trail dips south into Mexico, the route follows State Route 98, which passes through the SEZ (see Figure 9.1.3.1.1).

There are no undesignated areas with wilderness characteristics near the SEZ that have been identified.

9.1.3.2 Impacts

9.1.3.2.1 Construction and Operations

The primary potential impacts on specially designated areas generally are from visual impacts of solar energy development that could affect scenic, recreational, or wilderness characteristics of the areas. This visual impact is difficult to determine and would vary by solar technology employed, the specific area being affected, and the perception of individuals viewing the development. Assessment of the visual impact of solar energy projects must be done on a site-specific and technology-specific basis to accurately identify impacts

In general, the closer a viewer is to solar development, the greater the impact on an individual's perception. From a visual analysis perspective, the most sensitive viewing distances

[2] The ACECs included in this analysis are the ones that are either immediately adjacent to the SEZ or that were designated because of scenic resources and are within 25 mi (40 km) of the SEZ. An additional five ACECs within that distance have been determined not to be affected by development of the SEZ.

generally are from 0 to 5 mi (0 to 8 km). The viewing height above a solar energy development area, the size of the solar development area, and the purpose for which a person is visiting an area are also important. Individuals seeking a wilderness or scenic experience within these areas could be expected to be more adversely affected than those simply traveling along a highway with another destination in mind.

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 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.

The following areas could potentially be affected by development of the SEZ:

California Desert National Conservation Area

- The viewshed within 25 mi (40 km) of the Imperial East SEZ includes about 78,000 acres (316 km^2), or about 0.3% of the CDCA (see Table 9.1.14.2-1) and may be visible for over 40 mi (64 km). Installation of renewable energy facilities is consistent with the CDCA Plan. Anticipated impacts on the CDCA appear to be minimal.

Imperial Sand Dunes Recreation Area

- *The Mammoth Wash OHV Area*—This is the portion of the ISDRA most isolated from the SEZ and is 22 mi (35 km) away. The westernmost portion of the area would have long-distance views of the SEZ, but the SEZ would constitute a minor portion of the overall viewscape from the area. The majority of the OHV area would be screened from views of the SEZ. Because of the distance and the lack of visibility of the SEZ, there is no impact expected from development of the SEZ in this portion of the ISDRA.

- *North Algodones Dunes WA and ACEC*—A small portion (3%) of the WA/ACEC would have views of development within the SEZ. Because of the distance from the SEZ, the presence of agricultural development to the west in the Imperial Valley, and the motorized recreational use in the adjacent portions of the ISDRA, the potential for adverse impacts from the visual impact of the SEZ on wilderness characteristics and visitors, and on the scenic resources in the area, would not be significant.

Remainder of the ISDRA

- The largest portion of the ISDRA stretches southeast of State Route 78 for about 25 mi (40 km). The ISDRA border at its closest approach to the SEZ is about 6 mi (10 km) and solar development within the SEZ would be visible although large portions of the area would have little to no visibility of development in the SEZ. Visual impacts occurring in the ISDRA arising from solar energy development would depend on the location of the viewer and project location, project technology, site design, and other visibility factors but solar energy development within the SEZ would be expected to have a minimal impact on the ISDRA.

ACECs

- *Lake Cahuilla ACECs C and D*—The two Lake Cahuilla ACECs are located adjacent to the SEZ and could be exposed to additional human traffic related to construction and operation activities, as well as general human interest in viewing solar facilities, and this could result in the potential loss of important prehistoric resources. See Section 9.1.17 for further discussion of these areas.

- *East Mesa ACEC*—I-8 lies between the SEZ and this ACEC; thus there is no direct road connection between the two that could lead to increases in human traffic within the ACEC. It is not anticipated that solar development of the SEZ would result in any adverse effects on the prehistoric or wildlife resources in the ACEC.

Juan Bautista de Anza National Historic Trail

- The most significant portion of the National Historic Trail in the vicinity of the SEZ is about 10 mi (16 km) south in Mexico. Because the area south of the SEZ is flat, facilities in the SEZ may be visible from the trail corridor; however, the area in Mexico through which the trail corridor passes is heavily developed for agriculture, and it is anticipated that this development has a much larger effect on the trail corridor. It is anticipated there would be no impact on the Trail from solar development within the SEZ. For a discussion of the potential impact on the Juan Bautista de Anza National Historic Trail auto tour route that follows State Route 98 through the SEZ, see Section 9.1.5.2.

9.1.3.2.2 Transmission Facilities and Other Off-Site Infrastructure

See Section 9.1.2.2.2 for the discussion of the assumptions and requirements regarding construction of new transmission lines or roads that also applies to impacts on specially designated areas.

9.1.3.3 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 exceptions would be increases in human use of the Lake Cahuilla C and D ACECs.

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

- Because of a potential increase in human use in the two Lake Cahuilla ACECs, once solar energy facility construction begins, the BLM would monitor to determine whether increases in traffic in the ACECs occurs and whether additional management measures (e.g., fencing) are required to protect the resources in these areas.

9.1.4 Rangeland Resources

Rangeland resources include livestock grazing and wild horses and burros, both of which are managed by the BLM.

9.1.4.1 Livestock Grazing

9.1.4.1.1 Affected Environment

The SEZ is not included within a grazing allotment and grazing is not authorized.

9.1.4.1.2 Impacts

There would not be any impacts on livestock grazing.

9.1.4.1.3 SEZ-Specific Design Features and Design Feature Effectiveness

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

9.1.4.2 Wild Horses and Burros

9.1.4.2.1 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 wild horse and burro herd management areas (HMAs) occur within California. Also, several HMAs in Arizona are located near the Arizona–California border. Two of these HMAs (Chocolate-Mule Mountains and Cibola-Trigo) occur within a 50-mi (80-km) radius of the proposed Imperial East SEZ (Figure 9.1.4.2-1). Chocolate-Mule Mountains is the closest HMA, located nearly 22 mi (35 km) northeast of the SEZ. The Chocolate-Mule Mountains HMA contains an estimated population of 120 burros (BLM 2009b).

In addition to the HMAs managed by BLM, the U.S. Forest Service (USFS) has 51 established wild horse and burro territories in Arizona, California, Nevada, New Mexico, and Utah and is the lead management agency that administers 37 of the territories (Giffen 2009; USFS 2007). The closest territory to the proposed Imperial East SEZ is the Big Bear Territory within the San Bernardino National Forest. It is located more than 130 mi (209 km) northwest of the SEZ. This territory is managed for a population of 60 wild burros (USFS 2007).

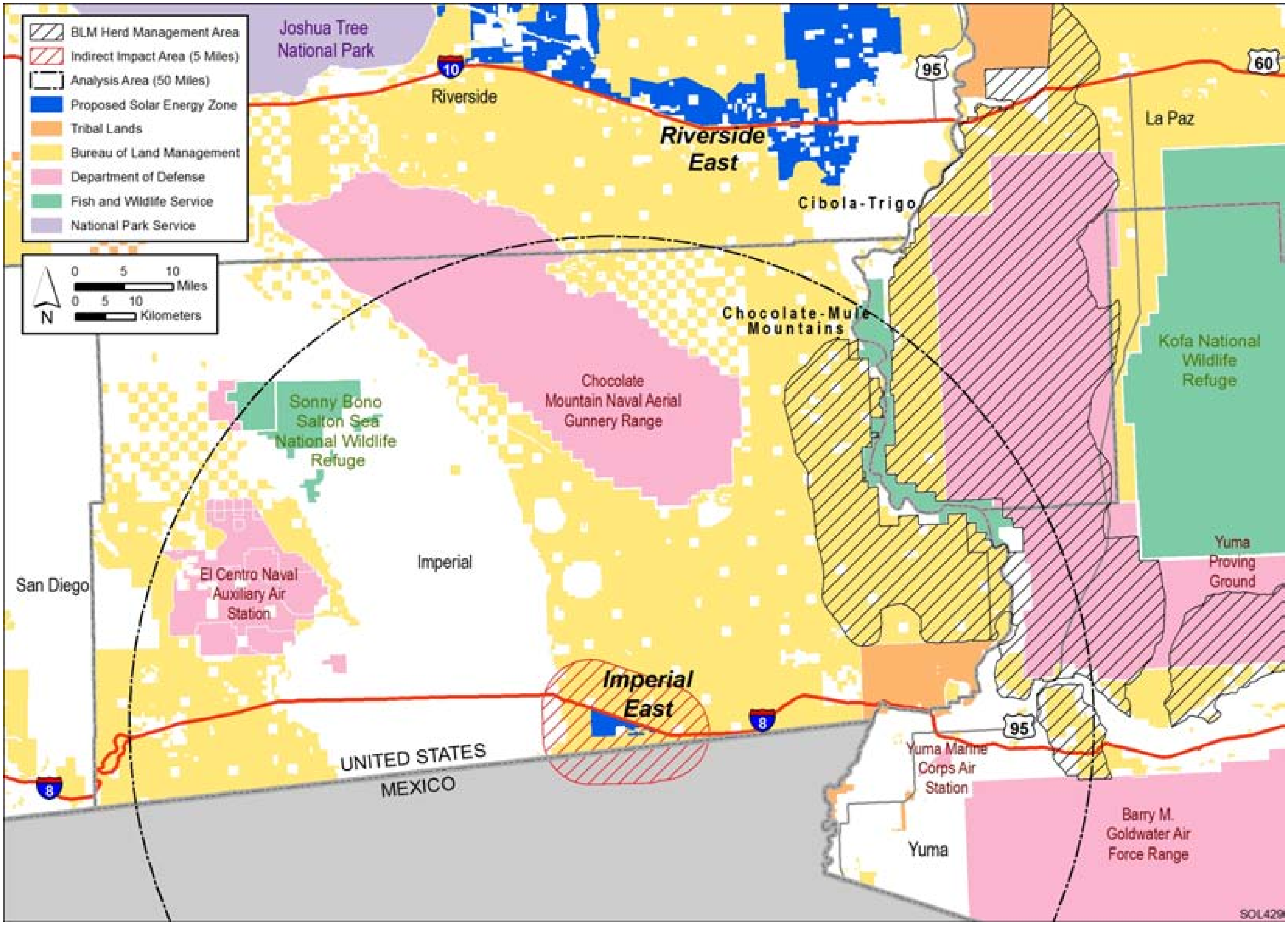

FIGURE 9.1.4.2-1 Wild Horse and Burro Herd Management Areas within the Analysis Area for the Proposed Imperial East SEZ (Source: BLM 2009a)

9.1.4.2.2 Impacts

Because the proposed Imperial East SEZ is nearly 22 mi (35 km) or more from any wild horse and burro HMA managed by the BLM and more than 130 mi (209 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 that are managed by these agencies.

9.1.4.2.3 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 wild horses and burros. No proposed Imperial East SEZ-specific design features would be necessary to protect or minimize impacts on wild horses and burros.

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9.1.5 Recreation

9.1.5.1 Affected Environment

The proposed Imperial East SEZ area is a triangle of land located between I-8 and State Route 98. State Route 98 cuts through the very southern end of the SEZ on a slight northwesterly angle and thus leaves a small portion of the area south of the highway within the western end of the SEZ. The western boundary of the SEZ is bordered by two double wood pole transmission lines, and the view to the south is dominated by additional transmission lines and the All-American Canal and associated facilities. The area is very flat and sparsely vegetated, mainly with creosotebush. The recreation value of the area is very low. Although there are signs of vehicle tracks throughout the area, it is not open to vehicle travel, but there are short segments of roads in the area that are designated as open to travel (BLM 2007b). The small Tamarisk Long Term Visitor Area (LTVA, about 10 units) is located just outside the SEZ and south of State Route 98. In the last two years, the LTVA has had no more than three or four camper units present at a time in the period from October through March (Meeks 2010). Visitors staying at the LTVA are likely the most frequent users of the SEZ area since it is within easy walking distance. Walking and bird watching are the most likely recreation uses of the area (Meeks 2010). Some people may be attracted to the area by the presence of two cultural resource ACECs on the west end of the SEZ, the All-American Canal, the international boundary fence about 1 mi (1.6 km) south of the area, and the Juan Bautista de Anza National Historic Trail auto tour route, which follows State Route 98.

There are few OHV routes designated as open within the proposed Imperial East SEZ; these are discussed in Section 9.1.21 and shown in Figure 9.1.21-1.

9.1.5.2 Impacts

Recreational users would be excluded from developed areas of the SEZ. Although there are no recreational use figures for the area of the SEZ, because of the generally low-quality recreation opportunities in the SEZ, the impact of solar energy development in the SEZ on recreation use is expected to be minimal.

The actual location of the route of the Juan Bautista de Anza Trail is about 10 mi (16 km) south in Mexico, but visitors traveling the auto route of the trail on State Route 98 may find the presence of a large solar development along the route inconsistent with their reasons for traveling the route. The potential effect of this on tour route travelers is not known. Because the SEZ is not actually on the route of the trail and because the area nearby already has been altered by the presence of the All-American Canal and related facilities, numerous transmission lines, and the international boundary fence, it is not anticipated that there would be a loss of recreation use of the auto tour route as a result of development of the SEZ.

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 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).

9.1.5.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features were identified for addressing impacts on recreation use at the proposed Imperial East 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 any recreational use impacts. The exceptions would be in the loss of any recreational use in the SEZ which would not be mitigated.

9.1.6 Military and Civilian Aviation

9.1.6.1 Affected Environment

The SEZ is entirely covered by two military training routes (MTRs) and Special Use Airspace (SUA). The area is identified in BLM land records (BLM and USFS 2010b) as requiring consultation with the U.S. Department of Defense (DoD) prior to approval of any facilities.

Four small public airports are within approximately 34 mi (55 km) of the Imperial East SEZ—three in the United States and one in Mexicali, Mexico. The Mexicali airport is the closest of the four airports and is about 5 mi (8 km) southwest of the SEZ.

9.1.6.2 Impacts

The development of any solar energy or transmission facilities that encroach into the airspace of the MTR/SUA could interfere with military training activities. While the military has indicated that solar development on portions of the Imperial East SEZ is compatible with existing military use, 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.

It is assumed that airspace required for the Mexicali airport is completely contained in Mexico, so there normally would be no effect from facilities constructed in the SEZ; however, inclement weather conditions or other considerations could alter this situation. The U.S. airports are all far enough away not to be affected by solar facilities in the SEZ.

9.1.6.3 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 on military and civilian aviation. The exception would be the potential impacts on the operation of Mexicali Airport if solar power towers are utilized within the SEZ.

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

- Should power tower facilities be proposed for the SEZ, coordination across the international border should be required to ensure that there is no airspace management concern associated with the Mexicali Airport.

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9.1.7 Geologic Setting and Soil Resources

9.1.7.1 Affected Environment

9.1.7.1.1 Geologic Setting

Regional Geology

The proposed Imperial East SEZ is located in the Imperial Valley, part of the Salton Trough, a sediment-filled structural basin that lies within the Basin and Range physiographic province in southern California (Figure 9.1.7.1-1). The Salton Trough is the landward extension of the East Pacific Rise as it emerges from the 1,000-mi (1,609-km) long trough occupied by the Gulf of California and continues northward to Palm Springs. The East Pacific Rise is a crustal spreading center characterized by a series of northwest-trending transform (strike-slip) faults, the northernmost being the San Andreas Fault System. The tectonic activity of the East Pacific Rise has downwarped, downfaulted, extended, and laterally translated the sediments within the Salton Trough. Although the basin is geologically complex, its surface is relatively featureless (Riney et al. 1982; Mase et al. 1981; Morton 1977).

The Salton Trough has received a continuous influx of sand, silt, and clay derived from the Colorado River, which created ephemeral lakes in the basin until about 300 years ago. Underlying this alluvial cover is a succession of late Tertiary and Quaternary sediments composed mainly of marine and nonmarine sandstones and clays and lake deposits. Water-bearing aquifers occur in the upper 2,000 ft (610 m) of these deposits (Loeltz et al. 1975). The depth to basement rock ranges from 11,000 to 15,400 ft (3,353 to 4,694 m), though metamorphism of sedimentary deposits is known to occur at depths as shallow as 4,000 ft (1,219 m) because of the high heat flows associated with crustal spreading. High heat flows also give rise to geothermal steam; and several known geothermal resource areas occur throughout the valley (Riney et al. 1982; Mase et al. 1981; Morton 1977; Robinson et al. 1976) Exposed sediments near the Imperial East SEZ consist mainly of modern alluvium, lake, and playa deposits (Q) and dune sands (Qs) (Figure 9.1.7.1-2).

Topography

The Imperial Valley is a flat, alluvium-filled basin following the same northwest trend as the Salton Trough. Located in the south-central part of Imperial County, the valley lies at or below sea level and has an area of about 989,450 acres (4,004 km^2) in the United States. It is bounded to the north by the Salton Sea and extends south into Mexico. To the east are the Algodones Dunes and Sand Hills; to the west (from north to south) are the Fish Creek Mountains, Superstition Hills, Superstition Mountain, and the Coyote Mountains. The Yuha Desert lies to the southwest. The Imperial Valley is separated from the Gulf of California by the ridge of the Colorado River delta (in Mexico), which has an elevation of about 30 ft (9 m) above mean sea level (MSL) at its lowest point (Morton 1977; Zimmerman 1981).

FIGURE 9.1.7.1-1 Physiographic Features in the Imperial Valley Region

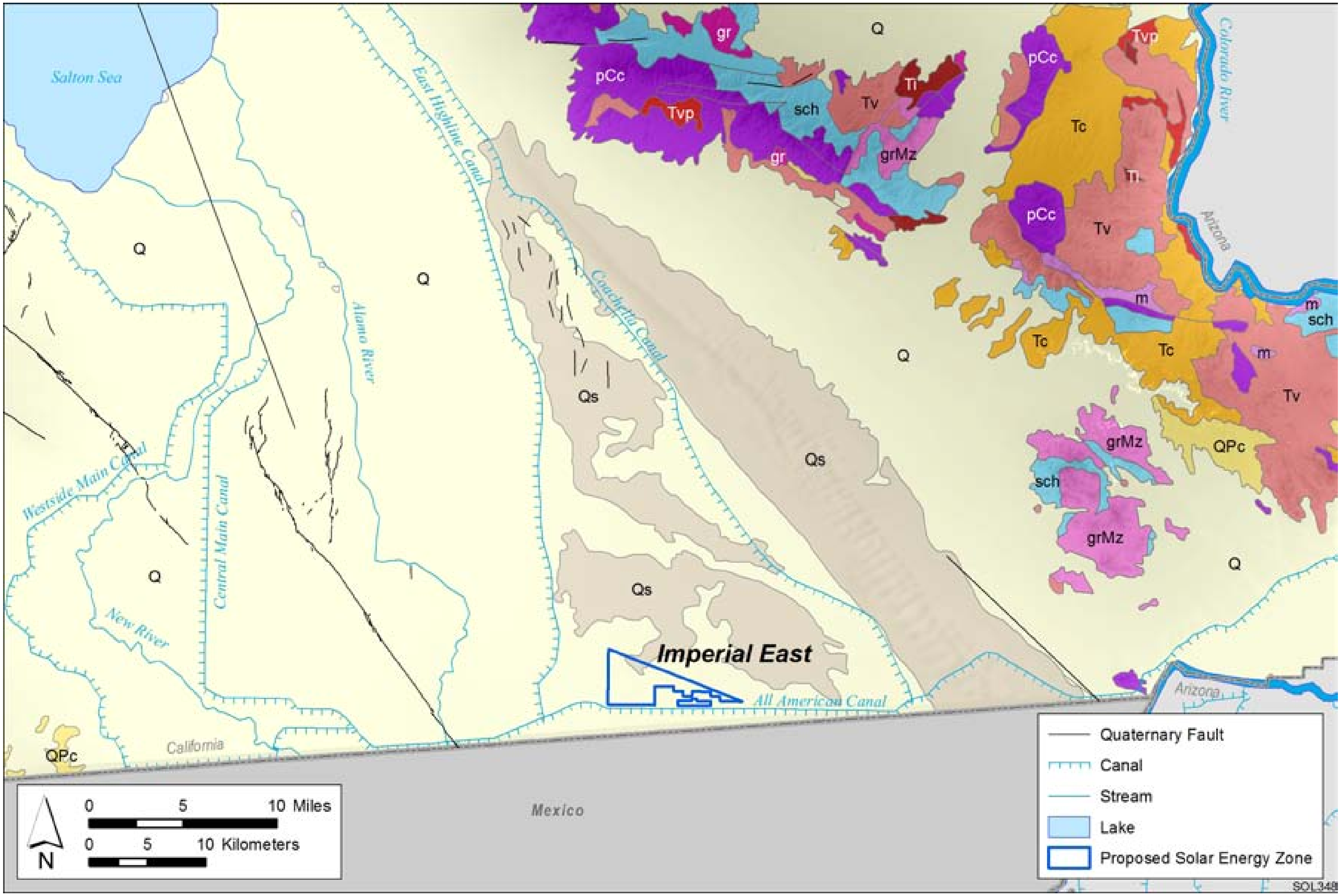

FIGURE 9.1.7.1-2 Geologic Map of the Imperial Valley Region (adapted from Ludington et al. 2007 and Gutierrez et al. 2010)

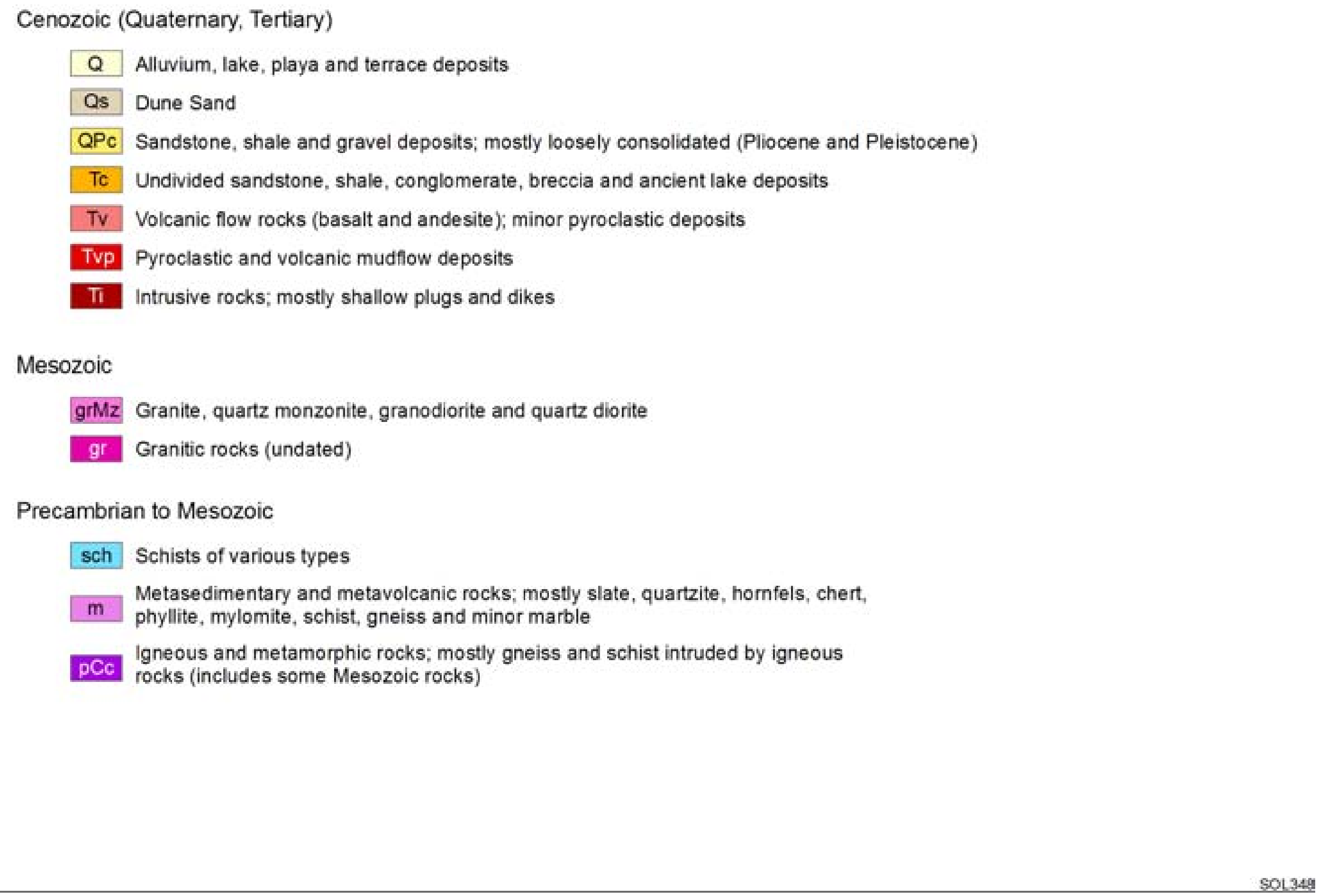

FIGURE 9.1.7.1-2 (Cont.)

As recently as 300 years ago, a freshwater lake, called Lake Cahuilla, filled the Imperial Valley basin to the elevation of the Colorado River delta. The ancient lake was actually a succession of lakes that periodically overflowed and covered a major portion of the Salton Trough during the late Pleistocene and Holocene epochs. Muds and silts of this ancient lake form the top 197 to 328 ft (60 to 100 m) of strata within the Imperial Valley (Mase et al. 1981). The former shoreline marking the maximum Holocene water level of Lake Cahuilla is well preserved around the margins of the Imperial Valley at an elevation of about 40 to 48 ft (12 to 15 m) above sea level (Blake 1914; Stanley 1963). At this maximum level, Lake Cahuilla would have been over 300 ft (91 m) deep, 105 mi (170 km) long, and 35 mi (56 km) across at its widest point (Hubbs and Miller 1948; Waters 1983). The Salton Trough is currently occupied by the Salton Sea, which lies 200 ft (61 m) below sea level (Riney et al. 1982).

The proposed Imperial East SEZ is located between the east side of the Lake Cahuilla lakebed and the Algodones Sand Hills on a desert plain, called the Imperial East Mesa, a terrace of the Colorado River delta. Its terrain is relatively flat with a very gentle dip to the west (Figure 9.1.7.1-3). Elevations range from about 40 ft (12 m) near the southeastern corner of the site to less than 20 ft (6.1 m) along its western boundary. The All-American Canal is located south of the site and runs parallel to its southern border.

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 Imperial East 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.

Seismicity. The proposed Imperial East SEZ is located east of the San Andreas Fault Zone, a seismically active region dominated by northwest-trending right-lateral strike slip faulting that is 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 9.1.7.1-4). 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).

Although the Imperial Valley is a seismically active area (with over 2,000 recorded earthquakes in the past 10 years), no known Quaternary faults intersect the proposed Imperial East SEZ (Figure 9.1.7.1-4). Earthquake activity over the past 100 years has consisted predominantly of swarms and clustered events along the Brawley Fault Zone, interspersed with swarms and magnitude 5 to 7 main-shock/aftershock sequences along the Imperial Fault just to

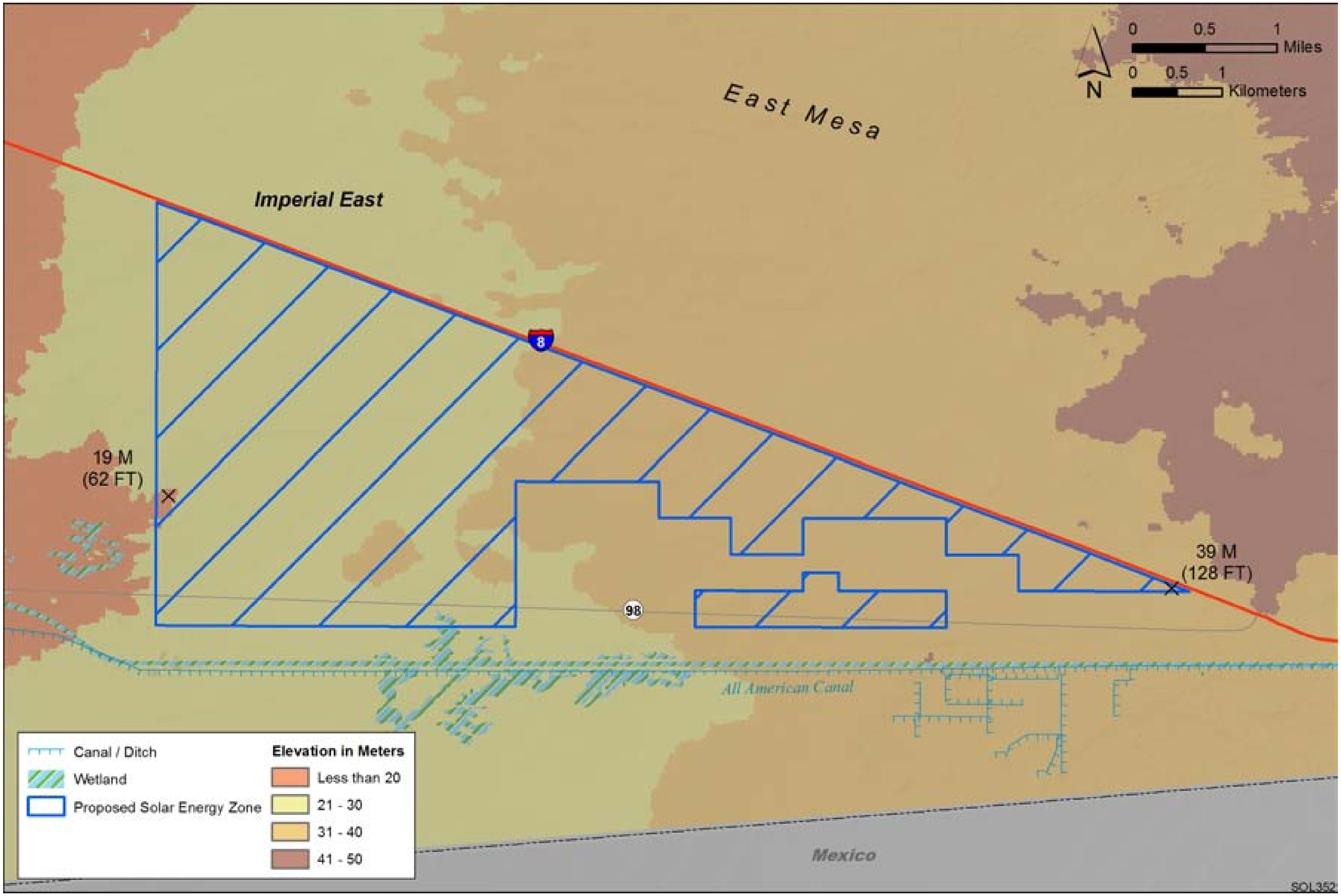

FIGURE 9.1.7.1-3 General Terrain of the Proposed Imperial East SEZ

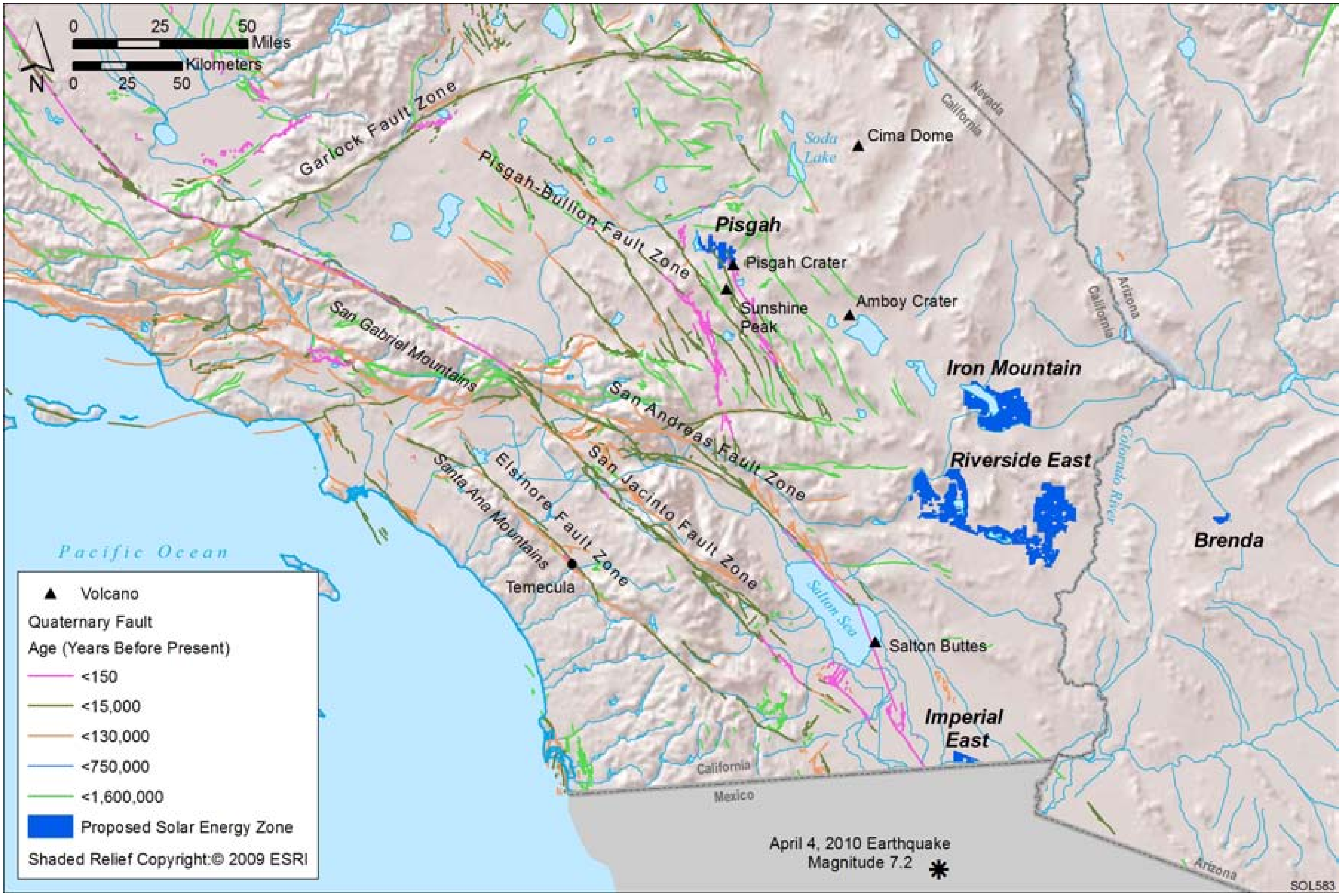

FIGURE 9.1.7.1-4 Quaternary Faults and Volcanoes in Southern California (USGS and CGS 2009; USGS 2010d)

the west of the site (Figure 9.1.7.1-5). Focal depths of earthquakes in the Imperial Valley are generally between 3 and 4 mi (4 and 6 km), with a maximum depth of about 5 mi (8 km) (Johnson and Hill 1982).

The Imperial Fault is the main strand of the San Andreas Fault System in the southern Salton Trough (Figure 9.1.7.1-5). The fault accommodates slip from both the San Andreas and San Jacinto Fault Zones. These fault zones are seismically active regions dominated by northwest-trending right-lateral strike slip faulting and are categorized as "potentially active" (i.e., having surface displacement within the last 11,000 years [Holocene]) under the Alquist-Priolo Earthquake Fault Zoning Act. The term "potentially active" generally denotes that a fault has shown evidence of surface displacement during Quaternary time (the last 2.6 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).

Two major earthquakes have occurred along the Imperial fault, causing significant surface rupture: the 1940 and 1979 Imperial Valley earthquakes (magnitudes 6.9 and 6.4, respectively). Based on these recent events, late Holocene creep rates have been estimated to range from 15 to 20 mm/yr. Slip along the Imperial Fault is transferred north to the San Andreas Fault Zone through the Brawley Seismic Zone (Figure 9.1.7.1-5). Locally, there is a vertical component (via subsidence) to the offset near Mesquite Lake to the northeast of the Imperial Fault and west of the Brawley Seismic Zone. Average recurrence intervals are estimated to range from 40 to 137 years (Treiman 1999).

On April 4, 2010, an earthquake referred to as the El Mayor-Cucapah Earthquake, registering a moment magnitude (Mw[3]) of 7.2 (at an approximate depth of 6.2 mi [10 km]), occurred along a segment of the Laguna Salada fault system in northern Baja California, about 30 mi (50 km) southwest of the Imperial East SEZ (Figure 9.1.7.1-4). The Laguna-Salada system is a northwest-trending zone of strike-slip faults that runs parallel to the San Andreas fault system. Displacement was a combination of vertical (east side down) and right lateral shifts with cumulative lateral offsets of about 3.9 ft (1.2 m). Aftershocks were concentrated along a northwest-trending line extending from the Colorado River delta (on the Gulf of California, Mexico) to Temecula, California. Ground-shaking in the vicinity of the Imperial East SEZ is estimated to have been very strong (about 0.18 to 0.34 g) with moderate to heavy potential structure damage (SCSN 2010 and USGS 2010d).

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3 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 2010e).

FIGURE 9.1.7.1-5 Delineated Earthquake Fault Zones near the Proposed Imperial East SEZ (CGS 2010)

Liquefaction. The proposed Imperial East SEZ lies within an area where the peak horizontal acceleration with a 10% probability of exceedance in 50 years is between 0.30 and 0.60 g. 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).

The 1979 Imperial Valley earthquake caused right lateral movement along a 22-mi (35-km) section of the Imperial Fault. Evidence of liquefaction as a result of this earthquake has been observed at several locations within the Imperial Valley, especially within the fine-grained fluvial sediments (point bar, channel fill, and overbank deposits associated with the Alamo River) and interbedded channel sands and lacustrine clays on the East Mesa. Sediments most affected were those in the upper 16 ft (5 m); below this depth, sand deposits were found to be dense enough to resist liquefaction under the ground-shaking conditions generated by the 1979 earthquake. The types of sediments with the greatest liquefaction effects were loose to very loose silt to clayey silt (overbank deposits), very loose to medium dense very fine sand to silt (channel fill), and stiff to very stiff silty clay to clay (lacustrine deposits). Investigators identified liquefaction effects such as sand boils, ground cracks, earth slumps, earth falls, rock falls, rock slides, lateral spreading, and ground settlement, some within 10 mi (16 km) of the SEZ (Bennet et al. 1981, 1984; Youd and Wieczorek 1982). On the basis of these findings, as well as the similarity in surface material and the very strong to severe ground-shaking intensity that is probable in the region during an earthquake, the risk of liquefaction and ground failure (i.e., permanent ground displacement capable of damaging structures) at the proposed Imperial East SEZ is considered high.

Volcanic Hazards. The nearest volcanoes to the proposed Imperial East SEZ are the five small rhyolitic domes (Obsidian Butte, Rock Hill, Red Island [composed of two domes], and Mullet Island) forming the Salton Buttes along the southeast end of the Salton Sea, about 40 mi (65 km) north-northwest of the SEZ (Figure 9.1.7.1-4). The Salton Buttes are within the Salton Sea Geothermal Field and are part of the active crustal spreading center that lies beneath the Colorado River delta sediments. The domes exhibit a bimodal (basalt-rhyolite) composition and were most recently active about 16,000 years ago. The most likely future potential hazard associated with the Salton Buttes volcanoes would result from an explosive rhyolitic eruption, which could give rise to pyroclastic flows and surges; these events could be destructive to distances of 6 mi (10 km) from an active vent (Robinson et al. 1976; Miller 1989).

The nearest active volcano is Mount St. Helens in the Cascade Range (Washington), about 1,000 mi (1,590 km) north-northwest of Imperial Valley; it 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 400 mi (640 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. Wind-blown 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 located about 700 mi (1,130 km) northwest of the SEZ (Diefenbach et al. 2009). The most recent eruption at Medicine Lake was rhyolitic in composition and occurred about 900 years ago (USGS 2010f). 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 in the vicinity of the proposed Imperial East SEZ is low because it is located on the relatively flat terrain of the Imperial East Mesa.

Subsidence due to earthquakes, geothermal fluid production, and groundwater withdrawal has been observed in the Imperial Valley. The Imperial County Department of Public Works[4] established a subsidence monitoring program (Geothermal Subsidence Detection Network) between 1971 and 1972. Monitoring has shown that substantial downward movement of the valley floor relative to the mountains to the west has occurred (Crow and Kasamayer 1978). A study conducted by Massonnet et al. (1997) found maximum rates of subsidence on the East Mesa to be about 18 mm/yr between 1991 and 1994. Subsidence is not generally a serious hazard if it occurs as a broad depression over a large region (except in flood-prone areas sensitive to changes in elevation). The major problems associated with subsidence occur as a result of differential vertical subsidence, horizontal displacement, and earth fissures (Burbey 2002).

Other Hazards. Other potential hazards at the Imperial East 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. Section 9.1.9.1.1 provides a discussion of flood risks within the Imperial East SEZ.

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[4] The Imperial County Department of Public Works together with the Imperial Irrigation District, the California Division of Oil and Gas, and the U.S. Geological Survey formed the Imperial Valley Subsidence Detection Committee in the 1970s and constructed a network of precisely leveled benchmarks throughout the valley (Crow and Kasameyer 1978).

9.1.7.1.2 Soil Resources

Soils within the proposed Imperial East SEZ are predominantly fine sands and loamy fine sands of the Rositas and Superstition Series, which together make up about 96% of the soil coverage at the site (Figure 9.1.7.1-6). Soil map units within the Imperial East SEZ are described in Table 9.1.7.1-1. Parent material consists of alluvium and eolian sands derived from various sources. Soils are characterized as moderately to somewhat excessively well drained. Most soils on the site have low surface runoff potential and rapid permeability. The natural soil surface is suitable for roads, with a slight to moderate erosion hazard when used as roads or trails. The water erosion potential is slight for all soils. The susceptibility to wind erosion is high for most soils, with as much as 220 tons of soil eroded by wind per acre each year. All the soils within the SEZ have features that are favorable for fugitive dust formation (NRCS 2010). Biological soil crusts and desert pavement have not been documented in the SEZ, but may be present.

None of the soils within the SEZ is rated as hydric[5] (a few units have not been rated). Flooding is not likely for soils at the site (occurring less than once in 500 years). Most of the soils (about 91%) are classified as farmland of statewide importance; about 6% of the soils (Superstition loamy fine sand) are classified as prime farmland if irrigated (NRCS 2010).

9.1.7.2 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.

9.1.7.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features were identified for soil resources at the proposed Imperial East 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 soil impacts during all project phases.

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[5] A hydric soil is a soil formed under conditions of saturation, flooding, or ponding.

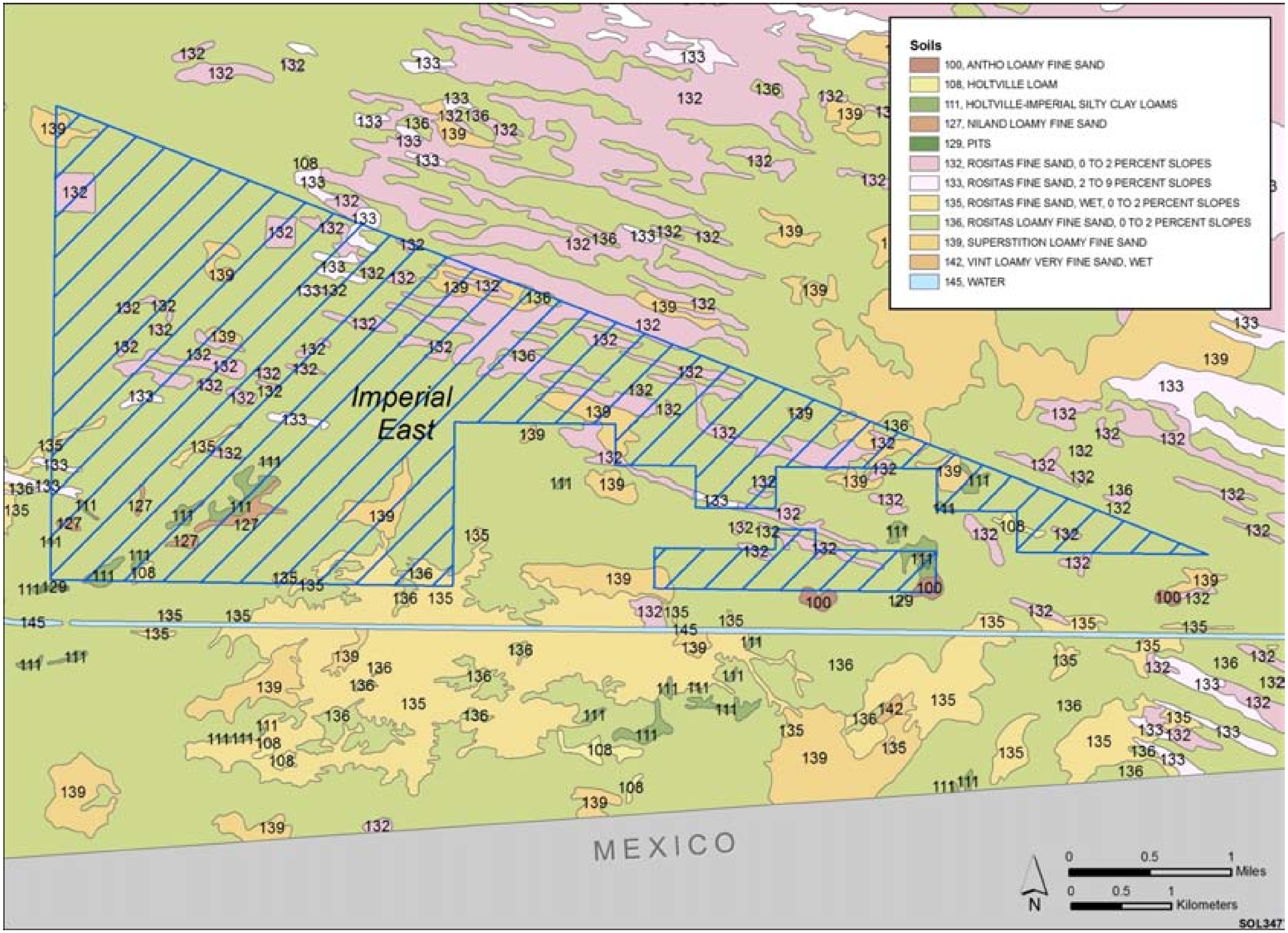

FIGURE 9.1.7.1-6 Soil Map for the Proposed Imperial East SEZ (NRCS 2008)

TABLE 9.1.7.1-1 Summary of Soil Map Units within the Proposed Imperial East SEZ

Map Unit Symbol	Map Unit Name	Water Erosion Potential[a]	Wind Erosion Potential	Description	Area in Acres[b] (% of SEZ)
136	Rositas loamy fine sand (0 to 2% slope)	Slight (0.10)	High (WEG 2)[c]	Nearly level soils on the valley floor. Parent material consists of alluvium and eolian deposits derived from mixed sources. Very deep and somewhat excessively drained with low surface runoff potential (high infiltration rate) and rapid permeability; slightly saline. Available water capacity is low. Moderate rutting hazard. Used mainly for grazing, cropland, and wildlife habitat. Crops include citrus fruits, grapes, alfalfa, and truck crops. Farmland of statewide importance.[d]	8,515 (67)
135	Rositas fine sand, wet (0 to 2% slopes)	Slight (0.05)	High (WEG 1)	Nearly level soils on the valley floor. Parent material consists of alluvium and eolian deposits derived from mixed sources. Very deep and moderately well drained with low surface runoff potential (high infiltration rate) and rapid permeability; nonsaline to very slightly saline. Available water capacity is low. Moderate rutting hazard. Used mainly for grazing, cropland, and wildlife habitat. Crops include citrus fruits, grapes, alfalfa, and truck crops. Farmland of statewide importance.	1,904 (15)
132	Rositas fine sand (0 to 2% slopes)	Slight (0.05)	High (WEG 1)	Nearly level soils on the valley floor. Parent material consists of alluvium and eolian deposits derived from mixed sources. Very deep and somewhat excessively drained with low surface runoff potential (high infiltration rate) and rapid permeability; nonsaline to very slightly saline. Available water capacity is low. Moderate rutting hazard. Used mainly for grazing, cropland, and wildlife habitat. Crops include citrus fruits, grapes, alfalfa, and truck crops. Farmland of statewide importance.	854 (7)
139	Superstition loamy fine sand	Slight (0.10)	High (WEG 2)	Nearly level to gently sloping soils on alluvial fans. Parent material consists of alluvium derived from mixed sources. Very deep and somewhat excessively drained with low surface runoff potential (high infiltration rate) and rapid permeability; nonsaline. Most areas are without vegetation; provides some cover for wildlife. Available water capacity is low. Moderate rutting hazard. Used mainly for grazing and irrigated cropland. Prime farmland if irrigated.	756 (6)

TABLE 9.1.7.1-1 (Cont.)

Map Unit Symbol	Map Unit Name	Water Erosion Potential[a]	Wind Erosion Potential	Description	Area in Acres[b] (% of SEZ)
133	Rositas fine sand (0 to 9% slopes)	Slight (0.05)	High (WEG 1)	Nearly level to gently sloping soils on alluvial fans and sand sheets. Parent material consists of eolian deposits derived from mixed sources. Very deep and somewhat excessively drained, with low surface runoff potential (high infiltration rate) and rapid permeability; nonsaline to very slightly saline. Available water capacity is low. Moderate rutting hazard. Used mainly for grazing, cropland, and as wildlife habitat. Crops include citrus fruits, grapes, alfalfa, and truck crops. Farmland of statewide importance.	163 (1)
111	Holtville Imperial silty clay loam	Moderate (0.32)	Moderate (WEG 4)	Consists of about 50% Holtville silty clay loam and 40% Imperial silty clay loam. Nearly level to gently sloping soils on valley floor (floodplains and old lake beds). Parent material consists of alluvium derived from mixed sources. Very deep and moderately well to well drained with low runoff potential and very slow permeability; nonsaline to slightly saline. Available water capacity is moderate to high. Severe rutting hazard. Used for native desert plants and irrigated cropland. Used mainly for grazing, cropland, and as wildlife habitat. Crops include cotton, sugar beats, alfalfa, barley, annual ryegrass, sorghums, flax, safflower, carrots, and lettuce. Farmland of statewide importance.	154 (1)

[a] Water erosion potential rates the hazard of soil loss from off-road and off-trail areas after disturbance activities that expose the soil surface. The ratings are based on slope and soil erosion factor K (whole soil; doesn't account for the presence of rock fragments) and represent soil loss caused by sheet or rill erosion where 50 to 75% of the surface has been exposed by ground disturbance. A rating of "slight" indicates that erosion is unlikely under ordinary climatic conditions. A rating of "very severe" indicates that significant erosion is expected; loss of soil productivity and damage are likely and erosion control measures are costly and generally impractical.

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

Footnotes continued on next page.

TABLE 9.1.7.1-1 (Cont.)

[c] WEG = wind erodibility group. WEGs are based on soil texture, content of organic matter, effervescence of carbonates, content of rock fragments, and mineralogy, and also take into account soil moisture, surface cover, soil surface roughness, wind velocity and direction, and the length of unsheltered distance (USDA 2004). Groups range in value from 1 (most susceptible to wind erosion) to 8 (least susceptible to wind erosion). The NRCS provides a wind erodibility index, expressed as an erosion rate in tons per acre per year, for each of the wind erodibility groups: WEG 1, 220 tons (200 metric tons) per acre (4,000 m^2) per year; WEG 2,134 tons (122 metric tons) per acre (4,000 m^2) per year; and WEG 4, 86 tons (78 metric tons) per acre (4,000 m^2) per year.

[d] Prime farmland is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and that is available for these uses. Farmland of statewide importance includes soils in NRCS's land capability Class II and III that do not meet the criteria for Prime farmland, but may produce high yields of crops when treated and managed according to acceptable farming methods.

Source: NRCS (2010).

9.1.8 Minerals (Fluids, Solids, and Geothermal Resources)

9.1.8.1 Affected Environment

There are no existing locatable mining claims or oil and gas leases (BLM and USFS 2010a) within the proposed Imperial East SEZ. In June 2009, public land in the SEZ was closed to locatable mineral entry pending the outcome of this solar energy PEIS.

In the past, all of the area was leased for oil and gas, but no development occurred and the leases were closed (BLM and USFS 2010b). The area remains open for discretionary mineral leasing, including leasing for oil and gas, and other leasable minerals, and for disposal of salable minerals.

About 60% of the SEZ is included within a known geothermal resource area (KGRA) (BLM and USFS 2010b). There is an operating geothermal plant about 3 mi (4.8 km) northwest of the SEZ.

9.1.8.2 Impacts

If the area is identified by the BLM as an SEZ to be used for utility-scale solar development, it would continue to be closed to all incompatible forms of mineral development. Since there are no oil and gas leases in the area, it is assumed that there would be no significant impacts on these resources if the area were developed for solar energy production. Also, since the area does not contain existing mining claims, it is also assumed there would be no loss of locatable mineral production there in the future. Surface development for geothermal resources would also be foregone on 3,462 acres (14 km^2) within the KGRA.

If the area is identified as a solar energy development zone, some 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. It might also be possible to develop geothermal resources by using directional drilling techniques. The production of common minerals, such as sand and gravel and mineral materials used for road construction, might take place in areas not directly developed for solar energy production.

9.1.8.3 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 protection of mineral resources with the possible exception of geothermal resources.

A proposed design features specific to the proposed SEZ includes the following:

- To protect the option for geothermal leasing under solar energy facilities, ROW authorizations for solar energy facilities should specifically note the potential for geothermal leasing with no surface occupancy stipulations.

9.1.9 Water Resources

9.1.9.1 Affected Environment

The proposed Imperial East SEZ is located within the Southern Mojave–Salton Sea subbasin of the California hydrologic region (USGS 2010c) and the Basin and Range physiographic province characterized by intermittent mountain ranges and desert valleys (Planert and Williams 1995). The proposed SEZ is within the desert landscape portion of the Imperial Valley and has surface elevations ranging between 75 and 125 ft (23 and 38 m) above sea level. This region of southern California is within the Colorado River subdivision of the Sonoran Desert, which is characterized as a hot and dry climate with summer high temperatures up to 120°F (48.8°C) and less than 3 in. (7.6 cm) of annual rainfall (ASDM 2010). The majority of the precipitation falls in the winter and spring months with occasional monsoonal thunderstorms (CDWR 2009). Evapotranspiration rates range between 57 and 75 in./yr (145 and 190 cm/yr) within the Imperial and Coachella Valleys (CIMIS 2010), and the average annual pan evaporation rate is 118 in./yr (300 cm/yr) (Cowherd et al. 1988; WRCC 2010a). While the Imperial Valley is a very arid region, it supports more than 450,000 acres (1,821 km^2) of farmland irrigated primarily by water diverted from the Colorado River (Layton 1978).

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

There are no surface water features located on the proposed Imperial East SEZ, but the Salton Sea, along with several irrigation canals and small washes, is found within the Imperial Valley, as shown in Figure 9.1.9.1-1. The All-American Canal flows along the southern boundary of the proposed SEZ. The canal diverts Colorado River water at the Imperial Dam, located 35 mi (56 km) east, to the agricultural fields of the Imperial Valley to the north and west of the proposed SEZ. Annual average flows in the All-American Canal coming out of the Colorado River ranged between 2.8 million and 3.7 million ac-ft/yr (3.5 billion and 4.6 billion m^3/yr) for the period from 1962 to 1992 (USGS 2010b; stream gauge 09527500). The canal has recently been lined with concrete to prevent seepage losses on a 23-mi (40-km) reach, which includes the portion along the southern boundary of the proposed SEZ (CDWR 2009; IID 2009). Diversions off the All-American Canal include the Coachella Canal (9 mi [14.5 km] east), East Highland Canal (4 mi [6.5 km] west), and Central Main Canal (14 mi [22.5 km] west of the proposed SEZ). The Alamo River and the New River are located 9 mi (14 km) and 23 mi (37 km) west of the proposed SEZ, respectively. Salinity is the primary water quality concern for Colorado River water that flows in the canals and rivers of the Imperial Valley, which typically have total dissolved solids concentrations (TDS) between 700 and 800 mg/L (Layton 1978; CRBSCF 2008).

The Salton Sea, located 37 mi (59.5 km) northwest of the proposed Imperial East SEZ (Figure 9.1.9.1-1), is California's largest inland water body, covering 230,000 acres (931 km^2) (CDWR 2009). The Salton Sea is the hydrologic sink for the Imperial Valley with no surface outflows and has a water surface elevation of 230 ft (70 m) below sea level. The majority of the Salton Sea's inflow comes from the Alamo and New Rivers, which are classified as impaired

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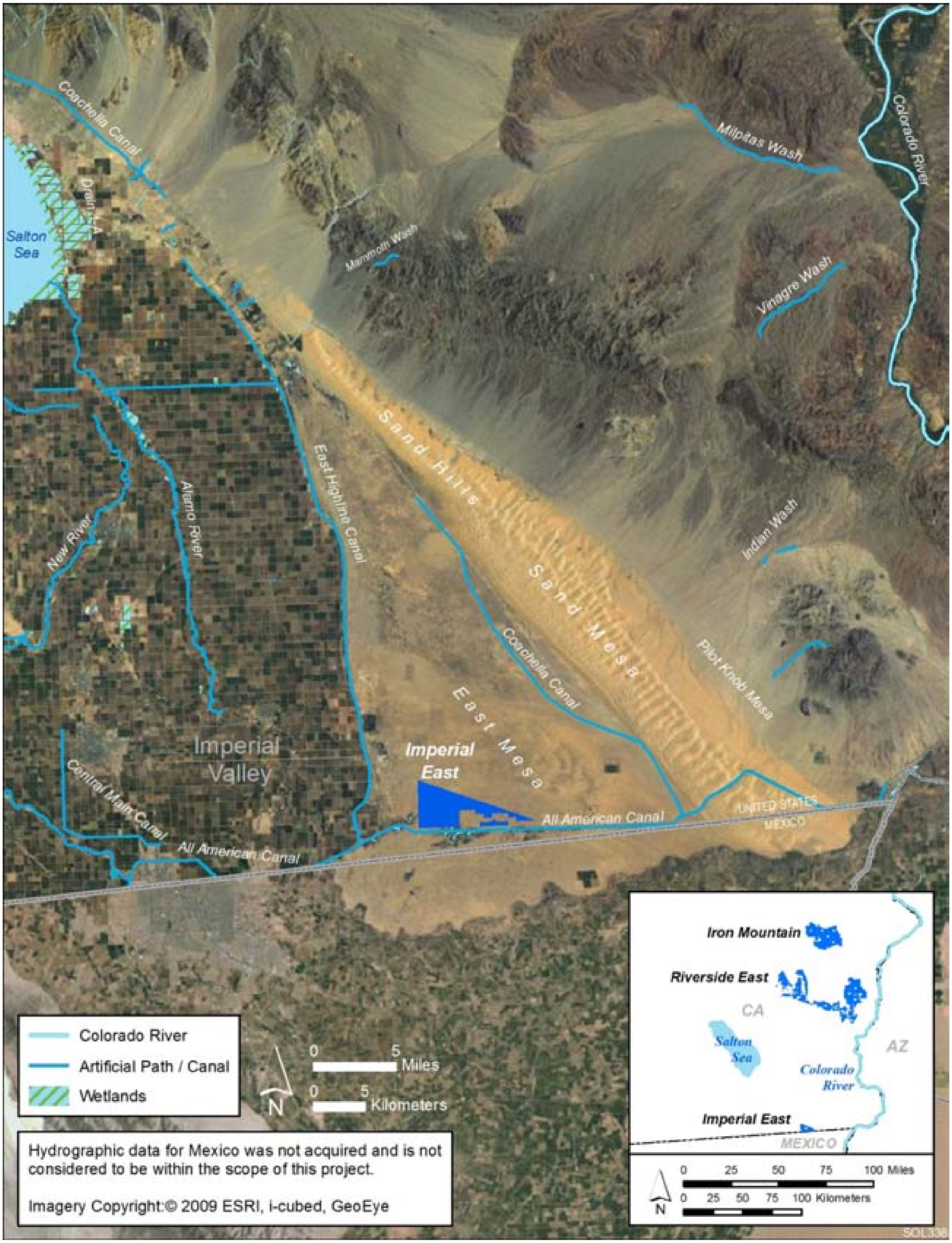

2 **FIGURE 9.1.9.1-1 Surface Water Features near the Proposed Imperial East SEZ**

water bodies because they primarily receive agricultural runoff and wastewater containing elevated pesticides, dissolved salts, and sediment concentrations (Orlando et al. 2008). The lack of surface outlets, high evaporation rates, and agricultural pollution have resulted in the Salton Sea having a higher salt content (46 g/L) than seawater (33 g/L) (Thompson et al. 2008).

Flood hazards for the majority of the Imperial Valley region are considered moderate (Zone X), and land within the proposed SEZ is classified as being susceptible to floods between the 100-year and 500-year events (FEMA 2009). While the Imperial Valley has an arid climate, the landscape has very little vegetation, and there are braided, ephemeral washes and drainage patterns that experience flash floods and debris flows during large storm events. These conditions, in combination with low-capacity stormwater infrastructure throughout the region, result in the potential for flooding during storm events (CDWR 2009).

The NWI identified several small palustrine wetlands located along the All-American Canal, which are described in more detail in Section 9.1.10.1. These wetlands are temporally flooded throughout the year, and the groundwater level is often below the land surface (USFWS 2009). Historically, these small wetlands have been supported by seepage water from the unlined All-American Canal, which has been recently lined. The IID, which operates the canal, is planning to create and enhance 44 acres (0.2 km^2) of wetlands located just along the southern boundary of the proposed SEZ as a mitigation measure for the canal lining project (IID 2010a).

9.1.9.1.2 Groundwater

The proposed Imperial East SEZ is located within the Imperial Valley groundwater basin and covers an area of 1.2 million acres (4,860 km^2), with its eastern boundary extending northwestward along the Sand Hills/Sand Mesa region and Chocolate Mountains toward the Salton Sea (Figure 9.1.9.1-1). The valley fill alluvium can be as deep as 20,000 ft (6,100 m) in the center of the valley and consists of Quaternary and Tertiary aged sediments; however, the water-bearing aquifers are found in the top 2,000 ft (610 m) (Loeltz et al. 1975). The top 2,000 ft (610 m) of alluvium is primarily unconfined and contains two main aquifers separated by a semipermeable layer averaging 60 ft (18 m) in thickness. The lower aquifer averages 380 ft (116 m) in thickness with a maximum thickness of 1,500 ft (457 m), while the upper aquifer averages 60 ft (18 m) in thickness with a maximum thickness of 280 ft (85 m) (CDWR 2003; groundwater basin number 7-30). These aquifers comprise silt, sand, and clays that originate from the Colorado River mixed with locally derived coarse sands and gravels (Loeltz et al. 1975). The upper aquifer also contains patches of up to 80 ft (24 m) of low-permeability lake deposits from the prehistoric Lake Cahuilla, which creates localized areas of confined conditions (CDWR 2003).

Recharge to the Imperial Valley groundwater basin is primarily through irrigation returns, Colorado River recharge, seepage under unlined canals, surface runoff from surrounding higher elevations, underflow from the Mexicali Valley to the south, and direct runoff and percolation of precipitation (CDWR 2003). Discharge of groundwater is primarily through irrigation withdrawals, losses to streams, and evapotranspiration (Thompson et al. 2008). A groundwater model based on data from 1970 to 1990 suggests that the total recharge by irrigation returns and seepage under canals was 250,000 ac-ft/yr (308 million m^3/yr) and underflow recharge was 173,000 ac-ft/yr (213 million m^3/yr), while total discharge from the basin was 439,000 ac-ft/yr (541 million m^3/yr) (CDWR 2003). Recharge by precipitation runoff and infiltration was estimated to be less than 10,000 ac-ft/yr (12 million m^3/yr) (Loeltz et al. 1975). It is very likely that the estimated value of recharge by seepage from unlined canals was overestimated, because in 1980 a 49-mi (79-km) reach of the Coachella Canal was lined with concrete, and in early 2010, lining of 23 mi (37 km) of the All-American Canal, including the reach along the south portion of the proposed Imperial East SEZ, is scheduled to be completed (CDWR 2003, 2009; IID 2009a). The newly lined portion of the canal is expected to save 67,700 ac-ft/yr (83.5 million m^3/yr) (IID 2009a).

The primary groundwater flow path follows the valley to the northwest in the direction of the Salton Sea. Transmissivity values vary across the Imperial Valley groundwater basin; values for fine-grained deposits typically range between 134 and 1,340 ft^2/day (12 and 125 m^2/day). Regions of higher transmissivity are located along the Sand Mesa area (Figure 9.1.9.1-1); values reach 114,000 ft^2/day (10,590 m^2/day). In general, transmissivity values decrease moving west and north from the Sand Mesa area (Loeltz et al. 1975).

The majority of groundwater wells in the Imperial Valley are used for irrigation and are located in the agricultural portion of the valley (5 mi [8 km] west of the proposed SEZ). Reported groundwater well yields range between 45 and 1,550 gpm (170 and 5,687 L/min) (Loeltz et al. 1975). Groundwater levels have remained steady in the region for several decades because of relatively constant recharge rates (CDWR 2003). Three U.S. Geological Survey (USGS) wells located in the desert portion of the Imperial Valley also show steady groundwater elevations ranging from 23 to 47 ft (7 to 14 m) below the surface (USGS 2010b; well numbers 324242115073501, 324340115073401, 324632115011001). Groundwater quality is a concern in the Imperial Valley because of high dissolved salts and agricultural chemical concentrations. TDS concentrations range from 498 to 7,280 mg/L; values often exceed 2,000 mg/L (CDWR 2003). Another potential water quality concern is that approximately 20% of the groundwater in this region has temperatures greater than 59°F (15°C), which is why this region is often considered for geothermal energy production (Dutcher et al. 1972).

9.1.9.1.3 Water Use and Water Rights Management

In 2005, water withdrawals from surface waters and groundwater in Imperial County were 2.4 million ac-ft/yr (2.9 billion m^3/yr), of which 98% came from surface waters and was used primarily for irrigating agricultural fields. The majority of this water is imported into the Imperial Valley from the Colorado River. Total groundwater withdrawals were 46,000 ac-ft/yr (57 million m^3/yr), which was used primarily for irrigation. Municipal and domestic water uses totaled 34,000 ac-ft/yr (42 million m^3/yr), and industrial and thermoelectric power uses totaled 3,000 ac-ft/yr (3.7 million m^3/yr) (Kenny et al. 2009).

To manage water resources, California uses a "plural" system, which consists of a mixture of riparian and prior appropriation doctrines for surface waters, a separate doctrine for groundwater, and pueblo rights (BLM 2001a). 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 2001a).

Groundwater management in California is primarily done at the local level of government through local agencies or ordinances; it can also be subject to court adjudications. State statute assigns authority and revenue mechanisms to several types of local agencies to provide water for beneficial uses, as well as to manage withdrawals in order to prevent overdraft[6] of the aquifers. Local ordinances (typically at the county level) also can 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[7] is maintained (CDWR 2003).

Water resources potentially available for solar energy development at the proposed Imperial East SEZ are imported Colorado River water and groundwater. Imported Colorado River water via the All-American Canal is controlled by the IID, which is a public entity that delivers Colorado River water to the agricultural regions of the Imperial Valley, supports and maintains water infrastructure (e.g., canals, tile drainage systems, pumping stations), and implements water conservation measures (IID 2005). Although the IID primarily supports irrigation for agriculture, Section 22121 of the California water code allows organizations such as the IID to appropriate water for energy production. The IID currently allows up to 25,000 ac-ft/yr (30.8 million m^3/yr) to be used for non-agricultural uses within its service area (IID 2009b). However, given the high demand of water for agricultural purposes and the limited supply of Colorado River water, it is highly unlikely that IID water could be used to support projects seeking large volumes of water for non-irrigation uses (Layton 1978; Anderholdt-Shields 2010).

Groundwater withdrawals to support solar energy development are subject to the Imperial County groundwater ordinance (Groundwater Management, Title 9, Division 22). The permitting of new groundwater wells is reviewed by the county's groundwater planning commission, which oversees all groundwater extractions, exports, and artificial recharge applications. In addition,

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

[7] 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.

the county groundwater planning commission has the authority to manage the groundwater resources in terms of quantifying groundwater storage capacity, acquiring water rights, requiring water conservations practices, and limiting groundwater withdrawal rates.

9.1.9.2 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, 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 the excessive withdrawal from aquifers).

9.1.9.2.1 Land Disturbance Impacts on Water Resources

Impacts related to land disturbance activities are common to all utility-scale solar energy facilities, which are described in more detail for the four phases of development in Section 5.9.1; 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). Runoff of water and sediments from the proposed Imperial East SEZ could impair the existing wetlands along the All-American Canal and mitigation wetlands associated with the canal lining project. Siting of solar energy facilities and land disturbance should avoid interfering with natural drainage patterns near the southern boundary of the proposed SEZ, where wetland areas could be affected.

9.1.9.2.2 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 Imperial East SEZ are as follows:

- On the basis of a total area of less than 10,000 acres (40 km^2), it is assumed that one solar project would 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, result in the potential to disturb up to 52% of the SEZ total area during the peak construction year;

- 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); and

- For the purposes of this analysis, Colorado River water from the All-American Canal is assumed to be unavailable for wet- and dry-cooling purposes at solar energy developments because of two factors: (1) negotiation with IID for canal water would have to be done on a project-specific basis, and (2) limited water availability and irrigation demands in the Imperial Valley suggest minimal canal water would be available (see Section 9.1.9.1.3 for more details).

Site Characterization

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

Construction

During construction, water would be used mainly for fugitive dust control and the workforce potable water supply. Because there are no significant surface water bodies on the proposed Imperial East SEZ, the water requirements for construction activities could be met by either trucking water to the sites or by using on-site groundwater resources (the potential for using All-American Canal water for construction activities, except for potable supply, is considered infeasible for the purposes of this analysis given the relatively short duration of construction activities with respect to the logistical issues of conveying canal water to the proposed SEZ). Water requirements for dust suppression and potable water supply during the peak construction year, which are shown in Table 9.1.9.2-1, could be as high as 2,074 ac-ft (2.6 million m^3). In addition, up to 74 ac-ft (91,300 m^3) of sanitary wastewater would be generated and would need to be treated either on-site or sent to an off-site facility.

Groundwater wells would have to yield an estimated 883 to 1,284 gpm (3,343 to 4,860 L/min) to meet the water requirements estimated for construction. These yields are on the order of large municipal and agriculture production wells (Harter 2003) and similar in magnitude to reported well yields found in the Imperial Valley (Loeltz et al. 1975). Groundwater used for a potable supply must have a TDS of less than 1,500 mg/L and is recommended to be less than 500 mg/L to meet secondary maximum contaminant levels (*California Code*, Title 22, Article 16, Section 64449). Given the potential for high TDS values in the groundwater of the Imperial Valley groundwater basin, workforce water supplies may have to be brought in from off-site regardless of the availability of groundwater.

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 9.1.9.2-2). Water needs for cooling are a function of the type of cooling used (dry, wet, or hybrid). Further refinements to water requirements for cooling would result from the percentage of time that the option was employed (30 to 60% range assumed) and the power of the system. The differences between the water requirements reported in Table 9.1.9.2-2 for the parabolic trough and power

TABLE 9.1.9.2-1 Estimated Water Requirements during the Peak Construction Year for the Proposed Imperial East SEZ

Activity	Parabolic Trough	Power Tower	Dish Engine	PV
Water use requirements[a]				
Fugitive dust control (ac-ft)[b,c]	1,352	2,029	2,029	2,029
Potable supply for workforce (ac-ft)	74	45	19	9
Total water use requirements (ac-ft)	1,426	2,074	2,048	2,038
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 118 in./yr (300 cm/yr) (Cowherd et al. 1988; WRCC 2010a).

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

TABLE 9.1.9.2-2 Estimated Water Requirements during Operations at Full Build-out Capacity at the Proposed Imperial East SEZ

Activity	Parabolic Trough	Power Tower	Dish Engine	PV
Full build-out capacity (MW)[a,b]	916	509	509	509
Water use requirements				
Mirror/panel washing (ac-ft/yr)[c,d]	458	254	254	25
Potable supply for workforce (ac-ft/yr)	13	6	6	1
Dry cooling (ac-ft/yr)[e]	183–916	102–509	NA[f]	NA
Wet cooling (ac-ft/yr)[e]	4,120–13,275	2,289–7,375	NA	NA
Total water use requirements				
Non-cooled technologies (ac-ft/yr)	NA	NA	260	26
Dry-cooled technologies (ac-ft/yr)	654–1,387	362–769	NA	NA
Wet-cooled technologies (ac-ft/yr)	4,591–13,746	2,549–7,635	NA	NA
Wastewater generated				
Blowdown (ac-ft/yr)[g]	260	144	NA	NA
Sanitary wastewater (ac-ft/yr)	13	6	6	1

[a] Land area for parabolic trough 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.

tower technologies are attributable to the assumptions of acreage per megawatt. 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.

At full build-out capacity, water needs for mirror/panel washing are estimated to range from 25 to 458 ac-ft/yr (31,000 to 565,000 m^3/yr) and workforce potable water up to 13 ac-ft/yr (16,000 m^3/yr). The maximum total water usage during operations at full-build-out capacity would be greatest for those technologies using the wet-cooling option and is estimated to be as high as 13,746 ac-ft/yr (17 million m^3/yr). Water usage for dry-cooling systems would be as high as 1,387 ac-ft/yr (1.7 million m^3/yr), approximately a factor of 10 times less than that for the wet-cooling option. Non-cooled technologies—dish engine and PV systems—require substantially less water at full build-out capacity, at 260 ac-ft/yr (320,700 m^3/yr) for dish engine and 26 ac-ft/yr (32,100 m^3/yr) for PV (Table 9.1.9.2-2). Operations would produce up to 13 ac-ft/yr (16,000 m^3/yr) of sanitary wastewater; in addition, for wet-cooled technologies, up to 260 ac-ft/yr (320,700 m^3/yr) of cooling system blowdown water would need to be treated either on- or off-site. Any on-site treatment of wastewater would have to ensure that treatment ponds are effectively lined in order to prevent any groundwater contamination.

Groundwater is the primary water resource available for solar energy development at the proposed Imperial East SEZ. The estimates of recharge and discharge processes, along with information on groundwater levels presented previously, suggest that the overall groundwater balance is at a state of equilibrium. However, further characterization of the alluvial aquifers of the Imperial Valley groundwater basin is needed to fully address the impacts of increased groundwater withdrawals for solar energy development. It is estimated that the newly lined portion of the All-American Canal near the southern boundary of the proposed SEZ will eliminate up to 67,700 ac-ft/yr (83.5 million m^3/yr) of recharge to the local aquifer. Loeltz et al. (1975) reported well yields ranging between 45 and 1,550 gpm in the Imperial Valley, which is equivalent to 72 and 2,500 ac-ft/yr (89,000 and 1.9 million m^3/yr). Given these values of historical well yields, anticipated losses in groundwater recharge, and the estimated water requirements presented in Table 9.1.9.2-2, water use requirements could be sustainable by groundwater resources for technologies using dry-cooling, dish engine, and PV systems. The water use estimates for wet-cooling technologies could potentially cause groundwater drawdown, given that they are a factor of 1 to 5 times greater than the largest historical well yields of the Imperial Valley, and that local groundwater recharge will decrease due to the lining of the All-American Canal. The potential use of All-American Canal water would have to be negotiated with the IID on a project-specific basis, but it is likely that water use estimates for dish engine and PV technologies could be supported by the IID's allocation for non-agricultural uses (IID 2009b; Anderholdt-Shields 2010).

Groundwater drawdown that could potentially occur as a result of solar energy development could potentially disrupt groundwater flow patterns in the Imperial Valley, but greater concerns are associated with the land subsidence that has been observed in the valley (Layton 1978). Land subsidence could cause cracks in the newly lined All-American Canal and affect water quantities and rights of the IID. An additional concern of using groundwater for solar energy development is the poor quality of the groundwater that is typically found in the Imperial Valley. As mentioned previously, the potable water supply for the workforce may need to brought in from off-site (potentially from the All-American Canal) or the groundwater may need to be treated to reduce TDS values to meet California requirements. The TDS values of the groundwater are potentially high enough to cause corrosion and fouling of infrastructure (Layton 1978).

Decommissioning/Reclamation

During decommissioning/reclamation, all surface structures associated with the solar project would be dismantled, and the site reclaimed to its pre-construction 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 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.

9.1.9.2.3 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. The extent of the impacts on water resources is proportional to the amount and location of land disturbance needed to connect the proposed SEZ to major roads and existing transmission lines. The proposed Imperial East SEZ is located adjacent to existing roads and transmission lines, as described in Section 9.1.1.2, so it is assumed that no additional construction outside of the SEZ would be required and there would be no impacts.

9.1.9.2.4 Summary of Impacts on Water Resources

The impacts on water resources associated with developing solar energy in the proposed Imperial East SEZ are associated with land disturbance effects on natural hydrology, water use requirements for the various solar energy technologies, and water quality concerns. Land disturbance impacts are of specific concern along the southern boundary of the proposed SEZ, because excess water and sediment runoff could impair the existing and mitigation wetland areas along the All-American Canal.

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, hybrid) employed. The recent lining of the All-American Canal along the southern boundary of the proposed SEZ is expected to drastically decrease the local groundwater recharge of the area. Given the water use estimates for the various solar energy technologies, dry-cooled parabolic trough and power tower, along with dish engine and PV systems, could be feasible with respect to the availability of groundwater resources. In addition, dish engine and PV technologies could potentially be supported by All-American Canal water supplied by the IID, but would have to be negotiated on a project-specific basis. Parabolic trough and power tower technologies using wet cooling have the potential to cause groundwater drawdown and possibly land subsidence. Given this analysis of available water resources, wet cooling would not be considered feasible for the full build-out scenario of the proposed Imperial East SEZ

Water quality of the groundwater in the Imperial Valley is of concern because of its high salts concentrations and potential for agricultural chemical pollution. Potable water from supply sources may not be obtainable from the groundwater aquifers without considerable treatment; thus bringing water in from off-site (potentially All-American Canal water) may be needed during all phases of solar energy projects. Additional concerns regarding groundwater TDS values that could potentially be corrosive to solar facility infrastructure would have to be addressed during the site characterization phase.

9.1.9.3 SEZ-Specific Design Features and Design Feature Effectiveness

The program for solar energy development on BLM-administered lands will require implementation of the programmatic design features described in Appendix A, Section A.2.2, thus mitigating some impacts on water resources. Programmatic design features would focus on coordination 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 on hydrological studies to characterize the aquifer from which groundwater would be obtained (including drawdown effects, if a new point of diversion were 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 Imperial East 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 in the vicinity of the existing and mitigation wetlands located along the southern boundary of the site.

- 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).

- The groundwater-permitting process should be in compliance with the Imperial 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 Imperial County.

- Stormwater management plans and BMPs should comply with standards developed by the California Stormwater Quality Association (CASQA 2003).

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

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9.1.10 Vegetation

This section addresses vegetation that could occur or is known to occur within the potentially affected area of the proposed Imperial East 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 effect. No area of direct or indirect effects was assumed for new transmission lines or access roads, because they are not expected to be needed for developments on the Imperial East SEZ because of the proximity of an existing transmission line and state highway.

Indirect effects considered in the assessment included effects from surface runoff, dust, and accidental spills from the SEZ, but did not include 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.

9.1.10.1 Affected Environment

The proposed Imperial East SEZ is located within the Sonoran Basin and Range Level III ecoregion (EPA 2007), which supports creosotebush (*Larrea tridentata*) and white bursage (*Ambrosia dumosa*) plant communities with large areas of palo verde (*Cercidium microphyllum*)-cactus shrub and saguaro cactus (*Carnegiea gigantea*) communities (EPA 2002). The dominant species of the Lower Colorado River Valley subdivision of the Sonoran Desert are primarily creosotebush, white bursage, and all-scale (*Atriplex polycarpa*), with big galleta (*Pleuraphis rigida*), Palmer alkali heath (*Frankenia palmeri*), brittlebush (*Encelia farinosa*), and western honey mesquite (*Prosopis glandulosa* var. *torreyana*) are dominant in some areas (Turner and Brown 1994). Larger drainageways and washes support species of small trees and shrubs that may also occur in adjacent areas, such as western honey mesquite, ironwood (*Olneya tesota*), and blue palo verde (*Cercidium floridum*), as well as species such as smoketree (*Psorothamnus spinosa*), which are mostly restricted to drainageways. Shrub species found in minor drainages include cat-claw acacia (*Acacia greggii*), burrobrush (*Hymenoclea salsola* var. *pentalepis*), Anderson thornbush (*Lycium andersonii*), and desert broom (*Baccharis sarothroides*). Annual precipitation in the Sonoran Desert occurs in winter and summer (Turner and Brown 1994) and is very low in the area of the SEZ, averaging about 2.7 in. (6.8 mm), at Calexico (see Section 9.1.13).

Land cover types, described and mapped under the California Gap Analysis Program (CAReGAP) (NatureServe 2009) 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 Imperial East SEZ are shown in

Figure 9.1.10.1-1. Table 9.1.10.1-1 provides the surface area of each cover type within the potentially affected area.

Lands within the Imperial East SEZ are classified primarily as Sonora-Mojave Creosotebush-White Bursage Desert Scrub. The North American Warm Desert Active and Stabilized Dune cover type increases from west to east across the SEZ, becoming the dominant cover type east of the SEZ. Additional cover types within the SEZ are given in Table 9.1.10.1-1. Creosote was observed to be the dominant species over most of the SEZ in August 2009, with quail brush (*Atriplex lentiformis*) codominant in some northern areas. Stabilized dunes, considered sensitive habitats, support mesquite hummocks and clumps of Mormon tea (*Ephedra trifurca*) and creosote. Sensitive habitats on the SEZ also include wetlands, desert dry washes, and riparian areas. A characteristic Sonoran Desert species observed on the SEZ is western honey mesquite.

The area surrounding the SEZ, within 5 mi (8 km), includes 16 cover types, which are listed in Table 9.1.10.1-1. The predominant cover types are Sonora-Mojave Creosotebush-White Bursage Desert Scrub and North American Warm Desert Active and Stabilized Dune. The SEZ and affected area occur in California and a small portion of northern Mexico (Figure 9.1.10.1-1). Cover types are mapped only for the U.S. portions of the indirect impact area; the remaining portions are unmapped.

One wetland mapped by the *National Wetlands Inventory* (NWI) extends into the south-central portion of the SEZ, south of State Route 98 (USFWS 2009). The wetland is supported by seepage from the All-American Canal, located to the south (Figure 9.1.10.1-2) of the SEZ, and is classified as a palustrine wetland with a scrub-shrub plant community that is temporarily flooded. NWI maps are produced from high-altitude imagery and are subject to uncertainties inherent in image interpretation (USFWS 2009). The All-American Canal was not lined in this section of the canal partly because of the high value of these wetlands. In addition, these wetlands were enhanced to offset impacts from the All-American Canal lining project; therefore, they are considered a mitigation area to support nesting Yuma clapper rail (see Section 9.1.12). Approximately 5 acres (0.02 km^2) of the wetland is located within the SEZ and primarily mapped as the North American Warm Desert Riparian Woodland and Shrubland cover type. The wetland communities are characterized by the dominance of either tamarisk (*Tamarix* spp.) or arrow-weed (*Tessaria sericea*) (BOR 2006). 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. Several shallow drainages in the west and south-central portions of the SEZ, however, support dense stands of woody vegetation that are mapped as North American Warm Desert Riparian Woodland and Shrubland, although these areas are not identified as wetlands. Mesquite and arrow-weed occur in some drainages in the western portion of the SEZ.

Wetlands within the 5 mi (8 km) indirect impact area include those associated with the All-American Canal. The canal is classified as a riverine wetland that is sparsely vegetated, with less than 30% plant cover. Common reed (*Phragmites australis*), an invasive native species, is abundant along the canal margin in many areas. Tamarisk, a non-native woody invasive, also

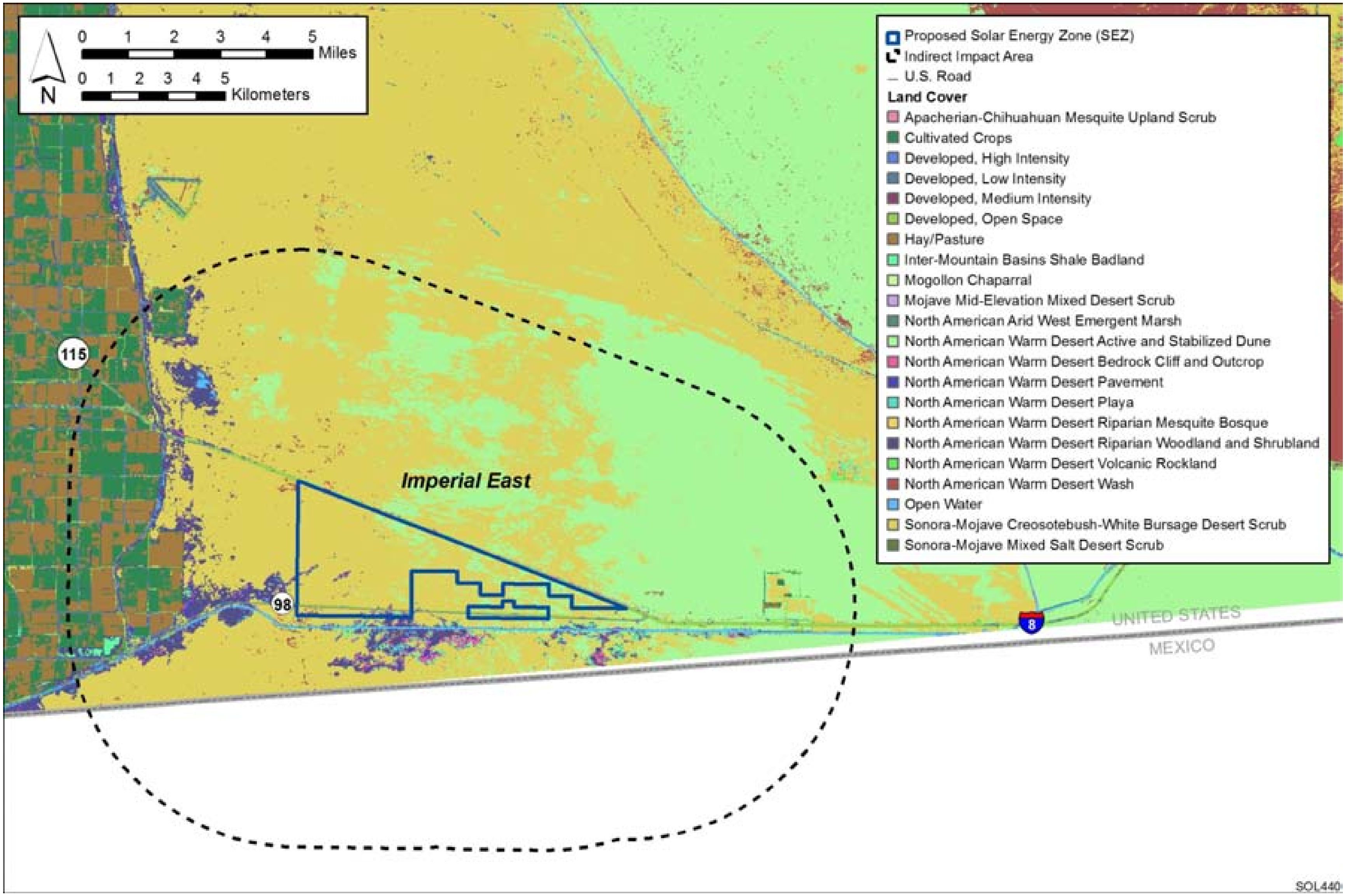

FIGURE 9.1.10.1-1 Land Cover Types within the Proposed Imperial East SEZ (Source: NatureServe 2009)

TABLE 9.1.10.1-1 Land Cover Types within the Potentially Affected Area of the Proposed Imperial East SEZ and Potential Impacts

	Area of Cover Type in Affected Areas (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.	4,631 acres[f] (0.5%, 1.1%)	35,911 acres (3.6%)	Small
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.	705 acres (0.4%, 0.4%)	24,102 acres (12.7%)	Small
21, 22 Developed, Open Space–Low Intensity: Includes housing, parks, golf courses, and other areas planted in developed settings. Impervious surfaces compose up to 49% of the total land cover.	230 acres (0.4%, 3.2%)	1,907 acres (3.1%)	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.	44 acres (0.1%, 0.4%)	3,226 acres (4.1%)	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.	34 acres (<0.1%, <0.1%)	343 acres (0.1%)	Small

TABLE 9.1.10.1-1 (Cont.)

Land Cover Type[a]	Area of Cover Type in Affected Areas (acres)[b] Within SEZ[c] (Direct Effects)	Outside SEZ[d] (Indirect Effects)	Overall Impact Magnitude[e]
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.	33 acres (<0.1%, <0.1%)	540 acres (0.3%)	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.	33 acres (0.4%, 0.7%)	793 acres (10.2%)	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.	11 acres (<0.1%, <0.1%)	473 acres (0.5%)	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.	<1 acres (<0.1%, <0.1%)	31 acres (<0.1%)	Small
81, 82 Hay/Pasture, Cultivated Crops: Areas where pasture/hay or cultivated crops account for more than 20% of the total land cover.	0 acres	7,502 acres (1.3%)	Small
11 Open Water: Plant or soil cover is generally less than 25%.	0 acres	644 acres (0.6%)	Small
23, 24 Developed, Medium-High Density: Includes housing and commercial/industrial development. Impervious surfaces compose 50 to 100% of the total land cover.	0 acres	9 acres (<0.1%)	Small

1

TABLE 9.1.10.1-1 (Cont.)

Land Cover Type[a]	Area of Cover Type in Affected Areas (acres)[b] Within SEZ[c] (Direct Effects)	Outside SEZ[d] (Indirect Effects)	Overall Impact Magnitude[e]
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.	0 acres	2 acres (0.1%)	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 is typically composed of one or more *Atriplex* species; other salt-tolerant plants are often present or even codominant. Grasses occur at varying densities.	0 acres	1 acre (<0.1%)	Small

[a] Land cover descriptions are from NatureServe (2009). 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. The SEZ region intersects portions of California, Arizona, and northern Mexico. However, the SEZ and affected area occur only in California and a small portion of northern Mexico.

[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.

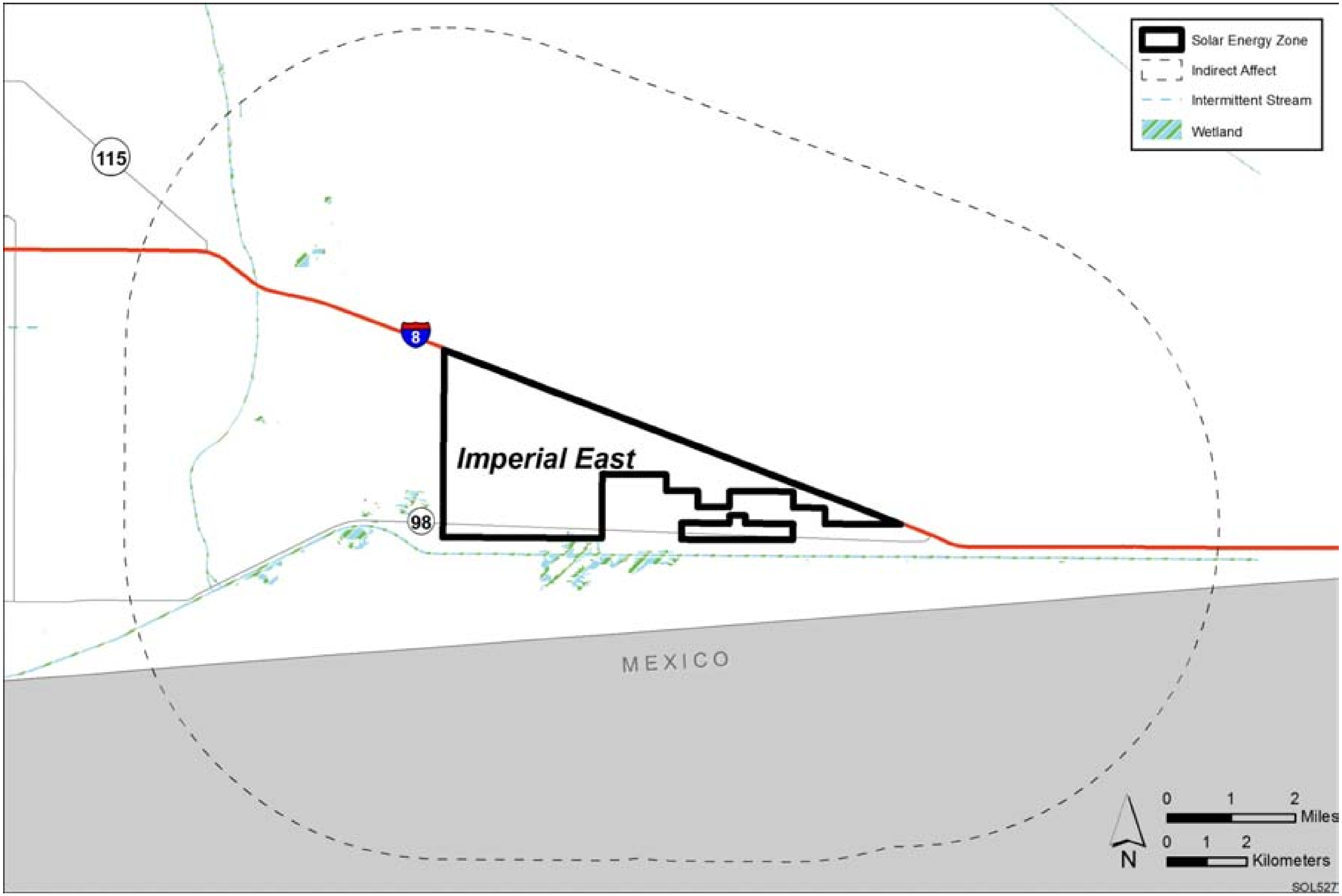

FIGURE 9.1.10.1-2 Wetlands within the Proposed Imperial East SEZ (Source: USFWS 2009)

occurs along the canal. Numerous wetland areas, supported by canal seepage, occur near the canal and range from temporarily to seasonally flooded. They are primarily classified as North American Warm Desert Riparian Woodland and Shrubland. Most of these wetlands are palustrine wetlands with a scrub-shrub plant community. Small areas of emergent plant communities also occur near the canal. Emergent plant communities are composed primarily of herbaceous species rooted in shallow water or saturated soil. Changes in wetland boundaries may occur in some areas subsequent to the lining of portions of the All-American Canal and associated wetland mitigation programs (BOR 2006). Similar wetland types occur to the west of the SEZ and are associated with the East Highline Canal. A number of excavated areas that contain surface water are located northwest of the SEZ. These wetlands are sparsely vegetated and semipermanently to permanently flooded. They are classified as Sonora-Mojave Creosotebush-White Bursage Desert Scrub and as North American Warm Desert Riparian Woodland and Shrubland. One small seasonally flooded wetland in this area supports a scrub-shrub plant community. Wetlands south of the U.S.–Mexico border include the Andrade Mesa wetlands, a system of marshes that are likely supported by seepage from the All-American Canal (University of Arizona 2003).

The proposed Imperial East SEZ is located within the Imperial County Weed Management Area (ICWMA). Table 9.1.10.1-2 provides a list of invasive plant species of the California Sonoran Desert Region, which includes Imperial County. Common reed and tamarisk, which occur in wet areas, occur within the 5-mi (8-km) indirect impact area along the All-American Canal.

9.1.10.2 Impacts

The construction of solar energy facilities within the Imperial East 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 (4,578 acres [18.5 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 for another. The 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, are described in more detail in Section 5.10.1. Any such impacts will be minimized through the implementation of required programmatic design features described in Appendix A,

TABLE 9.1.10.1-2 Weed Species of the California Sonoran Desert Region

Common Name	Scientific Name
Barbwire Russian thistle	*Salsola paulsenii*
Bermudagrass	*Cynodon dactylon*
Camelthorn	*Alhagi maurorum*
Common Russian thistle	*Salsola tragus*
Field bindweed	*Convolvulus arvensis*
Giant reed	*Arundo donax*
Giant salvinia	*Salvinia auriculata*
Hydrilla	*Hydrilla verticillata*
Scarlet wisteria	*Sesbania punicea*
Tamarisk	*Tamarix ramosissima*
Tocalote	*Centaurea melitensis*
White horsenettle	*Solanum elaeagnifolium*

Source: CDFA (2010).

Section A.2.2, and through any additional mitigation applied. SEZ-specific design features are described in Section 9.1.10.3.

9.1.10.2.1 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); a moderate impact (>1 but <10%) could affect an intermediate proportion of cover type; a large impact could affect greater than 10% of a 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 Active and Stabilized Dune; Developed, Open Space–Low Intensity; North American Warm Desert Riparian Woodland and Shrubland; North American Warm Desert Wash; North American Warm Desert Bedrock Cliff and Outcrop; Inter-Mountain Basins Shale Badland; North American Warm Desert Pavement; and North American Warm Desert Volcanic Rockland. The developed areas likely support few native plant communities. The potential impacts on native species cover types resulting from solar energy facilities in the proposed Imperial East SEZ are summarized in Table 9.1.10.1-1. Most of these cover types are relatively common in the SEZ region; however, Inter-Mountain Basins Shale Badland is relatively uncommon, representing approximately 0.3% of the land area within the SEZ region. The construction, operation, and decommissioning of solar projects within the SEZ would result in small impacts on each of the cover types in the affected area.

Re-establishment of shrub communities in temporarily disturbed areas would likely be very difficult because of the arid conditions and might require extended periods of time. In addition, noxious weeds could become established in disturbed areas and colonize adjacent undisturbed habitats, thus reducing restoration success and potentially resulting in widespread habitat degradation.

Potential impacts on wetlands as a result of solar energy facility development are described in Section 5.10.1. Specific to the affected area of the proposed Imperial East SEZ, approximately 5 acres (0.02 km^2) of wetland habitat occurs within the SEZ and could be affected by project development. These wetlands were enhanced to offset impacts from the All-American Canal lining project and are considered a mitigation area.

Grading could result in direct impacts on the wetlands within the SEZ if fill material were placed within wetland areas. Grading near the wetlands in or near the SEZ could disrupt surface water or groundwater flow characteristics, resulting in changes in the frequency, duration, depth, or extent of inundation or soil saturation, and could potentially alter wetland plant communities and affect wetland function. Increases in surface runoff from a solar energy project site could also affect wetland hydrologic characteristics. The introduction of contaminants into wetlands in or near the SEZ could result from spills of fuels or other materials used on a project site. Soil disturbance could result in sedimentation in wetland areas, which could degrade or eliminate wetland plant communities. Sedimentation effects or hydrologic changes could also extend to wetlands outside of the SEZ. 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 9.1.9 for further discussion of impacts on washes.

Although the use of groundwater within the Imperial East SEZ for technologies with high water requirements, such as wet-cooling systems, may be unlikely, groundwater withdrawals for such systems could affect groundwater resources (see Section 9.1.9.2.2). However, further characterization of the alluvial aquifers of the Imperial Valley groundwater basin would be needed to fully address the impacts of increased groundwater withdrawals for solar energy development. Most of the wetlands in the vicinity of the SEZ are supported by the discharge of shallow groundwater sources, primarily originating from seepage from the All-American Canal and the East Highline Canal. Reductions in groundwater inflows to wetlands that are supported by groundwater discharge could alter wetland hydrologic characteristics and plant communities and could potentially reduce wetland surface area.

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 impact area identified in Table 9.1.10.1-1.

9.1.10.2.2 Impacts from Noxious Weeds and Invasive Plant Species

Executive Order (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*, Volume 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 required design features 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 Imperial East 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 and common reed, occur near the SEZ. Additional species potentially occurring in the Sonoran Desert Region are given in Table 9.1.10.1-2.

Past or present land uses may affect the susceptibility of plant communities to the establishment of noxious weeds and invasive species. Existing roads and recreational OHV use within the SEZ area of potential impact would also likely contribute to the susceptibility of plant communities to the establishment and spread of noxious weeds and invasive species. Portions of the SEZ have been disturbed by the construction of transmission lines. Small areas of Developed, Open Space–Low Intensity, totaling about 230 acres (0.93 km^2), occur within the SEZ, and approximately 1,907 acres (7.72 km^2) occur within the area of indirect effects. Because disturbance may promote the establishment and spread of invasive species, developed areas may provide sources of such species.

9.1.10.3 SEZ-Specific Design Features and Design Feature Effectiveness

In addition to the programmatic design features, SEZ-specific design features would reduce the potential for impacts on plant communities. While the specific practices are best established when project details are considered, some measures can be identified at this time, as follows:

- 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 Sonoran Desert habitats, such as desert scrub and dunes, and minimize the potential for the spread of invasive species. Invasive species control should focus on biological and mechanical methods where possible to reduce the use of herbicides.

- Wetland, riparian habitats, desert dry washes which occur primarily within the western and southern portions of the SEZ, and sand dune habitats and sand transport areas, primarily in the northern and eastern portions of the SEZ, should be avoided to the extent practicable, and any impacts minimized and mitigated. A buffer area should be maintained around wetlands, riparian areas, and dry washes to reduce the potential for impacts on wetlands on or near the SEZ. Appropriate engineering controls should 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.

- An appropriate buffer shall be maintained between project impacts and the wetland south of the Imperial Valley SEZ to ensure all impacts from construction, operations, and maintenance of solar facilities do not impair the current functions and values associated with wetland resource, including habitat support for sensitive species.

- Groundwater withdrawals should be limited to reduce the potential for indirect impacts on wetland habitats associated with groundwater discharge, such as the wetlands near the All-American Canal and East Highline Canal.

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 impacts on wetlands, dry washes, sand dunes, and riparian habitats would be reduced to a minimal potential for impact. Residual impacts on wetlands could result from remaining groundwater withdrawal, etc.; however, it is anticipated that these impacts would be avoided in the majority of instances.

9.1.11 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 Imperial East 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 Project (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 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. No area of direct or indirect effects was assumed for a new transmission line or access road because they are not expected to be needed for facilities on the proposed Imperial East SEZ because of the proximity of an existing transmission line and state highway.

9.1.11.1 Amphibians and Reptiles

9.1.11.1.1 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 Imperial East 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 (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.

On the basis of 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*) is expected to occur within the proposed Imperial East SEZ. However, because it prefers dry, rocky areas near temporary sources of standing water, its occurrence within the SEZ would be spatially limited. The Couch's spadefoot (*Scaphiopus couchii*) could potentially occur in the SEZ, although its mapped range is east of the SEZ (CDFG 2008). Several other amphibian species could inhabit the All-American Canal, immediately south of the SEZ, and the East Highline Canal, located about 2.8 mi (4.5 km) west of the SEZ. These species include the bullfrog (*Rana catesbeiana*), Colorado River toad (*Bufo alvarius*), Rio Grande leopard frog (*Rana berlandieri*), and Woodhouse's toad (*Bufo woodhousii*). Because these species tend to occur within 300 ft (100 m) of permanent water (USGS 2007), they would not be expected to occur within the SEZ.

Twenty-seven reptile species could occur within the proposed Imperial East SEZ (CDFG 2008): 1 tortoise, 12 lizards, and 14 snakes. The desert tortoise (*Gopherus agassizii*) is a federal- and state-listed threatened species. This species is discussed in Section 9.1.12. Among the more common lizard species that could occur within the SEZ are the Colorado fringe-toed lizard (*Uma notata*), desert horned lizard (*Phrynosoma platyrhinos*), long-nosed leopard lizard (*Gambelia wislizenii*), 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 Imperial East 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 9.1.11.1-1 provides habitat information for the representative amphibian and reptile species that could occur on or in the affected area of the proposed Imperial East SEZ.

9.1.11.1.2 Impacts

The potential for impacts on amphibians and reptiles from utility-scale solar energy development within the proposed Imperial East 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 9.1.11.1.3, below, identifies SEZ-specific design features of particular relevance to the Imperial East 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 9.1.11.1.1 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 9.1.11.1.3).

TABLE 9.1.11.1-1 Representative Amphibians and Reptiles That Could Occur on or in the Affected Area of the Proposed Imperial East 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]	
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 1,065,200 acres[f] of potentially suitable habitat occurs in the SEZ region.	4,578 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	35,912 acres of potentially suitable habitat (3.4% of available potentially suitable habitat)	Small
Lizards				
Colorado Desert fringe-toed lizard (*Uma notata*)	Restricted to sparsely vegetated windblown sand of dunes, flats, riverbanks, and washes. Requires fine, loose sand for burrowing. About 190,100 acres of potentially suitable habitat occurs in the SEZ region.	705 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	24,102 acres of potentially suitable habitat (12.7% of available potentially suitable habitat)	Small
Desert horned lizard (*Phrynosoma platyrhinos*)	Deserts dominated by sagebrush, creosotebush, greasewood, or cactus. Occurs on sandy flats, alluvial fans, washes, and edges of dunes. Burrows in soil during periods of inactivity. Common throughout Mojave and Colorado Deserts. About 2,209,200 acres of potentially suitable habitat occurs in the SEZ region.	4,578 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat)	65,422 acres of potentially suitable habitat (3.0% of available potentially suitable habitat)	Small

TABLE 9.1.11.1-1 (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]
Lizards (Cont.)				
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, which it occupies when inactive. Widely distributed in the Mojave, Colorado, and other desert areas in California. About 1,065,200 acres of potentially suitable habitat occurs in the SEZ region.	4,578 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	35,912 acres of potentially suitable habitat (3.4% 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 1,800,500 acres of potentially suitable habitat occurs in the SEZ region.	4,578 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	37,267 acres of potentially suitable habitat (2.1% 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 periods of inactivity. About 1,617,600 acres of potentially suitable habitat occurs in the SEZ region.	4,578 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	39,483 acres of potentially suitable habitat (2.4% of available potentially suitable habitat)	Small
Zebra-tailed lizard (*Callisaurus draconoides*)	Sparsely vegetated deserts on open sandy washes, dunes, floodplains, beaches, or desert pavement. Common and widely distributed throughout Mojave and Colorado Deserts. About 1,992,200 acres of potentially suitable habitat occurs in the SEZ region.	4,578 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat)	64,089 acres of potentially suitable habitat (3.2% of available potentially suitable habitat)	Small

TABLE 9.1.11.1-1 (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 1,430,200 acres of potentially suitable habitat occurs in the SEZ region.	4,578 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	60,553 acres of potentially suitable habitat (4.2% of available potentially suitable habitat)	Small
Glossy snake (*Arizona elegans*)	Variety of habitats including barren to sparsely shrubby deserts, sagebrush flats, grasslands, and sandhills. 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 1,698,000 acres of potentially suitable habitat occurs in the SEZ region.	4,578 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	60,356 acres of potentially suitable habitat (3.6% 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 2,016,600 acres of potentially suitable habitat occurs in the SEZ region.	4,578 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat)	65,501 acres of potentially suitable habitat (3.2% of available potentially suitable habitat)	Small
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 1,125,900 acres of potentially suitable habitat occurs in the SEZ region.	4,578 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	39,137 acres of potentially suitable habitat (3.5% of available potentially suitable habitat)	Small

TABLE 9.1.11.1-1 (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 783,700 acres of potentially suitable habitat occurs in the SEZ region.	783 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat)	27,671 acres of potentially suitable habitat (3.5% 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 1,125,800 acres of potentially suitable habitat occurs in the SEZ region.	4,578 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	39,137 acres of potentially suitable habitat (3.5% 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 1,307,400 acres of potentially suitable habitat occurs in the SEZ region.	4,578 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	63,239 acres of potentially suitable habitat (4.8% of available potentially suitable habitat)	Small

Footnotes on next page.

TABLE 9.1.11.1-1 (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). Only the U.S. portion is tabulated. 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 4,578 acres (18.5 km^2) 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. Only the U.S. portion is tabulated. 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*: ≤1.7% 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*: >1.7 but ≤17% 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*: >17% 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. Design features would reduce most indirect effects to negligible levels. Proportion cutoffs were adjusted to account for the fact that 40% of the SEZ region occurs in Mexico.

[e] Species-specific mitigation is presented for those species with 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).

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. Table 9.1.11.1-1 summarizes the potential impacts on representative amphibian and reptile species resulting from solar energy development that could occur on or in the affected area of the proposed Imperial East SEZ.

On the basis of the impacts on amphibians and reptiles summarized in Table 9.1.11.1-1, direct impacts on amphibian and reptile species would be small, because only 0.1 to 0.4% 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 12.7% of available habitat for the Colorado River fringe-toed 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.

9.1.11.1.3 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., palustrine wetlands). 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, design features that can be identified at this time include the following:

- The potential for indirect impacts on several amphibian species could be reduced by maximizing the distance between solar energy development and the All-American Canal.

- Avoid wetlands located along the southern boundary of the SEZ, including those that are to be created or enhanced in the area (Section 9.1.9.1.1).

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

9.1.11.2 Birds

9.1.11.2.1 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 Imperial East SEZ. The list of bird species potentially present in the project area was determined from range maps and habitat information available from the California Wildlife Habitat Relationships System (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.

> **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).

Nearly 90 species of birds have a range that encompasses the SEZ region. However, habitats for about 40 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 within only the winter range (40 species) or the summer range (9 species) of a number of birds. Eleven 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*), crissal thrasher (*Toxostoma crissale*), 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 9.1.11.2-1. The ash-throated flycatcher would be a summer resident within the SEZ, while the other desert focal bird species could occur yearlong (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 habitat, but they occur within the area of the All-American Canal just south of the SEZ. The killdeer (*Charadrius vociferus*) and least sandpiper (*Calidris minutilla*) (shorebird species) would be expected to occur on the SEZ. The Colorado River, located more than 20 mi (32 km) east of the SEZ, and the Salton Sea,

TABLE 9.1.11.2-1 Representative Bird Species That Could Occur on or in the Affected Area of the Proposed Imperial East SEZ and Potential Impacts

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]
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 317,000 acres[f] of potentially suitable habitat occurs in the SEZ region. Yearlong.	230 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat)	2,562 acres of potentially suitable habitat (0.8% of available potentially suitable habitat)	Small
Least sandpiper (*Calidris minutilla*)	Wet meadows, mudflats, flooded fields, lake shores, edge of salt marshes, and river sandbars. About 186,600 acres of potentially suitable habitat occurs in the SEZ region. Common to abundant in winter.	44 acres of potentially suitable habitat lost (0.02% of available potentially suitable habitat)	3,870 acres of potentially suitable habitat (2.1% of available potentially suitable habitat)	Small
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 1,615,100 acres of potentially suitable habitat occurs in the SEZ region. Summer.	4,578 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	39,481 acres of potentially suitable habitat (2.4% of available potentially suitable habitat)	Small
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 1,709,900 acres of potentially suitable habitat occurs in the SEZ region. Yearlong.	4,578 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	60,356 acres of potentially suitable habitat (3.5% of available potentially suitable habitat)	Small

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TABLE 9.1.11.2-1 (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.)				
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 1,429,800 acres of potentially suitable habitat occurs in the SEZ region. Yearlong.	4,578 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	61,310 acres of potentially suitable habitat (4.3% of available potentially suitable habitat)	Small
Brewer's sparrow (*Spizella breweri*)	Common in Mojave and Colorado Deserts during winter. Occupies open desert scrub and cropland habitats. About 1,172,300 acres of potentially suitable habitat occurs in the SEZ region.	4,578 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	40,403 acres of potentially suitable habitat (3.4% of available potentially suitable habitat)	Small
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 802,100 acres of potentially suitable habitat occurs in the SEZ region. Yearlong.	111 acres of potentially suitable habitat lost (0.01% of available potentially suitable habitat)	4,109 acres of potentially suitable habitat (0.5% of available potentially suitable habitat)	Small
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 1,808,500 acres of potentially suitable habitat occurs in the SEZ region. Yearlong.	4,578 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	40,021 acres of potentially suitable habitat (2.2% of available potentially suitable habitat)	Small

TABLE 9.1.11.2-1 (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 1,355,400 acres of potentially suitable habitat occurs in the SEZ region. Yearlong.	4,578 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	41,054 acres of potentially suitable habitat (3.0% of available potentially suitable habitat)	Small
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, desert, and 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 located in trees, shrubs, vines, or cacti. About 1,614,700 acres of potentially suitable habitat occurs in the SEZ region. Common in summer and uncommon in winter in California.	4,578 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	39,481 acres of potentially suitable habitat (2.4% of available potentially suitable habitat)	Small
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 2,114,100 acres of potentially suitable habitat occurs in the SEZ region. Yearlong.	4,578 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat)	63,599 acres of potentially suitable habitat (3.0% of available potentially suitable habitat)	Small

TABLE 9.1.11.2-1 (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.)				
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 1,134,600 acres of potentially suitable habitat occurs in the SEZ region. Yearlong.	4,578 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	35,912 acres of potentially suitable habitat (3.2% of available potentially suitable habitat)	Small
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 289,800 acres of potentially suitable habitat occurs in the SEZ region. Yearlong.	274 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat)	5,142 acres of potentially suitable habitat (1.8% of available potentially suitable habitat)	Small
Ladder-backed woodpecker (*Picoides scalaris*)	Fairly common in the 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 1,146,500 acres of potentially suitable habitat occurs in the SEZ region. Yearlong.	4,578 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	39,138 acres of potentially suitable habitat (3.4% of available potentially suitable habitat)	Small

TABLE 9.1.11.2-1 (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.)				
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 1,698,700 acres of potentially suitable habitat occurs in the SEZ region. Yearlong but uncommon to rare.	4,578 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	60,356 acres of potentially suitable habitat (3.6% of available potentially suitable habitat)	Small
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 2,128,000 acres of potentially suitable habitat occurs in the SEZ region. Uncommon summer resident.	4,578 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat)	62,194 acres of potentially suitable habitat (2.9% of available potentially suitable habitat)	Small
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 1,802,100 acres of potentially suitable habitat occurs in the SEZ region. Yearlong.	4,578 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	41,388 acres of potentially suitable habitat (2.3% of available potentially suitable habitat)	Small

TABLE 9.1.11.2-1 (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 910,000 acres of potentially suitable habitat occurs in the SEZ region. Yearlong, but many move to more western and northern portions of California during summer.	783 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat)	27,671 acres of potentially suitable habitat (3.0% of available potentially suitable habitat)	Small
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 1,392,200 acres of potentially suitable habitat occurs in the SEZ region. Yearlong.	4,578 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	38,359 acres of potentially suitable habitat (2.8% of available potentially suitable habitat)	Small
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 1,701,000 acres of potentially suitable habitat occurs in the SEZ region. Yearlong.	4,578 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	39,480 acres of potentially suitable habitat (2.3% of available potentially suitable habitat)	Small

TABLE 9.1.11.2-1 (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 379,200 acres of potentially suitable habitat occurs in the SEZ region. Yearlong.	307 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat)	5,682 acres of potentially suitable habitat (1.5% of available potentially suitable habitat)	Small
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 664,600 acres of potentially suitable habitat occurs in the SEZ region. Yearlong.	307 acres of potentially suitable habitat lost (0.05% of available potentially suitable habitat)	5,714 acres of potentially suitable habitat (0.9% of available potentially suitable habitat)	Small
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 2,032,000 acres of potentially suitable habitat occurs in the SEZ region. Winter.	4,578 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat)	40,054 acres of potentially suitable habitat (2.0% of available potentially suitable habitat)	Small

TABLE 9.1.11.2-1 (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.)				
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 1,901,300 acres of potentially suitable habitat occurs in the SEZ region. Yearlong.	4,578 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat)	40,020 acres of potentially suitable habitat (2.07% of available potentially suitable habitat)	Small
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 246,900 acres of potentially suitable habitat occurs in the SEZ region. Yearlong.	230 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat)	1,908 acres of potentially suitable habitat (0.8% 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. Roosts communally in trees, exposed boulders, and occasionally transmission line support towers. About 1,423,300 acres of potentially suitable habitat occurs in the SEZ region. Summer.	4,578 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	39,678 acres of potentially suitable habitat (2.8% of available potentially suitable habitat)	Small

TABLE 9.1.11.2-1 (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				
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 1,902,800 acres of potentially suitable habitat occurs in the SEZ region. Yearlong.	4,578 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat)	40,494 acres of potentially suitable habitat (2.1% of available potentially suitable habitat)	Small
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 1,846,200 acres of potentially suitable habitat occurs in the SEZ region. Yearlong.	4,578 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat)	42,192 acres of potentially suitable habitat (2.3% of available potentially suitable habitat)	Small
White-winged dove (*Zenaida asiatica*)	Desert riparian, wash, succulent shrub, scrub, and Joshua tree habitats; orchards and vineyards, croplands, and pastures. About 1,737,700 acres of potentially suitable habitat occurs in the SEZ region. Summer.	4,578 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	60,357 acres of potentially suitable habitat (3.5% 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). Only the U.S. portion is tabulated. 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 4,578 acres (18.5 km^2) would be developed in the SEZ.

Footnotes continued on next page.

1

TABLE 9.1.11.2-1 (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. Only the U.S. portion is tabulated. 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*: ≤1.7% 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*: >1.7 but ≤17% 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*: >17% 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. Design features would reduce most indirect effects to negligible levels. Proportion cutoffs were adjusted to account for the fact that 40% of the SEZ region occurs in Mexico.

[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).

located more than 35 mi (56 km) northwest 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 Imperial East 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, crissal thrasher, 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. More than 15 birds of prey species have ranges that encompass the proposed Imperial East SEZ (CDFG 2008). Some of these species, particularly several owl and hawk species, are not expected to occur within the SEZ, because their preferred habitats are not present within the SEZ. These species include the long-eared owl (*Asio otus*), northern saw-whet owl (*Aegolius acadicus*), sharp-shinned hawk (*Accipiter striatus*, winter), and western screech-owl (*Megascops kennicottii*). Some raptor species such as the Cooper's hawk (*Accipiter cooperii*), great horned owl (*Bubo virginianus*), merlin (*Falco columbarius*), red-shouldered hawk (*Buteo lineatus*), and rough-legged hawk (*Buteo lagopus*) would either utilize the SEZ occasionally for feeding or would occur only where riparian areas or other woodland habitat occurs.

Raptor species expected to occur within the SEZ include the American kestrel (*Falco sparverius*, yearlong), burrowing owl (yearlong), ferruginous hawk (*Buteo regalis*, winter), golden eagle (*Aquila chrysaetos*, winter), prairie falcon (*Falco mexicanus*, yearlong), red-tailed hawk (*Buteo jamaicensis*, yearlong), and turkey vulture (*Cathartes aura*, summer) (CDFG 2008). However, the American kestrel, golden eagle, prairie falcon, and red-tailed hawk make only infrequent use of the desert regions within which the proposed Imperial East 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 yearlong within the proposed Imperial East SEZ are Gambel's quail (*Callipepla gambelii*) and mourning dove (*Zenaida macroura*), while the white-winged dove (*Zenaida asiatica*) would occur during the summer (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). The white-winged dove occurs in the southeastern corner of California. It inhabits desert riparian, wash, succulent shrub, scrub, alkali scrub, and Joshua tree habitats. It also occurs in orchards, vineyards, cropland, and pastures (CDFG 2008).

Table 9.1.11.2-1 provides habitat information for the representative bird species that could occur on or in the affected area of the proposed Imperial East SEZ. Due to their special status standing, the burrowing owl, crissal thrasher, ferruginous hawk, and short-eared owl are discussed in Section 9.1.12.1.

9.1.11.2.2 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 9.1.11.2.3, below, identifies design features of particular relevance to the proposed Imperial East 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 9.1.11.2.1 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 9.1.11.2.3).

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 9.1.11.2-1 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 Imperial East SEZ. Direct impacts on bird species would be small for all bird species, because only 0.4% or less of habitats potentially suitable for each species would be lost (Table 9.1.11.2-1). Larger areas of suitable habitat would be lost 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-throated sparrow). Other impacts on birds could result from collision with vehicles and buildings, 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.

9.1.11.2.3 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 SEZ-specific design features important to reducing impacts on birds are best established when specific 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, crissal thrasher, 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 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).

- Wetland habitats along the southern boundary of the SEZ boundary should be avoided to the extent practicable.

- 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.

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 given 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, additional species-specific mitigation of direct effects for those species would be difficult or infeasible. The potential for indirect impacts on several bird species (particularly waterfowl, wading birds, and shorebirds) could be reduced by maximizing the distance between solar energy facilities and the All-American Canal.

9.1.11.3 Mammals

9.1.11.3.1 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 proposed Imperial East SEZ. The list of mammal species potentially present in the project area was determined from range maps and habitat information available from the California Wildlife Habitat Relationships System (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 species distributions and habitat preferences, about 40 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 Imperial East SEZ, (2) are important to humans (e.g., big game, small game, and furbearer species), and/or (3) are representative of other species with 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 Imperial East SEZ. Because it is a BLM sensitive species, the desert bighorn sheep is discussed in Section 9.1.12. 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). The burro deer (*Odocoileus hemionus eremicus*), a subspecies of mule deer, occurs in the Colorado Desert. It occurs primarily along the Colorado River, especially during hot summers, and in desert wash woodland communities when away from the river (generally when late summer thunderstorms and cooler temperatures allow the deer to move up the larger washes into the mountains or wash complexes in the foothills) (BLM and CDFG 2002). Burro deer consume foliage from riparian and woodland trees (e.g., willow, palo verde, and ironwood) and various shrubs. Major threats to the burro deer include habitat loss from agricultural development and urbanization and infestation of tamarisk along the Colorado River (BLM and CDFG 2002).

Other Mammals

A number of small game and furbearer species occur within the area of the proposed Imperial East 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 Imperial East 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 ranges of nine bat species encompass 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 only the SEZ 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 9.1.11.3-1 provides habitat information for the representative mammal species that could occur on or in the affected area of the proposed Imperial East 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 9.1.12.1.

9.1.11.3.2 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 9.1.11.3.3, below, identifies design features of particular relevance to the proposed Imperial East SEZ.

TABLE 9.1.11.3-1 Representative Mammal Species That Could Occur on or in the Affected Area of the Proposed Imperial East 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]	
Big Game				
Mule deer (*Odocoileus hemionus*)	Occurs in early to intermediate successional stages of most forest, woodland, and brush habitats. About 1,781,800 acres of potentially suitable habitat occurs in the SEZ region.	4,578 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	41,748 acres of potentially suitable habitat (2.3% of available potentially suitable habitat)	Small. Ensure that development does not block free access to the unlined section of the All-American Canal.
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 1,119,200 acres[f] of potentially suitable habitat occurs in the SEZ region.	4,578 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	39,137 acres of potentially suitable habitat (3.5% 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 2,118,900 acres of potentially suitable habitat occurs in the SEZ region.	4,578 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat)	66,029 acres of potentially suitable habitat (3.1% of available potentially suitable habitat)	Small

TABLE 9.1.11.3-1 (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.)				
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 1,613,800 acres of potentially suitable habitat occurs in the SEZ region.	4,578 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	42,180 acres of potentially suitable habitat (2.6% of available potentially suitable habitat)	Small
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, restricted to broken, rough country with abundant shrub cover and a good supply of rabbits or rodents. About 2,358,200 acres of potentially suitable habitat occurs in the SEZ region.	4,578 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	64,112 acres of potentially suitable habitat (2.7% of available potentially suitable habitat)	Small
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 1,690,200 acres of potentially suitable habitat occurs in the SEZ region.	4,578 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	38,161 acres of potentially suitable habitat (2.3% of available potentially suitable habitat)	Small

TABLE 9.1.11.3-1 (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.)				
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 1,146,200 acres of potentially suitable habitat occurs in the SEZ region.	4,578 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	39,138 acres of potentially suitable habitat (3.4% of available potentially suitable habitat)	Small
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 1,709,700 acres of potentially suitable habitat occurs in the SEZ region.	4,578 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	36,794 acres of potentially suitable habitat (2.2% 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 manmade structures used for hibernation sites. About 1,555,000 acres of potentially suitable habitat occurs in the SEZ region.	4,578 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	30,011 acres of potentially suitable habitat (2.5% of available potentially suitable habitat)	Small

TABLE 9.1.11.3-1 (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 2,194,100 acres of potentially suitable habitat occurs in the SEZ region.	4,578 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat)	66,038 acres of potentially suitable habitat (3.0% 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 1,626,700 acres of potentially suitable habitat occurs in the SEZ region.	4,578 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	39,481 acres of potentially suitable habitat (2.4% of available potentially suitable habitat)	Small
Californian myotis (*Myotis californicus*)	Cliffs, deserts, forests, woodlands, grasslands, savannas, shrublands, and savannas. Often uses manmade 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. For maternity colonies may inhabit rock crevices, under bark, or under eaves of buildings. Common to abundant below 6,000 ft. About 1,790,000 acres of potentially suitable habitat occurs in the SEZ region.	4,578 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	40,020 acres of potentially suitable habitat (2.2% of available potentially suitable habitat)	Small

TABLE 9.1.11.3-1 (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 1,245,000 acres of potentially suitable habitat occurs in the SEZ region.	4,578 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	39,169 acres of potentially suitable habitat (3.1% 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 658,700 acres of potentially suitable habitat occurs in the SEZ region.	739 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat)	24,445 acres of potentially suitable habitat (3.7% 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 2,132,700 acres of potentially suitable habitat occurs in the SEZ region.	4,578 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat)	64,123 acres of potentially suitable habitat (3.0% 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 2,017,000 acres of potentially suitable habitat occurs in the SEZ region.	4,578 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat)	41,318 acres of potentially suitable habitat (2.0% of available potentially suitable habitat)	Small

TABLE 9.1.11.3-1 (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 1,723,800 acres of potentially suitable habitat occurs in the SEZ region.	4,578 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	60,357 acres of potentially suitable habitat (3.5% 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 1,836,700 acres of potentially suitable habitat occurs in the SEZ region.	4,578 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat)	36,826 acres of potentially suitable habitat (2.0% of available potentially suitable habitat)	Small
Merriam's kangaroo rat (*Dipodomys merriami*)	Most widespread kangaroo rat in California. In southern Califorbnia, 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 subsrates. Uses underground burrows often located at the base of a shrub. About 1,817,200 acres of potentially suitable habitat occurs in the SEZ region.	4,578 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	60,830 acres of potentially suitable habitat (3.3% of available potentially suitable habitat)	Small

TABLE 9.1.11.3-1 (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 1,815,000 acres of potentially suitable habitat occurs in the SEZ region.	4,578 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	63,583 acres of potentially suitable habitat (3.5% 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 1,765,000 acres of potentially suitable habitat occurs in the SEZ region.	4,578 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	40,020 acres of potentially suitable habitat (2.3% 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 1,342,900 acres of potentially suitable habitat occurs in the SEZ region.	4,578 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	38,367 acres of potentially suitable habitat (2.9% 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). Only the U.S. portion is tabulated. 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 4,578 acres (18.5 km^2) would be developed in the SEZ.

Footnotes continued on next page.

TABLE 9.1.11.3-1 (Cont.)

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[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. Only the U.S. portion is tabulated. 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*: ≤1.7% 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*: >1.7 but ≤17% 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*: >17% 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. Design features would reduce most indirect effects to negligible levels. Proportion cutoffs were adjusted to account for the fact that 40% of the SEZ region occurs in Mexico.

[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).

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 9.1.11.3.1 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 9.1.11.3.3).

Table 9.1.11.3-1 summarizes the potential impacts on representative mammal species resulting from solar energy development (with the implementation of required programmatic design features) in the proposed Imperial East SEZ.

Direct impacts on small game, furbearers, and nongame (small) mammal species would be small, because 0.4% or less of potentially suitable habitats identified for the species would be lost (Table 9.1.11.3-1). Larger areas of suitable habitat for these species occur within the area of potential indirect effects (e.g., up to 3.7% for the desert kangaroo rat). 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.

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.

9.1.11.3.3 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, one design feature that can be identified at this time is the following:

- Ensure that solar project development does not prevent mule deer free access to the unlined section of the All-American Canal.

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.

9.1.11.4 Aquatic Biota

9.1.11.4.1 Affected Environment

This section addresses aquatic habitats and biota that are known to occur on the proposed Imperial East 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 Imperial East SEZ, the area of direct effects was considered to be the entire SEZ area. As discussed in Section 9.1.1.1, a new access road would not be needed because State Route 98, a two-lane highway, passes through the southern edge of the 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 115-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. The area of potential indirect impacts on aquatic biota from SEZ development was considered to extend up to 5 mi (8 km) beyond the SEZ boundary.

There are no water body or stream features located within the proposed Imperial East SEZ (Figure 9.1.10.1-2). As described in Section 9.1.10, there are approximately 5 acres (0.02 km^2) of palustrine wetlands along the southern edge of the SEZ that are part of a larger wetland area located along the All-American Canal. The NWI classification indicates that these wetlands are temporarily flooded throughout the year primarily through seepage from the canal. The recently completed concrete lining of the canal may have reduced the traditional water source for these wetlands. However, restoration efforts are planned (Section 9.1.9.1.1). Fish communities in these wetlands have not been studied in detail, but the limited collection data available indicate that short-lived, heat- and salt-tolerant species like mosquitofish (*Gambusia affinis*), tilapia (*Tilapia zilli*), and mollies (*Poecilia* spp.) predominate (USFWS 1988). The presence of federally listed pupfish and other native California desert species has not been documented within wetlands associated with the All-American Canal, and in evaluating the canal lining project, the USFWS did not identify impacts on endangered fish as a concern (Section 9.1.12) (BOR 2006).

The area of potential indirect impacts on aquatic biota from SEZ development was considered to extend up to 5 mi (8 km) beyond the SEZ boundary (Figure 9.1.10.1-2). No standing water bodies are present in the area of potential indirect effects. The majority of the palustrine wetlands described above are located along the All-American Canal in the area of indirect effects. The only stream-like features within the area of potential indirect effects are portions of the All-American Canal and the East Highline Canal. A total of approximately 17 mi (27 km) of the All-American Canal is located within the area of potential indirect effects, 7 mi (11 km) of which runs from east to west about 0.25 mi (0.4 km) from the southern boundary of the SEZ. The All-American Canal diverts Colorado River water from the Imperial Dam, which is located approximately 39 mi (63 km) northeast of the proposed SEZ. Twenty-three miles (37 km) of the All-American Canal is lined with concrete to prevent water seepage. The East Highline Canal is a diversion off the All-American Canal and is located approximately 4 mi (6.4 km) west of the Imperial East SEZ. Approximately 8 mi (13 km) of the East Highline Canal is located within the area of potential indirect effects. Chironomidae, Oligochaeta, hydracarina, and corbicula dominated the macroinvertebrate community of the nearby Coachella Canal (USFWS 1988) and presumably similar species would be present in the All-American Canal and East Highline Canal. Both canals support populations of non-native sport fish including striped bass (*Morone saxatilis*), largemouth bass (*Micropterus salmoides*), carp (*Cyprinus carpio*), flathead catfish (*Pylodictis olivaris*), channel catfish (*Ictalurus punctatus*), sunfish (*Lepomis* spp.), and tilapia (*Tilapia* spp.) (USFWS 1988). Both canals are heavily used as recreational fishing areas. Native fish are relatively rare in the lower Colorado River due to overfishing, predation by non-native species, and human alteration of streams and rivers (Mueller and Marsh 2002). There are no records of endangered species native to the Colorado River within the All-American Canal (see Section 9.1.12), and the USFWS found no adverse impacts on endangered fish would occur as a result of lining the canal (BOR 2006), suggesting endangered species and suitable habitat are not present.

Outside of the indirect effects area, but within 50 mi (80 km) of the SEZ, there is approximately 94,721 acres (383 km^2) of lake and reservoir habitat (including reservoirs formed by dams constructed on the Colorado River). Also present within 50 mi (80 km) of the SEZ is approximately 40 mi (64 km) of the Colorado River above Ferguson Lake and 42 mi (67.5 km) below the Imperial Dam. There are approximately 122 mi (196 km) of perennial stream habitat, 114 mi (183 km) of intermittent stream habitat, and a total of 371 mi (597 km) of canal habitat within 50 mi (80 km) of the SEZ. Only canal habitat is present within the area of potential indirect effects and represents approximately 5% of the overall amount of stream and canal habitat available within the overall analysis area.

9.1.11.4.2 Impacts

The types of impacts that could occur to aquatic habitats and biota from 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.

No permanent water bodies or streams are present within the boundaries of the Imperial East SEZ; therefore, no direct impacts on these features are expected. However, wetlands are present and therefore direct impacts on wetland communities are possible as a result of solar energy development within the SEZ. It is also assumed that the man-made All-American Canal and East Highline Canal and associated palustrine wetlands within 5 mi (8 km) of the SEZ (Figure 9.1.10-2) could be indirectly affected by development and operation of solar energy facilities. Aquatic organisms present in these habitat features could be affected by runoff of water and sediment from the SEZ, especially if ground disturbance occurred along the southern boundary of the SEZ (Section 9.1.9.2.1). However, the aquatic communities in both canals are composed primarily of introduced non-native species and implementation of commonly used engineering practices to control water runoff and sediment deposition into these canal and wetland habitat features would control the potential for impacts on aquatic organisms. Overall, the potential for indirect impacts on aquatic habitats and organisms within the region are small.

Water quality in aquatic habitats could be affected by the introduction of contaminants such as fuels, lubricants, or pesticides/herbicides during site characterization, construction, operation, or decommissioning for a solar energy facility, as identified in Section 5.9.1.2.4. Because of the proximity of the Imperial East SEZ to the All-American Canal and associated wetlands, there is the potential for contaminants from solar energy development activities within the SEZ to affect aquatic biota or habitats within these areas.

In arid environments, reductions in the quantity of water in aquatic habitats are of particular concern. Water quantity in aquatic habitats could also be affected if significant amounts of surface water or groundwater were utilized for power plant cooling water, for washing mirrors, or for other needs. The greatest need for water would occur if technologies employing wet cooling, such as parabolic trough or power tower, were developed at the site; the associated impacts would ultimately depend on the water source used (including groundwater from aquifers at various depths). As discussed in Section 9.1.9.2.2, it seems unlikely that sufficient water for wet cooling could be obtained from the All-American Canal. 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.

9.1.11.4.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features have been identified. If programmatic design features are implemented and if the utilization of water from groundwater or surface water sources is adequately controlled to maintain sufficient water levels in nearby aquatic habitats, the impacts on aquatic biota and habitats from solar energy development at the Imperial East SEZ would be expected to be small.

9.1.12 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 Imperial East SEZ. Special status species include the following types of species[8]:

- Species listed as threatened or endangered under the Endangered Species Act (ESA);

- Species that are proposed for listing, are under review, or are candidates for listing under the ESA;

- Species that are listed as threatened or endangered under the California Endangered Species Act (CESA), or that are identified as fully protected by the state[9];

- 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 Imperial East 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), California Natural Diversity Database (CNDDB) (CDFG 2010d), California Regional Gap Analysis Project (CAReGAP) (Davis et al. 1998, USGS 2010a), and SWReGAP (USGS 2004, 2005, 2007). Information reviewed consisted of county-level occurrences as determined from NatureServe, point and polygon element occurrences as determined from CNDDB, as well as modeled land cover types and predicted suitable habitats for the species within the 50-mi (80-km) region as determined from CAReGAP and SWReGAP. The 50-mi (80-km) SEZ region intersects Imperial and Riverside Counties, California; La Paz and Yuma Counties, Arizona; and northern Mexico. However, the SEZ and affected area occur only in Imperial County, California. See Appendix M for additional information on the approach used to identify species that could be affected by development within the SEZ.

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[8] 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.

[9] 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.

9.1.12.1 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 Imperial East SEZ, the area of direct effects 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 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 I-8 (see Section 9.1.1.2 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 effects. Indirect effects considered in the assessment included effects from surface runoff, dust, noise, lighting, and accidental spills from the SEZ, but did not include ground-disturbing activities. The potential magnitude 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 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 9.1.10). Potentially unique habitats in the affected area in which special status species may reside include desert dunes and various aquatic and wetland habitats. Aquatic and riparian habitats in the affected area occur within and along the All-American Canal and the East Highline Canal, both of which are operated by the IID for the BOR. Seepage wetlands also have the potential to occur along these canals, which may support riparian, freshwater marsh, and scrub communities (see Section 9.1.9; Figure 9.1.12.1-1). Other wetland habitats may occur in the affected area through the seasonal inundation of agricultural fields.

All special status species that are known to occur within the Imperial East 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, 35 could occur on or in the affected area, 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 9.1.12.1-1. 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) from the SEZ.

On the basis of CNDDB records and information provided by the CDFG and USFWS, six special status species are known to occur within the affected area of the Imperial East SEZ: giant Spanish-needle, sand food, flat-tailed horned lizard, California black rail, Yuma clapper

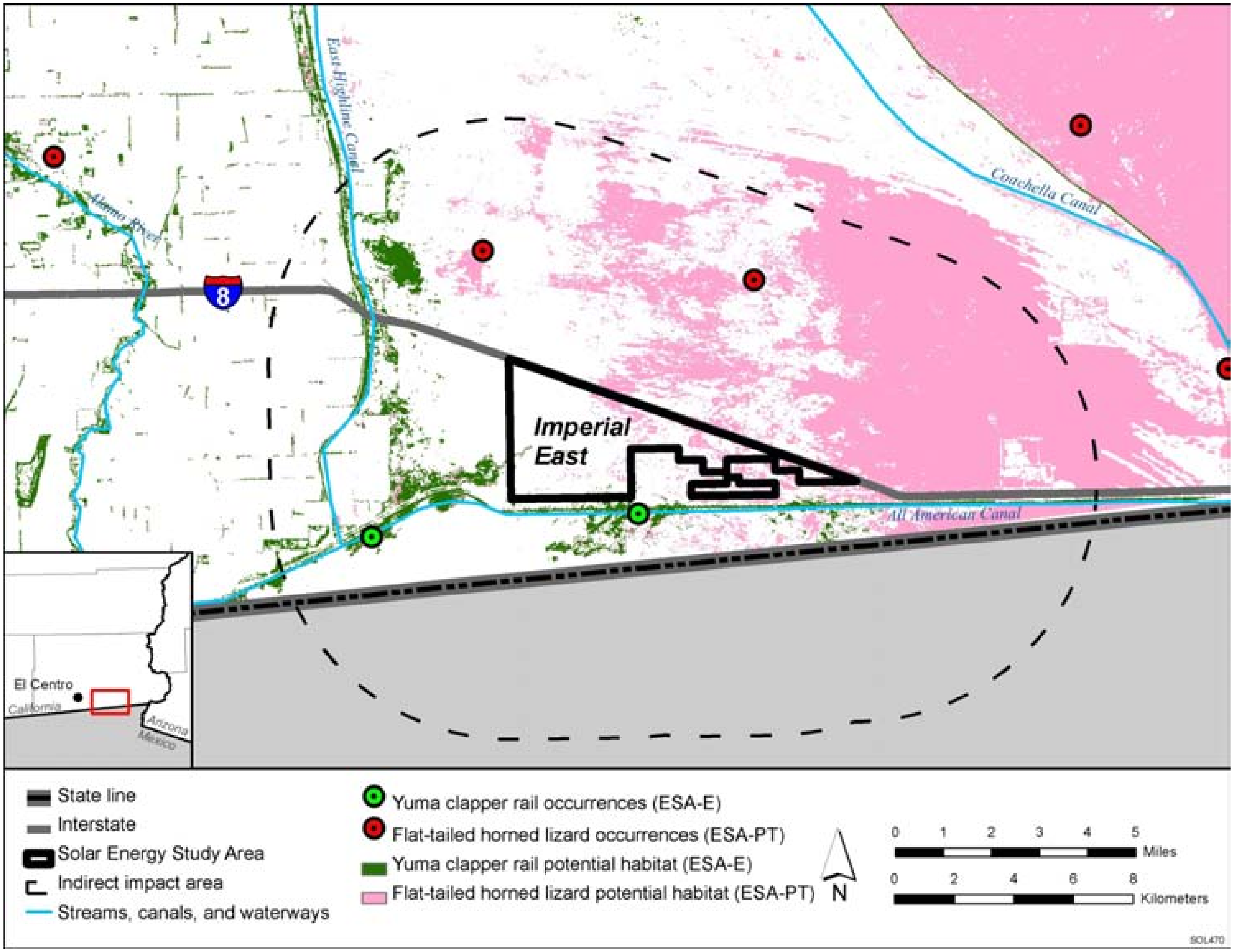

FIGURE 9.1.12.1-1 Known or Potential Occurrences of Species Listed as Endangered, Threatened, or Proposed for Listing under the ESA That May Occur in the Proposed Imperial East SEZ Affected Area (potentially suitable habitat was determined from the CAReGAP land cover model) (Sources: CDFG 2010b; USGS 2010a)

TABLE 9.1.12.1-1 Special Status Habitats, Potential Impacts, and Potential Mitigation for Special Status Species That Could Occur on or in the Affected Area of the Proposed Imperial East SEZ and Potential Impacts

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						
Abrams' spurge	*Chamaesyce abramsiana*	CA-S1	Restricted to deserts of southern California. Inhabits sandy substrates within creosotebush scrub communities in the Mojave and Sonoran Deserts at elevations below 3,000 ft.[h] Nearest recorded occurrences are 18 mi[i] from the SEZ. About 993,869 acres[j] of potentially suitable habitat occurs within the SEZ region.	4,631 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	35,911 acres of potentially suitable habitat (3.6% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance of desert dunes and sand transport systems could reduce impacts. In addition, pre-disturbance surveys and avoiding or minimizing disturbance of occupied habitats in the areas of direct effect; 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.

TABLE 9.1.12.1-1 (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.)						
Bitter hymenoxys	*Hymenoxys odorata*	CA-S2	Sandy substrates within riparian and Sonoran Desert scrub communities. Also occurs within open flats, mesquite flats, ditches, and drainage areas, and along roads and streams. Elevation ranges between 150 and 500 ft. Nearest recorded occurrences are 10 mi from the SEZ. About 1,375,118 acres of potentially suitable habitat occurs within the SEZ region.	4,720 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	39,954 acres of potentially suitable habitat (2.9% of available potentially suitable habitat)	Small overall impact. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.
Brown turbans	*Malperia tenuis*	CA-S1	Rocky hillsides, alluvium washes, sandy flats, and lava flats within Sonoran Desert scrub and creosotebush scrub communities. Elevation ranges between 50 and 1,100 ft. Nearest recorded occurrences are 31 mi from the SEZ. About 1,526,944 acres of potentially suitable habitat occurs within the SEZ region.	4,665 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	36,255 acres of potentially suitable habitat (2.4% of available potentially suitable habitat)	Small overall impact. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.

TABLE 9.1.12.1-1 (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]	
Plants (Cont.)						
California satintail	*Imperata brevifolia*	CA-S2	Chaparral, coastal sage scrub, creosotebush, desert scrub, mesic riparian scrub, and alkaline meadow and seep communities. Elevation ranges between 0 and 1,650 ft. Nearest recorded occurrences are 25 mi from the SEZ. About 1,059,507 acres of potentially suitable habitat occurs within the SEZ region.	4,631 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	35,912 acres of potentially suitable habitat (3.4% of available potentially suitable habitat)	Small overall impact. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.
Chaparral sand-verbena	*Abronia villosa* var. *aurita*	BLM-S; CA-S2	Endemic to southern California. Chaparral desert sand dunes at elevations between 350 and 5,250 ft. Historically occurred on and in the vicinity of the SEZ; the species has not been recorded in the project area since 1964. Most recent recorded occurrences are 15 mi west of the SEZ. About 190,582 acres of potentially suitable habitat occurs within the SEZ region.	705 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	24,102 acres of potentially suitable habitat (12.6% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance of desert dunes and sand transport systems could reduce impacts. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.

TABLE 9.1.12.1-1 (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.)						
Coves' cassia	*Senna covesii*	CA-S2	Sonoran Desert dry washes and slopes with sandy substrates within desert scrub and creosotebush scrub communities. Elevation ranges between 1,000 and 3,500 ft. Nearest recorded occurrences are 43 mi from the SEZ. About 1,527,612 acres of potentially suitable habitat occurs within the SEZ region.	4,665 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	36,255 acres of potentially suitable habitat (2.4% of available potentially suitable habitat)	Small overall impact. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.
Dwarf germander	*Teucrium cubense* ssp. *depressum*	CA-S2	Desert dunes, playas, riparian, creosotebush scrub, and desert scrub communities. Elevation ranges between 150 and 1,300 ft. Nearest recorded occurrence is 40 mi from the SEZ. About 1,346,699 acres of potentially suitable habitat occurs within the SEZ region.	5,380 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	63,242 acres of potentially suitable habitat (4.7% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance of desert dunes and sand transport systems could reduce impacts. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.

TABLE 9.1.12.1-1 (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.)						
Emory's crucifixion-thorn	*Castela emoryi*	CA-S2	Restricted to deserts of southern California and southwestern Arizona, where it occurs at low densities. Inhabits slightly wet areas within Mojave Desert scrub, nonsaline playas, creosotebush scrub, and Sonoran Desert scrub communities. Preferred sites are described as being moist, having fine-textured alluvial bottomland soils, and associated with basalt flows. Elevation ranges between 295 and 2,200 ft. Nearest recorded occurrence is 25 mi from the SEZ. About 1,061,542 acres of potentially suitable habitat occurs within the SEZ region.	4,631 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	35,914 acres of potentially suitable habitat (3.4% of available potentially suitable habitat)	Small overall impact. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.

TABLE 9.1.12.1-1 (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	Sandy substrates of desert dunes within Sonoran Desert scrub communities at elevations below 650 ft. Nearest recorded occurrences are 45 mi from the SEZ. About 1,249,216 acres of potentially suitable habitat occurs within the SEZ region.	5,336 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	60,014 acres of potentially suitable habitat (4.8% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance of desert dunes and sand transport systems could reduce impacts. Pre-disturbance surveys and avoiding or minimizing disturbance of occupied habitats in the areas of direct effect and off site mitigation, including compensatory mitigation, could reduce impacts. Translocation is not a feasible option for this species.
Giant Spanish-needle[k]	***Palafoxia arida* var. *gigantea***	BLM-S; CA-S1	Desert sand dune habitats at elevations below 330 ft. Known to occur in the affected area within 5 mi east of the SEZ. About 190,187 acres of potentially suitable habitat occurs within the SEZ region.	705 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	24,102 acres of potentially suitable habitat (12.7% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance of desert dunes and sand transport systems could reduce impacts. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.

TABLE 9.1.12.1-1 (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.)						
Glandular ditaxis	*Ditaxis claryana*	CA-S1	Sandy substrates within desert scrub communities at elevations below 1,525 ft. Nearest recorded occurrence is 20 mi from the SEZ. About 1,059,112 acres of potentially suitable habitat occurs within the SEZ region.	4,631 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	35,912 acres of potentially suitable habitat (3.4% of available potentially suitable habitat)	Small overall impact. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.
Hairy stickleaf	*Mentzelia hirsutissima*	CA-S2	Patchy distribution in southern California. Washes, fans, or slopes having rocky or sandy substrates within Sonoran Desert scrub and creosotebush scrub communities at elevations below 2,300 ft. Nearest recorded occurrences are 25 mi west of the SEZ. About 1,527,612 acres of potentially suitable habitat occurs within the SEZ region.	4,665 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	36,255 acres of potentially suitable habitat (2.4% of available potentially suitable habitat)	Small overall impact. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.
Harwood's milkvetch	*Astragalus insularis* var. *harwoodii*	CA-S2	Sonoran Desert of Arizona and California on sandy or gravelly substrates of desert dunes within desert scrub communities. Elevation ranges between 0 and 2,325 ft. Nearest occurrences are approximately 20 mi from the SEZ. About 1,249,216 acres of potentially suitable habitat occurs within the SEZ region.	5,336 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	60,014 acres of potentially suitable habitat (4.8% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance on desert dunes and sand transport systems could reduce impacts. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.

TABLE 9.1.12.1-1 (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.)						
Mud nama	*Nama stenocarpum*	CA-S1	Margins of freshwater wetlands in southern California, including lakes, streams, rivers, marshes, and swamps. Elevation ranges between 0 and 1,640 ft. Nearest occurrences are approximately 30 mi from the SEZ. About 94,887 acres of potentially suitable habitat occurs within the SEZ region.	44 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	3,226 acres of potentially suitable habitat (3.4% of available potentially suitable habitat)	Small overall impact. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.
Munz's cholla	*Opuntia munzii*	BLM-S; CA-S1; FWS-SC	Gravelly or sandy to rocky soils, often on lower bajadas, washes, and flats. Also occurs in hills and canyon sides. Occurs in Sonoran Desert creosotebush shrub communities at elevations below 3,280 ft. Nearest recorded occurrences are 25 mi north (upgradient) of the SEZ. About 1,856,676 acres of potentially suitable habitat occurs within the SEZ region.	4,709 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	37,298 acres of potentially suitable habitat (2.0% of available potentially suitable habitat)	Small overall impact. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.

TABLE 9.1.12.1-1 (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.)						
Saguaro cactus	*Carnegiea gigantea*	CA-S1	Endemic to the Sonoran Desert along the Colorado River from the Whipple Mountains to Laguna Dam; on rocky substrates within Sonoran Desert scrub and creosote scrub communities at elevations between 160 and 4,900 ft. Nearest recorded occurrence is from the Chuckwalla DWMA, approximately 30 mi northeast of the SEZ. About 1,158,649 acres of potentially suitable habitat occurs within the SEZ region.	4,631 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	35,943 acres of potentially suitable habitat (3.1% of available potentially suitable habitat)	Small overall impact. See Abrams’ spurge for a list of potential mitigations applicable to all special status plant species.
Sand evening-primrose	*Camissonia arenaria*	CA-S2	Sandy washes and rocky slopes within Sonoran Desert scrub communities at elevations below 3,000 ft. Nearest recorded occurrence is from the Chuckwalla DWMA, approximately 30 mi northeast of the SEZ. About 1,627,232 acres of potentially suitable habitat occurs within the SEZ region.	4,665 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	36,286 acres of potentially suitable habitat (2.2% of available potentially suitable habitat)	Small overall impact. See Abrams’ spurge for a list of potential mitigations applicable to all special status plant species.

TABLE 9.1.12.1-1 (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.)						
Sand food	***Pholisma sonorae***	BLM-S; CA-S2; FWS-SC	Sonoran sand dune habitats at elevations below 650 ft. Known to occur in the affected area within 5 mi east of the SEZ. About 190,187 acres of potentially suitable habitat occurs within the SEZ region.	705 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	24,102 acres of potentially suitable habitat (12.7% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance of desert dunes and sand transport systems could reduce impacts. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.
Slender cottonheads	*Nemacaulis denudata* var. *gracilis*	CA-S2	Mojave and Sonoran Deserts on sandy soils within coastal dunes, desert dunes, creosotebush scrub, and desert scrub communities at elevations below 1,300 ft. Nearest recorded occurrences are 11 mi from the SEZ. About 1,249,299 acres of potentially suitable habitat occurs within the SEZ region.	5,336 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	60,014 acres of potentially suitable habitat (4.8% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance of desert dunes and sand transport systems could reduce impacts. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.

TABLE 9.1.12.1-1 (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.)						
Wiggins' croton	*Croton wigginsii*	CA-S1	Restricted to desert dunes of the Sonoran Desert. Elevation ranges between 164 and 330 ft. Nearest recorded occurrences are from the Algodones Dunes, approximately 11 mi east of the SEZ. About 190,187 acres of potentially suitable habitat occurs within the SEZ region.	705 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	24,102 acres of potentially suitable habitat (12.7% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance of desert dunes and sand transport systems could reduce impacts. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.
Arthropods						
Cheeseweed owlfly	*Oliarces clara*	CA-S1	Colorado River drainage of southwestern Arizona and southern California within creosotebush scrub communities on or near bajadas at elevations below 330 ft. Nearest recorded occurrences are 30 mi from the SEZ. About 993,869 acres of potentially suitable habitat occurs within the SEZ region.	4,631 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	35,911 acres of potentially suitable habitat (3.6% 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.

TABLE 9.1.12.1-1 (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						
Colorado Desert fringe-toed lizard	*Uma notata*	BLM-S; CA-S2	Sparsely vegetated arid areas with windblown sand, including dunes, flats, and washes at elevations below 1,600 ft. Nearest recorded occurrence is 6 mi northeast of the SEZ. About 658,770 acres of potentially suitable habitat occurs within the SEZ region.	739 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat)	24,445 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance of desert dunes and sand transport systems could reduce impacts. in addition, pre-disturbance surveys and avoidance of occupied habitats on the SEZ; translocation of individuals from areas of direct effect; or compensatory mitigation of direct effects could reduce impacts.
Flat-tailed horned lizard	***Phrynosoma mcallii***	ESA-PT; BLM-S; CA-S2; CA-SC	Sandy desert hardpan, gravel flats, and dunes with sparse vegetation of low species diversity at elevations below 850 ft. Known to occur in the affected area within 3 mi north of the SEZ. About 281,300 acres of potentially suitable habitat occurs within the SEZ region.	716 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	24,575 acres of potentially suitable habitat (9.0% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance of desert dunes and sand transport systems could reduce impacts. In addition, pre-disturbance surveys and avoidance of occupied habitats on the SEZ or compensatory mitigation of direct effects could reduce impacts.

TABLE 9.1.12.1-1 (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						
California black rail	***Laterallus jamaicensis coturniculus***	BLM-S; CA-FP; CA-T; CA-S1; FWS-SC	Year-round resident in the Imperial Valley and lower Colorado River in Arizona and California. Locally common in marshes along the Colorado River or canal systems. Known to occur in the affected area from the All-American Canal. About 184,792 acres of potentially suitable habitat occurs within the SEZ region.	44 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	3,870 acres of potentially suitable habitat (2.1% of available potentially suitable habitat)	Small overall impact. Pre-disturbance surveys and avoiding disturbance to occupied and potentially suitable wetland habitats in the area of direct effect could reduce impacts. Translocation and compensatory mitigation are not permitted for California fully protected species. The potential for impact and need for mitigation should be determined in coordination with the USFWS and CDFG.

TABLE 9.1.12.1-1 (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.)						
Ferruginous hawk	*Buteo regalis*	BLM-S; FWS-SC	Winter resident and migrant at lower elevations and open grasslands, shrublands, and agricultural areas in southern California. Open grasslands, sagebrush flats, desert scrub, desert valleys, and fringes of pinyon-juniper habitats. This species is known to occur in Imperial County, California. About 1,252,826 acres of potentially suitable habitat occurs within the SEZ region.	4,855 acres of potentially suitable foraging habitat lost (0.4% of available potentially suitable habitat)	44,553 acres of potentially suitable foraging habitat (3.6% of available potentially suitable habitat)	Small overall impact on foraging habitat only. Avoidance of all potentially suitable foraging habitat is not feasible because this habitat is widespread in the area of direct effect and readily available throughout the SEZ region.
Least bittern	*Ixobrychus exilis*	BLM-S; CA-S1; CA-SC	Year-round resident in the lower Colorado River Valley including the Salton Sea and the Colorado River in California and Arizona. Emergent vegetation of larger bodies of water such as lakes, ponds, and rivers. Nests in dense cattail marshes and thickets of saltcedar. The species occurs near the Colorado River as near as 35 mi and 40 mi east and northwest of the SEZ, respectively. About 206,149 acres of potentially suitable habitat occurs within the SEZ region.	44 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	3,870 acres of potentially suitable habitat (1.9% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing impacts on wetlands would reduce impacts. Pre-disturbance surveys and avoidance of occupied habitats in the area of direct effect; or compensatory mitigation of direct effects on occupied habitats could reduce impacts.

TABLE 9.1.12.1-1 (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; CA-SC	Year-round resident within the SEZ region. Open areas with short sparse vegetation, including grasslands, agricultural fields, and disturbed areas. Nests in burrows created by mammals or tortoises. Feeds on insects and small mammals. Nearest recorded occurrence is 10 mi west of the SEZ. About 2,531,363 acres of potentially suitable habitat occurs within the SEZ region.	5,718 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat)	76,150 acres of potentially suitable habitat (3.0% of available potentially suitable habitat)	Small overall impact. Pre-disturbance surveys and avoidance of discovered populations and occupied habitats on the SEZ, or compensatory mitigation of direct effects on occupied habitats could reduce impacts.
White-faced ibis	*Plegadis chihi*	CA-S1; FWS-SC	Winter resident in the lower Colorado River Forages in fresh emergent wetlands, shallow lacustrine waters, muddy ground of wet meadows, and irrigated or flooded pastures and croplands. Dense, fresh emergent wetlands serve as nesting habitat. Roosts amidst dense, freshwater emergent vegetation such as bulrushes, cattails, reeds, or low shrubs over water. Nearest recorded occurrences are from the Salton Sea, approximately 40 mi northwest of the SEZ. About 789,151 acres of potentially suitable habitat occurs within the SEZ region.	44 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	11,372 acres of potentially suitable habitat (1.4% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing impacts on wetlands would reduce impacts. Pre-disturbance surveys and avoidance of occupied habitats in the area of direct effect or compensatory mitigation of direct effects on occupied habitats could reduce impacts.

TABLE 9.1.12.1-1 (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.)						
Yuma clapper rail	***Rallus longirostris yumanensis***	ESA-E; CA-FP; CA-T; CA-S1	Freshwater marshes containing dense stands of cattails. Nests on dry hummocks or in small shrubs among dense cattails or bulrushes along the edges of shallow ponds in freshwater marshes with stable water levels. Known to occur in the affected area along the All-American Canal within 0.5 mi south of the SEZ. About 185,175 acres of potentially suitable habitat occurs within the SEZ region.	44 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	3,870 acres of potentially suitable habitat (2.1% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing impacts on wetlands would reduce impacts. Pre-disturbance surveys and avoiding disturbance to occupied and potentially suitable wetland habitats in the area of direct effect also could reduce impacts. Translocation and compensatory mitigation are not permitted for California fully protected species. The potential for impact and need for mitigation should be determined in consultation with the USFWS and CDFG.

TABLE 9.1.12.1-1 (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						
California leaf-nosed bat	*Macrotus californicus*	BLM-S; CA-S2; CA-SC; FWS-SC	Year-round resident in SEZ region. Desert riparian, desert wash, desert scrub, and palm oasis habitats at elevations below 2,000 ft. Roosts in mines, caves, and buildings. Nearest recorded occurrences are 20 mi east of the SEZ. About 1,539,377 acres of potentially suitable habitat occurs within the SEZ region.	4,698 acres of potentially suitable foraging habitat lost (0.3% of available potentially suitable habitat)	36,795 acres of potentially suitable foraging habitat (2.4% of available potentially suitable habitat)	Small overall impact on foraging habitat only. Avoidance of all potentially suitable foraging habitat is not feasible because this habitat is widespread in the area of direct effect and readily available throughout the SEZ region.
Pallid bat	*Antrozous pallidus*	BLM-S; CA-SC; FWS-SC	Year-round resident throughout the California solar region. Inhabits low-elevation desert communities, including grasslands, shrublands, and woodlands. Day roosts in caves, crevices, and mines. Nearest recorded occurrence is from the North Algodones Dunes Wilderness, approximately 18 mi north of the SEZ. About 1,403,590 acres of potentially suitable habitat occurs within the SEZ region.	4,708 acres of potentially suitable foraging habitat lost (0.3% of available potentially suitable habitat)	39,678 acres of potentially suitable foraging habitat (2.8% of available potentially suitable habitat)	Small overall impact on foraging habitat only. Avoidance of all potentially suitable foraging habitat is not feasible because this habitat is widespread in the area of direct effect and readily available throughout the SEZ region.

TABLE 9.1.12.1-1 (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.)						
Pocketed free-tailed bat	*Nyctinomops femorosaccus*	CA-S2; CA-SC; FWS-SC	Arid lowland areas including creosotebush and chaparral habitats in association with very large boulders, high cliffs, rugged rock outcroppings, and rocky canyons. Nearest recorded occurrences are 16 mi from of the SEZ. About 1,120,055 acres of potentially suitable habitat occurs within the SEZ region.	4,631 acres of potentially suitable foraging habitat lost (0.4% of available potentially suitable habitat)	35,912 acres of potentially suitable foraging habitat (3.2% of available potentially suitable habitat)	Small overall impact on foraging habitat only. Avoidance of all potentially suitable foraging habitat is not feasible because this habitat is widespread in the area of direct effect and readily available throughout the SEZ region.
Townsend's big-eared bat	*Corynorhinus townsendii*	BLM-S; CA-S2; CA-SC; FWS-SC	Found throughout California, in all but subalpine and alpine habitats, and may be found at any season throughout its range. Roosts in caves, mines, tunnels, buildings, or other human-made structures. Nearest recorded occurrence is approximately 35 mi from the SEZ. About 2,919,158 acres of potentially suitable habitat occurs within the SEZ region.	5,721 acres of potentially suitable foraging habitat lost (0.2% of available potentially suitable habitat)	75,484 acres of potentially suitable foraging habitat (2.6% of available potentially suitable habitat)	Small overall impact on foraging habitat only. Avoidance of all potentially suitable foraging habitat is not feasible because this habitat is widespread in the area of direct effect and readily available throughout the SEZ region.

TABLE 9.1.12.1-1 (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.)						
Western mastiff bat	*Eumops perotis californicus*	BLM-S; FWS-SC; CA-SC	Year-round resident in southern California and southwestern Arizona in many open semiarid habitats, including conifer and deciduous woodlands, shrublands, grasslands, chaparral, and urban areas. Day roosts in crevices in cliff faces, buildings, and tall trees. Nearest recorded occurrence is 16 mi west of the SEZ. About 2,435,906 acres of potentially suitable habitat occurs within the SEZ region.	5,721 acres of potentially suitable foraging habitat lost (0.2% of available potentially suitable habitat)	75,484 acres of potentially suitable foraging habitat (3.1% of available potentially suitable habitat)	Small overall impact on foraging habitat only. Avoidance of all potentially suitable foraging habitat is not feasible because this habitat is widespread in the area of direct effect and readily available throughout the SEZ region.
Yuma hispid cotton rat	***Sigmodon hispidus eremicus***	CA-S2; CA-SC; FWS-SC	Southern Colorado River Valley in southwest Arizona and southwestern California in dense stands of vegetation near wetlands, herbaceous grasslands, and hardwood woodland communities. Preferred sites are described as being dense grassy areas such as fields, marshes, and roadside edges, brushy areas along streams or ponds, irrigated fields, and desert scrub. Known to occur in the affected area near the All-American Canal within 0.5 mi south of the SEZ. About 574,906 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	12,554 acres of potentially suitable habitat (2.2% of available potentially suitable habitat)	Small overall impact; no direct effect. Pre-disturbance surveys and avoidance of occupied habitats in the area of direct effect or compensatory mitigation of direct effects on occupied habitats could reduce impacts.

Footnotes on next page.

TABLE 9.1.12.1-1 (Cont.)

[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-T = listed as threatened by the state of California; ESA-E = listed as endangered under the ESA; ESA-PT = proposed threatened under the ESA; FWS-SC = USFWS species of concern.

[b] For plant and invertebrate species, potentially suitable habitat was determined by using CAReGAP and SWReGAP land cover types. For reptile, bird, and mammal species, potentially suitable habitat was determined by using CAReGAP and SWReGAP habitat suitability models as well as CAReGAP and SWReGAP land cover models. Area of potentially suitable habitat for each species is presented for the SEZ region, which is 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 SEZ region was determined by using CAReGAP and SWReGAP 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.

[d] Direct effects within the SEZ consist of the ground-disturbing activities associated with construction and the 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 from the SEZ.

[f] Overall impact magnitude categories were based on professional judgment and were (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. 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] To convert mi to km, multiply by 1.609.

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

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

rail, and Yuma hispid cotton rat. There are no groundwater-dependent species in the vicinity of the SEZ based upon CNDDB records, comments provided by the USFWS (Stout 2009), and the evaluation of groundwater resources in the Imperial East SEZ region (Section 9.1.9).

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

In its scoping comments on the proposed Imperial East SEZ, the USFWS expressed concern for impacts of project developments on the Yuma clapper rail, a species listed as endangered under the ESA (Stout 2009). The Yuma clapper rail is also listed as threatened under the CESA and is a California fully protected species. This species has the potential to occur on the SEZ or within the affected area on the basis of observed occurrences near the SEZ and the presence of apparently suitable habitat (Figure 9.1.12.1-1; Table 9.1.12.1-1). Appendix J provides basic information on life history, habitat needs, and threats to populations of this species. No other species currently listed under the ESA is likely to occur within the Imperial East SEZ affected area. The USFWS determined that the desert tortoise is absent from the affected area on the basis of the USGS habitat suitability model (Nussear et al. 2009) and known range of the species.

The Yuma clapper rail occurs in freshwater marsh habitats containing dense vegetation such as cattail (*Typha* sp.), bulrush (*Scirpus* sp.), or reeds (*Phragmites* sp.) from southern Nevada, south and west to the Salton Sea, California, and southeast to Arizona and Mexico. According to CNDDB records, the species is known to occur in the affected area of the Imperial East SEZ along the All-American Canal system (Figure 9.1.12.1-1; Table 9.1.12.1-1). The USFWS identified seepage wetland habitats along the canal that could serve as sensitive wetland resources for the species (Stout 2009). In addition, mitigation wetland habitat adjacent to the southern boundary of the SEZ is maintained to offset impacts from previous construction and lining projects for the All-American Canal. According to the CAReGAP land cover model, potentially suitable habitats along the All-American Canal and within associated seepage wetlands are known to occur in the affected area within 0.5 mi (0.8 km) south of the SEZ. Potentially suitable wetland habitat may also occur on the SEZ (Figure 9.1.12.1-1; Table 9.1.12.1-1). A site visit in August 2009 confirmed the presence of potentially suitable habitat along the canal, although no individuals were recorded. Designated critical habitat for this species does not occur in the SEZ region.

9.1.12.1.2 Species Proposed for Listing under the ESA That Could Occur in the Affected Area

The USFWS did not identify any species proposed for listing under the ESA in its scoping comments on the Imperial East SEZ (Stout 2009). However, the flat-tailed horned lizard is proposed for listing as a threatened species under the ESA (USFWS 2010) and is known to occur in the vicinity of the SEZ (Figure 9.1.12.1-1; Table 9.1.12.1-1). Appendix J provides basic information on life history, habitat needs, and threats to populations of this species.

The flat-tailed horned lizard is restricted to desert habitats from Imperial, Riverside, and San Diego Counties, California, and Yuma County, Arizona. It is confined to sandy habitats including dunes, sandy washes, and desert flats. Creosote scrub is the dominant vegetation cover among inhabited locations. Similar to other horned lizards (genus *Phrynosoma*), the flat-tailed horned lizard is an ant specialist, and the distribution of this species is often associated with the occurrence of harvester ants (*Pogonomyrex californicus*). According to CNDDB, the species is known to occur within 3 mi (5 km) north of the Imperial East SEZ. The BLM El Centro Field Office also acknowledged the potential occurrence of this species on BLM-administered lands within the SEZ. Potentially suitable habitat (desert dune and pavement) occurs on the SEZ according to the CAReGAP land cover model and confirmed by a site visit in August 2009 (Figure 9.1.12.1-1; Table 9.1.12.1-1).

9.1.12.1.3 BLM-Designated Sensitive Species

There are 15 BLM-designated sensitive species that may occur in the affected area of the Imperial East SEZ (Table 9.1.12.1-1). These BLM-designated sensitive species include the following: (1) plants—chaparral sand-verbena, flat-seeded spurge, giant Spanish-needle, Munz's cholla, and sand food; (2) reptiles—Colorado Desert fringe-toed lizard and flat-tailed horned lizard; (3) birds—California black rail, ferruginous hawk, least bittern, and western burrowing owl; and (4) mammals—California leaf-nosed bat, pallid bat, Townsend's big-eared bat, and western mastiff bat. Of these species, the giant Spanish-needle and sand food 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 presented in Table 9.1.12.1-1. The flat-tailed horned lizard was previously discussed because it is under review for listing under the ESA (Section 9.1.12.1.2). The remaining 14 BLM-designated sensitive species as related to the SEZ are described in the remainder of this section. Additional life history information for these species is provided in Appendix J.

Chaparral Sand-Verbena

The chaparral sand-verbena is a flowering herb endemic to southern California. It historically occurred approximately 15 mi (24 km) west of the SEZ, but it is currently known to occur only in Riverside and Orange Counties outside the area of indirect effects. Although the species has not been recently recorded near the SEZ, potentially suitable sand dune habitat still occurs on the SEZ and in other portions of the affected area according to the CAReGAP land cover model (Table 9.1.12.1-1).

Flat-Seeded Spurge

The flat-seeded spurge is a flowering herb known only from the Sonoran Desert in southern California and southwestern Arizona. The species inhabits sandy substrates of dunes within desert scrub communities. The species is known to occur as near as 45 mi (72 km) from the SEZ. Populations are not known to occur on the SEZ, but potentially suitable habitat occurs on the SEZ and in other portions of the affected area according to the CAReGAP land cover model (Table 9.1.12.1-1).

Giant Spanish-Needle

The giant Spanish-needle is a flowering herb endemic to sand dune habitats in the Sonoran Desert of southern California and southwestern Arizona. Populations are known to occur as near as 5 mi (8 km) east of the SEZ. Populations are not known to occur on the SEZ, but suitable desert dune habitats may occur on the SEZ and in other portions of the affected area according to the CAReGAP land cover model (Table 9.1.12.1-1).

Munz's Cholla

The Munz's cholla is a tree-like cactus endemic to southern California, where it is known only from the Chocolate Mountains in Imperial and Riverside Counties as near as 25 mi (40 km) north of the SEZ. The species inhabits Sonoran Desert creosotebush scrub communities. It is not known to occur on the SEZ, but potentially suitable habitat occurs on the SEZ and in other portions of the affected area according to the CAReGAP land cover model (Table 9.1.12.1-1).

Sand Food

The sand food is a parasitic plant endemic to Sonoran Desert habitats of southern California and southwestern Arizona. The species lacks chlorophyll and exists as a parasite on the roots of various desert shrubs that inhabit desert dunes. The species is known to occur within 5 mi (8 km) east of the SEZ. Potentially suitable habitat for the species occurs on the SEZ and in other portions of the affected area according to the CAReGAP land cover model (Table 9.1.12.1-1).

Colorado Desert Fringe-Toed Lizard

The Colorado Desert fringe-toed lizard is a fairly small smooth-skinned lizard that inhabits desert sand dune habitats in southeastern California and western Arizona. The species is a habitat specialist, occurring in specialized dune habitats composed of fine, loose, windblown sand deposits. The species is known to occur 6 mi (10 km) northeast of the SEZ. Potentially suitable habitat for the species occurs on the SEZ and in other portions of the affected area according to the CAReGAP land cover model (Table 9.1.12.1-1).

California Black Rail

The California black rail is a small wetland bird that inhabits coastal and freshwater marshes of southern California and western Arizona. This species is also listed as threatened under the CESA and is a California fully protected species. In the SEZ region, the species is associated with marsh habitats containing dense vegetation such as cattail (*Typha* sp.), bulrush (*Scirpus* sp.), or reeds (*Phragmites* sp.). Nearest recorded CNDDB occurrences are 25 mi (40 km) east of the SEZ. However, the USFWS has confirmed the presence of this species in seepage wetland areas associated with the All-American Canal within the affected area (Stout 2009). According to the CAReGAP land cover model, potentially suitable wetland habitats may occur on the SEZ and within other portions of the affected area (Table 9.1.12.1-1).

Ferruginous Hawk

The ferruginous hawk is a winter resident and migrant in the Imperial East SEZ region. The species inhabits open grasslands, sagebrush (*Artemisia* sp.) flats, desert scrub, and the fringes of pinyon-juniper woodlands. This species is known to occur in Imperial County, California, and according to the CAReGAP land cover model, potentially suitable foraging habitat may occur on the SEZ and in other portions of the affected area (Table 9.1.12.1-1).

Least Bittern

The least bittern is a common summer resident in suitable habitats of the lower Colorado River in southwestern California and southwestern Arizona. The species inhabits freshwater marsh habitats containing dense emergent vegetation such as cattail (*Typha* sp.) and reeds (*Phragmites* sp.). Nearest recorded CNDDB occurrences are from the Salton Sea, approximately 35 mi (56 km) northwest of the SEZ. The species may occur in seepage wetlands associated with the All-American Canal, which is located within 0.5 mi (0.8 km) south of the SEZ (Stout 2009). According to the CAReGAP land cover model, potentially suitable foraging and nesting habitats may occur on the SEZ and within other portions of the affected area (Table 9.1.12.1-1).

Western Burrowing Owl

The western burrowing owl is a year-round resident of open, dry grasslands and desert habitats in southern California and Arizona. Populations occur locally in open areas with sparse vegetation. The USFWS has estimated that the Imperial Valley supports the highest western burrowing owl density within North America and over 70% of California's western burrowing owl population. Nearest recorded occurrences are 10 mi (16 km) west of the SEZ. According to the CAReGAP habitat suitability model, potentially suitable habitat may occur on the SEZ and in other portions of the affected area (Table 9.1.12.1-1). 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.

California Leaf-Nosed Bat

The California leaf-nosed bat is a large-eared bat with a leaflike flap of protective skin on the tip of its nose. It primarily occurs along the Colorado River from southern Nevada, through Arizona and California, to Baja California, and Sinaloa Mexico. The species forages in a variety of desert habitats including desert riparian, desert wash, desert scrub, and palm oasis. It roosts in caves, crevices, and mines. Nearest recorded occurrences are 20 mi (32 km) east of the SEZ. According to the CAReGAP land cover model, potentially suitable foraging habitat may occur on the SEZ and in other portions of the affected area (Table 9.1.12.1-1). On the basis of an evaluation of SWReGAP land cover types, there is no potentially suitable roosting habitat (rocky cliffs and outcrops) in the affected area.

Pallid Bat

The pallid bat is a large pale bat with large ears 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 the North Algodones Dunes Wilderness, approximately 18 mi (29 km) north of the SEZ. According to the CAReGAP land cover model, potentially suitable foraging habitat may occur on the SEZ and in other portions of the affected area (Table 9.1.12.1-1). On the basis of an evaluation of SWReGAP land cover types, there is no potentially suitable roosting habitat (rocky cliffs and outcrops) in the affected area.

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 nondesert habitats. The species roosts in caves, mines, tunnels, buildings, and other man-made structures. Nearest recorded occurrences are approximately 35 mi (56 km) from the SEZ. According to the CAReGAP land cover model, potentially suitable foraging habitat may occur on the SEZ and in other portions of the affected area (Table 9.1.12.1-1). On the basis of an evaluation of SWReGAP land cover types, there is no potentially suitable roosting habitat (rocky cliffs and outcrops) in the affected area.

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. Nearest recorded occurrences are 16 mi (26 km) west of the SEZ. According to the CAReGAP land cover model, potentially suitable foraging habitat may occur on the SEZ and in other portions of the affected area (Table 9.1.12.1-1). On the basis of an evaluation of SWReGAP land cover types, there is no potentially suitable roosting habitat (rocky cliffs and outcrops) in the affected area.

9.1.12.1.4 State-Listed Species

There are 2 species listed by the state of California that may occur in the Imperial East SEZ affected area (Table 9.1.12.1-1): California black rail and Yuma clapper rail. Both of these species are listed as a threatened species under the CESA; they are also considered to be California fully protected species. These species were previously discussed in Section 9.1.12.1.1 or Section 9.1.12.1.3 because of their status under the ESA or the BLM.

9.1.12.1.5 Rare Species

There are 35 species that have a state status of S1 or S2 in California or are listed as species of concern by the State of California or USFWS that may occur in the affected area of the Imperial East SEZ (Table 9.1.12.1-1). Of these species, 19 have not been discussed as ESA-listed (Section 9.1.12.1.1), proposed for listing under the ESA (Section 9.1.12.1.2), BLM-designated sensitive (Section 9.1.12.1.3), or state-listed (Section 9.1.12.1.4). The Yuma hispid cotton rat is considered rare in the state of California and is known to occur in the affected area.

9.1.12.2 Impacts

The potential for impacts on special status species from utility-scale solar energy development within the proposed Imperial East 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 9.1.12.1 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 National Environmental Policy Act of 1969 (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 9.1.12.3).

Solar energy development within the Imperial East SEZ could affect a variety of habitats (see Section 9.1.10). These impacts on habitats could in turn affect special status species dependent on those habitats. Based on CNDDB records and information provided by the CDFG and USFWS, there are six special status species known to occur in the affected area: giant Spanish-needle, sand food, flat-tailed horned lizard, California black rail, Yuma clapper rail, and

Yuma hispid cotton rat. These species are listed in bold in Table 9.1.12.1-1. Other special status species may occur on the SEZ or within the affected area based upon the presence of potentially suitable habitat. As discussed in Section 9.1.12.1, 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 effects outside the SEZ are presented in Table 9.1.12.1-1. In addition, the overall potential magnitude of impacts on each species (assuming 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 were sited in areas where special status species are known to or could occur. As presented in Section 9.1.1.2, 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 development 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, but long-term benefits would accrue if original land contours and native plant communities were restored in previously disturbed areas.

The successful implementation of design features (discussed in Appendix A) would reduce direct impacts on some special status species, especially those that depend on habitat types that can be easily avoided. Indirect impacts on special status species could be reduced to negligible levels by implementing design features, especially those engineering controls that would reduce runoff, sedimentation, spills, and fugitive dust.

9.1.12.2.1 Impacts on Species Listed under the ESA

The Yuma clapper rail is the only species listed under the ESA that has the potential to occur in the affected area of the proposed Imperial East SEZ and the only ESA-listed species that the USFWS identified for its potential to be affected by solar energy development on the SEZ (Stout 2009). The Yuma clapper rail is known to occur in freshwater marsh habitats in southeastern California and southwestern Arizona. Within the Imperial East SEZ region, the species is known to occur along the All-American Canal in Imperial County, California, within 0.5 mi (0.8 km) south of the SEZ (Figure 9.1.12.1-1). According to the CAReGAP land cover model, approximately 44 acres (0.2 km^2) of potentially suitable habitat on the SEZ (desert riparian habitat) could be directly affected by construction and operations of solar energy development on the SEZ (Table 9.1.12.1-1). This direct effects area represents <0.1% of available suitable habitat of the Yuma clapper rail in the SEZ region. About 3,870 acres (16 km^2) of suitable habitat occurs in the area of potential indirect effects; this area represents about 2.1% of the available suitable habitat in the SEZ region (Table 9.1.12.1-1).

The USFWS cautioned that full-scale solar energy development near the southern boundary of the SEZ may directly affect the seepage wetlands associated with the All-American Canal that may provide suitable habitat for this species (Stout 2009). In addition to direct impacts, these wetland habitats may be indirectly affected by fugitive dust, runoff, and sedimentation from solar development on the SEZ.

The overall impact on the Yuma clapper rail from construction, operation, and decommissioning of utility-scale solar energy facilities within the Imperial East 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 design features and complete avoidance of wetland habitats on the SEZ would reduce impacts to negligible levels. Impacts also could be reduced by conducting pre-disturbance surveys and avoiding occupied habitats in the areas of direct effect.

As a California fully protected species (pursuant to the California Fish and Game Code Section 3511), the CDFG has the authority to prohibit impacts on and the taking of Yuma clapper rails under any circumstance. Therefore, direct and indirect impacts on occupied and potentially suitable wetland habitats should be completely avoided. The implementation of design features and complete avoidance of wetland habitats on the SEZ would reduce impacts on this species to negligible levels. Consultation with the USFWS and CDFG would be required under the ESA and CESA to fully address the impacts of solar development on the Yuma clapper rail and to determine any additional mitigation requirements.

9.1.12.2.2 Impacts on Species Proposed for Listing under the ESA

The USFWS did not identify any species proposed for listing under the ESA that might be affected by solar development on the Imperial East SEZ (Stout 2009). However, the flat-tailed horned lizard is proposed for listing as a threatened species under the ESA and is known to occur in the vicinity of the SEZ (Figure 9.1.12.1-1; Table 9.1.12.1-1). This species is restricted to desert habitats from Imperial, Riverside, and San Diego Counties, California, and Yuma County, Arizona. It is primarily confined to sandy habitats including dunes, sandy washes, and desert flats, where there is an abundance of harvester ants (*Pogonomyrex californicus*). According to CNDDB, the species is known to occur within 3 mi (5 km) north of the Imperial East SEZ. The BLM El Centro Field Office also acknowledged the potential occurrence of this species on BLM-administered lands within the SEZ. According to the CAReGAP land cover model, approximately 716 acres (3 km^2) of potentially suitable habitat on the SEZ (desert dune and pavement) could be directly affected by construction and operations of solar energy facilities on the SEZ (Table 9.1.12.1-1). This direct effects area represents about 0.3% of available suitable habitat of the flat-tailed horned lizard in the SEZ region. About 24,575 acres (99 km^2) of suitable habitat occurs in the area of potential indirect effects; this area represents about 9.0% of the available suitable habitat in the SEZ region (Table 9.1.12.1-1).

The overall impact on the flat-tailed horned lizard from construction, operation, and decommissioning of utility-scale solar energy facilities within the Imperial East 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 design features would further reduce indirect impacts to negligible levels.

Avoidance or minimizing disturbance to all occupied or potentially suitable habitat in the area of direct effects could further reduce direct impacts on this species. Potentially suitable habitat on the SEZ that should be avoided include all desert dunes and associated sand transport systems. If avoidance or minimization is not a feasible option, a compensatory mitigation plan could be developed and implemented to mitigate direct effects on occupied or suitable habitats. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. Consultation with the USFWS and CDFG would be required under the ESA and CESA to fully address the impacts of solar development on the flat-tailed horned lizard and to determine mitigation requirements.

9.1.12.2.3 Impacts on BLM-Designated Sensitive Species

Impacts on the 14 BLM-designated sensitive species that have potentially suitable habitat within the SEZ and are not previously discussed as ESA-listed or proposed for ESA listing (Sections 9.1.12.2.1 or 9.1.12.2.2) are discussed below.

Chaparral Sand-Verbena

The chaparral sand-verbena historically occurred as near as 15 mi (24 km) west of the SEZ, but it is currently known to occur only as near as Riverside County, California, outside of the area of indirect effects. According to the CAReGAP land cover model, approximately 705 acres (3 km^2) of potentially suitable desert sand dune habitat within the SEZ may be directly affected by project construction and operations (Table 9.1.12.1-1). This direct effects area represents 0.4% of available suitable habitat in the SEZ region. About 24,102 acres (98 km^2) of potentially suitable habitat occurs within the area of indirect effects; this area represents about 12.6% of the available suitable habitat in the SEZ region (Table 9.1.12.1-1).

The overall impact on the chaparral sand-verbena from construction, operation, and decommissioning of utility-scale solar energy facilities within the Imperial East 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 design features would further reduce indirect impacts to negligible levels.

Chaparral sand-verbena habitat (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. Avoiding or minimizing disturbance to occupied habitats and dunes and sand transport systems would further 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 design features, should 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 Imperial East SEZ. According to the CAReGAP land cover model, however, approximately 5,366 acres (22 km^2) of suitable habitat on the SEZ could be directly affected by construction and operations (Table 9.1.12.1-1). This direct effects area represents about 0.4% of available suitable habitat in the SEZ region. About 60,014 acres (243 km^2) of suitable habitat occurs in the area of potential indirect effects; this area represents about 4.8% of the available suitable habitat in the SEZ region (Table 9.1.12.1-1).

The overall impact on the flat-seeded spurge from construction, operation, and decommissioning of utility-scale solar energy facilities within the Imperial East 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 design features would further reduce indirect impacts to negligible levels.

Avoiding and minimizing disturbance of dunes and sand transport systems would reduce impacts on this species. In addition, impacts could be reduced by avoiding or minimizing disturbance to discovered populations and occupied habitats on the SEZ. A compensatory mitigation plan could be developed and implemented to mitigate direct effects on occupied habitats. Compensation could involve the protection and enhancement of protected off site habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that uses one or more of these options could be designed to completely offset the impacts of development. The BLM has determined that translocation is not a feasible mitigation option for this species.

Giant Spanish-Needle

The giant Spanish-needle is known to occur in the affected area of the Imperial East SEZ in desert sand dune habitats. According to the CAReGAP land cover model, approximately

705 acres (3 km^2) of potentially suitable desert dune habitat on the SEZ could be directly affected by construction and operations (Table 9.1.12.1-1). This direct effects area represents 0.4% of available suitable habitat in the SEZ region. About 24,102 acres (98 km^2) of potentially suitable habitat occurs in the area of potential indirect effects; this area represents about 12.7% of the available suitable habitat in the SEZ region (Table 9.1.12.1-1).

The overall impact on the giant Spanish-needle from construction, operation, and decommissioning of utility-scale solar energy facilities within the Imperial East 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 design features would further reduce indirect impacts to negligible levels.

Giant Spanish-needle 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. Avoiding or minimizing disturbance to occupied habitats and dunes and sand transport systems, and the mitigation measures described previously for the chaparral sand-verbena, could further reduce impacts on this species.

Munz's Cholla

The Munz's cholla is not known to occur in the affected area of the Imperial East SEZ. However, according to the CAReGAP land cover model, approximately 4,709 acres (19 km^2) of potentially suitable desert scrub and wash habitats on the SEZ could be directly affected by construction and operations (Table 9.1.12.1-1). This direct impact area represents about 0.3% of available suitable habitat in the SEZ region. About 37,298 acres (151 km^2) of potentially suitable habitat occurs in the area of potential indirect effects; this area represents about 2.0% of the available suitable habitat in the SEZ region (Table 9.1.12.1-1).

The overall impact on the Munz's cholla from construction, operation, and decommissioning of utility-scale solar energy facilities within the Imperial East 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 design features would further reduce indirect impacts to negligible levels.

The avoidance of all potentially suitable habitats is not a feasible way to mitigate impacts on the Munz's cholla, because these habitats (mostly desert scrub) are widespread throughout the area of direct effects. However, the implementation of mitigation options described previously for the chaparral sand-verbena could reduce impacts on this species.

Sand Food

The sand food is known to occur in the affected area of the Imperial East SEZ in desert sand dune habitats. According to the CAReGAP land cover model, approximately 705 acres (3 km^2) of potentially suitable desert dune habitat on the SEZ could be directly affected by construction and operations (Table 9.1.12.1-1). This direct effects area represents 0.4% of available suitable habitat in the SEZ region. About 24,102 acres (98 km^2) of potentially suitable habitat occurs in the area of potential indirect effects; this area represents about 12.7% of the available suitable habitat in the SEZ region (Table 9.1.12.1-1).

The overall impact on the sand food from construction, operation, and decommissioning of utility-scale solar energy facilities within the Imperial East 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 design features would further reduce indirect impacts to negligible levels.

Sand food 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. Avoiding or minimizing disturbance to occupied habitats and dunes and sand transport systems, and the mitigation measures described previously for the chaparral sand-verbena, could further reduce impacts on this species.

Colorado Desert Fringe-Toed Lizard

The Colorado Desert fringe-toed lizard is not known to occur in the affected area of the Imperial East SEZ, although nearest occurrences are 6 mi (10 km) northeast of the SEZ. According to the CAReGAP land cover model, approximately 739 acres (3 km^2) of potentially suitable habitat (desert dunes and washes) on the SEZ could be directly affected by construction and operations (Table 9.1.12.1-1). This direct effects area represents about 0.1% of available suitable foraging habitat in the SEZ region. About 24,445 acres (99 km^2) of potentially suitable foraging 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 9.1.12.1-1).

The overall impact on the Colorado Desert fringe-toed lizard from construction, operation, and decommissioning of utility-scale solar energy facilities within the Imperial East 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 design features would further reduce indirect impacts to negligible levels.

Colorado Desert fringe-toed lizard habitat (desert sand dunes and washes) occupies a limited portion of the SEZ and could be avoided during the development of facilities and protected from indirect effects. Avoiding or minimizing disturbance to occupied habitats, dune and sand transport systems, and desert wash habitats would reduce impacts on this species. If avoidance or minimization is not feasible, impacts could be reduced to negligible levels by conducting pre-disturbance surveys and avoiding occupied habitats on the SEZ. A compensatory mitigation plan could also 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 a number of mitigation options could be designed to completely offset the impacts of development.

California Black Rail

The California black rail is listed as a BLM-designated sensitive species; it is also listed as threatened under the CESA and is a California fully protected species. This species is associated with freshwater marsh habitats in southern California and southwestern Arizona. According to CNDDB and information provided by the CDFG and USFWS, the species is known to occur in the affected area of the Imperial East SEZ. The USFWS has confirmed the presence of this species in seepage wetland areas associated with the All-American Canal within the affected area. According to the CAReGAP land cover model, approximately 44 acres (0.2 km^2) of potentially suitable habitat on the SEZ (desert riparian habitat) could be directly affected by construction and operations of solar energy facilities on the SEZ (Table 9.1.12.1-1). This direct effects area represents about less than 0.1% of available suitable habitat of the California black rail in the SEZ region. About 3,870 acres (16 km^2) of suitable habitat occurs in the area of potential indirect effects; this area represents about 2.1% of the available suitable habitat in the SEZ region (Table 9.1.12.1-1).

The overall impact on the California black rail from construction, operation, and decommissioning of utility-scale solar energy facilities within the Imperial East 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 design features would further reduce indirect impacts to negligible levels.

As a California fully protected species (pursuant to the California Fish and Game Code Section 3511), the CDFG has the authority to prohibit impacts on and the taking of California black rails under any circumstance. Therefore, direct and indirect impacts on occupied and potentially suitable wetland habitats should be completely avoided. Complete avoidance of wetland habitats on the SEZ would reduce impacts on this species to negligible levels. Consultation with the CDFG should be conducted to fully address the impacts of solar development on the California black rail and to determine any additional mitigation requirements.

Ferruginous Hawk

The ferruginous hawk is a winter resident in southern California within the Imperial East SEZ region. According to the CAReGAP land cover model, approximately 4,855 acres (20 km^2) of potentially suitable foraging habitat on the SEZ could be directly affected by construction and operations (Table 9.1.12.1-1). This direct effects area represents about 0.4% of available suitable habitat in the SEZ region. About 44,553 acres (180 km^2) of potentially suitable habitat occurs in the area of potential indirect effects; this area represents about 3.6% of the available suitable habitat in the SEZ region (Table 9.1.12.1-1).

The overall impact on the ferruginous hawk from construction, operation, and decommissioning of utility-scale solar energy facilities within the Imperial East 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 design features is expected to be sufficient to reduce indirect impacts on this species to negligible levels. Avoidance of 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.

Least Bittern

Within the Imperial East SEZ region, the least bittern is a common summer resident in marsh and wetland habitats from the Salton Sea northwest of the SEZ to the Colorado River east of the SEZ. The species is not known to occur in the affected area of the Imperial East SEZ. However, according to the CAReGAP land cover model, approximately 44 acres (0.2 km^2) of potentially suitable habitat on the SEZ (desert riparian habitat) could be directly affected by construction and operations of solar energy facilities on the SEZ (Table 9.1.12.1-1). This direct effects area represents less than 0.1% of available suitable habitat of the least bittern in the SEZ region. About 3,870 acres (16 km^2) of suitable habitat occurs in the area of potential indirect effects; this area represents about 2.1% of the available suitable habitat in the SEZ region (Table 9.1.12.1-1).

The overall impact on the least bittern from construction, operation, and decommissioning of utility-scale solar energy facilities within the Imperial East 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 design features would further reduce indirect impacts to negligible levels.

Because the least bittern, California black rail, and Yuma clapper rail occupy similar habitats in the SEZ region, mitigation would be similar to offset impacts of solar energy development within the Imperial East SEZ for these three species. Although the least bittern is not a California fully protected species, the strict provisions provided to the California black rail and Yuma clapper rail as fully protected species would also preclude direct and indirect impacts of solar energy development within the Imperial East SEZ to the least bittern.

Western Burrowing Owl

The western burrowing owl is not known to occur in the affected area of the Imperial East SEZ. However, according to the CAReGAP habitat suitability model, approximately 5,718 acres (23 km^2) of potentially suitable desert scrub habitat on the SEZ could be directly affected by construction and operations (Table 9.1.12.1-1). This direct effects area represents less than 0.1% of available suitable habitat in the SEZ region. About 11,372 acres (46 km^2) of potentially suitable habitat occurs in the area of potential indirect effects; this area represents about 3.0% of the available suitable habitat in the SEZ region (Table 9.1.12.1-1). 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 Imperial East 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 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 western burrowing owl because potentially suitable shrubland habitats are widespread throughout the area of direct effect and readily available in other portions of the SEZ region. 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, other than design features, should be determined by conducting preconstruction surveys for the species and its habitat within the area of direct effects.

California Leaf-Nosed Bat

The California leaf-nosed bat is a year-round resident in southern California within the Imperial East SEZ region. According to the CAReGAP land cover model, approximately 4,698 acres (19 km^2) of potentially suitable foraging habitat on the SEZ could be directly affected by construction and operations (Table 9.1.12.1-1). This direct effects area represents about 0.3% of available suitable foraging habitat in the SEZ region. About 36,795 acres (149 km^2) of potentially suitable foraging habitat occurs in the area of potential indirect effects; this area represents about 2.4% of the available suitable foraging habitat in the SEZ region (Table 9.1.12.1-1). Most of the potentially suitable habitat in the affected area is foraging habitat represented by desert shrubland. On the basis of an evaluation of CAReGAP land cover types, there is no potentially suitable roosting habitat (rocky cliffs and outcrops) in the affected area.

The overall impact on the California leaf-nosed bat from construction, operation, and decommissioning of utility-scale solar energy facilities within the Imperial East 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 foraging habitat in the SEZ region. The implementation of design features is expected to be sufficient to reduce indirect impacts on this species to negligible levels. Avoidance of all potentially suitable foraging habitats is not feasible because potentially suitable habitat is widespread throughout the area of direct effect and readily available in other portions of the SEZ region.

Pallid Bat

The pallid bat is a year-round resident in southern California within the Imperial East SEZ region. According to the CAReGAP land cover model, approximately 4,708 acres (19 km^2) of potentially suitable foraging habitat on the SEZ could be directly affected by construction and operations (Table 9.1.12.1-1). This direct effects area represents about 0.3% of available suitable foraging habitat in the SEZ region. About 39,678 acres (161 km^2) of potentially suitable foraging habitat occurs in the area of potential indirect effects; this area represents about 2.8% of the available suitable foraging habitat in the SEZ region (Table 9.1.12.1-1). Most of the potentially suitable habitat in the affected area is foraging habitat represented by desert shrubland. On the basis of an evaluation of CAReGAP land cover types, there is no potentially suitable roosting habitat (rocky cliffs and outcrops) in the affected area.

The overall impact on the pallid bat from construction, operation, and decommissioning of utility-scale solar energy facilities within the Imperial East 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 design features is expected to be sufficient to reduce indirect impacts on this species to negligible levels. Avoidance of all potentially suitable foraging habitats is not feasible because potentially suitable habitat is widespread throughout the area of direct effect and readily available in other portions of the SEZ region.

Townsend's Big-Eared Bat

The Townsend's big-eared bat is a year-round resident in southern California within the Imperial East SEZ region. According to the CAReGAP land cover model, approximately 5,721 acres (23 km^2) of potentially suitable foraging habitat on the SEZ could be directly affected by construction and operations (Table 9.1.12.1-1). This direct impact area represents about 0.2% of available suitable foraging habitat in the SEZ region. About 75,484 acres (305 km^2) of potentially suitable foraging habitat occurs in the area of potential indirect effects; this area represents about 2.6% of the available suitable foraging habitat in the SEZ region (Table 9.1.12.1-1). Most of the potentially suitable habitat in the affected area is foraging habitat represented by desert shrubland. On the basis of an evaluation of CAReGAP land cover types, there is no potentially suitable roosting habitat (rocky cliffs and outcrops) in the affected area.

The overall impact on the Townsend's big-eared bat from construction, operation, and decommissioning of utility-scale solar energy facilities within the Imperial East 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 design features is expected to be sufficient to reduce indirect impacts on this species to negligible levels. Avoidance of all potentially suitable foraging habitats is not feasible because potentially suitable habitat is widespread throughout the area of direct effect and readily available in other portions of the SEZ region.

Western Mastiff Bat

The western mastiff bat is a year-round resident in southern California within the Imperial East SEZ region. According to the CAReGAP land cover model, approximately 5,721 acres (23 km^2) of potentially suitable foraging habitat on the SEZ could be directly affected by construction and operations (Table 9.1.12.1-1). This direct effects area represents about 0.2% of available suitable foraging habitat in the SEZ region. About 75,484 acres (305 km^2) of potentially suitable foraging habitat occurs in the area of potential indirect effects; this area represents about 3.1% of the available suitable foraging habitat in the SEZ region (Table 9.1.12.1-1). Most of the potentially suitable habitat in the affected area is foraging habitat represented by desert shrubland. On the basis of an evaluation of CAReGAP land cover types, there is no potentially suitable roosting habitat (rocky cliffs and outcrops) in the affected area.

The overall impact on the western mastiff bat from construction, operation, and decommissioning of utility-scale solar energy facilities within the Imperial East 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 design features is expected to be sufficient to reduce indirect impacts on this species to negligible levels. Avoidance of all potentially suitable foraging habitats is not feasible because potentially suitable habitat is widespread throughout the area of direct effect and readily available in other portions of the SEZ region.

9.1.12.2.4 Impacts on State-Listed Species

There are two species listed by the state of California that could occur in the affected area of the Imperial East SEZ (Table 9.1.12.1-1): California black rail and Yuma clapper rail. Impacts on each of these species were previously discussed in Section 9.1.12.2.1 or Section 9.1.12.2.3 because of their status under the ESA or BLM.

9.1.12.2.5 Impacts on Rare Species

There are 35 species that have a state status of S1 or S2 in California or are listed as species of concern by the state of California or USFWS that may occur in the affected area of the Imperial East SEZ. Impacts have been previously discussed for 16 of these species that are also listed under the ESA (Section 9.1.12.2.1), proposed for listing under the ESA (Section 9.1.12.2.2), BLM-designated sensitive (Section 9.1.12.2.3), or state-listed (Section 9.1.12.2.4). Impacts on the remaining 19 rare species that do not have any other special status designation are presented in Table 9.1.12.1-1.

9.1.12.3 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 effects of utility-scale solar energy development on special status species. While some SEZ-specific design features 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 9.1.12.1-1; disturbance to 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, and where appropriate, 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 uses 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 wetland habitats within the SEZ should be avoided or minimized to the extent practicable. Adverse impacts on the following species could be reduced with the avoidance of desert riparian, wash, and wetland habitats: bitter hymenoxys, brown turbans, California satintail, coves' cassia, dwarf germander, Emory's crucifixion-thorn, mud nama, Munz's cholla, sand evening-primrose, Colorado Desert fringe-toed lizard, California black rail, ferruginous hawk, least bittern, white-faced ibis, Yuma clapper rail, California leaf-nosed bat, pallid bat, pocketed free-tailed bat, Townsend's big-eared bat, western mastiff bat, and Yuma hispid cotton rat.

- Avoidance of desert dunes and sand transport systems on the SEZ could reduce impacts on several special status species, including the Abrams' spurge, chaparral sand-verbena, dwarf germander, flat-seeded spurge, giant Spanish-needle, Harwood's milkvetch, sand food, slender cottonheads, Wiggins' croton, Colorado Desert fringe-toed lizard, and flat-tailed horned lizard.

- As California fully protected species, direct and indirect impacts on the California black rail and Yuma clapper rail should be completely avoided.

- Consultations with the USFWS and the CDFG should be conducted to address the potential for impacts on the Yuma clapper rail a species listed as endangered 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 to determine any addition mitigation requirements beyond those already afforded to the Yuma clapper rail as a California fully protected species.

- Coordination with the USFWS and CDFG should be conducted to address the potential for impacts on the flat-tailed horned lizard, a species that is proposed for listing under the ESA. Coordination would identify an appropriate survey protocol, avoidance measures, and, potentially, translocation or compensatory mitigation.

- 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 other project design features, impacts on the special status and rare species could be reduced.

9.1.13 Air Quality and Climate

9.1.13.1 Affected Environment

9.1.13.1.1 Climate

The proposed Imperial East SEZ is located in the south central portion of Imperial County in the southeastern corner of California, along the Arizona and U.S.–Mexico borders. The SEZ with an average elevation of about 94 ft (29 m) lies in the northwestern portion of the Sonoran Desert, which has a low desert climate. As a result, the area surrounding the SEZ is one of the hottest and driest parts of California, characterized by temperate winters and hot, dry summers, large daily temperature swings, scant precipitation, high evaporation rates, low relative humidity, and abundant sunshine. Meteorological data collected at the Imperial Airport and Calexico stations, which are about 21 mi (34 km) west–northwest of and 15 mi (24 km) west of the Imperial East SEZ, respectively, are summarized below.

A wind rose from the Imperial Airport in Imperial, California for the 5 years including 2004 to 2007 and 2009, and taken at a level of 33 ft (10 m), is presented in Figure 9.1.13.1-1 (NCDC 2010a). During this period, the annual average wind speed at the airport was about 7.2 mph (3.2 m/s), with a prevailing wind direction from the west (about 17.9% of the time) and secondarily from the west–southwest (about 12.8% of the time). Predominant west winds are reflective of the statewide prevailing westerlies, because the airport is located in the middle of a wide valley and winds are not affected by local terrain (NCDC 2010b). Winds for the period were predominantly from the west throughout the year, except in July and August, when winds were mostly from the southeast. Wind speeds categorized as calm (less than 1.1 mph [0.5 m/s]) occurred frequently (about 17% 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 8.6 mph (3.9 m/s), lower in summer and fall at 7.9 mph (3.5 m/s) and 6.4 mph (2.9 m/s), respectively, and lowest in winter at 5.8 mph (2.6 m/s).

Imperial County experiences a very hot and dry climate due to large-scale sinking and compressional warming of air in the semipermanent Pacific high-pressure system centered off the California coast except in winter. For the 1904 to 2009 period, the annual average temperature at Calexico was 71.1°F (21.7°C) (WRCC 2010b). January was the coldest month, with an average minimum temperature of 39.0°F (3.9°C), and July was the warmest month with an average maximum of 103.9°F (39.9°C). On most days in summer, daytime maximum temperatures were in the 100s, and minimums were in the upper 60s or higher. The minimum temperatures recorded were below freezing (≤32°F [0°C]) on five days in January and four days in December, but subzero temperatures were never recorded. During the same period, the highest temperature, 117°F (47.2°C), was reached in July 1905, and the lowest, 21°F (–6.1°C) was reached in January 1913. In a typical year, about 166 days had a maximum temperature of ≥90°F (32.2°C), while about 11 days had minimum temperatures at or below freezing.

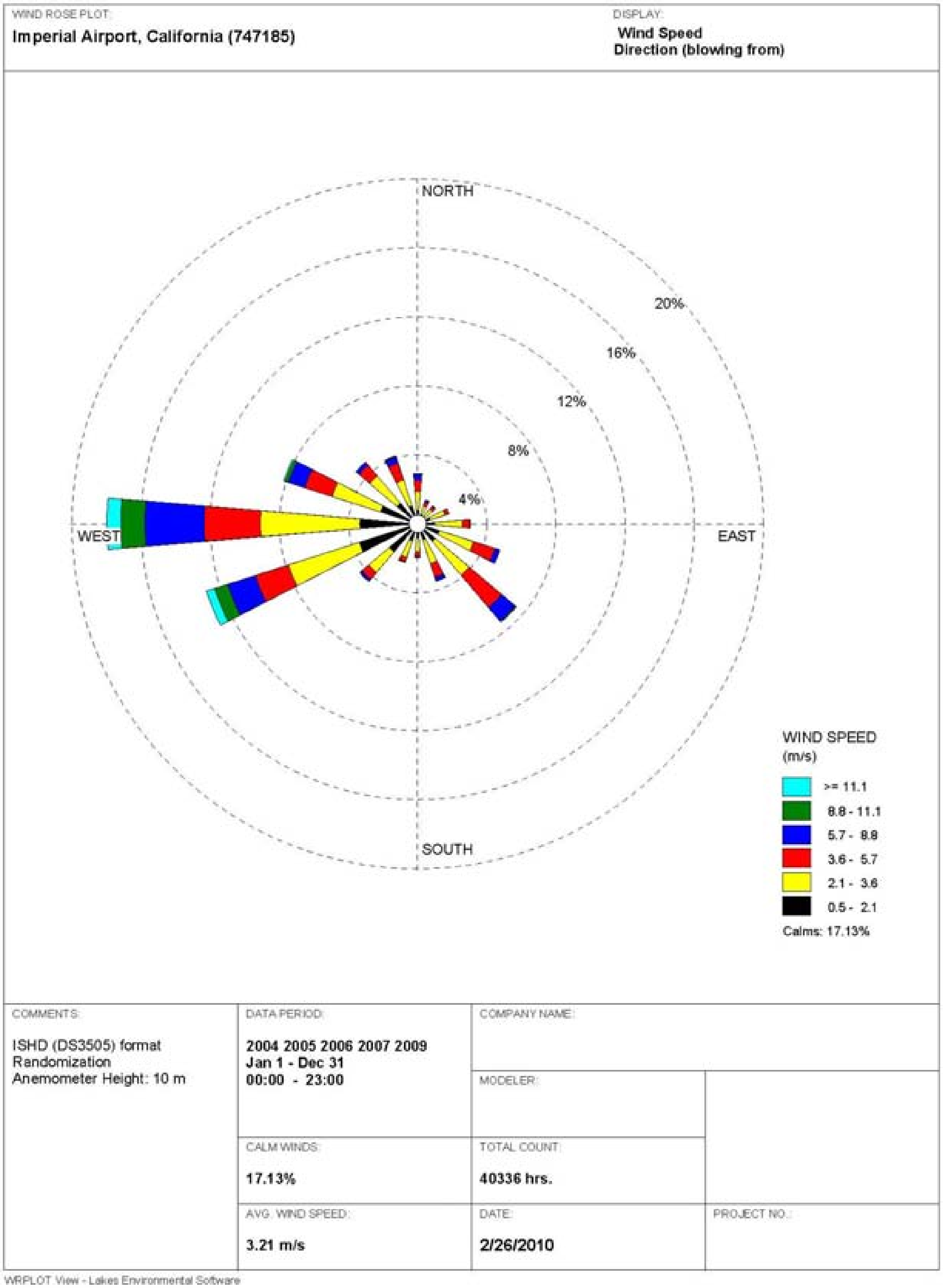

FIGURE 9.1.13.1-1 Wind Rose at 33-ft (10-m) Height at Imperial Airport, Imperial, California, 2004–2007, 2009 (Source: NCDC 2010a)

Driven by the prevailing westerlies, cool and humid air masses from the Pacific Ocean lose most of their moisture on the windward side of western mountain ranges parallel to the California coastline. Thus, Imperial County on the leeward side experiences a lack of precipitation. For the 1904 to 2009 period, annual precipitation at Calexico averaged about 2.67 in. (6.8 cm) (WRCC 2010b). There is an average of 12 days annually with measurable precipitation (0.01 in. [0.025 cm] or higher). About 60% of the annual precipitation occurs during August and the three winter months, while spring has the lowest precipitation. No measurable snowfall at Calexico was ever recorded.

Because a semipermanent Pacific high-pressure system centered off the California coast deflects most storms far to the north except in winter, Imperial County rarely experiences severe weather events, such as thunderstorms, hurricanes, and tornadoes. Many thunderstorms in California are accompanied by little or no precipitation, and lightning strikes sometimes cause forest fires (NCDC 2010b).

Each year some flash flooding is reported as a result of thunderstorms with heavy rains, especially in areas with steep slopes. Since 1999, eight floods (mostly flash floods) were reported in Imperial County (NCDC 2010c), one of which did cause minimal property damage.

In Imperial County, six hail events in total, which caused no property or crop damage, have been reported since 1990. Hail measuring 1.75 in. (4.4 cm) in diameter was reported in 1990 and 2008. In Imperial County, one high-wind event was reported in 2007, and 33 thunderstorm wind events have been reported since 1955; those with a maximum wind speed of up to 100 mph (45 m/s) have occurred mostly from July through September, causing some property damage (NCDC 2010c).

Since 1999, eight dust storm events, occurring from late spring to early fall, were reported in Imperial County (NCDC 2010c). The ground surface of the SEZ is covered predominantly with fine sands and loamy fine sands, which have relatively high dust storm potential. High winds can trigger large amounts of blowing dust in areas of Imperial County that have dry and loose soils with sparse vegetation. Dust storms can deteriorate air quality and visibility and have adverse effects on health, particularly for people with asthma or other respiratory problems.

Historically, two Category one hurricane and four tropical storms/depressions have passed within 100 mi (160 km) of the proposed Imperial East SEZ (CSC 2010). In the period 1950 to June 2010, a total of seven tornadoes (0.1 per year) were reported in Imperial County (NCDC 2010c). However, most tornadoes were relatively weak (i.e., one was uncategorized, four were F0, and two were F1 on the Fujita tornado scale). One of these tornadoes caused minor property damage. None of the tornadoes in Imperial County were reported near the proposed Imperial East SEZ.

9.1.13.1.2 Existing Air Emissions

Imperial County, which encompasses the proposed Imperial East SEZ, has many industrial emission sources, which are mostly concentrated over the central Imperial Valley, a metropolitan and agricultural region. Several geothermal power plants representing point source emissions are located to the northwest of the SEZ and produce relatively minor volatile organic compound (VOC) emissions. Mobile source emissions are substantial because the county is crossed by a major interstate highway, I-8, and many state and county routes. Data on annual emissions of criteria pollutants and VOCs in Imperial County are presented in Table 9.1.13.1-1 for 2002 (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 and NO_x emissions (about 72% and 36%, respectively). Onroad sources were secondary contributors to NO_x emissions (about 33%), but with contributions comparable to nonroad sources. Onroad sources were major contributors to CO emissions (about 38%). Biogenic sources (i.e., vegetation—including trees, plants, and crops—and soils) that release naturally occurring emissions accounted for most of VOC emissions (about 94%) and secondarily contributed to CO emissions (about 35%). Area sources accounted for about 90% of PM_{10} and 72% of $PM_{2.5}$. Fire sources are minor secondary contributors to SO_2 and $PM_{2.5}$ emissions. In Imperial County, point sources are minor contributors to all criteria pollutants and VOC emissions.

TABLE 9.1.13.1-1 Annual Emissions of Criteria Pollutants and VOCs in Imperial County, California, Encompassing the Proposed Imperial East SEZ, 2002[a]

Pollutant	Emissions (tons/yr)
SO_2	499
NO_x	14,520
CO	70,360
VOC	150,725
PM_{10}	19,367
$PM_{2.5}$	5,542

[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*[10] carbon dioxide equivalent (CO_2e)[11] emissions (CARB 2010a). Gross greenhouse gas (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, considering carbon sinks from forestry activities and agricultural soils throughout the state. The EPA (2009a) also estimated 2005 emissions in California. Its 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 the

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

11 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.

CO_2 emissions total, respectively, while the electric power generation accounted for the remainder (about 10.8%).

9.1.13.1.3 Air Quality

California Ambient Air Quality Standards (CAAQS) address the same six criteria pollutants as does the National Ambient Air Quality Standards (NAAQS) (CARB 2010b; EPA 2010a): sulfur dioxide (SO_2), nitrogen dioxide (NO_2), carbon monoxide (CO), ozone (O_3), particulate matter (PM; PM_{10} and $PM_{2.5}$) and lead (Pb). CAAQS are more stringent than the NAAQS for most of criteria pollutants. In addition, California has set standards for some pollutants that are not addressed by the NAAQS: visibility-reducing particles, sulfates, hydrogen sulfide, and vinyl chloride. The NAAQS and CAAQS for criteria pollutants are presented in Table 9.1.13.1-2.

Imperial County is located administratively within Southeast Desert Intrastate Air Quality Control Region (AQCR) (Title 40, Part 81, Section 167 of the *Code of Federal Regulations* [40 CFR 81.167]), along with parts of Kern, Los Angeles, Riverside, and San Bernardino Counties. In addition, the Imperial East SEZ is located within the Salton Sea Air Basin, 1 of 15 geographic air basins designated for the purpose of managing air resources in California, which also includes the Coachella Valley in the central portion of Riverside County. Currently, the area surrounding the proposed SEZ is designated as being in attainment of NAAQS for all criteria pollutants, except O_3 and PM_{10} (40 CFR 81.305). The central Imperial Valley is designated as a nonattainment area for $PM_{2.5}$, but the proposed Imperial East SEZ is located outside the nonattainment area boundary. Further, area designations by the state based on the CAAQS are almost the same as those based on the NAAQS (CARB 2010c), except that only the City of Calexico is designated as an nonattainment area for $PM_{2.5}$ based on the CAAQS.

Air quality in Imperial County is frequently poor, especially with respect to O_3 and PM_{10} levels. Imperial County has favorable conditions for high O_3 production, such as high temperature, intense solar radiation, and little precipitation. Large areas of barren lands and agricultural lands in Imperial County contribute to higher PM concentrations under high winds. PM concentrations are dominated by primary PM, which includes windblown dust from paved and unpaved roads, agricultural activities, construction activities, and dust transported from the South Coast region, San Diego, and densely populated Mexicali in Mexico across the border.

There are no ambient air monitoring stations in the area surrounding the proposed Imperial East SEZ. To characterize ambient air quality around the SEZ, two representative monitoring stations in Calexico were chosen: Calexico—East, about 10 mi (16 km) to the west, and Calexico High School, about 15 mi (24 km) to the west of the SEZ. Ambient concentrations of NO_2, CO, and O_3 are recorded at the former station, while all criteria pollutants are recorded at the latter station. The background concentrations of criteria pollutants at these stations for the 2004 to 2008 period are presented in Table 9.1.13.1-2 (EPA 2010b). Monitored SO_2, NO_2, CO, and Pb levels at either station were lower than their respective standards. Monitored O_3, PM_{10}, and $PM_{2.5}$ exceeded both the NAAQS and CAAQS, except annual average $PM_{2.5}$ levels, which were lower than the NAAQS but higher than the CAAQS.

TABLE 9.1.13.1-2 NAAQS, CAAQS and Background Concentration Levels Representative of the Proposed Imperial East SEZ in Imperial 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	0.162 ppm (–; 65%)	Calexico, 2006
	3-hour	0.5 ppm	–[e]	0.066 ppm (13%; –)	Calexico, 2006
	24-hour	0.14 ppm	0.04 ppm	0.019 ppm (14%; 48%)	Calexico, 2006
	Annual	0.030 ppm	–	0.002 ppm (6.7%; –)	Calexico, 2006
NO_2	1-hour	0.100 ppm[f]	0.18 ppm	0.107 ppm (–; 59%)	Calexico, 2007
	Annual	0.053 ppm	0.030 ppm	0.012 ppm (23%; 40%)	Calexico, 2006
CO	1-hour	35 ppm	20 ppm	9.8 ppm (28%; 49%)	Calexico, 2005
	8-hour	9 ppm	9.0 ppm	7.4 ppm (82%; 82%)	Calexico, 2005
O_3	1-hour	0.12 ppm[g]	0.09 ppm	0.107 ppm (–; 119%)	Calexico, 2007
	8-hour	0.075 ppm	0.070 ppm	0.083 ppm (111%; 119%)	Calexico, 2007
PM_{10}	24-hour	150 $\mu g/m^3$	50 $\mu g/m^3$	154 $\mu g/m^3$ (103%; 308%)	Calexico, 2004
	Annual	–[h]	20 $\mu g/m^3$	66 $\mu g/m^3$ (–; 330%)	Calexico, 2007
$PM_{2.5}$	24-hour	35 $\mu g/m^3$	–	46 $\mu g/m^3$ (131%; –)	Calexico, 2006
	Annual	15.0 $\mu g/m^3$	12 $\mu g/m^3$	13.3 $\mu g/m^3$ (89%; 111%)	Calexico, 2005
Pb	30-day	–	1.5 $\mu g/m^3$	–	–
	Calendar quarter	1.5 $\mu g/m^3$	–	0.03 $\mu g/m^3$ (2.0%; –)	Calexico, 2007
	Rolling 3-month	0.15 $\mu g/m^3$ [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 standards 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 $\mu g/m^3$.

[i] Effective January 12, 2009.

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

The Prevention of Significant Deterioration (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 Imperial East SEZ, but none of the Class I areas are located within 62 mi (100 km). The nearest Class I area is the Joshua Tree National Park (NP) (40 CFR 81.405), about 69 mi (111 km) north–northwest of the SEZ, which is not in the direction of prevailing winds at the SEZ (Figure 9.1.13.1-1). The next nearest Class I areas are the San Jacinto WA and the Agua Tibia WA, which are located about 103 mi (165 km) northwest and 108 mi (174 km) west-northwest of the SEZ, respectively.

9.1.13.2 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 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 Imperial East 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 9.1.13.3 below identifies SEZ-specific design features of particular relevance to the Imperial East SEZ.

9.1.13.2.1 Construction

The Imperial East 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.[12] No PSD increment levels at the nearby Class I areas were estimated, because all such areas are located more than 62 mi (100 km) from the SEZ, which is farther than maximum modeling distance of 31 mi (50 km) for AERMOD, and not downwind of prevailing winds in the area. For the Imperial East SEZ, the modeling was conducted based on the following assumptions and input:

- Uniformly distributed emissions over the 3,000 acres (12.1 km^2) in the western portion of the SEZ, close to the nearest residences (IID employee housings) and the nearby communities, such as Holtville;

- Surface hourly meteorological data from the Imperial Airport and upper air sounding data from Miramar Naval Air Station near San Diego for the 5-year period (2004 to 2007 and 2009); and

- A regularly spaced receptor grid over a modeling domain of 62 mi × 62 mi (100 km × 100 km) centered on the proposed SEZ, and 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 9.1.13.2-1. Maximum 24-hour PM_{10} concentration increments modeled to occur at the site boundaries would be an estimated 574 $\mu g/m^3$, which far exceeds the relevant standards of 150 or 50 $\mu g/m^3$. Total 24-hour PM_{10} concentrations of 728 $\mu g/m^3$ at the SEZ boundary would also exceed the standard. However, high PM_{10} concentrations would be limited to the immediate area surrounding the SEZ boundary and would decrease quickly with distance. Predicted maximum 24-hour PM_{10} concentration increments at the nearest residences, which are employee housing for the IID located about 500 ft (150 m) south of the southwestern corner of the SEZ, would be about 170 $\mu g/m^3$. Predicted maximum 24-hour PM_{10} concentration increments would be about 27 $\mu g/m^3$ at the next nearest residences (about 2.7 mi [4.3 km] west of the SEZ), about 12 $\mu g/m^3$ at Yuma, about 11 $\mu g/m^3$ at Holtville, and 5 $\mu g/m^3$ or lower at all other nearby cities. Modeled annual average

[12] To provide a quantitative assessment, the modeled air impacts of construction were compared to the NAAQS/CAAQS levels. 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 9.1.13.2-1 Maximum Air Quality Impacts from Emissions Associated with Construction Activities for the Proposed Imperial East SEZ

			Concentration ($\mu g/m^3$)				Percent 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	574	154	728	150/50	383/1,149	486/1,457
	Annual	NA[f]	69.1	66	135	NA/20	NA/345	NA/675
$PM_{2.5}$	24 hours	H8H	38.0	46	84.0	35/NA	108/NA	240/NA
	Annual	NA	6.9	13.3	20.2	15.0/12	46/58	134/168

[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 5-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 9.1.13.1-2.

[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] NA = not applicable.

increment and total (increment plus background) PM_{10} concentrations at the SEZ boundary would be about 69.1 μg/m^3 and 135 μg/m^3, respectively, which are much higher than the CAAQS level of 20 μg/m^3. Modeled increment and background concentrations make comparable contributions to this total. Annual PM_{10} increments would be much lower, about 10 μg/m^3 at the nearest residences and about 1 μg/m^3 or lower for the other mentioned residences and cities; these levels are well below the CAAQS of 20 μg/m^3. Modeled 24-hour total $PM_{2.5}$ concentrations would be 84.0 μg/m^3 at the SEZ boundary, which is higher than the NAAQS of 35 μg/m^3, while the annual average total $PM_{2.5}$ concentration would be 20.2 μg/m^3, which is above both the NAAQS and CAAQS of 15.0 and 12 μg/m^3, respectively. Modeled annual average $PM_{2.5}$ increments would be lower than its respective standards, but total concentrations would exceed standards because of relatively high background contributions. At the nearest residences, predicted maximum 24-hour and annual $PM_{2.5}$ concentration increments would be about 5.0 and 1.3 μg/m^3, respectively.

As mentioned, no AERMOD modeling was made for nearby Class I areas because of the distances from the SEZ. Considering distances, prevailing winds, and topography, contours of predicted concentration levels over the modeling domain indicates that no Class I PSD increments are anticipated to be exceeded at the nearby Class I areas, including the nearest one (Joshua Tree NP).

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 immediate surrounding areas during the construction of solar facilities. To reduce potential impacts on ambient air quality and in compliance with BLM design features, aggressive dust control measures would be used. Potential air quality impacts on any nearby residences and cities would be much lower. Modeling indicates that construction activities could result in negligible impacts on the nearest federal Class I area (Joshua Tree NP), which are located about 69 mi (111 km) from the SEZ. Accordingly, it is anticipated that impacts of construction activities on ambient air quality would be moderate and temporary.

Construction emissions from the engine exhaust from heavy equipment and vehicles could cause impacts on air-quality-related values (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 BLM 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 115-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.

9.1.13.2.2 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 were implemented (drift comprises low-level PM 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 Imperial East SEZ are presented in Table 9.1.13.2-2. Total power generation capacity ranging from 509 to 916 MW is estimated for the Imperial East SEZ for various solar technologies (see Section 9.1.2). The estimated amount of emissions avoided for the solar technologies 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 Imperial East SEZ were fully developed, it is expected that emissions avoided would be somewhat substantial. Development of solar power in the SEZ would result in avoided air emissions ranging from 0.8 to 1.5% 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 0.3% of total emissions from electric power systems in the six-state study area. When compared with all source categories, power production from the same solar facilities would displace up to 0.29% of SO_2, 0.03% of NO_x, and 0.19% of CO_2 emissions in the state of California (EPA 2009a; WRAP 2009). These emissions would be up to 0.10% 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 Imperial East SEZ could considerably reduce fuel-combustion-related emissions in California but relatively less so than those built in other states with higher fossil use rates.

About one-quarter of the 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 Imperial East SEZ were fully developed, emissions avoided would be somewhat considerable. Development of solar power in the SEZ would result in avoided air emissions ranging from 0.27 to 0.48% 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 0.26% of total emissions from all source categories in the six-state study area.

TABLE 9.1.13.2-2 Annual Emissions from Combustion-Related Power Generation Displaced by Full Solar Development of the Proposed Imperial East 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
5,722	509–916	891–1,604	114–205 (673–1,212)	187–337 (992–1,786)	0.002–0.003 (0.008–0.014)	443–797 (703–1,266)
Percentage of total emissions from electric power systems in California[d]			0.84–1.5%	0.84–1.5%	0.84–1.5%	0.84–1.5%
Percentage of total emissions from all source categories in California[e]			0.16–0.29%	0.02–0.03%	–[f]	0.10–0.19%
Percentage of total emissions from electric power systems in the six-state study area[d]			0.05–0.08% (0.27–0.48%)	0.05–0.09% (0.27–0.48%)	0.06–0.10% (0.27–0.48%)	0.17–0.30% (0.27–0.48%)
Percentage of total emissions from all source categories in the six-state study area[e]			0.02–0.04% (0.14–0.26%)	0.007–0.012% (0.04–0.07%)	– (–)	0.05–0.10% (0.08–0.15%)

[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).

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 high-voltage lines during rain or very humid conditions. Since the Imperial East 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.

9.1.13.2.3 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 mitigation measures adopted during the construction phase would also be implemented during the decommissioning phase (Section 5.11.3).

9.1.13.3 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 Imperial East SEZ (such as increased watering frequency or road paving or treatment) is a required 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.

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9.1.14 Visual Resources

9.1.14.1 Affected Environment

The proposed Imperial East SEZ is located approximately 1.2 mi (1.9 km) north of the United States–Mexico border in the Sonoran Desert, within the CDCA in Imperial County in southern California. The SEZ occupies an area of 5,722 acres (23.2 km^2) and measures approximately 2.9 mi (4.7 km) north to south (at greatest extent) and 7.1 mi (11.4 km) east to west. The SEZ is located approximately 10 mi (16 km) (at closest approach) southeast of the town of Holtville, California, and 16 mi (26 km) east of the community of Calexico. I-8 runs along the northeastern boundary of the SEZ, and State Route 98 runs east to west through the southern portion of the SEZ. The SEZ and surrounding mountain ranges are shown in Figure 9.1.14.1-1. The SEZ ranges in elevation from 78 ft (24 m) in the northwestern portion to 127 ft (39 m) in the southeastern portion of the SEZ.

The Imperial East SEZ is located in the Sonoran Basin and Range ecoregion (EPA 2007) and the USFS's East Mesa-Sand Hills subsection, which consists of very gently to moderately sloping alluvial fans and moderately steep to steep sand dunes (USFS 1997).

The SEZ presents a flat, open landscape, mostly treeless, but with shrubs in some areas tall enough to provide partial screening of views. The landscape is visually dominated by the strong horizon line; the closest visible mountain ranges are too far from the SEZ to affect the SEZ's visual values significantly.

Vegetation varies somewhat in different parts of the SEZ. Much of the SEZ is covered with creosote flats consisting of generally tall, widely spaced creosotebushes on gravel, as shown in Figure 9.1.14.1-2. The gravel in the flats is light gray, and because many areas have less than 10% vegetative cover, landscape color in these areas is predominantly gray, scattered with olive green and browns of the creosotebush. Some areas in the south-central portion contain a more dense and diverse set of shrubs, with some small trees and a few palm trees. During an August 2009 site visit, areas with denser vegetation presented a range of gray-blues, greens, golds and browns, as shown in Figure 9.1.14.1-3.

No permanent water features are present on the SEZ. This landscape type is common within the region.

Although the SEZ itself is generally natural appearing, cultural modifications within the SEZ detract markedly from the SEZ's scenic quality. In addition to State Route 98, several gravel and dirt roads of various sizes cross the SEZ. Traffic on I-8 is visible from portions of the SEZ. Several transmission lines, ranging from large, galvanized steel with open lattice, to relatively small, wooden "H" frame towers cross or pass near the SEZ in different directions, and one or more transmission lines are visible from most locations within the SEZ. Communication and camera towers (for monitoring the international border) are also visible from much of the SEZ. Panoramic views of the SEZ are shown in Figures 9.1.14.1-2 and 9.1.14.1-3.

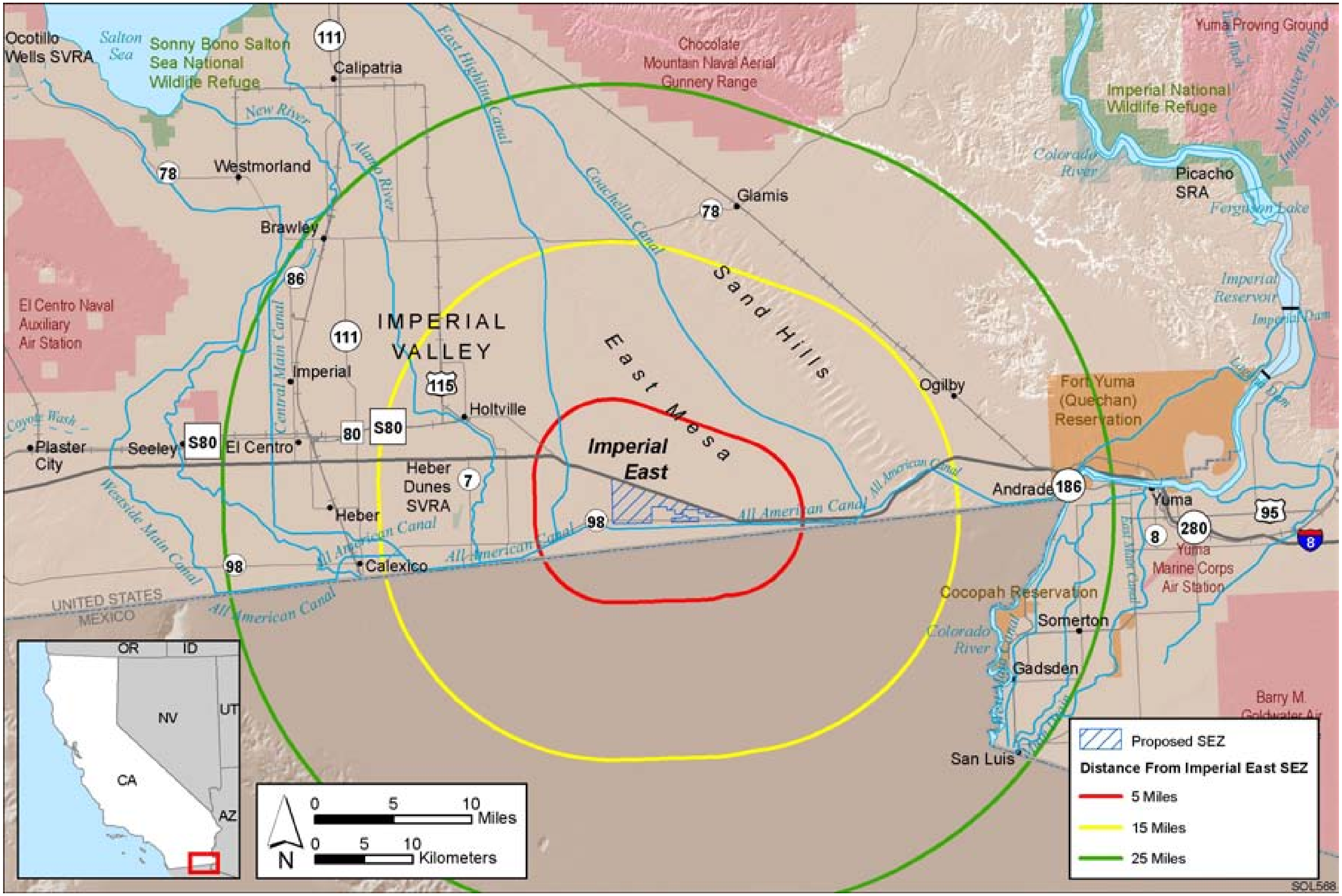

FIGURE 9.1.14.1-1 Proposed Imperial East SEZ and Surrounding Lands

FIGURE 9.1.14.1-2 Approximately 180° Panoramic View of the Proposed Imperial East SEZ, from Northwest Corner of the SEZ near I-8, Looking South

FIGURE 9.1.14.1-3 Approximately 180° Panoramic View of the Proposed Imperial East SEZ, from South-Central Portion of the SEZ near State Route 98, Looking West

Off-site views do little to enhance the scenic quality of the SEZ and offer almost no topographic relief or other features of interest. The SEZ lies in East Mesa, which is bounded by Imperial Valley to the west and Imperial Sand Dunes to the east. Topographic relief on the mesa is low, generally less than 45 ft (13.7 m), and the mesa is characterized by open views. Distant mountains to the south add slightly to the scenic value of views in that direction, but mountains in other directions are too distant to add to the scenic quality of the SEZ. The Imperial Sand Dunes, located approximately 8 to 10 mi (13 to 16 km) northeast of the SEZ, are theoretically visible just above the horizon from portions of the SEZ but are likely screened in most locations within the SEZ by vegetation and small undulations in topography between the SEZ and the dunes.

Immediately south of the SEZ is the All-American Canal, which runs parallel to the southern boundary of the SEZ at a distance of 0.3 mi (0.5 km). The canal is a major man-made water feature. Its two hydropower facilities and associated dams and substations are visible from portions of the SEZ. The structures' strong regular geometry, visual complexity, and more reflective, uniformly colored and smooth surfaces contrast strongly in form, line, color, and texture with the simple, relatively natural-appearing landscape; some viewers, however, might find that the structures add visual interest to an otherwise monotonous landscape.

Also to the south of the SEZ (in Mexico in the vicinity of the SEZ) is the Juan Bautista de Anza Trail, though it is not likely visible from the SEZ (its exact location in the area is not known at this time). This historic trail dates to 1775–1776 as the first overland route to connect New Spain with San Francisco. The Juan Bautista de Anza National Historic Trail approaches to within about 17 mi (27 km) east of the SEZ where it loops south into Mexico and then passes about 10 mi (16 km) south of the SEZ before turning back north into the United States about 20 mi (32 km) west of the SEZ. The trail then heads north and northwest. The auto tour portion of the trail follows State Route 98, within the southern boundary of the SEZ, although the route in this area is not associated with the historic trail.

The BLM conducted a visual resource inventory (VRI) for the SEZ and surrounding lands in 2009 (BLM 2010c). 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 key observation points (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 9.1.14.1-4. The VRI values for the SEZ and immediate surroundings are VRI Class III, indicating moderate relative visual values, and VRI Class IV, indicating low relative visual values. The inventory indicates low scenic quality for the SEZ and its immediate surroundings, based in part on the lack of visual variety and notable features, and the relative commonness of the landscape type within the region. Positive scenic quality attributes included some variety in vegetation types and color; however, these positive attributes were insufficient to raise the scenic quality to the "Moderate" level. The inventory indicates moderate sensitivity for the SEZ and its immediate surroundings. The inventory indicates relatively low levels of use; however, the overall sensitivity rating is "Moderate" for the following reasons:

1. The SEZ is within the CDCA,

2. There are several ACECs nearby, and

3. The SEZ is adjacent to the auto tour route of the Juan Bautista de Anza National Historic Trail.

Within the El Centro Field Office, lands within the 25-mi (40-km), 650-ft (198-m) viewshed of the SEZ contain 760 acres (3.08 km^2) of VRI Class I lands, north of the SEZ in the Imperial Sand Hills; 4,874 acres (19.72 km^2) of VRI Class II lands, north and northeast of the SEZ in the Imperial Sand Hills; 13,829 acres (55.964 km^2) of Class III lands, primarily north of the SEZ on East Mesa or northeast beyond the Imperial Sand Hills; and 20,188 acres (81.698 km^2) of VRI Class IV lands, north of the SEZ on East Mesa or northeast beyond the Imperial Sand Hills.

More information about VRI methodology is available in Section 5.12 and in *Visual Resource Inventory*, BLM Manual Handbook 8410-1 (BLM 1986a). 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).

9.1.14.2 Impacts

The potential for impacts from utility-scale solar energy development on visual resources within the proposed Imperial East 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, 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 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 used in this PEIS, including assumptions and limitations, is presented in Appendix M.

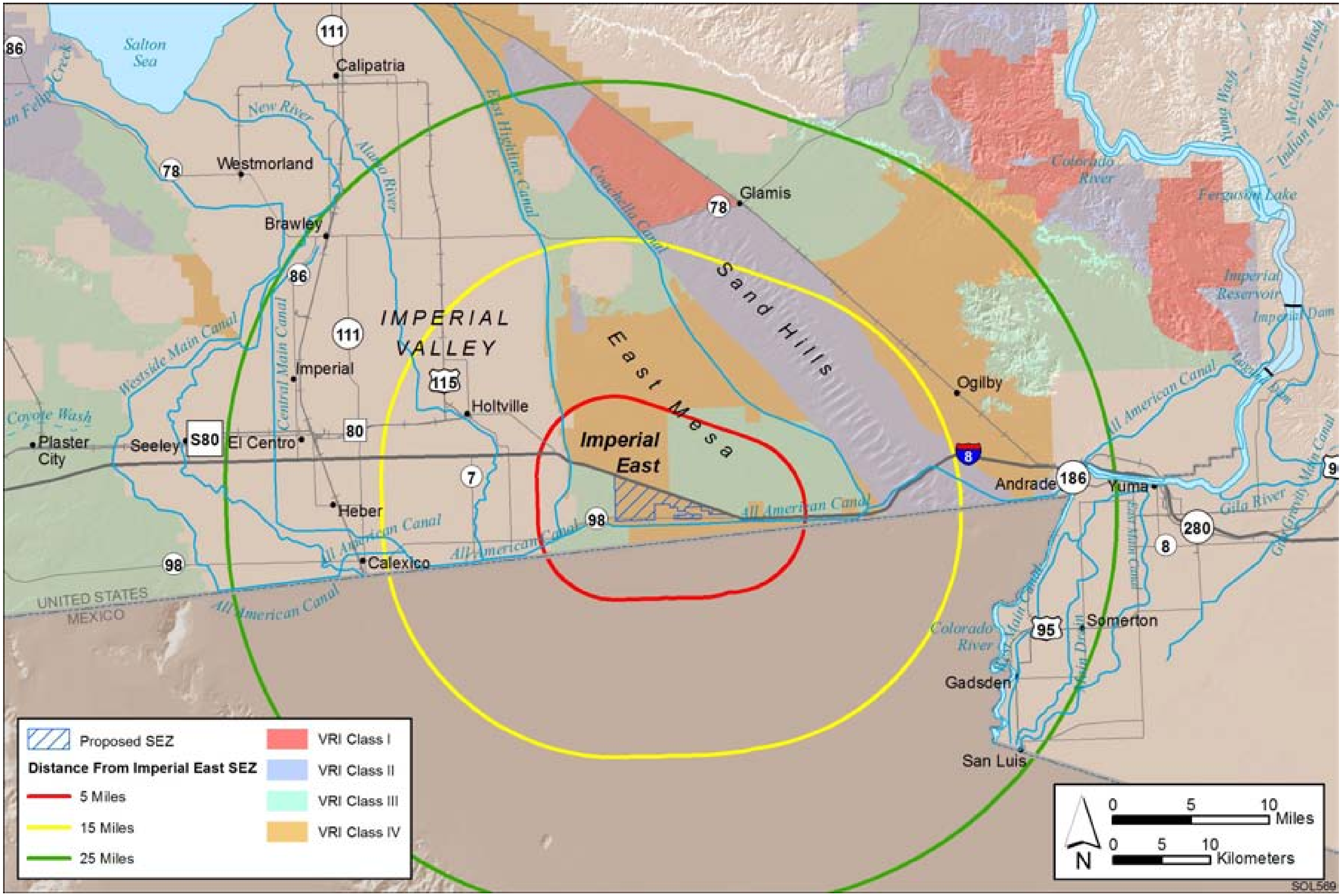

FIGURE 9.1.14.1-4 Visual Resource Inventory Values for the Proposed Imperial East SEZ and Surrounding Lands

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.

9.1.14.2.1 Impacts on the Proposed Imperial East 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 F. 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 that utilize 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 nearby. Additional, and potentially large impacts would occur as a result of the construction, operation, and decommissioning of related facilities, such as access roads and electric transmission lines within the SEZ (however, no new transmission lines construction outside of the proposed SEZ was assessed; see Section 9.1.1.2). 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 9.1.22.4.13 of the PEIS.

The changes described above would be expected to be consistent with BLM VRM objectives for VRM Class IV, as seen from nearby KOPs. As noted above, the BLM has not assigned VRM classes for the SEZ and surrounding BLM lands. More information about impact determination using the BLM 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.

9.1.14.2.2 Impacts on Lands Surrounding the Proposed Imperial East SEZ

Impacts on Selected Sensitive Visual Resource Areas

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 N for important information on the 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 (38 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 presented in Appendix N.

Figure 9.1.14.2-1 shows the combined results of the viewshed analyses for all four solar technologies. The colored segments 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

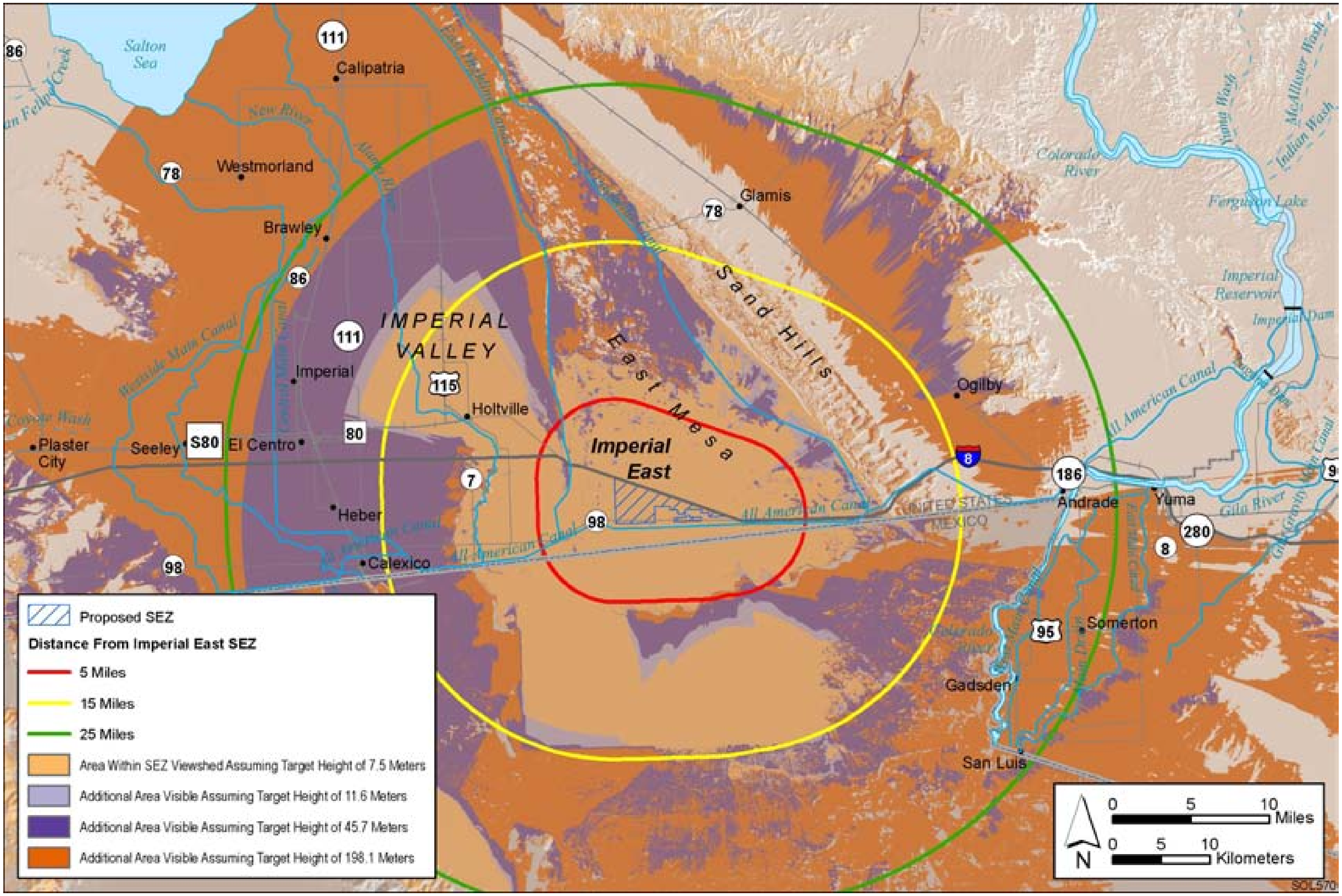

FIGURE 9.1.14.2-1 Viewshed Analyses for the Proposed Imperial East SEZ and Surrounding Lands, Assuming Solar Technology Heights of 24.6 ft (7.5 m), 38 ft (11.6 m), 150 ft (45.7 m), and 650 ft (198.1 m) (shaded areas indicate lands from which solar development within the SEZ could be visible)

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 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 for at least the upper portions of power tower receivers could be visible from 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 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 (38 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 9.1.14.2-2 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 [8 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 analysis 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;

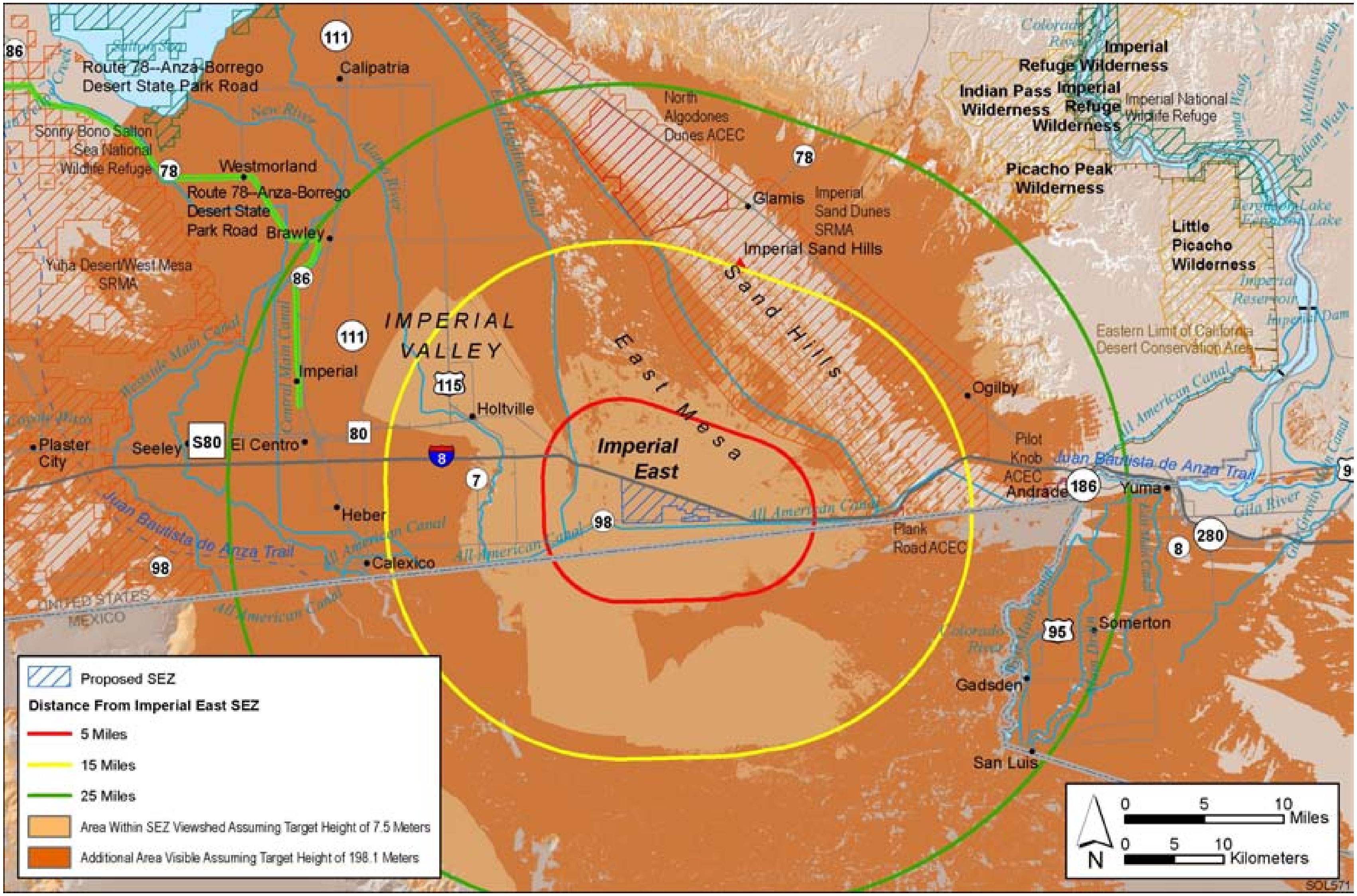

FIGURE 9.1.14.2-2 Overlay of Selected Sensitive Visual Resource Areas onto Combined 650-ft (198.1-m) and 24.6-ft (7.5-m) Viewsheds for the Proposed Imperial East SEZ

- 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.

Potential impacts on specific sensitive resource areas visible from and within 25 mi (40 km) of the proposed Imperial East SEZ are discussed below. The results of this analysis are also summarized in Table 9.1.14.2-1. Further discussion of impacts on these areas is available in Sections 9.1.3 (Specially Designated Areas and Lands with Wilderness Characteristics) and 9.1.17 (Cultural Resources) of the 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 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.

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.

TABLE 9.1.14.2-1 Selected Potentially Affected Sensitive Visual Resources within a 25-mi (40.2-km) Viewshed of the Proposed Imperial East 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 (Total Acreage/Linear Distance)	Visible within 5 mi	5 and 15 mi	15 and 25 mi
National Conservation Area	California Desert (25,919,319 acres)	9,127 acres (0.0%)[b]	26,738 acres (0.1%)	42,544 acres (0.2%)
WA	North Algodones Dunes (26,330 acres)	0 acres	0 acres	762 acres (2.9%)
National Historic Trail	Juan Batista de Anza	0 mi	0 mi	4 mi
National Natural Landmark	Imperial Sand Hills (NA[c])	NA	NA	NA
ACEC designated for outstanding scenic values	North Algodones Dunes (25,835 acres)	0 acres	0 acres	745 acres (2.9%)

[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.

[c] NA = data not available.

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 Federal Land Policy and Management Act. About 10 million acres (40,000 km^2) of the CDCA are administered by the BLM. As shown in Figure 9.1.14.2-2, the proposed Imperial East SEZ is located within the CDCA.

  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 on the basis of management 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 an area classified as multiple use class "L." This limited class 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.

Utility-scale solar development within the SEZ is an allowable use in multiple use Class "L" lands under the CDCA management plan. 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.

Portions of the CDCA within the 650-ft (198.1-m) viewshed for the Imperial East SEZ include approximately 78,409 acres (317.3 km^2), or 0.3% of the total CDCA acreage. Portions of the CDCA within the 24.6-ft (7.5-m) viewshed encompass approximately 23,599 acres (95.5 km^2) or 0.1% of the total CDCA acreage. Absent screening and other visibility factors that would prevent viewers from seeing solar energy facilities within the SEZ, all CDCA lands within the SEZ viewshed would be subject to visual impacts from solar development within the SEZ. The nature of the impacts experienced would vary with the distance from the SEZ, the angle of view, project numbers, sizes and locations, and other project- and site-specific factors.

Wilderness Area

- *North Algodones Dunes*—The 26,330-acre (106.6 km^2) North Algodones Dunes Wilderness is a congressionally designated WA located about 16 mi (25 km) at the point of closest approach north of the SEZ. As shown in Figure 9.1.14.2-2, solar energy facilities within the SEZ could be visible from a very small portion of the WA. Portions of the WA within the 650-ft (198.1-m) viewshed (approximately 762 acres [3.08 km^2], or 2.9% of the total WA acreage) extend from the point of closest approach at the northwest corner of the SEZ to approximately 22.5 mi (36.2 km) from the SEZ. Portions of the WA within the 24.6-ft (7.5-m) viewshed encompass approximately 342 acres (1.4 km^2) or 1.3% of the total WA acreage.

  The North Algodones Dunes WA is entirely contained within Imperial Sand Dunes Recreation Area and constitutes much of the northern portion of the area. The largest and tallest dunes are on the west side of the WA, while the east side contains smaller, secondary dunes.

  Figure 9.1.14.2-3 is a three-dimensional Google Earth™ perspective visualization of the SEZ (highlighted in orange) as seen from one of the higher dunes (elevated approximately 300 ft [91.4 m] above the SEZ) on the west side of the WA, and approximately 21 mi (34 km) from the northeastern boundary of the SEZ. The visualization includes two simplified wireframe

FIGURE 9.1.14.2-3 Google Earth Visualization of the Proposed Imperial East SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Model, as Seen from the North Algodones Dunes WA/ACEC

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. In the visualization, the SEZ area is depicted in orange, the heliostat fields in blue.

Looking south at the SEZ from one of the higher dunes (elevated approximately 300 ft [91.4 m] above the SEZ) on the west side of the WA, the visualization suggests that the upper portions of sufficiently tall power towers and other tall solar facility components (e.g., transmission towers and plumes located within the SEZ) could be visible from the higher dunes in the WA, and that lower height solar collector arrays might also be visible, in the absence of screening vegetation or structures. The SEZ is far enough from the WA, and the angle of view is low enough, however, that any visible solar collector arrays would be barely visible over the horizon and would appear as a very thin horizontal band that would repeat the strong horizon line. At the long distance between the WA and the SEZ, the SEZ would occupy a very small part of the field of view. Visible operating power tower receivers within the SEZ would appear as distant points of light on the southern horizon. If sufficiently tall, power towers could have red or white flashing hazard navigation lights that could be visible for long distances at night, and could potentially be seen from this viewpoint, although there would be numerous other lights visible in the vicinity of the SEZ. Under the development scenario analyzed in this PEIS, solar energy development within the SEZ would be expected to cause minimal visual impacts on the North Algodones Dunes WA.

National Historic Trail

- *Juan Bautista de Anza*—The Juan Bautista de Anza National Historic Trail is a congressionally designated multistate and two-country historic trail that passes within approximately 10 mi (18 km) of the SEZ at the point of closest approach on the south side of the SEZ, located in Mexico. As shown in Figure 9.1.14.2-2, within the United States, the eastern portion of the trail is 18 mi (30 km) east of the SEZ at the point of closest approach. The western portion of the trail in the United States is located 20 mi (33 km) west of the SEZ. Portions of the western portion of the historic trail in the United States are within the 650-ft (198.1-m) viewshed, extending from the point of closest approach at the western boundary of the SEZ to approximately 24 mi (39 km) from the SEZ. The historic trail is not within the lower-height viewsheds, except for a roughly 0.5-mi (0.8-km) segment approximately 20 mi (32 km) east of the SEZ.

The area of intermittent visibility east of the SEZ is within and around the Pilot Knob ACEC (see discussion below). In the absence of vegetative or other screening, the SEZ and solar development within the SEZ could be visible on the western horizon from the highest ridges and west-facing slopes in the Pilot Knob area, but the SEZ would occupy a very small portion of the field of view. If visible at the long distance between Pilot Knob and the SEZ, operating power tower receivers located within the SEZ would appear as distant lights on the horizon, viewed against the background of the In-Ko-Pah Mountains. If sufficiently tall, power towers could have red or white flashing hazard navigation lights that could be visible for long distances at night, and could potentially be seen from this viewpoint, although there would be numerous other lights visible in the vicinity of the SEZ. Expected visual impacts on trail users would be minimal.

In Yuma, Arizona, the trail splits into the historic route and the auto route. The historic trail goes southwest into Baja California, Mexico, for approximately 55 mi (89 km) and then turns north back into California. Because of the lack of accurate elevation data and uncertainty about the exact location of the historic trail in Mexico, accurate GIS-based viewshed analyses for the trail in Mexico were not performed. In Mexico, the trail is approximately 12 mi (19 km) south of the SEZ and runs generally east–west through agricultural lands. The elevation gradually decreases south of the SEZ; thus it is likely that the SEZ is visible from nearby locations in Mexico, but a large area of agricultural lands is located about 6 mi (10 km) south of the SEZ in Mexico that may screen views of the SEZ. Absent vegetative or other screening, because the elevation is lower than the SEZ, low-height solar facilities would not likely be visible; however, taller structures might be visible. When operating, sufficiently tall power tower receivers within the SEZ might be visible as points of light on the northern horizon. If sufficiently tall, power towers could have red or white flashing hazard navigation lights that could be visible for long distances at night. Unless there was screening present, they could potentially be seen from the trail, although there would be other lights visible in the vicinity of the SEZ.

Approximately 19 mi (31 km) west of the SEZ, the national historic trail re-enters the United States in an agricultural area but at an elevation approximately 70 to 80 ft (21 to 24 m) lower than the western boundary of the SEZ. Within the 25-mi (40-km) viewshed of the SEZ, the trail west of the SEZ is only visible in the 650-ft (198.1-m) viewshed, indicating that if solar development within the SEZ were not screened by vegetation or structures between the trail and the SEZ, only the upper portions of taller operating power towers within the SEZ would be visible as distant lights on the horizon. As above, flashing red or white hazard navigation lights on power towers could potentially be visible at night. At the long distance to the SEZ, and very low viewing angle, impacts from solar development within the SEZ on views from the trail would be minimal.

As noted previously, while the historic trail route passes through Mexico in the close vicinity of the SEZ, the auto route stays in California. It follows I-8 from Yuma to State Route 98, where it crosses the SEZ, paralleling the southern boundary of the SEZ. In Calexico, west of the SEZ, the auto route travels north on State Route 111.

Traveling along the auto route from the east, the trail auto route enters the 25-mi (40-km) SEZ viewshed near the Imperial Sand Dunes, approximately 20 mi (32 km) east of the SEZ. At this point, in the absence of screening by vegetation, the upper portions of sufficiently tall power towers would come into view, likely appearing as distant points of light on the western horizon. In this area, the trail passes through flat lands, with sandy soils and sparse vegetation that would not generally be tall or dense enough to screen views of the SEZ. Traveling west on the auto route, solar facilities in the SEZ would appear in front of travelers, gradually increasing in apparent size.

Figure 9.1.14.2-4 is a Google Earth visualization that depicts a view of the SEZ (highlighted in orange) as seen from a point along State Route 98, within the SEZ. The heliostat field is highlighted in blue.

Where the auto route passes through the SEZ, solar facilities within the SEZ would generally be visible, and facilities located near the roads could strongly attract attention, and would likely dominate views from the roads. Views of East Mesa and surrounding Imperial Valley and Imperial Sand Dunes could be completely or partially screened by solar facilities, depending on the layout of solar facilities within the SEZ. The collector/reflector arrays of solar facilities within the SEZ would be seen edge-on, so they would repeat the line of eth horizon, but could be so close to the roadway that their forms and structural details would be visible, which would increase visual 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, and their structural details could be evident 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 likely, but their extent would depend on the materials and surface treatments utilized in the facilities.

Under the 80% development scenario analyzed in this PEIS, strong visual contrasts would be expected for viewpoints on the auto route portion or the trail within the SEZ. If solar facilities were located on both sides of the roads, the banks of solar collectors on both sides of the roads could form a visual “tunnel” that travelers would pass through.

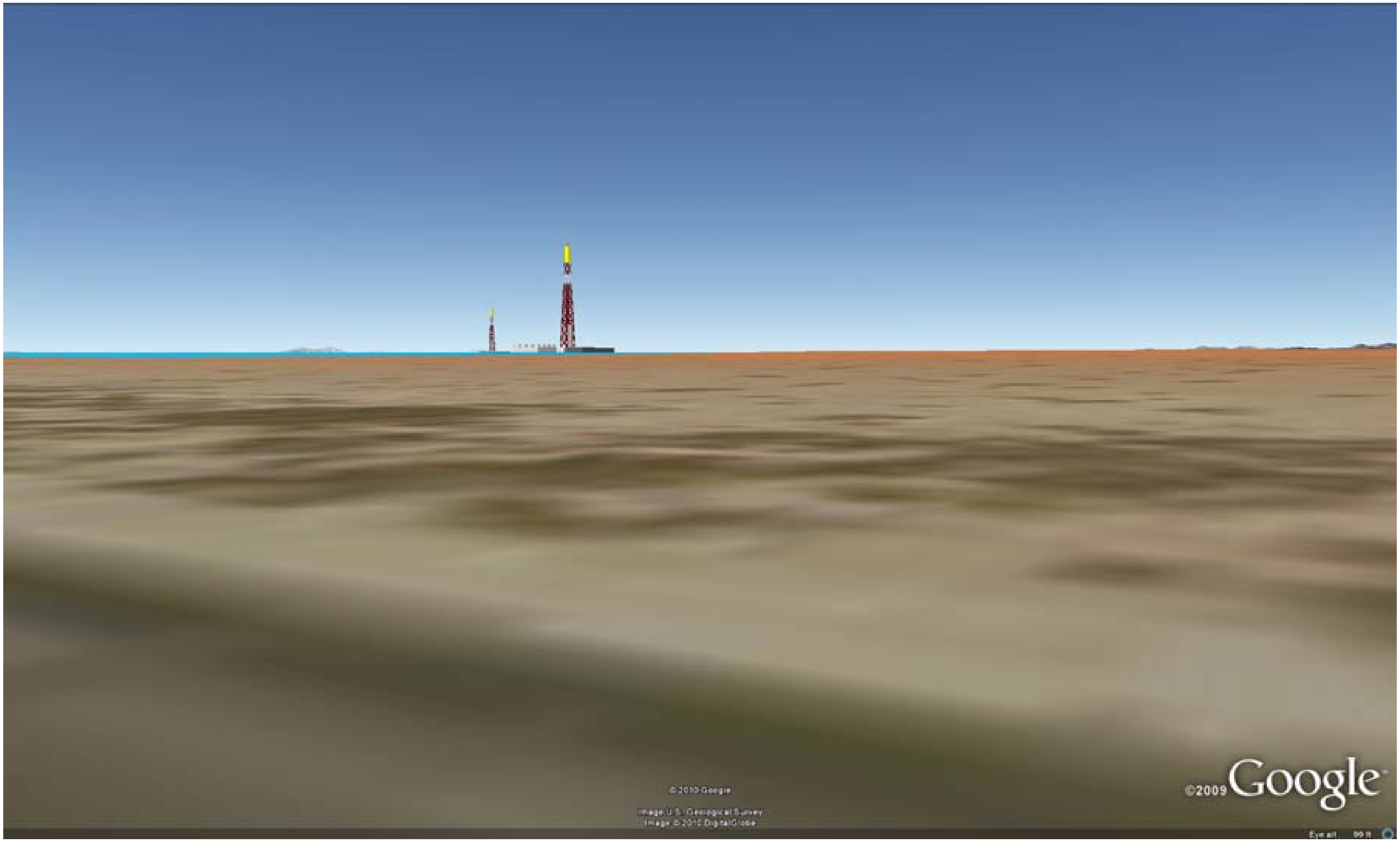

FIGURE 9.1.14.2-4 Google Earth Visualization of the Proposed Imperial East SEZ (shown in orange tint), as Seen from Viewpoint on the Auto Route of the Juan Bautista de Anza Trail within the SEZ

If power tower facilities were located in the SEZ in close proximity to the auto tour route, when operating, the receivers could appear as brilliant light sources as viewed from the road, and if sufficiently close to the road, would likely strongly attract views. Also, 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, power towers could have red or white flashing hazard navigation lights that could be visible for long distances at night, and could be visually conspicuous from this viewpoint. Other lighting associated with solar facilities in the SEZ could be visible as well.

From the west, the auto route of the Juan Bautista de Anza National Historic Trail enters the 25-mi (40-km) SEZ viewshed approximately 23 mi (38 km) northwest of the SEZ, at which point the SEZ would come into view in the absence of screening by vegetation or structures. Solar facilities in the SEZ would gradually increase in apparent size as drivers moved eastward on State Route 98. Where visible, the SEZ would appear just to the left of the center of the field of view looking down the road.

Within the SEZ, the visual experience would be similar to that described above for west-bound travelers, except that most solar facilities would likely be viewed on the left side of west-bound vehicles, as most of the SEZ lands are north of the auto tour route.

National Natural Landmark

- *Imperial Sand Hills*—Imperial Sand Hills National Natural Landmark (NNL) is located approximately 16 mi (25 km) northeast of the SEZ. It is one of the largest masses of sand dunes in the United States and is an outstanding example of dune geology and ecology. Dunes in excess of 500 ft (152.4 m) high are found within the NNL, and the SEZ and solar energy facilities within the SEZ would be visible from the highest dunes within the NNL. If power tower facilities were sited in the SEZ, the receivers could project slightly above the line of the horizon for viewers on high dunes within the NNL, and at the relatively long distance to the SEZ, would appear as distant points of light when operating. If sufficiently tall, power towers could have red or white flashing hazard navigation lights that could be visible from the NNL at night. Potential visual impacts occurring in the landmark arising from solar energy development within the SEZ would depend on the location of the viewer and project location, project technology, site design, and other visibility factors. Under the 80% development scenario analyzed in this PEIS, solar energy development within the SEZ would be expected to cause minimal to weak visual contrasts with the natural-appearing surroundings, as seen from the NNL.

ACEC Designated for Outstanding Scenic Qualities

- *North Algodones Dunes*—The North Algodones Dunes ACEC is a 25,835-acre (104.6-km^2) BLM-designated ACEC that is located north of the Imperial Sand Hills NNL. The ACEC was designated to provide special management for this outstanding scenic area. The ACEC is located approximately 16 mi (25 km) north of the SEZ at the point of closest approach. As shown in Figure 9.1.14.2-2, the area of the ACEC within the viewshed of the SEZ includes the western-most portion of the ACEC and extends east for approximately 2.7 mi (4.3 km).Portions of the ACEC within the 650-ft (198.1-m) viewshed include approximately 745 acres (3.0 km^2), or 2.9% of the total ACEC acreage. Portions of the ACEC within the 24.6-ft (7.5-m) viewshed include approximately 346 acres (1.4 km^2), or 1.3% of the total ACEC acreage.

  The North Algodones Dunes ACEC is entirely contained within the North Algodones Dunes WA and constitutes nearly the same area as the WA. Potential impacts on the ACEC from solar energy development within the SEZ are the same as those described for the WA (discussed above).

Impacts on Selected Other Federal Lands and Resources

- *Plank Road*—The 298-acre (1.2-km^2) Plank Road ACEC has been designated by the BLM as a unique historic road. The ACEC is located within the Imperial Sand Dunes Recreation Area and is located about 10 mi (16 km) from the southeastern corner of the SEZ, at the point of closest approach. The area of the ACEC within the 650-ft (198.1-m) viewshed of the SEZ includes 26 acres (0.1 km^2), or 8.8% of the total ACEC acreage. The area within the 24.6-ft (7.5-m) viewshed of the SEZ includes 16 acres (0.07 km^2), or 5.2% of the total SRMA acreage.

  The elevation within the ACEC is approximately 80 to 100 ft (24 to 30 m) higher than the SEZ. The area between the ACEC and the SEZ has few cultural disturbances visible except unpaved roads and fences. Solar collector arrays and other low-height components of solar facilities within the SEZ would be barely visible and would be viewed edge-on, so they would tend to repeat the strong horizontal line of the plain in which the ACEC and the SEZ are located, which would reduce visual contrast. Less reflective objects, such as PV panel arrays, might be difficult to distinguish against the background. Power towers, transmission towers, other power block facilities, and plumes could be visible above the collector arrays. If sufficiently tall, power towers could have red or white flashing hazard navigation lights that could be visible from the ACEC at night. Under the development scenario analyzed in this PEIS, solar energy facilities located within the SEZ would be expected to create minimal to weak visual contrasts, as seen from the ACEC.

- *Pilot Knob*—The 869-acre (3.5-km^2) Pilot Knob ACEC was designated for its prehistoric and Native American values. In addition to its Native American values and the Fort Yuma Indian Reservation bordering its public lands, the Pilot Knob ACEC was used by General Patton in training troops for combat in World War II (WWII). As shown in Figure 9.1.14.2-2, the ACEC is located approximately 20 mi (31 km) from the nearest eastern edge of the SEZ, at the point of closest approach. The area of the ACEC within the 650-ft (198.1-m) viewshed of the SEZ includes 37 acres (0.2 km^2). The area within the 24.6-ft (7.5-m) viewshed of the SEZ includes 6 acres (0.02 km^2), or 0.6% of the total ACEC acreage.

  As noted above (under discussion of impacts on Juan Bautista de Anza National Historic Trail), there is an area of intermittent SEZ visibility within and around the Pilot Knob ACEC. In the absence of vegetative or other screening, the SEZ and solar development within the SEZ could be visible on the western horizon from the highest ridges and west-facing slopes in the Pilot Knob area, but would occupy a very small portion of the field of view. Even at the higher elevations, the angle of view is low enough that the tops of solar collector arrays would not likely be visible, and the arrays, if visible at all, would repeat the line of the plain in which the SEZ is located. If power tower receivers located within the SEZ were visible at the long distance between Pilot Knob and the SEZ, when operating, they would appear as distant lights on the horizon, viewed against the background of the In-Ko-Pah Mountains. If sufficiently tall, power towers could have red or white flashing hazard navigation lights that could be visible from the ACEC. Expected visual impacts on trail users would be minimal.

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. Note that 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. For this analysis, the impacts of construction and operation of transmission lines outside of the SEZ were not assessed, assuming that the existing 115-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, transmission lines to connect facilities to the existing line would be required. 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

Route 78-Anza Borrego Desert State Park Road. Approximately 7 mi (1 km) of Route 78-Anza Borrego Desert State Park Road is within the northwestern portion of the viewshed of the Imperial East SEZ. The visible portion of the trail within the 25-mi (40 km) limit of analysis for visual impacts is within 21 mi (34 km) of the SEZ. Since both the SEZ and the road in this area are in low-lying areas, the angle of view between them is low, and at the very long distance between them, minimal visual impacts on State Route 78 users would be expected.

I-8 and State Route 98. As noted above (under discussion of impacts on Juan Bautista de Anza Historic Trail auto tour route), State Route 98, a two-lane highway, passes through the southern portion of the Imperial East SEZ. It is also the auto tour portion of the Juan Bautista de Anza National Historic Trail. The annual average daily traffic (AADT) value for State Route 98 in the vicinity of the SEZ is 1,900 to 2,500 vehicles. I-8 is a two-lane interstate highway that follows the northern boundary of the SEZ. The AADT value for I-8 in the vicinity of the SEZ is 11,200 to 14,000 vehicles. Under the PEIS development scenario, travelers on both roadways could be subject to large visual impacts from solar energy development within the SEZ; however, because of the relatively small size of the SEZ and high travel speed for the two roads, the duration of these impacts would normally be brief, generally not exceeding 8 minutes per trip.

Solar facilities within the SEZ could be in full view from both roads, and facilities located near the roads would likely strongly attract visual attention and could dominate views from the roads. On State Route 98, views of East Mesa and surrounding Imperial Valley and Imperial Sand Dunes could be completely or partially screened by solar facilities, depending on the layout of solar facilities within the SEZ. Because State Route 98 passes through the SEZ, solar facilities within the SEZ could create strong visual contrasts for travelers, depending on solar project characteristics and location within the SEZ. If solar facilities were located on both sides of State Route 98, banks of solar collectors on both sides of the road could form a visual “tunnel” that travelers would pass through.

If operating power tower facilities were located in the SEZ in close proximity to the roads, the receivers could appear as brilliant light sources as viewed from the roads, and if sufficiently close to the roads would likely strongly attract views. Also, 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.

As travelers approached and passed through the SEZ, depending on lighting conditions, the solar technologies present, facility layout, and mitigation measures employed, there would be the potential for significant levels of glint and glare from reflective surfaces. These effects could potentially distract drivers and/or impair views toward the facilities. These potential impacts could be reduced by siting reflective components away from the roads, employing various screening mechanisms, and/or adjusting the mirror operations to reduce potential impacts.

Communities of Holtville, Calexico, Heber, El Centro, and Imperial. As shown in Figure 9.1.14.2-2, the viewshed analyses indicate visibility of the SEZ from the communities of Holtville (approximately 10 mi [16 km] northwest of the SEZ), Calexico (approximately 16 mi [26 km] southwest of the SEZ), Heber (approximately 18 mi [29 km] west of the SEZ), El Centro (approximately 20 mi [33 km] northwest of the SEZ) and Imperial (approximately 21 mi [34 km] northwest of the SEZ). A detailed future site-specific NEPA analysis is required to determine visibility precisely; however, given the flatness of the area and the relatively long distances to these communities from the SEZ, visual impacts from solar energy facilities within the SEZ would be expected to be minimal. All of these communities are lower in elevation than the SEZ. Because of the long distance and very low angle of view, visibility of solar facilities within the SEZs from any of these communities except Holtville, is very doubtful. Visibility from Holtville is unlikely, except that sufficiently tall power towers, transmission towers, plumes, and other tall solar facility components might be visible above the horizon but not likely conspicuous. Where visibility existed, it would be limited to the outskirts of these communities in the direction of the SEZ, because structures and vegetation within the urban areas would screen views of the SEZ from most of the communities.

Other Impacts. In addition to the impacts described for the resource areas above, nearby residents 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) from their residences, or as they travel area roads. The range of impacts experienced would be highly dependent on viewer location, project types, locations, sizes, and layouts, as well as the presence of screening, but under the 80% development scenario analyzed in the PEIS, from some locations, strong visual contrasts from solar development within the SEZ could potentially be observed.

9.1.14.2.3 Summary of Visual Resource Impacts for the Proposed Imperial East SEZ

Under the 80% development scenario analyzed in this PEIS, there could be multiple solar facilities within the Imperial East 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 mostly natural-appearing landscape. Large visual impacts on the SEZ and surrounding lands within the SEZ viewshed would be associated with solar energy development within the SEZ because of major modification of the character of the existing landscape. Additional impacts could occur from construction and operation of transmission lines and access roads within and/or outside the SEZ.

The SEZ is in an area of low scenic quality, with numerous cultural disturbances already present. 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. The residents nearest to the SEZ could be subjected to large visual impacts from solar energy development within the SEZ.

Utility-scale solar energy development within the proposed Imperial East SEZ is unlikely to cause even moderate visual impacts on highly sensitive visual resource areas, the closest of which is more than 15 mi (24 km) from the SEZ. The closest community is beyond 10 mi (16 km) from the SEZ and is likely to experience minimal visual impacts from solar development within the SEZ.

9.1.14.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features have been identified to protect visual resources for the proposed Imperial East SEZ. 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 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 assessment 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 viewshed, 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.

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9.1.15 Acoustic Environment

9.1.15.1 Affected Environment

The proposed Imperial East SEZ is located in south central Imperial County in the southeastern corner of California. Imperial County has established noise standards (ICPDS undated). Noise standards applicable to solar energy development include the property-line noise standards: 50 dBA daytime (7 a.m. to 10 p.m.) L_{eq} and 45 dBA nighttime (10 p.m. to 7 a.m.) L_{eq} for residential zones. In addition, the construction noise limit has been established at 75 dBA L_{eq} at the nearest sensitive receptor, and construction equipment operation is limited to 7 a.m. to 7 p.m., Monday through Friday, and 9 a.m. to 5 p.m. Saturday.

I-8 runs east–west along the northeast edge of the proposed Imperial East SEZ, while State Route 98, a two-lane highway, passes through the southern edge. About 0.25 mi (0.4 km) to the south of the SEZ lies the All-American Canal, along which two hydroelectric power plants are located. Several geothermal facilities and development projects are located to the northwest within 5 mi (8 km) from the proposed SEZ. Large-scale irrigated agricultural activities occur about 2.5 mi (4 km) to the west and 6 mi (10 km) in Mexico to the south of the SEZ. The Mexicali Airport in Mexico and Holtville Airport are about 5 to 6 mi (8 to 10 km) southwest and north–northwest of the SEZ, respectively. Therefore, noise sources around the SEZ include road traffic from I-8 and State Route 98, industrial noise from hydroelectric power plants and geothermal facilities, agricultural activities, noise from activities and events at nearby communities and aircraft flyover including military/commercial/private airplanes, crop dusters, and border patrol helicopters. No sensitive receptors (e.g., hospitals, schools, or nursing homes) exist around the SEZ. The nearest noise receptor lies in a cluster of employee residences of the IID, which are located about 500 ft (150 m) south of the southwestern corner of the SEZ. Temporary residences including a small Tamarisk long-term visitor area, is located just south of the SEZ and north of the All-American Canal. The next nearest residences are located about 2.7 mi (4.3 km) west of the northwestern corner of the SEZ along the East Highline Canal. The nearest population center with schools or town infrastructure is Holtville, located about 10 mi (16 km) northwest of the SEZ. Background noise levels would be relatively high along the north and south SEZ boundary, while noise levels in the central portion of the SEZ would be relatively low. To date, no environmental noise survey has been conducted around the Imperial East SEZ. On the basis of the population density in Imperial County, the day-night average sound level (L_{dn} or DNL) is estimated to be 37 dBA for Imperial County, typical of a rural area (Eldred 1982; Miller 2002). However, maximum noise levels in the SEZ would be about 75 and 65 dBA L_{dn} along I-8 and State Route 98, respectively (ICPDS undated), and thus noise levels within the SEZ are estimated to be about 50 dBA L_{dn}[13] or slightly higher.

[13] Typically, the nighttime level is 10 dBA lower than the daytime level, and it can be interpreted as 50 dBA during daytime hours and 40 dBA during nighttime hours.

9.1.15.2 Impacts

Potential noise impacts associated with solar projects in the Imperial East 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 on nearby residences (within 500 ft [150 m]) would be anticipated, albeit of short duration. 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 Imperial East 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 9.1.15.3 below). This section primarily addresses potential noise impacts on humans, although potential impacts on wildlife and/or visitors at nearby sensitive areas are discussed, Additional discussion on potential noise impacts on wildlife is presented in Section 5.10.2.

9.1.15.2.1 Construction

The proposed Imperial East 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 it 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) to the facility boundary. However, noise levels from construction of the solar array would be lower than 95 dBA. When geometric spreading and ground effects are taken into consideration, as explained in Section 4.13.1, noise levels would attenuate to about 50 dBA at a distance of 0.5 mi (0.8 km) from the power block area, which is assumed to be at or near the facility boundary. This noise level is the same as an estimated daytime 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 0.5 mi (0.8 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 residences closest to the southwestern SEZ boundary, estimated noise levels at the nearest residences would be about 69 dBA, which is well above an estimated background level of 50 dBA but below the Imperial County regulation of 75 dBA L_{eq} for construction noise. In addition, an estimated 65 dBA L_{dn}[14] at this location is well above the EPA guideline of 55 dBA L_{dn} for residential areas. However, noise levels at this location would be lower than these values, because these residences are located upwind of prevailing winds, which creates a shadow zone (to be discussed later).

There are three specially designated areas near the SEZ (Lake Cahuilla ACECs C and D, and East Mesa ACEC) within 5-mi (8-km) of the Imperial East SEZ, which is the farthest distance that noise (except extremely loud noise) would be discernable. However, these ACECs are not noise-sensitive areas (i.e., they were designed as ACECs because they could contain significant cultural resources), and thus no noise impact analysis for these ACECs was conducted.

Depending on the soil conditions, pile driving might be required for installation of solar dish engines. However, the pile drivers used would be relatively small and quiet, such as vibratory or sonic drivers, rather than the impulsive impact pile drivers frequently seen at large-scale construction sites. Potential impacts on the nearest residences (more than 500 ft [150 m] from the SEZ boundary) would be anticipated to be minor, except when pile driving occurs near the southwestern corner of the SEZ.

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 residences, particularly for activities occurring near the southwestern proposed SEZ boundary, close to the nearby residences.

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 about 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, including from pile driving for dish engines.

For this analysis, the impacts of construction and operation of transmission lines outside of the SEZ were not assessed, assuming that the existing 115-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 noise impacts on nearby residences

[14] For this analysis, background levels of 50 and 40 dBA for daytime and nighttime hours, respectively, are assumed, which result in day-night average noise level (L_{dn}) of 50 dBA.

would be a minor component of construction impacts in comparison with solar facility construction and would be temporary in nature.

9.1.15.2.2 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 sources.

For the parabolic trough and power tower technologies, most noise sources 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 about 52 dBA at the facility boundary, about 0.5 mi (0.8 km)from the power block area. For a facility located near the southwestern corner of the SEZ, the predicted noise level would be about 50 dBA at the nearest residences about 500 ft (150 m) from the SEZ boundary, which is the same as estimated background level and the Imperial County regulation of 50 dBA daytime L_{eq}. Such noise from a solar facility could be discernable at the residences depending on meteorological conditions. If thermal energy storage (TES) were not used (i.e., if the operation were limited to daytime, 12 hours only[15]), 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 residences, about 52 dBA as L_{dn} is estimated, which is below the EPA guideline level. However, if TES were used during nighttime hours, day-night average sound levels 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 Imperial East 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[16] within 1 or 2 mi (2 or 3 km) of the noise

[15] Maximum possible operating hours at the summer solstice, but limited to 7 to 8 hours at the winter solstice.

[16] A shadow zone is defined as the region where direct sound does not penetrate because of upward diffraction.

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 the day-night average sound level (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 sound levels estimated from the uniform atmosphere (see Section 4.13.1). On the basis of these assumptions, the estimated sound level at the nearest residences (about 0.6 mi [1.0 km] from the power block area for a solar facility located near the southwestern SEZ boundary) would be 60 dBA L_{eq}, which is higher than the Imperial County regulation of 45 dBA nighttime L_{eq}. The combined day/night noise is estimated to be about 61 dBA as L_{dn}, which is higher than the EPA guideline of 55 dBA for residential areas. The assumptions are conservative in terms of operating hours, and no credit was given to other attenuation mechanisms; thus it is likely that sound levels would be lower than 61 dBA at the nearest residences, even if TES were used at a solar facility. Operating parabolic trough or power tower facilities using TES and located near the southwestern SEZ boundary could result in noise levels above background levels and corresponding adverse noise impacts on the nearest residences. In the permitting process, refined noise propagation modeling would be warranted along with measurement of background sound levels.

The solar dish engine is unique among concentrating solar power (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 Imperial East SEZ, assuming a dish engine facility of up to 509 MW covering 80% of the total area (4,578 acres [19 km^2]), up to 20,360 25-kW dish engines could be employed. Also, for a large dish engine facility, several hundred 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, about 49 dBA at 1.0 mi (1.6 km) and 45 dBA at 2 mi (3 km) from the boundary of the square-shaped dish engine solar field; both values are lower than the daytime Imperial County regulation of 50 dBA. These levels would occur at somewhat shorter distances than the aforementioned distances, considering noise attenuation by atmospheric absorption and temperature lapse during daytime hours. To estimate noise levels at the nearest residences, it was assumed that dish engines were placed all over the Imperial East SEZ at intervals of 98 ft (30 m). Under these assumptions, the estimated noise levels at the nearest residences (500 ft [150 m] from the SEZ boundary) would be about 54 dBA, which is somewhat higher than the daytime Imperial County regulation of 50 dBA. On the basis of 12-hour daytime operation, the estimated 54 dBA L_{dn} at these residences is just below the EPA guideline of 55 dBA L_{dn} for residential areas. Considering other attenuation mechanisms and upwind location of prevailing winds, noise levels at the nearest residences would be lower than the values estimated above. Noise from dish engines could cause adverse impacts on the nearest residences, depending on background noise levels and meteorological conditions. Thus, 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 limit noise impacts.

During operations, no major ground-vibrating equipment would be used. In addition, no sensitive structures are located close enough to the Imperial East 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-generated humming noise 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 within the facility boundary and rarely be heard at nearby residences, assuming a 0.6-mi (1.0-km) distance (at least 0.5 mi [0.8 km] to the facility boundary and another 500 ft [150 m] to the nearby residences). Accordingly, potential impacts of these noise sources on nearby residences would be minimal.

For this analysis, the impacts of construction and operation of transmission lines outside of the SEZ were not assessed, assuming that the existing 115-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 within the SEZ could occur. For 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 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 and 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 Imperial East 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.

9.1.15.2.3 Decommissioning/Reclamation

Decommissioning/reclamation requires many of the same procedures and equipment used in 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 used 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 mitigation measures 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.

9.1.15.3 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 nearest residences to the southwest 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 Imperial East SEZ should be located more than 1 to 2 mi (1.6 to 3 km) from nearby residences located to the southwest of the SEZ (i.e., the facilities should be located in the central or eastern portion of the proposed SEZ). Direct noise control measures applied to individual dish engine systems could also be used to reduce noise impacts at nearby residences.

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9.1.16 Paleontological Resources

9.1.16.1 Affected Environment

The surface geology of the proposed Imperial East SEZ is predominantly composed of thick alluvial deposits (more than 100 ft [30 m] thick) and eolian sediments (loess). Age ranges from Miocene to Holocene suggests depositional environments that could produce fossils. The sub–sea-level basin of the Salton Trough has received a continuous influx of sand, silt, and clay derived from the Colorado River, which created ephemeral lakes in the basin until about 300 years ago. Underlying this alluvial cover is a succession of late Tertiary (Miocene and Pliocene) and Quaternary sediments composed mainly of marine and nonmarine sandstones and clays. The total acreage of the alluvial deposits within the SEZ is 12,310 acres (50 km^2) or 97% of the SEZ. The total acreage of the eolian deposits within the northwestern portion of the SEZ is 324 acres (1 km^2) or 3% of the SEZ. In the absence of a potential fossil yield classification (PFYC) map for the California Desert District, a preliminary classification of PFYC Class 3b is assumed, as there are some documented fossil localities in Imperial County. Class 3b 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).

9.1.16.2 Impacts

The potential for impacts on significant paleontological resources at the Imperial East SEZ is unknown. Vertebrate mammalian and invertebrate fossils have been found in deposits of Ancient Lake Cahuilla in the Salton Trough. However, the potential for impacts on significant paleontological resources at the Imperial East SEZ is unknown and a preliminary PFYC of Class 3b has been assigned. A more detailed investigation of the local geological deposits of the SEZ, and their location and potential depth is needed. Once a project area has been chosen, a paleontological survey will likely be needed following consultation with the BLM. The appropriate course of action would be determined as established in BLM IM2008-009 and IM2009-011 (BLM 2007a, 2008a). Section 5.14 discusses the types of impacts that could occur on any significant paleontological resources found to be present within the Imperial East SEZ. Impacts will be minimized through the implementation of 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. 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 Imperial East SEZ, assuming 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 excavation of the resource, if warranted. Depending on the significance of the find, it could also result in some modification to the project footprint. Since the SEZ is located in an area preliminarily classified as PFYC Class 3b, and fossil localities have been found in deposits of Ancient Lake Cahuilla, a stipulation would be included in permitting documents to alert solar energy developers of the possibility of a delay if paleontological resources were uncovered during surface-disturbing activities.

9.1.16.3 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.

9.1.17 Cultural Resources

9.1.17.1 Affected Environment

9.1.17.1.1 Prehistory

Human settlement in the Colorado Desert region extends back roughly 10,000 years. While a considerable amount of information has been collected for the Baja Region, more archaeological research has taken place on coastal areas rather than inland areas because of the higher density of development on the coast. The lack of evidence on the interior is also attributable to the instability of the landforms in the Salton Basin and the highly mobile settlement strategies of early populations (Schaefer and Laylander 2007). Evidence of past activities in the project area is primarily associated with Lake Cahuilla. This lake was formed by the periodic overflowing of the Colorado River into the Salton Basin. The lake would form every 100 to 150 years (Redlands Institute 2002). Most archaeological material found in the Salton Basin is associated with the later incarnations of Lake Cahuilla dating to the last 2000 years.

The oldest evidence for people in the Baja Peninsula region is associated with the San Dieguito Complex (10,000 B.C.–5,000 B.C.). People from this culture appear to have lived primarily along the coast, although some sites have been found inland. Artifacts attributed to this culture include large stone tools that are only worked on one side (unifacial worked stone), stones where flakes were removed in a single direction (unidirectional flake cores), and massive bifacial tools. Tools were made from numerous types of stone. People from this culture appear to have relied on hunting for their main food supply, stopping in any location for short periods of time only (Berryman and Cheever 2001). No solid evidence of the San Dieguito Complex sites has been found in the Salton Basin (Doyle et al. 2003).

The Archaic Period (5,000 B.C.–A.D. 500) represents a transition to a subsistence strategy that relies on a more intensive use of local resources. This time period is characterized by an expansion into locations away from the coast and a growing reliance on vegetation for food; however, hunting still remains a major portion of the diet. Artifacts associated with the Archaic period include well-made projectile points, knives and scrapers, and grinding stones. The projectile points are large and were used on spears. Sites from this time period are found near the margins of old watercourses and dry lakeshores. Very little evidence for this complex is found in the Salton Basin. Evidence for the Archaic Period is found in rock shelters on the edges of the Colorado Desert. Sites dating to this complex are likely either buried under alluvium or have been destroyed by agricultural development (Schaefer 1994).

Use of the Salton Basin during prehistoric times varied depending largely on the presence or absence of Lake Cahuilla. When the lake was present, it was exploited as a source for fish and plants that would grow on the lake margins. During periods when the lake was not present, an obsidian source known as Obsidian Butte, which is near the southern end of the current Salton Sea, was the major source for obsidian in the region (Schaefer and Laylander 2007). Obsidian serves as a key raw material for tool manufacture.

The last prehistoric phase identified for the Salton Basin prior to contact with Europeans is the Patayan Phase (500 A.D.–1500 A.D.). Extensive evidence from the Patayan Phase is found along the shore remnants of prehistoric Lake Cahuilla. Beginning with this phase, the prehistory of the Salton Basin is more fully understood. The Patayan culture appears to have been formed when the Archaic Period people of the region were influenced by the Hohokam cultures to the east along the Gila River. Technology associated with the Patayan culture includes buff ware ceramics, clay figurines and pipes, side-notched projectile points, stone manos, pestles and mortars, traded shell beads, rock art, and geoglyphs (Schaefer 1994). Larger more permanent Patayan settlements appear along the northwestern edge of Lake Cahuilla. Some of these sites include evidence of fish traps. However, sites on the southeastern edge of the lake are more widely distributed and suggest more seasonal usage (Schaefer 1994).

9.1.17.1.2 Ethnohistory

Although of differing linguistic stock, the Native Americans who inhabited the southeastern California deserts when Euro-Americans first arrived shared similar lifeways 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 the abundance of the resources available. A pattern of seasonal camps combined with semipermanent villages or rancherias emerged. Lineages tended to consider as their own, specific highly productive areas, while the areas between 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. Floodplain horticulture, adopted from the Southwest, allowed for semipermanent occupation of river floodplains and lakeshores (Halmo 2003). These gardens became part of the migratory pattern, which continued to take some bands into the highlands to harvest resources available there. Similarly, with the discovery of gold in the nineteenth century and the influx of Euro-American populations in the twentieth century, Native Americans added wage labor in mines, on river boats, and on large irrigated farms to their seasonal rounds (Bean et al. 1978).

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). 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 often still discernable trails reflects a web of social and trade links that stretched from the Pacific Coast to the Great Plains. As discussed below in Section 9.1.18.1, 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 thus could have sacred as well as profane aspects.

Many of the ethnic groups that inhabited the Colorado Desert shared a considerable amount of ritual behavior and world view. Common to most was some form of the *kəruk*, an important, often annual ritual in which lineages come together to commemorate those who had passed away since the last commemoration (Luomola 1978). For those whose traditional use area would have included the SEZ, Pilot Knob (*Avikwalal)* was a focal point in a sacred landscape (BOR 1994).

Located at the eastern edge of the Imperial Valley, the proposed Imperial East SEZ lies within an area of cultural transition between the hunting and gathering Kumeyaay bands west of the valley and the floodplain farmers who lived to the east along the banks of the Colorado River. The SEZ lies closest to the Kamia bands of the Kumeyaay who practiced floodplain horticulture along the banks of the New River and the Alamo River. The Kamia interacted with, traded with, and sometimes lived together with lineages from surrounding ethnic groups, including the Quechan and the Cocopah, Yuman-speaking groups living along the Colorado River, other Kumeyaay lineages based in the mountains to the west, and the Cahuilla, who were centered in Coachella Valley north of the Salton Sea.

Kamia

During the protohistoric period, the time between first European contact and the incorporation of Native Americans into the Euro-American political system, the traditional use area of the Kamia centered upon the banks of the Alamo River from Brawley south to Holtville, about 10 mi (16 km) northwest of the SEZ, along the New River and at Indian Wells (Knack 1981). The Kumeyaay in general are thought to have spread eastward from the California coast about AD 1000, eventually taking advantage of the resources provided by Lake Cahuilla,[17] which formed intermittently in the Salton Basin from at least 1200 into the seventeenth century (Schaefer and Laylander 2007). Changes in the weather pattern beginning about 1829 resulted in increasing aridity in the basin, and the Kamia moved southeastward following the retreating water sources, eventually joining with the Quechan around 1849 (Knack 1981). What is known of their culture is based on interviews conducted in the early part of the twentieth century with elderly Kamia descendants living on the Fort Yuma reservation (Gifford 1931).

Although speakers of the same language, the Kamia relied less completely on gathering and hunting than did their western Kumeyaay neighbors. Influenced by their Quechan neighbors, they grew maize, beans, taparies, and melons, but would often prefer to gather an abundant wild crop (Luomola 1978). They built substantial, rectangular semi-subterranean dwellings similar to those of the Quechan, but these were not grouped into nucleated villages, nor were they inhabited all year. Their crops, once planted and well started needed little additional tending, and the Kamia lineages scattered to collect wild foods as they began to ripen, most importantly honey mesquite and screwbeans. Honey Mesquite and screwbean pods could be stored and exchanged with their western neighbors for highland crops such as acorns, piñon nuts, tobacco, and agave

[17] Lake Cahuilla formed when the Colorado River shifted course to the west and flowed into the Salton Sea Basin, then dried when the river reverted to its former course. The process of formation and desiccation was cyclical before the construction of dams on the Colorado, with cycles lasting about 150 years (Redlands Institute 2002).

hearts. The Kamia appear to have been on friendly terms with their neighbors and traded with the Quechan, Cahuilla, and Cocopah. Although the Kamia were not long-distance traders, their homeland did lie across the major Yuma-San Diego Trail that linked the Quechan to the coast near present-day San Diego (Cleland and Apple 2003). Most of their trading was with their western neighbors in the Jacumba-Campo area, near mountain springs. There they obtained important mineral resources—granite for mortars and metates and hematite for arrow straighteners—as well as woven goods and abalone shell from the coasts. They occasionally visited the Cocopah to the south to obtain akwil nuts and traded shells, eagle feathers, and salt. Their western Kumeyaay neighbors would sometimes winter with them, enjoying garden produce and fishing (Doyle et al. 2003; Knack 1981; Luomola 1978).

Culturally intermediate between the gathering and hunting Kumeyaay bands to the west and the River Yumans to the east, the Kamia adopted many traits of the Quechan, including floodplain farming, house construction, religious symbols and practices, and cremation of the dead (Luomola 1978).

Quechan

Sometimes referred to as the Yuma, the Quechan (Kwatsan) are a Yuman-speaking group closely allied with the Mohave traditionally centered at the confluence of the Gila and Colorado Rivers. While it is not clear when they arrived at the confluence, they were there by the 1770s. They were not mentioned by Francisco Vasquez de Coronado who passed through the area in 1540. Quechan tradition tells that the Tribe migrated south from the sacred mountain *Avikwaame,* in the Newberry Mountains near Laughlin, Nevada. They are thought to have arrived at the confluence sometime between the thirteenth and the eighteenth centuries. Traditionally, the Quechan practiced floodplain horticulture, depending on the annual floods of the Colorado River to replenish their fields with fresh silt. The fertility of the soil allowed for multiple plantings and harvests, which the Quechan supplemented by gathering plants from the desert and by fishing. During the growing season, they dispersed along the floodplains of the Colorado and the Gila Rivers, moving to the upper terraces during the winter. The Quechan prospered using simple technology. Their bows were simple and unbacked. Arrows often had no stone points. Digging sticks served for planting maize, and clothing was minimal (Bee 1983).

While their settlements were dispersed and independent, more than the inland Colorado Desert tribes, the Quechan had a sense that they were a Tribe, a nation occupying a specific territory. They acted together in warfare; acting together with their allies the Mohave, they were often at odds with the Halchidhoma, the Maricopa, and the Cocopah.

The confluence of the Gila and Colorado Rivers was an important crossing along the Yuma-San Diego Trail, which lead to the coast. Important to the Spanish and later the Americans, the Spanish established a mission there in 1779 only to have it destroyed by the Quechan and Cahuilla two years later. The Hispanic connection remained important to the Quechan who desired Spanish trade goods, for which they exchanged slaves captured during raids on their enemies (Knack 1981). After the defeat of Mexico in 1848, the United States established a fort at Yuma to control the crossing which was now an important wagon road. A reservation was established for the Quechan in 1884.

Quechan cosmology included ritually important trails. The most important of these remains the *Xam Kwatcan* Trail that follows the Colorado River connecting Pilot Knob (*Avikwalali*) with Spirit Mountain (*Avikwaame),* thus connecting a series of ritually important places of power (Johnson 2003).

The Quechan were on friendly terms with the Kamia and eventually accepted Kamias displaced from the Imperial Valley into their communities. It is perhaps for this reason that the territorial claim they presented to the Indian Claims Commission in the 1950s extends 10 mi (16 km) west of Mexicali and included the SEZ.

Cocopah

The Cocopah are a Yuman-speaking Tribe who inhabited the Colorado Delta downstream of the Quechan and the southern reaches of the New River and the Alamo River and parts of Arizona. When Spanish seafarers first made their way through the Gulf of California and up the Colorado River in 1540, they encountered the Cocopah in the delta. It is believed that they came southward along the Colorado River some time after AD 1000. They remained along the river when Lake Cahuilla was formed, but likely could not have inhabited the delta area, which would likely have dried up (Schaefer and Laylander 2007). It is thought that as the lake diminished, Quechan and Mohave who had lived along the lake returned to the Colorado River, displacing the Cocopah to the reforming delta. The long-standing antipathy between the Cocopah and the Quechan and Mohave may have its roots in this event. The Cocopah had friendly relations with the Kumeyaay and Maricopa. They were allied in war with the Maricopa and traded with the Kumeyaay, including the Kamia (Doyle et al. 2003; de Williams 1983).

The Cocopah practiced floodplain agriculture but incorporated more irrigation structures such as dykes and dams than their northern neighbors. Like them, they practiced a seasonal round of food procurement. In the early part of the year, they moved to the high desert seeking agave and gisnaga cactus fruit. With the spring, they traveled downstream to islands near the gulf to harvest wild rice. By midsummer, there were more fish in the river and they returned northward, where they planted maize, beans, and squash as flood waters receded. Like their neighbors, honey mesquite was their most important wild food source, but they harvested other pods and seeds as well. Their housing was likewise seasonally adapted. Four-post semi-subterranean structures were their winter homes, built near their fields, while domed brush structures marked their seasonal summer camps (de Williams 1983).

The Gadsen Purchase in 1853 divided the Cocopah who lived in the newly acquired United States territory from those living in Mexico. They continued to live along the river and are first mentioned near Yuma, Arizona, in 1873. Throughout the latter half of the nineteenth century, they adapted to the newcomers by engaging in the riverboat trade then thriving on the Colorado River. They sold wood to fuel the boats and became known as expert river pilots. With the demise of the river traffic their fortunes diminished. They dispersed to serve as day laborers in the new irrigation-fed agricultural economy that began to flourish around Yuma and in the Imperial Valley in the early part of the twentieth century, and were first granted reservation lands in the United States in 1917. They remained reclusive until the 1960s, when with the advice of neighboring Tribes, they began the process of developing their reservation lands (de Williams 1983).

Cahuilla

The Cahuilla occupied the Coachella Valley. Their society was composed of lineage-based groups with hereditary leaders, but with no overarching sociopolitical organization. They are believed to have entered the Colorado Desert from the Great Basin sometime between 500 BC and AD 500. They were hunters and gatherers living in permanent villages near reliable water. They appear to have first settled on the shores of Lake Cahuilla and then moved to the mountains as the lake dried. The Cahuilla tended toward larger groups consisting of multiple lineages (Lightfoot and Parish 2009). Preferred settlement sites were near mesquite stands or palm oases. They considered the latter to be sacred (Bean et al. 1978). While villages were occupied year-round, small groups would move seasonally to temporary camps to collect localized plant resources or to hunt. Larger groups would travel to the mountains together with mountain allies to harvest pinyon nuts and acorns. These would be brought to the permanent villages for storage. Species important to the Cahuilla are discussed in Section 9.1.18.

The Cahuilla were long-distance traders. The routes westward through San Gorgonio Pass to the coast lay within their traditional use area, and the Cahuilla maintained trading relationships east of the Colorado River with the Maricopa. They participated in a trade network that stretched as far east as the Great Plains (Bean et al. 1978). While The Cocomaricopa Trail connecting the coast with the Colorado and Gila Rivers passed through their traditional use area (Cleland and Apple 2003) and their major trade orientation appears to have been east–west, they also interacted with their southern neighbors, the Kamia.

9.1.17.1.3 History

The first Europeans to explore southern California were the Spanish in the mid-1500s. Extensive exploration did not take place until the establishment of missions on the Pacific Coast beginning in 1769 (Redlands Institute 2002). The Colorado Desert was an obstacle to avoid during these early years of European exploration. The first Spaniard to cross the desert was Juan Bautista de Anza who crossed a portion of the Colorado Desert in the mid-1770s. He was attempting to establish an overland supply route to the missions on the California coast from those in southern Arizona. The de Anza expedition left modern Arizona in 1774. They followed the Colorado River south from Yuma close to the Colorado delta before turning northwest. The expedition crossed the Salton Basin west of modern Calexico (Doyle et al. 2003). De Anza eventually reached the missions along the coast and returned. After these crossings, the trail was not used again until the 1820s. Those crossing the Colorado Desert in the 1820s were also attempting to connect the missions on the Pacific with those in Arizona. Increasing exploration of the area also brought fur traders into the area during the same period (Doyle et al. 2003). All of the trips across the desert took the route south and west of modern Calexico. It was not until the discovery of gold that the trail system was used heavily.

European settlement in the California area greatly expanded when gold was discovered in 1849 on the American River near Sutter's Mill. The influx of people was so great due to the gold rush that California achieved statehood in the following year. Statehood and gold helped encourage the establishment of railroads into California. In 1853, a group laying out a prospective southern railroad route through the Colorado Desert followed along the eastern shore of prehistoric Lake Cahuilla from north to south. The proposing of this route brought attention to the resources of the Salton Basin. The first rail lines into the Salton Basin were laid in 1875. The railroads extended to Yuma in 1877. The railroad network into the area expanded significantly after the introduction of irrigated agriculture after 1900.

The potential for irrigation and commercial-scale agriculture in the Imperial Valley was first conceived by Dr. Oliver Wozencraft in 1849 (Doyle et al. 2003). His plans failed because of government distractions during the political and social upheavals that culminated in the Civil War. Other attempts were made and failed until money was finally allocated in 1900 to install an irrigation canal from the Colorado River into the Salton Basin. Due to design studies conducted during the late nineteenth century, the canal was to tap into the Colorado River in Mexico and run west to the Alamo River. Work began in 1900 on the Imperial Canal. The canal began operating the following year. A lack of maintenance on the canal and an unusually severe winter in 1904-1905 resulted in the canal being compromised by flood waters in 1905 (Doyle et al. 2003). It was this break that formed the modern Salton Sea. It took two years for the break to be completely repaired. In 1911, the IID was established, and in 1916, it took control of the canal. In 1928, Congress passed the Boulder Canyon Project Act, which authorized construction of the Boulder Dam and the All-American Canal. Actual construction began in 1934. The canal began operating in 1948 after delays caused by WWII.

Once irrigation began in 1901, the area became a major agricultural area. Much of the development in the Salton Basin was the result of the irrigation. Many of the towns in the Imperial Valley were established shortly after the irrigation system was completed. The towns of Imperial, Calexico, Brawley, Holtville, and El Centro were all established between 1900 and 1904 (Doyle et al. 2003). Additional economic development in the Imperial Valley came from the mining of gypsum, salt, manganese, and sand and gravel. Recreation became a source of revenue beginning in the post WWII years. Much of the recreation has focused on the Salton Sea. Fishing, boating, camping, hiking, and wildlife viewing are all activities that have become popular in the Imperial Valley. Several thousand people bring their recreational vehicles to the area every winter (Doyle et al. 2003).

A final aspect of the history of the Imperial Valley was the creation of the CAMA and DTC in 1942 by General George S. Patton. The training area extended from western Arizona, northwest to the Mohave Desert of California, to east of the Salton Sea. Other military facilities in the Imperial Valley included the Old Sandy Beach Naval Station and the Naval Auxiliary Air Station located on the southwest shore of the Salton Sea, and Camp Dunlop (Doyle et al. 2003). East of the Imperial Valley is the Chocolate Mountain Naval Aerial Gunnery Range, which is one part of a larger Naval Air Facility based out of El Centro.

9.1.17.1.4 Traditional Cultural Properties—Landscape

Colorado Desert Tribes 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 and 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. Tribal belief systems and ceremonial activities throughout the region have many elements in common. Many of these common elements have Mohave roots. There remains considerable interaction among the Tribes. A system of alliances furthered trade and the sharing of hunting and gathering grounds.

From the Native American perspective, the proposed Imperial East SEZ is encompassed by a sacred landscape tied together by a network of trails. Passing through the former Kamia settlement of Xahupai, near modern Indian Wells, the Yuma-San Diego Trail comes close to or passes through the SEZ. While an important trade route, it also links two sacred areas. The trail links Pilot Knob (*Avikwalali*), one of the foci of traditional ritual activities for the Quechan, Cocopah, and Kamia with another sacred area on Yuha Mesa (BOR 1994; Cleland and Apple 2003; Doyle et al. 2003). The cultural features at Yuha Basin form a Discontiguous District listed in the *National Register of Historic Places* (NRHP) and are included in the Yuha Basin ACEC. It is located 35 mi (56 km) west of the SEZ. The linked sites include such features as shaman hearths, spirit breaks, memorial cairns, trail cairns, burial cairns, initiation sites, and geoglyphs (Doyle et al. 2003). Such sacred areas served as cross-cultural common grounds or joint use areas for ceremonial activities (Johnson 2003). Pilot Knob serves as the southern terminus of the *Xam Kwatcan* Trail, thus linking the Imperial Valley to the sacred origin mountain *Avikwaame*, in southern Nevada. These trails seldom consist of a single path but were a network of alternative parallel paths most visible on the shoulders and tops of ridge systems, relatively stable alluvial fans, and other upland areas where footing was solid and there was less vegetation to deal with (Cleland and Apple 2003). Pilot Knob is included in BLM ACEC 73 (BLM 1999). It is located 20 mi (32 km) to the east of the SEZ and is visible on a clear day. Picacho Peak, located farther north along the trail and 34 mi (55 km) northeast of the SEZ, is another sacred feature (Singleton 2010a). Its peak would be just visible from the SEZ. The western branch of the *Xam Kwatcan* Trail (Trail of Dreams) reaches a crossroads at Indian Pass ACEC about 27 mi (43 km) northeast of the SEZ and passes the Gold Basin and Rand Intaglios ACEC located about 20 mi (33 km) northeast of the SEZ.

There are no reported pit-house remains in the Imperial East SEZ, but archaeological surveys along the All-American Canal, which parallels the southern boundary of the SEZ, found the area to have a relatively high density of Native American cultural remains (BOR 1994). Before the construction of the dams on the Colorado River lowered its height along the southern reach of the river, the SEZ would have been on its floodplain and may have been inundated during spring flooding. It is possible that fields were planted when waters receded, but more likely it was primarily used as a seasonal gathering area.

According to a Sacred Lands File Search through the Native American Heritage Commission, two burials are recorded in Township and Range sections partially included in the Imperial East SEZ (Singleton 2010b).

9.1.17.1.5 Cultural Surveys and Known Archaeological and Historic Resources

One archaeological survey has been conducted within the Imperial East SEZ in the northwest corner of the SEZ, according to GIS data available from the El Centro Field Office. No sites within the SEZ were recorded from that survey; however, several sites were recorded northwest of the SEZ. Two sites within the SEZ are identified adjacent to State Route 98. Archaeological work conducted in the area is primarily associated with the All-American Canal Lining Project in the early 1990s. According to the 1994 Final Environmental Impact Statement for the project, the area along the canal south of the SEZ is an area of known high density of both prehistoric and historic cultural remains. More than 50 sites have been recorded between the SEZ and the United States–Mexico International Border, most of these are south of the All-American Canal outside of the SEZ. Approximately 40 sites have been recorded directly to the west and southwest of the SEZ, and two sites have been recorded in close proximity to the SEZ in the east. No sites have been recorded to the north and northeast in the dune areas, but no surveys appear to have been conducted in this region, with the exception of the survey described above at the westernmost end of the SEZ.

The BLM has designated several locations within relatively close proximity to the proposed Imperial East SEZ as ACECs because of their significant cultural value. The East Mesa ACEC is adjacent to the SEZ on the east and includes prehistoric resources as well as important biological resources. The four segments of the Lake Cahuilla ACEC include archaeological sites associated with the shores of prehistoric Lake Cahuilla. They range from directly adjacent on the west of the SEZ to about 9 mi (14.5 km) to the northwest. Important places of Native American value associated with the *Xam Kwatcan* Trail are included in the Pilot Knob ACEC about 20 mi (32 km) to the east, Indian Pass ACEC about 27 mi (43 km) to the northeast in the Chocolate Mountains, and the Gold Basin and Rand Intaglios ACEC about 20 mi (33 km) to the northeast. Traditionally, these locations were linked by a network of trails to sites on the western edge of the Imperial Valley: the Yuha Basin ACEC about 27 mi (44 km) to the west of the SEZ, West Mesa SEZ about 35 mi (57 km) to the northwest, and the San Sebastian Marsh/San Felipe Creek ACEC located some 43 mi (70 km) northwest of the SEZ. The latter ACEC also includes historic resources. The Plank Road ACEC, about 10 mi (16 km) east of the SEZ is designated to protect a unique historic road.

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. The All-American Canal is an eligible historic resource that runs adjacent to the SEZ to the south but is not currently listed.

9.1.17.2 Impacts

Direct impacts on significant cultural resources could occur in the proposed Imperial East SEZ; however, as stated in Section 9.1.17.1, 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. Possible impacts from solar energy development on cultural resources that are encountered within the SEZ or along related ROWs are described in more detail in Section 5.15. Impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2. Programmatic design features assume that the necessary surveys, evaluations, and consultations will occur.

Programmatic design features to reduce water runoff and sedimentation would prevent the likelihood of indirect impacts on cultural resources resulting from erosion outside of the SEZ boundary (including along ROWs). Indirect impacts on cultural resources outside of the SEZ as a result of vandalism or theft are unlikely since the SEZ is small in size and is readily accessible and no new access pathways are assumed (see below).

No new access roads or transmission lines have been assessed for the Imperial East 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 the sacred landscape would affect the entire network. The proposed Imperial East SEZ includes or is close to the Yuma-San Diego Trail. Since visible segments tend to follow the shoulders and tops of ridge systems, it is likely that they will not be directly affected by the development of solar facilities. However, Native Americans have expressed concern over the visual impacts of development on segments of those trails that have religious importance (Halmo 2003). Development that is visible from the trails or sacred areas may be considered intrusive. The Imperial East SEZ is not pristine wilderness. It is crossed and bordered by a major interstate highway (I-8) and the All-American Canal. It is relatively distant from Pilot Knob, Yuha Mesa, and Picacho Peak. The horse geoglyph at the base of Pilot Knob is at the base of its southern side. Only a power tower would be visible from that side of the mountain. The site would be visible, but probably not dominant from Picacho Peak. It is also on the valley floor, and a solar facility may be visible from a distance. The construction of an extensive solar energy facility would have more visual impact on the landscape than already exists.

9.1.17.3 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. Because of the possibility for burials in the vicinity of the proposed Imperial East SEZ and its location along the Yuma-San Diego Trail interconnecting a sacred landscape and its associated sites, it is recommended that for surveys conducted in the SEZ, consideration be given to including Native American representatives in the development of survey designs and historic property treatment and monitoring plans.

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9.1.18 Native American Concerns

Native Americans share many environmental and socioeconomic concerns with other ethnic groups. 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 Imperial East SEZ, Section 9.1.17 discusses archaeological sites, structures, landscapes, trails, and traditional cultural properties; Section 9.1.8 discusses mineral resources; Section 9.1.9.1.3 discusses water rights and water use; Section 9.1.10 discusses plant species; Section 9.1.11 discusses wildlife species, including wildlife migration patterns; Section 9.1.13 discusses air quality; Section 9.1.14 discusses visual resources; Sections 9.1.19 and 9.1.20 discuss socioeconomics and environmental justice, respectively; and issues of human health and safety are discussed in Section 5.21. This section focuses on concerns that are specific to Native Americans and to which Native Americans bring a distinct perspective.

Many Native Americans tend to view the whole of the landscape as interconnected and as imbued with a life force, including features and objects viewed by Euro-American cultures as inanimate. The importance of landscapes, geophysical features, trails, rock art, and archaeological sites is discussed in Section 9.1.17. To the extent that these features are religiously significant, it is important to the Tribes that they retain access to those located on federal land as required by the American Indian Religious Freedom Act (AIRFA). They may also regard activities that Euro-Americans would consider secular as having sacred components. For example, for many Native Americans, the taking of game or the gathering of plants or other natural resources is seen as both a sacred and a secular act (Stoffle et al. 1990). The California Native American Heritage Commission (NAHC) has consulted its Sacred Lands File and determined that a Native American burial or village is located in two of the sections at least partially included in the SEZ (Singleton 2010b).

The NAHC has also been consulted to determine which Tribes have a traditional association with the California SEZs (Singleton 2010b). All federally recognized Tribes with traditional ties to the Imperial East SEZ were contacted so that they could identify their concerns regarding solar energy development. Table 9.1.18-1 lists the Tribes contacted because of their traditional ties to the SEZs in southeastern California. Appendix K lists all federally recognized Tribes contacted for this PEIS. The concerns Native Americans have brought up thus far about energy development projects are summarized in this section. Their comments provide important insights into their concerns over energy development in the area.

9.1.18.1 Affected Environment

As discussed in Section 9.1.17.1.2, the territorial boundaries of the Tribes who inhabited the Colorado Desert appear to have been fluid over time. At times they overlapped, and resources were shared where abundant. The Imperial East SEZ, devoid of reliable water sources until the construction of the All-American Canal, does not appear to have been the site of any long-term Native American habitation. While primarily in the traditional range of the Kamia (Knack 1981), it was likely used intermittently and jointly by the surrounding Tribes: the

TABLE 9.1.18-1 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 Fernando Band of Mission Indians	Newhall	California
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
Twentynine Palms Band of Mission Indians	Coachella	California
Viejas Band of Kumeyaay Indians	Alpine	California

Quechan, Cocopah, and perhaps the Cahuilla as well. The Tribal Traditional Use Area boundaries considered here are those presented by the Tribes themselves to the Indian Claims Commission in the 1950s where they exist. While the commission recognized some of the individual claims of the Quechan, most of California, including much of the Imperial Valley, was judged to be the common territory of the "Indians of California" and is so shown on maps of judicially established Native American land claims (Royster 2008). This 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). The claims of the Cahuilla and much of the land claimed by Quechan lie within the territory assigned to the Indians of California, but were presented individually to the commission (Indian Claims Commission 1958; CSRI 2002).

9.1.18.1.1 Territorial Boundaries

Kamia

Remnants of the Kamia had been absorbed by the Quechan by the mid-nineteenth century. They made no separate claim to the Indian Claims Commission, but their homeland, centered on New River and Alamo River, is included in the claims presented to the commission by the Quechan. Kamia territory, as reconstructed from ethnographic sources, would have included the Imperial East SEZ (Knack 1981). Kamia descendants can be found on the Fort Yuma Indian Reservation, located approximately 20 mi (32 km) east of the SEZ.

Quechan

While the heart of Quechan territory lies at the confluence of the Gila and Colorado Rivers well to the east of the SEZ, because the Kamia joined them and because the Quechan traveled westward along the Yuma–San Diego Trail to trade, the territorial claim they presented before the Commission includes the Imperial East SEZ. As presented, their territory extended westward to 10 mi (16 km) west of Mexicali and paralleled the New River northward, encompassing the southern end of the Salton Trough (Indian Claims Commission 1958). Their claim overlaps with that of the Cahuilla and includes lands awarded by the commission to the Indians of California. Quechan descendants occupy the Fort Yuma Indian Reservation in Arizona and California.

Cocopah

The Cocopah appear to have presented no claim before the Indian Claims Commission. Traditionally, they occupied the lower reaches of the Colorado River as far as its mouth and the southern reaches of the New River and Alamo River in what is now Mexico. Earlier, they may have occupied the area now inhabited by the Quechan, with whom they were not on friendly terms. However, they did trade with the Kamia and probably traversed the Imperial East SEZ (de Williams 1983). Cocopah descendants reside on reservations centered around Somerton, Arizona.

Cahuilla

The Coachella Valley, northwest of the Imperial East SEZ, is the heart of Cahuilla territory. Their traditional use area was well north of the SEZ. The southern boundary of the claim presented to the Indian Claims Commission extends from a point northeast of Volcan Mountain through "a point in the area of the Salton Sea, which is approximately 14 mi [23 km] west of the town of Niland" to a point 3 mi (5 km) south of the Riverside County line about 12 mi (19 km) west of the Colorado River (CSRI 2002). The Cahuilla appear to have been on friendly terms with the Kamia and, as traders, may have been familiar with the Yuma–San Diego Trail. Cahuilla descendants can be found on several small reservations in Southern California, including those of the Morongo Band of Mission Indians in Banning and the Agua Caliente Band of Cahuilla Indians in Palm Springs.

9.1.18.1.2 Plant Resources

The traditional Native American subsistence base in the Colorado Desert was a combination of floodplain agriculture and hunting and gathering. The proportion of farming to gathering varied with the Tribe and the land occupied. The banks of New River and Alamo River were used by the Kamia for floodplain agriculture, taking advantage of overflow from the Colorado River, which flowed northwest into the Salton Trough where it sank into the ground. The Imperial East SEZ may sometimes have been inundated during these periods of overflow. Archaeological surveys have shown a relatively high density of artifacts south of the All-American Canal. The SEZ does not appear to have been the center of Kamia occupation, although it may have been an area of traditional hunting and plant collecting.

The plant communities observed or likely to be present at the Imperial East SEZ are discussed in Section 9.1.10. Most of the SEZ is covered by Sonora-Mojave Creosotebush-White Bursage Desert Scrub and North American Warm Desert Active and Stabilized Dune plant communities (NatureServe 2008).

Native American populations have traditionally made use of hundreds of native plants. Table 9.1.18.1-1 lists plants often mentioned as important by Native Americans that were either observed at the Imperial East SEZ or are possible members of the cover-type plant communities identified at the SEZ. The table groups plants by use category, but individual plants are not necessarily confined to one category. These plants are the dominant species; however, other plants important to Native Americans could occur in the SEZ, depending on localized conditions

TABLE 9.1.18.1-1 Plant Species Important to Native Americans Observed or Likely To Be Present in the Proposed Imperial East SEZ

Common Name	Scientific Name	Status
Food		
Buckwheat	*Eriogonum* spp.	Possible
Honey mesquite	*Prosopis Glandolosa*	Observed
Saltbush	*Atriplex* spp.	Possible
Indigo bush	*Psorothamnus schotti*	Observed
Medicine		
Creosotebush	*Larrea tridentata*	Observed
Mormon tea	*Ephedra nevadensis*	Possible
Unspecified		
Boxthorn	*Lycium* sp.	Possible
Brittlebush	*Opuntia* sp.	Possible
Burrowbush	*Ambrosia dumosa*	Possible

Sources: Field visit and NatureServe (2008).

and the season. Creosotebush dominates the SEZ, while mesquite clusters in the western end. Mesquite was among the most important of the traditional wild food plants for Native Americans in this area. Its long, bean-like pods were harvested in the summer, could be stored, and were widely traded. Groves were managed by burning. Mesquite blossoms are edible, and the cicadas and grasshoppers that live in the groves were collected and eaten by the Cahuilla. Mesquite trunks served as a source of wood; fiber from its inner bark was made into string; its thorns were used for tattooing; and its gum was used as an adhesive, a cleansing agent, and medicine. Saltbush and buckwheat seeds were harvested, processed, and eaten (Lightfoot and Parish 2009).

The proposed Imperial East SEZ includes other plants useful to Native Americans. The leaves of the dominant creosote bush were widely made into tea for medicinal purposes, as was 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 by Native Americans, they do not appear to be especially plentiful in the SEZ. It is likely that better sources of these plants existed elsewhere.

9.1.18.1.3 Other Resources

Animal species potentially present in the proposed Imperial East SEZ are listed in Table 9.1.18.1-2. The SEZ has a relatively low potential for game species. Before the construction of the All-American Canal this area would likely have been too dry for game birds; with the canal, quail, a traditional tribal game species, may be present (see Section 9.1.11.2). The

TABLE 9.1.18.1-2 Animal Species Used by Native Americans Whose Range Includes the Proposed Imperial East SEZ

Common Name	Scientific Name	Status
Mammals		
Bighorn sheep	*Ovis canadensis*	All year
Black-tailed jackrabbit	*Lepus californicus*	All year
Coyote	*Canis latrans*	All year
Desert cottontail	*Silvilagus audubonii*	All year
Ground squirrel	*Spermophilus* sp. and *Ammospermophilus* sp.	All year
Wood rat	*Neotoma* spp.	All year
Birds		
Doves		
White-winged dove	*Zenaida asiatica*	Summer
Mourning dove	*Zenaida macrocura*	All year
Gambel’s quail	*Callipepla gambelii*	All year
Reptiles		
Rattlesnakes	*Crotalus* spp.	All year

Sources: Lightfoot and Parrish (2009); de Williams (1983).

SEZ is within the range of the desert mountain sheep. It is not preferred habitat, but individuals may pass through (see 9.1.11.3.1). Black-tailed jackrabbit (*Lepus californicus*) and desert cottontail (*Sylvilagus audubonii*), both traditionally hunted by Native Americans in the area (Doyle et al. 2003; Lightfoot and Parrish 2009), are likely to be present in the SEZ as are other small animals traditionally used as food.

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). Contamination of groundwater was one of the main concerns for industrial developments planned in this region in the past (CSRI 1987).

Some Tribes share with the populace as a whole concerns over potential danger from electromagnetic fields. In traditional Cahuilla culture, electricity, both natural (lightning) and artificially generated, is considered dangerous and something to be avoided (Bean et al. 1978). They may have concerns over a facility that produces electricity and its associated transmission system.

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 solar energy development take place on land that has already been disturbed, such as abandoned farmland, rather than on undisturbed ground (Jackson 2009).

9.1.18.2 Impacts

To date, no comments have been received from the Tribes specifically referencing the proposed Imperial East SEZ. However, in a response letter, the Quechan Indian Tribe of Fort Yuma indicates that some of the California SEZs lie within their Tribal Traditional Use Area, presumably including the Imperial SEZ. The Tribe stresses the importance of evaluating impacts of development on landscapes as a whole (Jackson 2009). The Imperial East SEZ is already surrounded by modern development. The All-American Canal and the United States–Mexico border fence parallel its southern boundary; a freeway, I-8, marks its northern boundary; and it includes hydropower plants and electric substations associated with the canal. These comprise already existing intrusions into the traditional Tribal landscape.

The impacts expected on resources important to Native Americans from solar energy development within the Imperial East SEZ fall into two major categories: impacts on the landscape and impacts on discrete localized resources.

Potential landscape-scale impacts are those caused by the presence of an industrial facility within a culturally important landscape that includes sacred mountains and other geophysical features tied together by a network of sacred 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 traditional cultural values 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 and other effects of solar energy development within the SEZ on a culturally important landscape, including features such as Pilot Knob and Picacho Peak, and on shrines and sacred places (see also Section 9.1.17); however, known features of this type are 20 to 35 mi (32 to 56 km) away from the SEZ. Section 9.1.14 discusses visual impacts and viewing distances.

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 development within the SEZ has the potential for destruction of localized resources. Since solar energy facilities cover large tracts of ground, even taking into account the implementation of design features, it is unlikely that avoidance of all resources would be possible. However, as discussed in Sections 9.1.10 and 9.1.11, impacts on plant and animal resources are expected to be small since there is an abundance of similar plant and animal habitat in the area. Programmatic design features (see Appendix A, Section A.2.2) assume that the necessary cultural surveys, site evaluations, and Tribal consultations will occur.

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.

9.1.18.3 SEZ-Specific Design Features and Design Feature Effectiveness

Programmatic design features to mitigate impacts of potential concern to Native Americans, such as avoidance of burials, 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 9.1.18.3-1 lists the Tribes recommended for contact by the NAHC.

The need for and nature of SEZ-specific design features regarding potential issues of concern, such as burials, the Yuma-San Diego Trail, and Pilot Knob, would be determined during government-to-government consultation with affected Tribes.

TABLE 9.1.18.3-1 Federally Recognized Tribes Listed by the NAHC to Contact Regarding the Proposed Imperial East 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

Sources: (Singleton 2010a,b).

The Quechan Tribe has requested that they be consulted at the inception of any solar energy project that would affect resources important to them. The Quechan also suggest 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 9.1.17.3, in addition to programmatic design features for historic properties discussed in Appendix A, Section A.2.2.

9.1.19 Socioeconomics

9.1.19.1 Affected Environment

This section describes current socioeconomic conditions and local community services within the region of influence (ROI) surrounding the proposed Imperial East SEZ. The ROI is a two-county area consisting of Yuma County in Arizona and Imperial 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 nonpayroll expenditures from the construction, operation, and decommissioning phases of the proposed SEZ facility are expected to take place.

9.1.19.1.1 ROI Employment

In 2008, employment in the ROI stood at 126,391 (Table 9.1.19.1-1). Over the period 1999 to 2008, the annual average employment growth rate was slightly higher in Yuma County (3.6%) than in Imperial County (3.0%). At 3.3%, the growth rate in the ROI as a whole was higher than the average rates for Arizona (2.3%) and California (0.9%).

In 2006, the service sector provided the highest percentage of employment in the ROI at 38.2%, followed by wholesale and retail trade with 23.3% (Table 9.1.19.1-2). Smaller employment shares were held by agriculture (15.2%), manufacturing (8.1%), and construction (7.4%). Within the ROI, the distribution of employment across sectors is similar to that of the ROI as a whole, but with a higher percentage of employment in agriculture (21.1%) and a lower percentage (30.1%) in services in Imperial County, and slightly lower employment in agriculture (10.3%) and slightly higher employment in services (44.4%) in Yuma County.

TABLE 9.1.19.1-1 ROI Employment in the Proposed Imperial East SEZ

Location	1999	2008	Average Annual Growth Rate, 1999–2008 (%)
Yuma County, Arizona	48,903	69,683	3.6
Imperial County, California	42,162	56,708	3.0
ROI	91,065	126,391	3.3
Arizona		2,960,199	2.3
California	15,566,900	17,059,574	0.9

Sources: U.S Department of Labor (2009a,b).

TABLE 9.1.19.1-2 ROI Employment in the Proposed Imperial East SEZ by Sector, 2006[a]

	Yuma County, Arizona		Imperial County, California		ROI	
	Employment	% of Total	Employment	% of Total	Employment	% of Total
Agriculture[a]	5,017	10.3	8,711	21.1	13,728	15.2
Mining	53	0.1	175	0.4	228	0.3
Construction	4,696	9.6	1,995	4.8	6,691	7.4
Manufacturing	3,374	6.9	3,938	9.5	7,312	8.1
Transportation and public utilities	1,471	3.0	1,981	4.8	3,452	3.8
Wholesale and retail trade	10,624	21.8	10,393	25.2	21,017	23.3
Finance, insurance, and real estate	1,874	3.8	1,495	3.6	3,369	3.7
Services	21,636	44.4	12,768	30.9	34,404	38.2
Other	10	0.0	6	0.0	16	0.0
Total	48,746		41,275		90,021	

[a] Agricultural employment includes 2007 data for hired farmworkers.

Sources: U.S. Bureau of the Census (2009a); USDA (2009a,b).

9.1.19.1.2 ROI Unemployment

Unemployment rates have been high in both counties in the ROI. Over the period 1999 to 2008, the average rate in Imperial County was 17.7%, slightly higher than the rate in Yuma County (17.4%) (Table 9.1.19.1-3). The average rate in the ROI over this period was 17.5%, much higher than the average rates for California (5.8%) and Arizona (4.8%). Unemployment rates for the first 10 months of 2009 contrast markedly with rates for 2008 as a whole; in Imperial County, the unemployment rate increased to 29.3%, while in Yuma County the rate reached 21.3%. The average rates for the ROI (25.1%), for California (11.6%), and for Arizona (8.4%) were also higher during this period than the corresponding average rates for 2008.

9.1.19.1.3 ROI Urban Population

The population of the ROI in 2008 was 72% urban, with a group of cities clustered around El Centro in the southern portion of Imperial County, and the largest population centered on Yuma, in the western part of Yuma County.

The largest urban area in Imperial County, El Centro, had an estimated 2006 to 2008 population of 40,081; other cities in the county include Calexico (37,978) and Brawley (22,593) (Table 9.1.19.1-4). In addition, four other cities in the county had a 2006 to 2008 population ranging between 2,185 and 13,444 persons. Most of these cities are about 20 mi (32 km) from the site of the proposed SEZ. Population growth rates among the cities in Imperial County have varied over the period 2000 to 2008. Imperial grew at an annual rate of 7.5% during this period, with higher than average growth also experienced in Calexico (4.3%). The cities of El Centro (0.7%), Calipatria (0.5%), Brawley (0.4%), Westmoreland (0.3%), and Holtville (–0.5%) all experienced lower growth rates between 2000 and 2008.

TABLE 9.1.19.1-3 ROI Unemployment Rates for the Proposed Imperial East SEZ (%)

Location	1999–2008	2008	2009[a]
Yuma County, Arizona	17.4	17.1	21.3
Imperial County, California	17.7	22.9	29.3
ROI	17.5	19.8	25.1
Arizona	4.8	5.5	8.4
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).

TABLE 9.1.19.1-4 ROI Urban Population and Income for the Proposed Imperial East SEZ

City	Population			Median Household Income ($ 2008)		
	2000	2008	Average Annual Growth Rate, 2000–2008 (%)	1999	2006–2008	Average Annual Growth Rate, 1999 and 2006–2008 (%)[a]
Yuma, Arizona	77,715	89,842	1.9	45,545	42,095	–0.9
El Centro	37,835	40,081	0.7	42,695	36,959	–1.6
Calexico	27,109	37,978	4.3	37,247	32,288	–1.5
San Luis, Arizona	15,322	24,654	6.1	29,569	23,305	–2.6
Brawley	22,052	22,593	0.4	40,270	35,582	–1.4
Imperial	7,560	13,444	7.5	63,669	NA	NA
Somerton, Arizona	7,266	12,146	6.9	34,176	NA	NA
Calipatria	7,289	7,566	0.5	39,864	NA	NA
Holtville	5,612	5,396	–0.5	46,760	NA	NA
Westmoreland	2,131	2,185	0.3	30,083	NA	NA
Wellton, Arizona	1,829	1,921	0.6	34,821	NA	NA

[a] Data are averages for the period 2006 to 2008.

Source: U.S. Bureau of the Census (2009b-d).

Yuma County has three small cities—San Luis (24,654), Somerton (12,146), and Wellton (1,921)—in addition to Yuma (89,842). Population growth between 2000 and 2008 was relatively high in Somerton (6.9%) and San Luis (6.1%), with annual growth rates of 1.9% in Yuma and 0.6% in Wellton.

9.1.19.1.4 ROI Urban Income

Median household incomes varied considerably across cities in the ROI. One city in Imperial County, Imperial ($63,669), had median incomes in 1999 that were higher than the average for the state ($61,154) (Table 9.1.19.1-4). The remainder of the cities in the ROI had relatively low median household incomes, and two cities—Westmoreland ($30,083) and San Luis ($29,569)—had median incomes that were less than half the state average.

Data on median household incomes in the ROI for the period 2006 to 2008 were only available for five cities. Among these cities, median incomes growth rates for the period 1999 and 2006 to 2008 were negative, with a fairly large decline in median incomes in San Luis (–2.6%). The average median household income growth rate for the state as a whole over this period was less than 0.1%.

9.1.19.1.5 ROI Population

Table 9.1.19.1-5 presents recent and projected populations in the ROI and states as a whole. Population in the ROI stood at 356,392 in 2008, having grown at an average annual rate of 2.1% since 2000. The average annual growth rate for the ROI was lower than that for Arizona (3.2%) and higher than that for California (1.5%) over the same period.

Both counties in the ROI have experienced growth in population since 2000; population in Yuma County grew at an annual rate of 2.4% between 2000 and 2008, while in Imperial County population grew by 1.7% over the same period. The ROI population is expected to increase to 519,735 by 2021 and to 583,043 by 2023.

9.1.19.1.6 ROI Income

Personal income in the ROI stood at $8.4 billion in 2007 and has grown at an annual average rate of 2.4% over the period 1998 to 2007 (Table 9.1.19.1-6). Per capita income in the ROI fell over the same period at a rate of −0.3%, declining from $23,036 to $22,375. Per-capita incomes were slightly higher in Imperial County ($22,476) than in Yuma County ($22,194) in 2007. Per-capita income growth rates were lower in both counties than the corresponding state rates for Arizona (0.9%) and California (1.1%).

Median household incomes in 2006 to 2008 varied from $37,492 in Imperial County to $40,079 in Yuma County (U.S. Bureau of the Census 2009d).

TABLE 9.1.19.1-5 ROI Population for the Proposed Imperial East SEZ

Location	2000	2008	Average Annual Growth Rate, 2000–2008 (%)	2021	2023
Yuma County, Arizona	160,026	193,299	2.4	276,132	285,531
Imperial County, California	142,361	163,093	1.7	243,603	252,512
ROI	302,387	356,392	2.1	519,735	583,043
Arizona	5,130,632	6,622,885	3.2	8,945,447	9,271,163
California	34,105,437	38,129,628	1.5	44,646,420	45,667,413

Sources: U.S. Bureau of the Census (2009e,f); Arizona Department of Commerce (2010); California Department of Finance (2010).

TABLE 9.1.19.1-6 ROI Personal Income for the Proposed Imperial East SEZ

Location	1998	2007	Average Annual Growth Rate, 1998–2007 (%)
Yuma County, Arizona			
Total income[a]	3.3	4.5	3.0
Per-capita income	22,314	22,194	−0.1
Imperial County, California			
Total income[a]	3.3	4.0	1.8
Per-capita income	23,806	22,476	−0.6
ROI			
Total income[a]	6.6	8.4	2.4
Per-capita income	23,036	22,375	−0.3
Arizona			
Total income[a]	149.2	215.8	3.8
Per-capita income	30,551	33,558	0.9
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 the Census (2009e,f).

9.1.19.1.7 ROI Housing

In 2007, more than 139,823 housing units were located in the two ROI counties, with about 62% of these located in Yuma County (Table 9.1.19.1-7). Owner-occupied units account for approximately 64% of the occupied units in the two counties, with rental housing making up 36% of the total. Vacancy rates in 2007 were 19.8% in Yuma County and 13.6% in Imperial County; 15.7% of housing units in Yuma County and 4.7% in Imperial County were used for seasonal or recreational purposes. With an overall vacancy rate of 17.5% in the ROI, there were 24,415 vacant housing units in the ROI in 2007, of which 8,868 are estimated to be rental units that would be available to construction workers. There were 13,750 seasonal, recreational, or occasional-use units in the ROI at the time of the 2000 Census.

Housing stock in the ROI as a whole grew at an annual rate of 2.4% over the period 2000 to 2007, with 21,792 new units added to the existing housing stock in the ROI (Table 9.1.19.1-7).

TABLE 9.1.19.1-7 ROI Housing Characteristics for the Proposed Imperial East SEZ

Parameter	2000	2007[a]
Yuma County, Arizona		
Owner-occupied	38,911	48,658
Rental	14,937	20,774
Vacant units	20,292	17,150
Seasonal and recreational use	11,668	NA
Total units	74,140	86,582
Imperial County, California		
Owner-occupied	22,975	24,831
Rental	16,409	21,145
Vacant units	4,507	7,265
Seasonal and recreational use	2,082	NA
Total units	43,891	53,241
ROI Total		
Owner-occupied	61,886	73,489
Rental	31,346	41,919
Vacant units	24,799	24,415
Seasonal and recreational use	13,750	NA
Total units	118,031	139,823

[a] NA = data not available.

Sources: U.S. Bureau of the Census (2009h,i).

The median value of owner-occupied housing in 2008 varied between $147,400 in Yuma County and $233,700 in Imperial County (U.S. Bureau of the Census 2009g).

9.1.19.1.8 ROI Local Government Organizations

The various local and county government organizations in Imperial County are listed in Table 9.1.19.1-8. No Tribal governments are located in the ROI, although there are members of Tribal groups located in the ROI, but whose Tribal governments are located in adjacent states.

9.1.19.1.9 ROI Community and Social Services

This section describes educational, health care, law enforcement, and firefighting resources in the ROI.

TABLE 9.1.19.1-8 ROI Local Government Organizations and Social Institutions in the Proposed Imperial East SEZ

Governments	
City	
Brawley	San Luis, Arizona
Calexico	Somerton, Arizona
Calipatria	Welton, Arizona
El Centro	Westmoreland
Holtville	Yuma, Arizona
Imperial	
County	
Imperial County	
Tribal	
None	

Sources: U.S. Bureau of the Census (2009b); U.S. Department of the Interior (2010).

Schools

In 2007, the six-county ROI had a total of 119 public and private elementary, middle, and high schools (NCES 2009). Table 9.1.19.1-9 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 Yuma County schools (20.2) is slightly lower than that for schools in Imperial County (20.9), while the level of service is slightly higher in Imperial County (10.8) than in Yuma County, where there are fewer teachers per 1,000 population (9.5).

Health Care

The number of physicians (268) and the number of doctors per 1,000 population (1.4) are slightly higher in Yuma County than in Imperial County (150 and 0.9, respectively) (Table 9.1.19.1-10).

Public Safety

Several state, county, and local police departments provide law enforcement in the ROI (Table 9.1.19.1-11). Imperial County has 177 officers and would provide law enforcement

TABLE 9.1.19.1-9 ROI School District Data for the Proposed Imperial East SEZ, 2007

Location	Number of Students	Number of Teachers	Student-Teacher Ratio	Level of Service[a]
Yuma County, Arizona	55	1,800	20.2	9.5
Imperial County, California	64	1,735	20.9	10.8
ROI	119	3,535	20.5	10.1

[a] Number of teachers per 1,000 population.

Source: NCES (2009).

TABLE 9.1.19.1-10 Physicians in the Proposed Imperial East SEZ ROI, 2007

Location	Number of Primary Care Physicians	Level of Service[a]
Yuma County, Arizona	268	1.4
Imperial County, California	150	0.9
ROI	418	1.1

[a] Number of physicians per 1,000 population.

Source: AMA (2009).

services to the SEZ; there are 68 officers in Yuma County. Currently, there are 237 professional firefighters in the ROI (Table 9.1.19.1-11). Levels of service of police protection are 1.1 per 1,000 population in Imperial County and 0.4 in Yuma County.

9.1.19.1.10 ROI Social Structure and Social 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.

TABLE 9.1.19.1-11 Public Safety Employment in the Proposed Imperial East SEZ ROI

Location	Number of Police Officers[a]	Level of Service[b]	Number of Firefighters[c]	Level of Service
Yuma County, Arizona	68	0.4	127	0.7
Imperial County, California	177	1.1	110	0.7
ROI	245	0.7	237	0.7

[a] 2007 data.

[b] Number per 1,000 population.

[c] 2008 data; number does not include volunteers.

Sources: U.S. Department of Justice (2008); Fire Departments Network (2009).

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 would increase and levels of community satisfaction would deteriorate (BLM 1980, 1983, 1996). Tables 9.1.19.1-12 and 9.1.19.1-13 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.

There is some variation in the level of crime across the ROI, with slightly higher rates of violent crime in Yuma County (3.1 per 1,000 population) than in Imperial County (2.9) (Table 9.1.19.1-12). Property-related crime rates are slightly higher in Imperial County (33.4) than in Yuma County (21.1), meaning that overall crime rates in Imperial County (36.0) were higher than for Yuma County (24.2).

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. There is some variation across the two regions in which the two counties are located, with slightly higher rates for alcoholism and illicit drug in the region in which Imperial County is located and slightly higher rates of mental illness in the region in which Yuma County is located (Table 9.1.19.1-13).

9.1.19.1.11 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 9.1.5.

TABLE 9.1.19.1-12 County and ROI Crime Rates for the Proposed Imperial East SEZ ROI[a]

	Violent Crime[b]		Property Crime[c]		All Crime	
Location	Offenses	Rate	Offenses	Rate	Offenses	Rate
Yuma County, Arizona	637	3.1	4,376	21.1	5,013	24.2
Imperial County, California	474	2.9	6,025	33.4	6,499	36.0
ROI	1,111	2.9	10,401	26.8	11,512	29.7

[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 9.1.19.1-13 Alcoholism, Drug Use, Mental Health, and Divorce in the Proposed Imperial East SEZ ROI[a]

Geographic Area	Alcoholism	Illicit Drug Use	Mental Health[b]	Divorce[c]
Arizona Rural South Region (includes Yuma County)	7.3	2.6	8.8	–[d]
California Region 13 (includes Imperial County)	8.5	3.2	8.6	–
Arizona				3.9
California				4.3

[a] Data for alcoholism and drug use represent percentage of the population over 12 years of age with dependence or abuse of alcohol, illicit drugs. Data are averages for 2004 to 2006.

[b] Data for mental health represent percentage 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).

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).

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, 10,020 people were employed in the ROI in the various sectors identified as recreation, constituting 8.2% of total ROI employment (Table 9.1.19.1-14). Recreation spending also produced $198 million in income in the ROI in 2007. The primary sources of recreation-related employment were eating and drinking places.

9.1.19.2 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.

TABLE 9.1.19.1-14 ROI Recreation Sector Activity in the Proposed Imperial East SEZ, 2007

ROI	Employment[b]	Income ($ million)
Amusement and recreation services	74	1.5
Automotive rental	142	12.7
Eating and drinking places	7,874	133.5
Hotels and lodging places	549	12.2
Museums and historic sites,	14	0.4
Recreational vehicle parks and campsites	385	10.4
Scenic tours	457	18.4
Sporting goods retailers	525	9.2
Total ROI	10,020	198.3

Source: MIG, Inc. (2009).

9.1.19.2.1 Common Impacts

Construction and operation of a solar energy facility at the proposed Imperial East 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 nonmarket values (i.e., 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 0.3% 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 lack of available housing to accommodate all in-migrating workers and families in smaller rural communities in the ROI, and insufficient range of housing choices to suit all solar occupations, many workers are likely to 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.

9.1.19.2.2 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 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 one project could be constructed within a given year, with a corresponding maximum land disturbance of up to 3,000 acres (12 km^2). For operations impacts, a representative first year of operations was assumed to be 2023 for trough and power tower, 2022 for the minimum facility size for dish engine and PV, and 2023 for the maximum facility size for these technologies. 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 technology would be up to 2,769 jobs (Table 9.1.19.2-1).

Construction activities would constitute 1.5% of total ROI employment. A solar development would also produce $159.9 million in income. Direct sales taxes would be $0.6 million; direct income taxes, $6.1 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 1,325 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 accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility construction on the number of vacant rental housing units would not be expected to be large, with 663 rental units expected to be occupied in the ROI. This occupancy rate would represent 5.4% of the vacant rental units expected to be available in the ROI.

In addition to the potential impact on housing markets, in-migration also 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, 13 new teachers, 2 physicians, and 2 public safety employees (career firefighters and uniformed police officers) would be required in the ROI. These increases would represent 0.3% of total ROI employment expected in these occupations.

Operations. Total operations employment impacts in the ROI (including direct and indirect impacts) from a build-out using solar trough technologies would be 288 jobs (Table 9.1.19.2-1). Such a solar development would also produce $9.8 million in income. Direct sales taxes would be $0.1 million; direct income taxes, $0.3 million. Based on fees established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010b), acreage rental payments would be $1.1 million, and solar generating capacity payments would total at least $6.0 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 65 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 accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility operation on the number of vacant owner-occupied housing units would not be expected to be large, with 59 owner-occupied units expected to be occupied in the ROI.

TABLE 9.1.19.2-1 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed Imperial East SEZ with Trough Facilities[a]

Parameter	Maximum Annual Construction Impacts	Operations Impacts
Employment (no.)		
Direct	1,682	199
Total	2,769	288
Income[b]		
Total	159.9	9.8
Direct state taxes[b]		
Sales	0.6	0.1
Income	6.1	0.3
BLM payments ($ million 2008)		
Rental	NA[d]	1.1
Capacity[e]	NA	6.0
In-migrants (no.)	1,325	65
Vacant housing[c] (no.)	663	59
Local community service employment		
Teachers (no.)	13	1
Physicians (no.)	2	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 600 MW (corresponding to 3,000 acres [12 km^2] of land disturbance) could be built. Operations impacts were based on full build-out of the site, producing a total output of 916 MW.

b Unless indicated otherwise, values are reported in $ million 2008.

c Construction activities would affect vacant rental housing; operations activities would affect vacant owner-occupied housing.

d NA = not applicable.

e 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 2010b), 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.

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 technology would be up to 1,103 jobs (Table 9.1.19.2-2). Construction activities would constitute 0.6% of total ROI employment. Such a solar development would also produce $63.7 million in income. Direct sales taxes would be less than $0.2 million; direct income taxes, $2.4 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 528 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 accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility construction on the number of vacant rental housing units would not be expected to be large, with 264 rental units expected to be occupied in the ROI. This occupancy rate would represent 2.2% 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, five new teachers, one physician, and one public safety employee 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) from a build-out using power tower technologies would be 133 jobs (Table 9.1.19.2-2). Such a solar development would also produce $4.3 million in income. Direct sales taxes would be less than $0.1 million; direct income taxes, $0.2 million. Based on fees established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010b), acreage rental payments would be $1.1 million, and solar generating capacity payments would total at least $3.3 million.

Given the likelihood of local worker availability in the required occupational categories, operation of a power tower facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 34 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 accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility operation on the number of vacant

TABLE 9.1.19.2-2 ROI Socioeconomic Impacts Assuming Full Build-out of the Imperial East SEZ with Power Tower Facilities[a]

Parameter	Maximum Annual Construction Impacts	Operations Impacts
Employment (no.)		
Direct	670	103
Total	1,103	133
Income[b]		
Total	63.7	4.3
Direct state taxes[b]		
Sales	0.2	<0.1
Income	2.4	0.2
BLM payments ($ million 2008)		
Rental	NA[d]	1.1
Capacity[e]	NA	3.3
In-migrants (no.)	528	34
Vacant housing[c] (no.)	264	30
Local community service employment		
Teachers (no.)	5	0
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 333 MW (corresponding to 3,000 acres [12 km^2] of land disturbance) could be built. Operations impacts were based on full build-out of the site, producing a total output of 509 MW.

b Unless indicated otherwise, values are reported in $ million 2008.

c Construction activities would affect vacant rental housing; operations activities would affect vacant owner-occupied housing.

d NA = not applicable.

e 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 2010b), 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.

owner-occupied housing units would not be expected to be large, with 30 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.

Dish Engine

Construction. Total construction employment impacts in the ROI (including direct and indirect impacts) from the use of dish engine technology would be up to 448 jobs (Table 9.1.19.2-3). Construction activities would constitute 0.2% of total ROI employment. Such a solar development would also produce $25.9 million in income. Direct sales taxes would be $0.1 million; direct income taxes, $1.0 million.

Given the scale of construction activities and the likelihood of local worker availability in the required occupational categories, construction of a dish engine facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 215 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 accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility construction on the number of vacant rental housing units would not be expected to be large, with 107 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, 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) from a build-out using dish engine technology would be 129 jobs (Table 9.1.19.2-3). Such a solar development would also produce $4.2 million in income. Direct sales taxes would be less than $0.1 million; direct income taxes, $0.2 million. Based on fees established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010b), acreage rental payments would be $1.1 million, and solar generating capacity payments would total at least $3.3 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 33 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 accommodations (hotels, motels, and mobile

TABLE 9.1.19.2-3 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed Imperial East SEZ with Dish Engine Facilities[a]

Parameter	Maximum Annual Construction Impacts	Operations Impacts
Employment (no.)		
Direct	272	100
Total	448	129
Income[b]		
Total	25.9	4.2
Direct state taxes[b]		
Sales	0.1	<0.1
Income	1.0	0.2
BLM payments ($ million 2008)		
Rental	NA[d]	1.1
Capacity[e]	NA	3.3
In-migrants (no.)	215	33
Vacant housing[c] (no.)	107	29
Local community service employment		
Teachers (no.)	2	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 333 MW (corresponding to 3,000 acres [12 km^2] of land disturbance) could be built. Operations impacts were based on full build-out of the site, producing a total output of 509 MW.

b Unless indicated otherwise, values are reported in $ million 2008.

c Construction activities would affect vacant rental housing; operations activities would affect vacant owner-occupied housing.

d NA = not applicable.

e 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 2010b), 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.

home parks) mean that the impact of solar facility operation on the number of vacant owner-occupied housing units would not be expected to be large, with 29 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.

Photovoltaic

Construction. Total construction employment impacts in the ROI (including direct and indirect impacts) from the use of PV technology would be up to 209 jobs (Table 9.1.19.2-4). Construction activities would constitute 0.1% of total ROI employment. Such a solar development would also produce $12.1 million in income. Direct sales taxes would be less than $0.1 million; direct income taxes, $0.5 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 100 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 accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility construction on the number of vacant rental housing units would not be expected to be large, with 50 rental units expected to be occupied in the ROI. This occupancy rate would represent 0.4% 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, one 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) from a build-out using PV technologies would be 13 jobs (Table 9.1.19.2-4). Such a solar development would also produce $0.4 million in income. Direct sales taxes would be less than $0.1 million; direct income taxes, less than $0.1 million. Based on fees established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010b), acreage rental payments would be $1.1 million, and solar generating capacity payments would total at least $2.7 million.

Given the likelihood of local worker availability in the required occupational categories, operation of a PV solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with three 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 accommodations (hotels, motels, and mobile home

TABLE 9.1.19.2-4 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed Imperial East SEZ with PV Facilities[a]

Parameter	Maximum Annual Construction Impacts	Operations Impacts
Employment (no.)		
Direct	127	10
Total	209	13
Income[b]		
Total	12.1	0.4
Direct state taxes[b]		
Sales	<0.1	<0.1
Income	0.5	<0.1
BLM payments ($ million 2008)		
Rental	NA[d]	1.1
Capacity[e]	NA	2.7
In-migrants (no.)	100	3
Vacant housing[c] (no.)	50	2
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 333 MW (corresponding to 3,000 acres [12 km^2] of land disturbance) could be built. Operations impacts were based on full build-out of the site, producing a total output of 509 MW.

b Unless indicated otherwise, values are reported in $ million 2008.

c Construction activities would affect vacant rental housing; operations activities would affect owner-occupied housing.

d NA = not applicable.

e 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 2010b), assuming full build-out of the site.

parks) mean that the impact of solar facility operation on the number of vacant owner-occupied housing units would not be expected to be large, with two 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.

9.1.19.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features addressing socioeconomic impacts have been identified for the proposed Imperial East 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.

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9.1.20 Environmental Justice

9.1.20.1 Affected Environment

Executive Order 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 Council on Environmental Quality's (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 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 Imperial East 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 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 in 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 origins. In addition, persons who classify themselves as being of multiple racial origin 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 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 9.1.20.1-1 show the minority and low-income composition of the 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 in Arizona, 55.8% of the population is classified as minority, while 19.2% is classified as low-income. The number of minority individuals exceeds 50% of the total population in the area, and the number of minority individuals exceeds the state average by 20 percentage points or more; thus, there is a 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; thus, there are no low-income populations in the 50-mi (80-km) area around the boundary of the SEZ.

Within the 50-mi (80-km) radius in California, 80.1% of the population is classified as minority, while 22.6% is classified as low income. The number of minority individuals exceeds 50% of the total population in the area, and the number of minority individuals exceeds the state average by 20 percentage points or more; thus, there is a 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

TABLE 9.1.20.1-1 Minority and Low-Income Populations within the 50-mi (80-km) Radius Surrounding the Proposed Imperial East SEZ

Parameter	Arizona	California
Total population	155,910	149,237
White, non-Hispanic	68,985	29,751
Hispanic or Latino	78,732	106,238
Non-Hispanic or Latino minorities	8,193	13,248
One race	6,524	11,949
Black or African American	3,105	7,260
American Indian or Alaskan Native	1,804	1,784
Asian	1,353	2,569
Native Hawaiian or Other Pacific Islander	132	112
Some other race	130	224
Two or more races	1,669	1,299
Total minority	86,925	119,486
Low income	28,763	29,419
Percentage minority	55.8	80.1
State percentage minority	24.5	40.5
Percentage low-income	19.2	22.6
State percentage low-income	13.9	14.2

Source: U.S. Bureau of the Census (2009k.l).

population in the area; thus, there are no low-income populations in the 50-mi (80-km) area around the boundary of the SEZ.

Figures 9.1.20.1-1 and 9.1.20.1-2 show the locations of the minority and low-income population groups within the 50-mi (80-km) area around the boundary of the SEZ.

In the California portion of the 50-mi (80-km) radius around the SEZ, more than 50% of the population is classified as minority in block groups located to the west and northwest of the SEZ; in the area surrounding the cities of Brawley, El Centro, Imperial, Westmoreland, and Calipatria; in the city of Brawley itself;; and next to the Colorado River in the Fort Yuma Indian Reservation. Block groups with a minority population that is more than 20 percentage points higher than the state average are located to the west of the SEZ, in the cities of Mexicali, El Centro, Holtville, Brawley, Westmoreland, and Calipatria, and in the Fort Yuma Indian Reservation. In the Arizona portion of the 50-mi (80-km) radius, more than 50% of the population is classified as minority in block groups located to the immediate east and south of

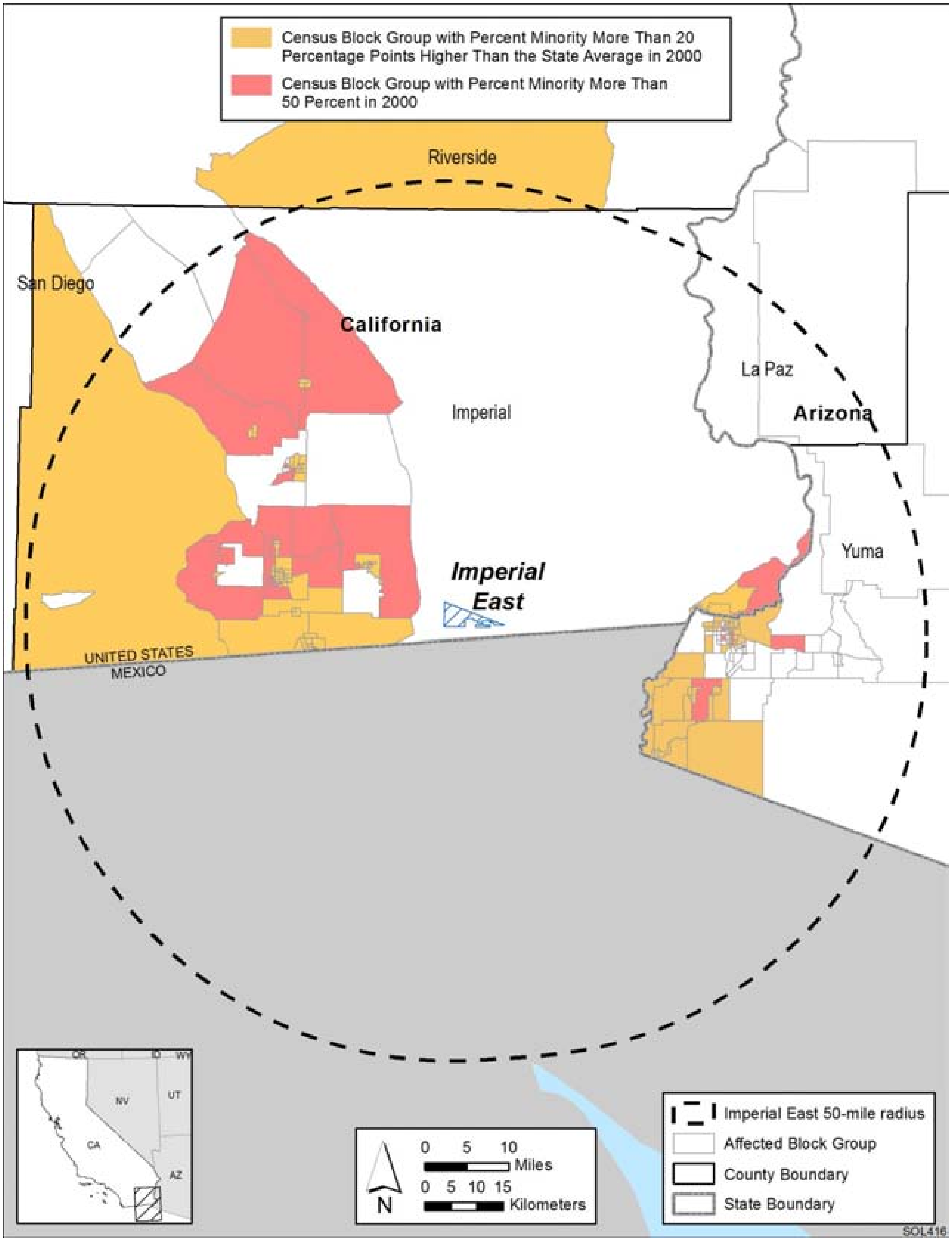

FIGURE 9.1.20.1-1 Minority Population Groups within the 50-mi (80-km) Area Surrounding the Proposed Imperial East SEZ

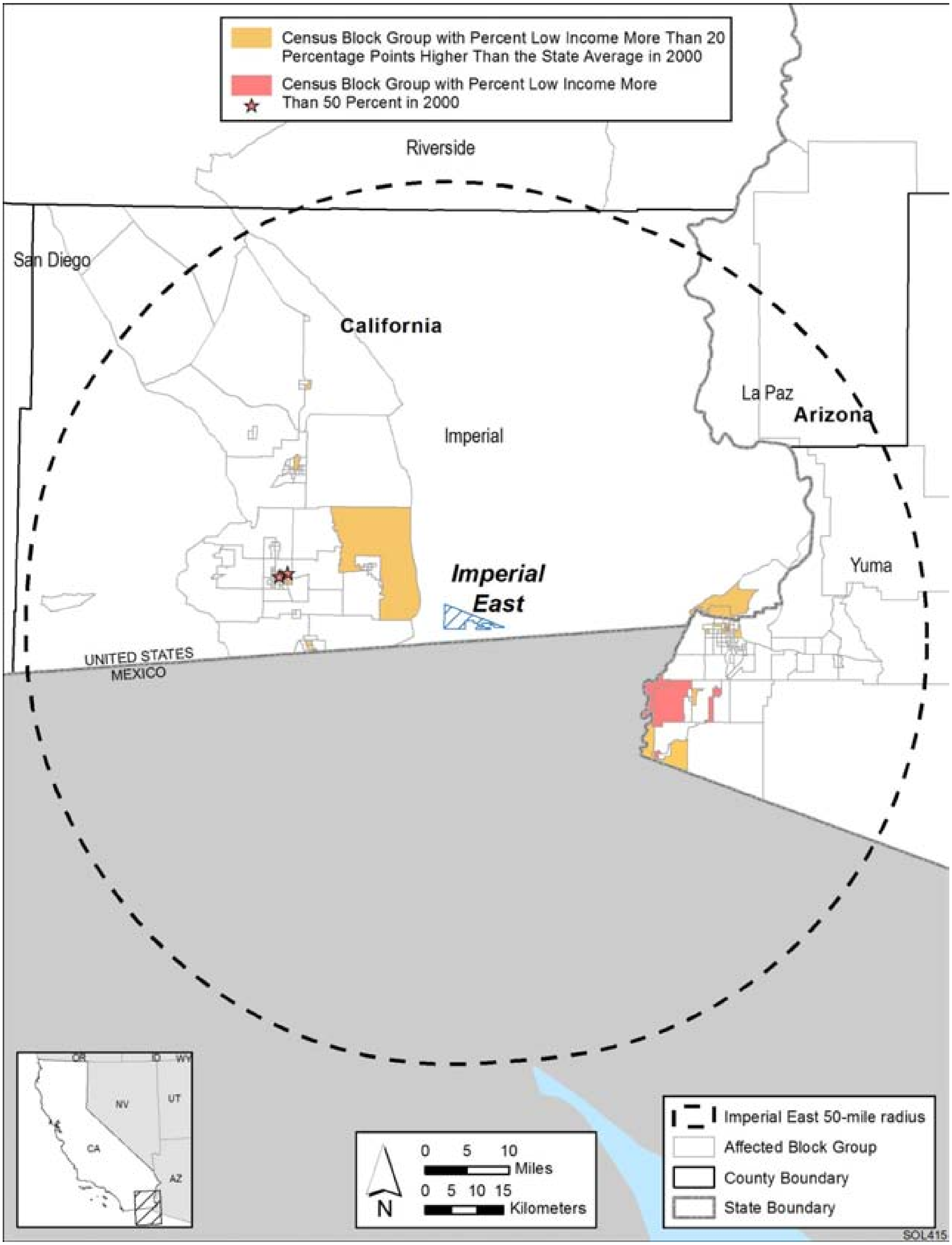

FIGURE 9.1.20.1-2 Low-Income Population Groups within the 50-mi (80-km) Radius Surrounding the Proposed Imperial East SEZ

the city of Yuma. Block groups with a minority population that is more than 20 percentage points higher than the state average are located in the city of Yuma, to the immediate east and to the southwest of the city.

Low-income populations in the 50-mi (80-km) radius are limited to block groups in the City of El Centro, around the City of Holtville, and in the Fort Yuma Indian Reservation. In Arizona, there are a number of block groups in which the low-income population exceeds 50% of the total population and in which the low-income population is more than 20 percentage points higher than the state average, located to the southwest of the city of Yuma.

9.1.20.2 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 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 Imperial East SEZ include noise and dust during the construction of solar facilities; noise and electromagnetic field (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; these are 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 Imperial East SEZ; no low-income populations are present (Section 9.1.20.1).

Potential impacts on low-income and minority populations could be incurred as a result of the construction and operation of solar development involving each of the four technologies. Although impacts are likely to be small, there are minority populations, as defined by CEQ guidelines (Section 9.1.20.1), within the 50-mi (80-km) radius around the boundary of the SEZ; thus 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.

9.1.20.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features addressing environmental justice impacts have been identified for the proposed Imperial East 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.

9.1.21 Transportation

The proposed Imperial East SEZ is accessible by road. An interstate highway and a state highway border the SEZ, with a rail line about 17 mi (27 km) away. Three small airports are located within 34 mi (55 km) of the SEZ in the United States with a fourth small airport located approximately 5 mi (8 km) away in Mexico. General transportation considerations and impacts are discussed in Sections 3.4 and 5.19, respectively

9.1.21.1 Affected Environment

State Route 98, a two-lane highway, passes through the southern edge of the Imperial East SEZ, as shown in Figure 9.1.21-1. The figure also shows the designated open OHV routes in the proposed Imperial East SEZ. These routes were designated under the CDCA Plan (BLM 1999). The town of Calexico is located about 15 mi (24 km) to the west of the SEZ along State Route 98. To the east, State Route 98 terminates at I-8 at the southeast corner of the SEZ. I-8 forms the northeastern boundary of the SEZ. Yuma, Arizona is about 29 mi (47 km) to the east along I-8, and El Centro, California is 19 mi (31 km) to the west along I-8, with San Diego slightly more than another 100 mi (160 km) farther down the road. Annual average traffic volumes along State Route 98 and I-8 near the SEZ for 2008 are provided in Table 9.1.21.1-1.

A branch line of the Union Pacific (UP) Railroad serves the nearby area (Union Pacific Railroad 2009). Rail service is available in Calexico and El Centro to the west of the Imperial East SEZ. A branch line originates at the Niland stop along the UP railroad main line between Los Angeles and Tucson. This branch line travels south through El Centro and Calexico before it passes into Mexico. The UP main line also provides service to the east of the SEZ in Yuma.

Three small public airports on the United States side of the border with Mexico are within a driving distance of approximately 34 mi (55 km) of the Imperial East SEZ. The nearest public airport, which is suitable only for light aircraft, is the Calexico International Airport, approximately 18 mi (29 km) to the west of the SEZ, taking State Route 98 to State Route 111 south in Calexico. The airport is operated by the City of Calexico and has one asphalt runway that is 4,679-ft (1,426-m) long in good condition (FAA 2009).

The Imperial County Airport is located north of El Centro off State Route 86, north of I-8, approximately 25 mi (40 km) to the northwest of the SEZ. Owned and operated by the County of Imperial, this airport has two asphalt runways, 4,500- and 5,304-ft (1,372- and 1,617-m) long, both in good condition (FAA 2009). In 2008, the amount of commercial freight shipped and received at the Imperial County Airport was 1,374,379 lb (623,408 kg) and 975,544 lb (442,499 kg), respectively (BTS 2009). Scheduled passenger service at the airport is provided by Skywest/United Airlines or one of its partners (SkyWest 2004). In 2008, 11,837 and 11,665 passengers arrived and departed, respectively (BTS 2009).

Approximately 34 mi (55 km) to the east of the SEZ, the Yuma County Airport Authority (YCAA) operates the Yuma International Airport in Yuma, Arizona, with scheduled passenger

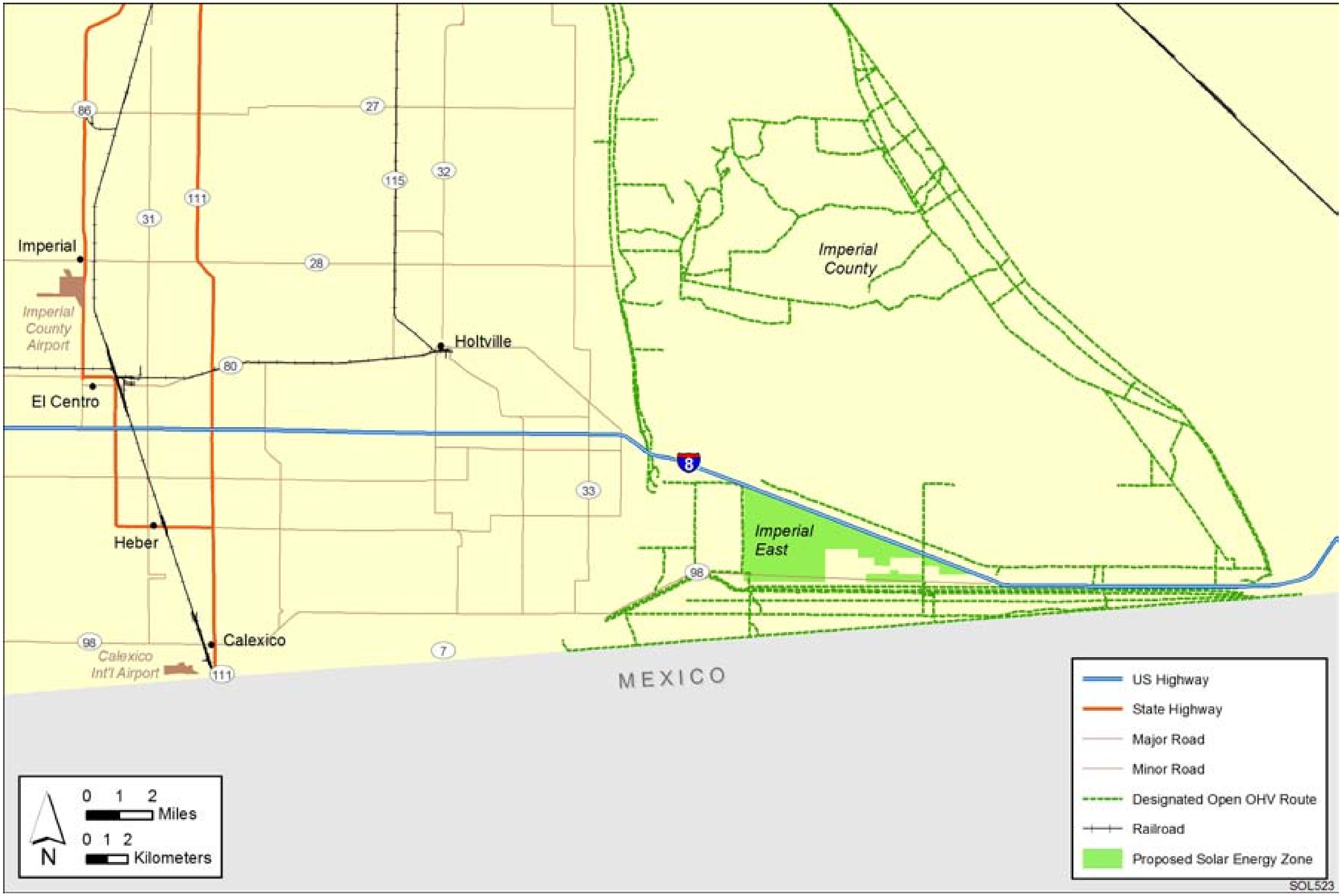

FIGURE 9.1.21-1 Local Transportation Network Serving the Proposed Imperial East SEZ

TABLE 9.1.21.1-1 AADT on Major Roads near the Proposed Imperial East SEZ, 2008

Road	General Direction	Location	AADT (Vehicles)
I-8	East–west	Junction State Route 111	14,600
		Junction State Route 7	11,200
		Junction U.S. 80/State Route 115	11,600
		Junction State Route 98	14,000
State Route 78	Southwest–northeast	Junction State Route 111	4,200
		Junction State Route 115	4,400
State Route 98	East–west	Junction State Route 111	24,100
		West of junction State Route 7	2,500
		Bonesteele Road (west of Imperial East SEZ)	1,900
		Junction I-8	1,950

Source: Caltrans (2009).

service provided by three airlines (Empire, Skywest/United, and Mesa/US Airways) (Yuma County Airport Authority 2010). The airport is jointly owned by Yuma County and the U.S. Marines Corps, and military activities (Yuma Marine Corps Air Station) account for about 50% of aircraft operations (AirNav, LLC 2010). The airport operates four runways, all in good condition. The longest runway is concrete and 13,300-ft (4,054-m) long (FAA 2009). The other three runways are asphalt/concrete with the shortest runway having a length of 5,710 ft (1,740 m) (FAA 2009). In 2009, the amount of commercial freight shipped and received at the Yuma International Airport was 669,802 lb (303,817 kg) and 940,501 lb (426,604 kg), respectively (BTS 2009). In 2010, 86,387 and 86,415 passengers arrived and departed, respectively (BTS 2009).

Mexicali General Rodolfo Sanchez Taboada International Airport (Mexicali Airport) is located approximately 5 mi (8 km) due southwest of the SEZ in Mexico. The airport has a single concrete runway that is 8,530 ft (2,600 m) long (World Aero Data 2010). Approximately 467,000 passengers passed through the airport in 2009 (Grupo Aeroportuario del Pacifico 2010).

9.1.21.2 Impacts

As discussed in Section 5.19, the primary transportation impacts are anticipated to be from commuting worker traffic. State Route 98 provides a regional traffic corridor that could experience moderate impacts for single projects that may have up to 1,000 daily workers, with an additional 2,000 vehicle trips per day (maximum). This would represent up to approximately two times the AADT values summarized in Table 9.1.21-1 for State Route 98 in the vicinity of the SEZ. For I-8, the exits at State Route 98 might experience some congestion as well. Local road improvements would be necessary in any portion of the SEZ along State Route 98 that might be developed 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 that are designated open and available for public use. Although there are few routes designated as open within the proposed SEZ, 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.

9.1.21.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features have been identified related to impacts on transportation systems around the Imperial East 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 SEZ. Depending on the location of a proposed solar facility within the SEZ, more specific access locations and local road improvements would be implemented. The proximity of the Mexicali Airport may require coordination with the proper Mexican authorities to minimize any potential impacts with flight traffic. However, all commercial passenger flights originating at or terminating at that airport are destined for southern Mexican cities, while the SEZ is to the northeast.

9.1.22 Cumulative Impacts

The analysis presented in this section addresses the potential cumulative impacts in the vicinity of the proposed Imperial East SEZ in Imperial 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 further than 5 to 10 years in the future.

The areas east and north of the Imperial East SEZ are largely undeveloped and have few permanent residents. Areas to the west and northwest are irrigated farmland receiving water from the All-American Canal that is immediately south of the Imperial East SEZ. The United States–Mexico border is within 2 mi (3 km) south of the proposed SEZ. The Imperial Sand Dunes are 10 to 15 mi (16 to 24 km) east and northeast. No grazing allotments or mineral mining activity occurs in the proposed Imperial East SEZ or within the immediate vicinity to the north and east.

The geographic extent of the cumulative impacts analysis for potentially affected resources near the Imperial East SEZ are identified in Section 9.1.22.1. An overview of ongoing and reasonably foreseeable future actions is presented in Section 9.1.22.2. General trends in population growth, energy demand, water availability, and climate change are discussed in Section 9.1.22.3. Cumulative impacts for each resource area are discussed in Section 9.1.22.4.

9.1.22.1 Geographic Extent of the Cumulative Impacts Analysis

The geographic extent of the cumulative impacts analysis for potentially affected resources evaluated near the Imperial East SEZ is provided in Table 9.1.22.1-1. These geographic areas define the boundaries encompassing potentially affected resources. Their extent may vary depending on 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 would cultural resources. Most of the lands around the SEZ are administered by the BLM, the DoD, or the City of El Centro. In addition, the Section 368 utility corridor is overlapping and adjacent to the south and west of the SEZ; the Mexico border is within 2 mi (3 km) to the south, and Tribal Lands are 20 mi (30 km) to the east. The BLM administers nearly 23% of the lands within a 50-mi (80-km) radius of the SEZ.

TABLE 9.1.22.1-1 Geographic Extent of the Cumulative Impacts Analysis by Resource Area: Proposed Imperial East SEZ

Resource Area	Geographic Extent
Lands and Realty	Eastern Imperial County
Specially Designated Areas and Lands with Wilderness Characteristics	Within a 25-mi (40-km) radius of the Imperial East SEZ
Rangeland Resources	Eastern Imperial County
Recreation	Eastern Imperial County
Military and Civilian Aviation	For Military Aviation, southeastern California and western Arizona. For Civilian Aviation, eastern Imperial County
Soil Resources	Areas within and adjacent to the Imperial East SEZ
Minerals	Eastern Imperial County
Water resources	
Surface Water	Colorado River, All-American Canal
Groundwater	Imperial Valley Groundwater Basin
Air Quality and Climate	A 31-mi (50-km) radius from the center of the Imperial East SEZ
Vegetation, Wildlife and Aquatic Biota, Special Status Species	A 50-mi (80-km) radius from the center of the Imperial East SEZ, including portions of Imperial and Riverside Counties in California and La Paz and Yuma Countries in Arizona
Visual Resources	Viewshed within a 25-mi (40-km) radius of the Imperial East SEZ
Acoustic Environment (noise)	Areas adjacent to the Imperial East SEZ
Paleontological Resources	Areas within and adjacent to the Imperial East SEZ
Cultural Resources	Areas within and adjacent to the Imperial East SEZ for archaeological sites; viewshed within a 25-mi (40-km) radius of the SEZ for other properties, such as traditional cultural properties
Native American Concerns	Imperial Valley and adjacent areas within a 25-mi (40-km) radius of the Imperial East SEZ
Socioeconomics	A 50-mi (80-km) radius from the center of the Imperial East SEZ
Environmental Justice	Imperial County
Transportation	I- 8; State Route 98

9.1.22.2 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 are as follows:

- 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 ongoing and reasonably foreseeable future actions described below are grouped into three categories: (1) actions that relate to energy production and distribution, including potential solar energy projects under the proposed action (Section 9.1.22.2.1) and (2) other ongoing and reasonably foreseeable actions, including those related to mining and mineral processing, grazing management, transportation, recreation, water management, and conservation (Section 9.1.22.2.2). Together, these actions have the potential to affect human and environmental receptors within the geographic range of potential impacts over the next 20 years.

9.1.22.2.1 Energy Production and Distribution

Reasonably foreseeable future actions related to energy production and distribution and other major actions within a 50-mi (80-km) radius from the center of the Imperial East SEZ, which includes portions of Imperial and Riverside Counties in California and La Paz and Yuma Counties in Arizona, are identified in Table 9.1.22.2-1 and described in the following sections. Locations are shown in Figure 9.1.22.2-1. 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. Thus, this analysis focuses on renewable energy and any other foreseeable large energy projects, nominally covering 500 acres (802 km^2) or more or requiring amounts of water on the scale of utility-scale CSP.

TABLE 9.1.22.2-1 Reasonably Foreseeable Future Actions Related to Energy Development and Distribution and Other Major Actions near the Proposed Imperial East SEZ

Description	Status	Resources Affected	Primary Impact Location
Fast-Track Energy Project on BLM-Administered Land			
Imperial Valley Solar Project (CACA-47740), 750 MW dish engine; 6,500 total acres[a]	Under review; AFC filed June 30, 2008	Land use, visual, terrestrial habitats, wildlife, groundwater	About 35 mi (56 km) west of Imperial East SEZ
Orresource Geothermal (CACA 6217, CACA 6218, CACA 17568)	Ongoing	Land use, terrestrial habitats, visual	About 3 mi (5 km) northwest of Imperial East SEZ, within the East Mesa Known Geothermal Resource Area
Geothermal Power Project (CACA 18092X)	Authorized	Land use, terrestrial habitats, visual	About 5 mi (8 km) northwest of Imperial East SEZ, within the East Mesa Known Geothermal Resource Area
Black Rock 1,2 ,and 3 Geothermal Power Project, 159 MW, 160 acres	Planned, currently on hold	Land use, terrestrial habitats, visual	Northwest Imperial County near Salton Sea and Sonny Bono Salton Sea National Wildlife Refuge
Transmission and Distribution Systems			
Existing Southwest Powerlink 500-kV Transmission Line	Ongoing	Land use, terrestrial habitats, visual	Line runs from the Palo Verde Nuclear Generating Station in Arizona to the San Diego area, passing just to the south of the Imperial East SEZ.
Upgrades to Imperial Irrigation District 230-kV Transmission Line	Planned	Land use, terrestrial habitats, visual	Line would run from the IID/San Diego Gas & Electric's (SDG&E) Imperial Valley Substation approximately 10 mi (16 km) southwest of the City of El Centro and terminate at the El Centro Switching Station.

TABLE 9.1.22.2-1 (Cont.)

Description	Status	Resources Affected	Primary Impact Location
Upgrades for Imperial Valley Solar Project Transmission Line	Planned	Land use, terrestrial habitats, wildlife, visual	Construction of a new 230-kV substation approximately in the center of the Imperial Valley Solar Project site and would connect to the SDG&E Imperial Valley Substation via 10.3-mi (16-km) transmission line.
New Sunrise Powerlink 500-kV Transmission Line	Planned	Land use, terrestrial habitats, wildlife, visual	Line would run westward 150 mi (242 km) from the El Centro area in Imperial County to western San Diego County.
Other Projects			
Imperial Irrigation District Hydroelectric Power Plants	Ongoing	Land use, surface water	Power plants are along the All-American Canal in Imperial County, including locations near Imperial East SEZ.
North Baja Pipeline Expansion Project	Planned	Land use, terrestrial habitats, visual	Gas pipeline would run 80 mi (128 km) from Ehrenberg, Arizona, through Riverside and Imperial Counties to a connection point located between Yuma, Arizona, and Imperial East SEZ.
Proposed West Chocolate Mountains Renewable Energy Evaluation Area	NOI to prepare an EIS issued on Feb 10, 2010	Land use, visual, terrestrial habitats, wildlife, groundwater	About 25 mi (40 km) north of the Imperial East SEZ

[a] Project approved. Updated information will be included in the Final EIS. See http://www.blm.gov/wo/st/en/prog/energy/ renewable_energy/fast-track_renewable.html for details.

Renewable Energy Development

Several recent executive and legislative actions in California have addressed renewable energy development in 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 Renewable Portfolio Standard (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. 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 requiring that electrical energy production meet a standard of 33% 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 9.1.22.2-1 lists one foreseeable solar energy project on public land, a so-called fast-track project. Fast-track projects are those 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 2010b). The fast-track project is considered foreseeable because the permitting and environmental review processes are under way. The location of this project is shown on Figure 9.1.22.2-1.

- *Imperial Valley Solar Project (CACA 47740).* Formerly named the Stirling Energy Systems Solar Two Project, this proposed fast-track project will use CSP dish engine technology (i.e., SunCatchers) in a facility with an output of 750 MW (BLM and CEC 2010). The project will be constructed in two phases—Phase I with 300 MW followed by Phase II with 450 MW. The proposed project site is located on approximately 6,500 acres (26.3 km^2) of land in Imperial County, of which 6,140 acres (24.8 km^2) are on public land and the remaining 360 acres (1.5 km^2) are on private land. The site is about 14 mi (23 km) west of El Centro, California, and about 35 mi (56 km) west of the Imperial East SEZ.

  The proposed project includes the solar facility, a 230-kV substation at the center of the project site, a 10-mi (16-km) 230-kV transmission line that will connect to the grid at the San Diego Gas & Electric (SDG&E) Imperial Valley Substation, an 112-mi (19-km) water-supply pipeline, and access roads. The upgrades to the transmission lines are described in the Transmission and Distribution section below.

  Construction for the proposed project would begin in 2010 and continue for 40 months, employing about 360 people per month and peaking to 731 people

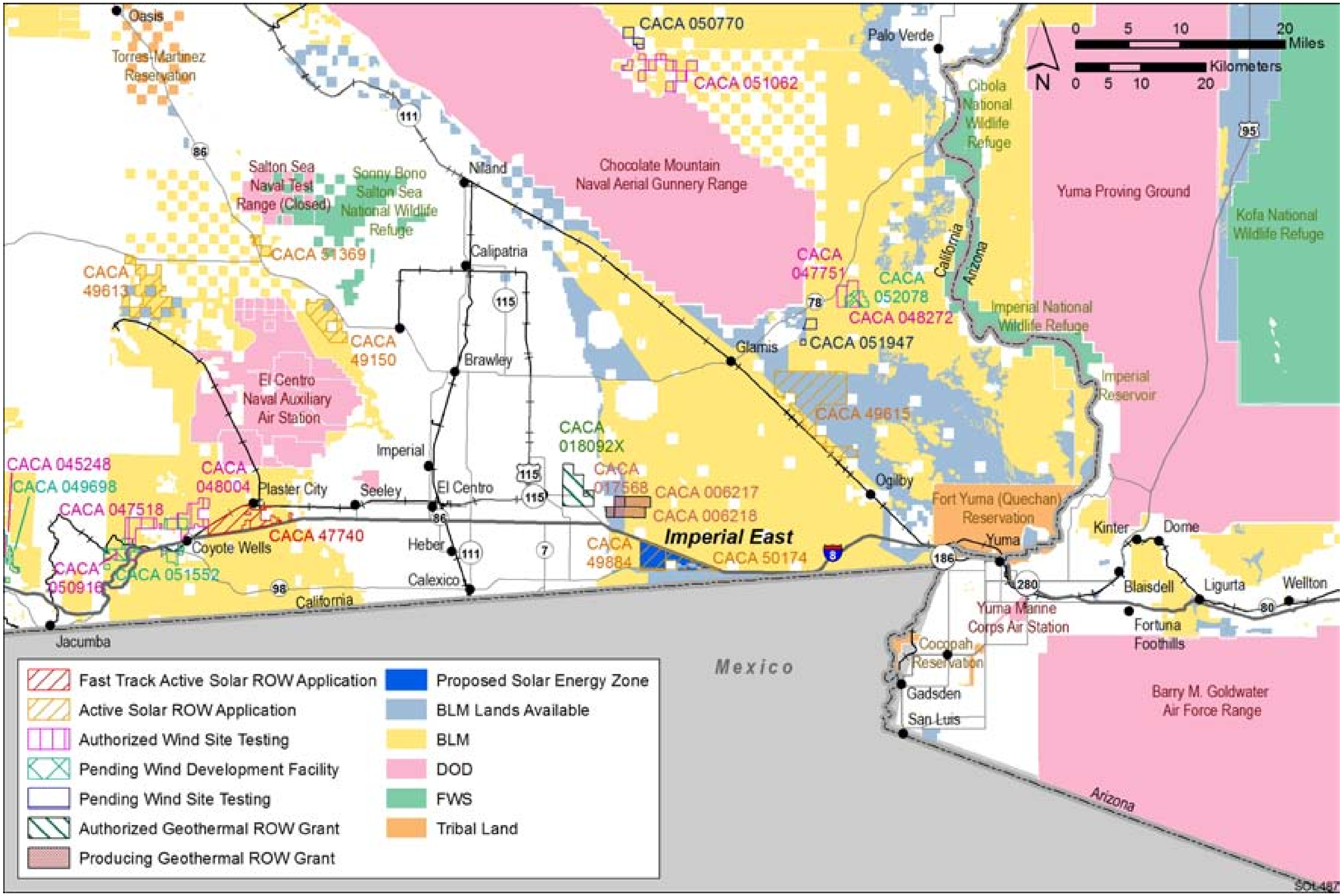

FIGURE 9.1.22.2-1 Locations of Renewable Energy Projects on Public Land within a 50-mi (80-km) Radius of the Proposed Imperial East SEZ

during the seventh month of construction. Operations would require 164 full-time employees.

Special status wildlife species of concern include the flat-tailed horned lizard and the burrowing owl. The proposed facility will have access to at least 150,000 to 200,000 gal (568 to 757 m^3) of reclaimed water per day for use in all construction and operation activities. On the basis of operation 365 days a year, this would amount to the availability of about 170 to 220 ac-ft/yr (210,000 to 272,000 m^3/yr). The proposed water source for mirror washings would be reclaimed water from the Seeley Waste Water Treatment Facility. Upgrades to this existing treatment facility would be funded by Imperial Valley Solar, LLC (BLM and CEC 2010).

- *Pending Solar ROW Applications on BLM-Administered Lands.* In addition to the fast-track solar project described above, a number of regular-track applications for solar project ROWs that have been submitted to the BLM are for projects that would be located either within the Imperial East SEZ or within 50 mi (80 km) of the SEZ (BLM 2010b). Table 9.1.22.2-2 provides a list of all solar projects that had pending applications submitted to BLM as of March 2010. Figure 9.1.22.2-1 shows the locations in these applications.

  Of the six active solar applications listed in Table 9.1.22.2-2, two applications are within the Imperial East SEZ: CACA 49884 encompasses the entire west side of the SEZ, and CACA 50174 encompasses the entire east side of the SEZ. One application (CACA 49615) is located about 20 mi (32 km) northeast of the boundary. Three applications lie within 35 to 50 mi (56 to 80 km) northwest of the boundary—CACA 49150, CACA 49613, and CACA 51369. All of these applications are administered through the El Centro Field Office of BLM.

  The likelihood of any of the regular-track application projects actually being developed is uncertain, but it is generally assumed to be less than that for fast-track applications. The projects are all listed in Table 9.1.22.2-2 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.

Wind Energy. Table 9.1.22.2-2 lists ROW grant applications for two pending wind site testing, seven authorized for wind site testing, and two pending wind development facilities within a 50-mi (80-km) radius of the proposed Imperial East SEZ. As shown in Figure 9.1.22.2-1, the locations of the applications lie generally west and northeast of the Imperial East SEZ. The actual development of all 11 proposals is considered pending, however, since they await authorization of development of wind facilities.

TABLE 9.1.22.2-2 Pending Renewable Energy Project ROW Applications on BLM-Administered Land within 50 mi (80 km) of the Proposed Imperial East SEZ[a]

Serial No.	Project Name	Application Received	Size (acres[b])	MW	Technology	Field Office
Solar Applications						
CACA 49150	BCL & Associates Inc.	July 17, 2007	5,464	500	PV	El Centro
CACA 49613	First Solar Development Inc.	Dec. 3, 2007	7,525	500	PV	El Centro
CACA 49615	Pacific Solar Investments Inc.	Sept. 4, 2007	17,807	1500	PV	El Centro
CACA 49884	Solar Reserve, LLC	April 24, 2008	3,830	100	CSP	El Centro
CACA 50174	LSR Midway, Well LLC	Aug. 11, 2008	2,571	400	CSP	El Centro
CACA 51369	Invenergy Solar Development, LLC	Sept. 16, 2009	1,081	50	PV	El Centro
Wind Applications						
Pending Wind Site Testing						
CACA 50770	–[c]	–	–	–	Wind	–
CACA 51947	L.H. Renewables, LLC	March 10, 2010	9,069	65	Wind	El Centro
Authorized Wind Site Testing		Application Authorized				
CACA 45248	Pacific Wind Development LLC	Sept. 15, 2004	16,355	–	Wind	El Centro
CACA 47518	GreenHunter Wind Energy LLC assigned to Ocotillo Express LLC	Feb. 3, 2009	6,280	–	Wind	El Centro
CACA 47751	Renewergy, LLC	Jan. 23, 2007	11,187	–	Wind	El Centro
CACA 48004	Ocotillo Renewables, LLC	April 26, 2006	3,208	–	Wind	El Centro
CACA 48272	Imperial Wind	Aug. 16, 2010	1,960	–	Wind	El Centro
CACA 50916	Ocotillo Express, LLC	June 11, 2009	8,757	–	Wind	El Centro
CACA 51062	John Deere Renewables, LLC	April 29, 2009	6,256	–	Wind	El Centro
Pending Wind Development Facility						
CACA 51552	Ocotillo Express, LLC	Oct. 09, 2009	14,691	–	Wind	El Centro
CACA 52078	Imperial Wind	May 28, 2010	2,054	–	Wind	El Centro

Footnotes on next page.

TABLE 9.1.22.2-2 (Cont.)

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[a] Information taken from pending and authorized wind energy projects listed on the BLM California Desert District Web site (BLM 2010d) and downloaded from *GeoCommunicator* (BLM and USFS 2010a). Total solar acres = 38,278; total solar MW = 3,050; 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.

The likelihood of any of these regular-track wind projects actually being developed is uncertain; the projects are all listed to give an indication of the level of interest in development of wind energy in the region. Most are in the wind testing stage and are in the process of preparing Environmental Assessments necessary for project approval.

The following paragraph describes the Ocotillo Express Project. This proposed project encompasses multiple applications, including two authorized applications for wind testing (CACA 47518 and CACA 50916).

- *Ocotillo Express Project.* Ocotillo Express LLC acquired GreenHunter Wind Energy, LLC's BLM ROW grant (CACA 47518), an additional adjacent ROW (CACA 50916), and a small amount of private land, together totaling approximately 15,000 acres (61 km^2) of land for a proposed 561-MW wind generation facility. The electricity would flow to the proposed Sunrise Powerlink 500-kV transmission line from Imperial County to San Diego County. The proposed project site is located near Ocotillo, borders the Anza-Borrego Desert State Park, and is about 40 mi (64 km) west of the SEZ.

  The project would be in operation by the end of 2012 and is expected to employ 400 workers over the two-year construction period. Special status wildlife species of concern include the flat-tailed horned lizard and peninsular bighorn sheep. In total, approximately 61.4 ac-ft (76,000 m3) of water would be needed during construction (Anza-Borrego Desert State Park 2010).

Geothermal Energy. Imperial County contains some of the most productive geothermal resource areas in the United States. Within the El Centro FO management area, 118,720 acres (480 km^2) of land are identified as having geothermal resource potential (BLM 2008b). This acreage is divided into seven Known Geothermal Resource Areas: Dunes, East Brawley, East Mesa, Glamis, Heber, Salton Sea, and South Brawley.

Three producing and one authorized geothermal leases are located within a 50-mi (80-km) radius of the proposed Imperial East SEZ, as listed in Table 9.1.22.2-1 and shown in Figure 9.1.22.2-1. These geothermal leases are within 5 mi (8 km) northwest of the SEZ and within the East Mesa KGRA. The producing leases (CACA 6217, CACA 6218, and CACA 17568) are all owned by Orresource Geothermal.

- *Black Rock 1,2, and 3 Geothermal Power Project*. Formerly named the Salton Sea Geothermal Unit 6 Power Project, CE Obsidian Energy, LLC (Applicant) currently possesses a license to construct a geothermal generating plant on an 80-acre (0.3-km^2) site in Imperial County, California. The project was designated as Salton Sea Unit 6 (docket # 02-AFC-2) and was originally granted a license by the California Energy Commission in December 2003 for a 185-MW plant. The original 2003 license was amended in May 2005 to enable the plant to increase its capacity to 215 MW. The applicant petitioned, and the California Energy Commission subsequently granted, an extension to the Salton Sea Unit 6 license, making it effective until December 18, 2011. The applicant is now proposing to amend its license to allow for the construction of three smaller geothermal plants totaling 159 MW net of generating capacity. Both the 185-MW and 215-MW projects proposed using multiple flash geothermal power generating technology, while the amended project proposes single flash technology, which requires less facility infrastructure and produces less waste compared to multiple flash technology.

The three units will be colocated on the same site as the original Salton Sea Unit 6 project and will share various common auxiliary facilities. The site is currently used for agriculture. Land uses in the surrounding area include existing geothermal power facilities, agriculture, and the Sonny Bono Salton Sea National Wildlife Refuge. The original project site covered 80 acres (0.32 km^2) bounded on the north by McKendry Road, on the east by Boyle Road, on the west by Severe Road, and on the south by Peterson Road. The Amended Project includes the original 80-acre (0.32-km^2) site plus an additional 80 acres (0.32 km^2) adjacent to the south, part of which was used for construction support in the original project. The three power plants would be situated generally in the middle of the site, with production well pads on the northern, western, and southern perimeters of the site (CEC 2009b).

Transmission and Distribution

Existing transmission lines near the Imperial East SEZ include the Southwest Powerlink transmission line and the IID Transmission System.

Existing Southwest Powerlink 500-kV Transmission Line. The Southwest Powerlink 500-kV transmission line, extending from the Palo Verde Nuclear Generating Station in Arizona to the San Diego, California, area, crosses just to the south of the Imperial East SEZ close to the United States–Mexico border near the All-American Canal. This line has been in operation since the 1980s.

Upgrades to Imperial Irrigation District 230-kV Transmission Line. The IID high-voltage transmission system includes 1,300 mi (2,093 km) of line in Imperial, Riverside, and San Diego Counties. The IID operates a 115-kV transmission line that crosses the Imperial East SEZ. The IID provides electricity for more than 145,000 customers from hydroelectric power units located on the All-American Canal and from gas-fired power plants (CEC 2010).

In October 2009, IID staff issued a Draft Mitigated Negative Declaration to be considered by the IID Board of Directors in December 2009 on a proposal to upgrade the existing 230-kV "S" line that runs from the IID/SDG&E Imperial Valley Substation located on BLM lands approximately 10 mi (16 km) southwest of the city of El Centro and terminating at the El Centro

Switching Station. The project consists of upgrading an approximate 18 mi (29 km) of 230-kV overhead transmission line by installing approximately 285 new double circuit steel poles, including all existing polymer horizontal insulators, to replace the existing wood poles supporting a single 230-kV circuit. The Draft Mitigated Negative Declaration concluded that impacts of the project would be less than significant if mitigations for the burrowing owl, Yuma clapper rail, and flat-tailed horned lizard are implemented (IID 2009b).

Upgrades for Imperial Valley Solar Project Transmission. This project would include the construction of a new 230-kV substation at the center of the Imperial Valley Solar Project and would connect to the SDG&E Imperial Valley Substation via an approximate 10-mi (16-km), double-circuit, 230-kV transmission line. The transmission line would parallel the Southwest Powerlink transmission line within the designated ROW.

Other than this interconnection transmission line, no new transmission lines or off-site substations would be required for the Phase I construction of Imperial Valley Solar Project. The full Phase II expansion of the solar project would require the construction of the 500-kV Sunrise Powerlink transmission line project proposed by SDG&E (CEC 2008) as described below.

New Sunrise Powerlink 500-kV Transmission Line. In December 2008, the CPUC granted a Certificate of Public Convenience and Necessity to SDG&E to construct and operate the Sunrise Powerlink 500-kV transmission line. The line is scheduled to go into service in late 2012. The line would be a new 500/230-kV transmission line extending westward north and south of I-8 for about 123 mi (198 km) from the Imperial Valley Substation in Imperial County to the western part of San Diego County. The portion of the line in Imperial County is a 500-kV line that extends westward from the Imperial Valley substation to a new 500/230 Suncrest Substation south of I-8 and east of the community of Alpine. The line then proceeds as a 230-kV line north of I-8 into the Sycamore Canyon Substation on the MCAS Miramar (CPUC 2008, 2010).

9.1.22.2.2 Other Actions

Other actions of relevance in the vicinity of the SEZ are as follows:

- *Existing Imperial Irrigation District Hydroelectric Power Plants.* The IID operates 14 hydroelectric power units at 7 locations along the All-American Canal in Imperial County, California (IID 2010b). Two of the seven locations are near the Imperial East SEZ. The All-American Canal draws water from the Colorado River near Yuma, Arizona, that is transported to the Imperial Valley for use primarily for crop irrigation. IID's installed hydroelectric generation capacity totals 84 MW (GE 2004).

- *North Baja Pipeline Expansion Project*. In October 2007, the Federal Energy Regulatory Commission (FERC) approved a request of North Pipeline LLC to construct an 80-mi (128-km) liquefied natural gas pipeline from Ehrenberg, Arizona, through Riverside and Imperial Counties, California, to a connection point with the Gasoducto Bajanorte Pipeline at the U.S.–Mexico border. The connection point is located between Yuma and the Imperial East SEZ (FERC 2010; BLM 2001b). The portion of the North Baja pipeline that crosses Imperial County is located east of the Imperial East SEZ and near the southeast corner of the Imperial Sand Dunes.

- *Proposed West Chocolate Mountains Renewable Energy Evaluation Area.* In a February 10, 2010 Notice of Intent (NOI) in the *Federal Register*, the BLM El Centro Field Office announced its intent to prepare an EIS to consider an amendment to the CDCA Plan to identify whether 21,300 acres (86.2 km^2) of BLM-administered lands within the West Chocolate Mountains area should be made available for geothermal, solar, or wind energy development. The Evaluation Area lies about 25 mi (40 km) north of the proposed Imperial East SEZ in Riverside County, east of Niland and northeast of El Centro, California. Cumulative impacts at this distance would affect mainly ecological and socioeconomic resources.

9.1.22.3 General Trends

9.1.22.3.1 Population Growth

Table 9.1.22.2-3 presents recent and projected populations in the 50-mi (80-km) radius ROI and in California as a whole. Population in the ROI stood at 387,798 in 2008, having grown at an average annual rate of 3.2% since 2000. Growth rates for the two counties in the ROI were higher than those for California (1.4%) over the same period.

Both counties in the ROI experienced growth in population since 2000; population in Imperial County grew at an annual rate of 3.0% between 2000 and 2008, while in Yuma County, population grew by 3.3% over the same period. The ROI population is expected to increase to 519,735 by 2021 and to 583,043 by 2023 (California Department of Finance 2010).

9.1.22.3.2 Energy Demand

The growth in energy demand is related to population growth through increases in housing, commercial floor space, transportation, manufacturing, and services. With population growth expected in Imperial, Riverside, and San Bernardino Counties between 2006 and 2016, an increase in energy demand is also expected. However, the Energy Information Administration (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%

TABLE 9.1.22.2-3 ROI Population for the Proposed Imperial East SEZ

Location	2000	2008[a]	Average Annual Growth Rate, 2000–2008 (%)	2021	2023
Yuma County, Arizona	160,026	207,305	3.3	276,132	285,531
Imperial County, California	142,361	180,493	3.0	243,603	252,512
ROI	302,387	387,798	3.2	519,735	583,043
Arizona	5,130,632	6,622,885	3.2	8,945,447	9,271,163
California	34,105,437	38,129,628	1.4	44,646,420	45,667,413

[a] Data are averages for the period 2006 to 2008.

Sources: U.S. Bureau of the Census (2009d); Arizona Department of Commerce (2010); California Department of Finance (2010).

each year. The fastest growth is projected for the residential, commercial, and industrial sector (RCI), which is expected to grow by about 5% (residential), 0.4% (commercial), and 0.19% (industrial) each year (EIA 2009).

9.1.22.3.3 Water Availability

Water used in the vicinity of the Imperial East SEZ comes primarily from surface water provided by irrigation canals. There are no surface water features on the proposed Imperial East SEZ, but several irrigation canals and small washes are located within the Imperial Valley. The All-American Canal flows along the southern boundary of the proposed SEZ. The canal diverts Colorado River water at the Imperial Dam (located 35 mi [56 km] west of the SEZ) to the agricultural fields of the Imperial Valley to the north and west of the proposed SEZ. Annual average flows in the canal coming out of the Colorado River ranged between 2.8 million and 3.7 million ac-ft/yr (3.5 billion to 4.6 billion m^3/yr) for the period of 1962 to 1992 (USGS 2010b; stream gauge 09527500).

The majority of groundwater wells in the Imperial Valley are used for irrigation and are located in the agricultural portion of the valley (5 mi [8 km] west of the proposed SEZ). Reported groundwater well yields range between 45 and 1,550 gpm (170 and 5,687 L/min) (Loeltz et al. 1975). In 2005, water withdrawals from surface waters and groundwater in Imperial County were 2.4 million ac-ft/yr (2.9 billion m^3/yr), of which 98% came from surface waters and was used primarily for irrigating agricultural fields. The majority of this water is imported into the Imperial Valley from the Colorado River. Total groundwater withdrawal was 46,000 ac-ft/yr (57 million m^3/yr), which was primarily used for irrigation. Municipal and domestic water uses totaled 34,000 ac-ft/yr (42 million m^3/yr), and industrial and thermoelectric power uses totaled 3,000 ac-ft/yr (3.7 million m^3/yr) (Kenny et al. 2009).

Groundwater levels have remained steady in the region for several decades because of relatively constant recharge rates (CDWR 2003). Three USGS wells located in the desert portion of the Imperial Valley also show steady groundwater elevations, ranging from 23 to 47 ft (7 to 14 m) below the surface (USGS 2010b; well numbers 324242115073501, 324340115073401, 324632115011001).

Recharge to the Imperial Valley groundwater basin is primarily through irrigation returns, Colorado River recharge, seepage under unlined canals, surface runoff from surrounding higher elevations, underflow from the Mexicali Valley to the south, and direct runoff and percolation of precipitation (CDWR 2003). Discharge of groundwater is primarily through irrigation withdrawals, losses to streams, and evapotranspiration (Tompson et al. 2008). A groundwater model based on data from 1970 to 1990 suggests that the total recharge by irrigation returns and seepage under canals was 250,000 ac-ft/yr (308 million m^3/yr) and underflow recharge was 173,000 ac-ft/yr (213 million m^3/yr), while total discharge from the basin was 439,000 ac-ft/yr (541 million m^3/yr) (CDWR 2003). Recharge by precipitation runoff and infiltration was estimated to be less than 10,000 ac-ft/yr (12 million m^3/yr) (Loeltz et al. 1975). Recharge from seepage may be overestimated because of a 1980 project that lined a 49-mi (79-km) stretch of the Coachella Canal with concrete and an ongoing project to line 23 mi (37 km) of the All-American Canal, including the reach along the south portion of the proposed Imperial East SEZ, scheduled to be completed in early 2010 (CDWR 2003, 2009; IID 2009a). The lining of that portion of the canal is expected to save 67,700 ac-ft/yr (83.5 million m^3/yr) of water (IID 2009a).

9.1.22.3.4 Climate Change

Global warming continues to affect many desert areas in the southwestern United States with increased temperature 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 documents current temperature and precipitation conditions and historic trends, and projects impacts during the remainder of the twenty-first century through modeling using low and high scenarios of GHG emissions. The report summarizes the science of climate change and the recent and future impacts of climate change on the United States (GCRP 2009). The following excerpts from this report indicate that there has been a trend for increasing global temperature and decrease in annual precipitation in desert regions:

- Average temperature in the United States had increased more than 2ºF (1.1°C) 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 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 carbon dioxide 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 trade-offs between competing uses.

- Climate project models also show a 10 to 20% decline in runoff in California and Nevada for the period of 2041 to 2060 compared with data from 1901 to 1970 used as a baseline.

- In the Southwest average temperatures increased about 1.5°F (0.8°C) in 2000 compared to a baseline period of 1960 to 1979. By the year 2020 temperatures are projected to rise 2 to 3°F (1.1 to 1.7°C) 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 of climate change impact predictions for the remainder of the twenty-first century that address topics such as economics, ecosystems, water use/availability, impacts of 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.

9.1.22.4 Cumulative Impacts on Resources

This section addresses potential cumulative impacts in the 5,722-acre (23-km^2) proposed Imperial East SEZ on the basis of the following assumptions: (1) because of the relatively small size of the proposed SEZ (less than 10,000 acres [40.5 km^2]), only one project would be constructed at a time, and (2) maximum total disturbance over 20 years would be about 4,578 acres (18.5 km^2) (80% of the entire proposed SEZ). For purposes of 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. An existing 115-kV transmission line intersects the southwest corner of the SEZ; therefore, for this analysis, the impacts of construction and operation of new transmission lines were not assessed. Regarding site access, because I-8 runs along the northeast border and State Route 98 crosses the SEZ along its southern edge, no major road construction activities outside of the SEZ would be needed for development to occur in the SEZ.

Cumulative impacts that would result in each resource area 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 uncertain nature 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 semiquantitatively, 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.

9.1.22.4.1 Lands and Realty

The proposed Imperial East SEZ contains BLM-administered lands within a triangle bordered by I-8 and State Route 98 on the north and south, respectively, and by the Lake Cahuilla ACEC on the west. Land within the SEZ is undeveloped. Immediately to the south lie several transmission lines, the All-American Canal and associated facilities, and the international boundary fence. BOR and state lands lie in close proximity to the SEZ, while the general area is rural in character. The IID holds a public water reserve on all lands in the SEZ, while a 2-mi (3-km) wide Section 368 energy corridor covers about 80% of the SEZ.

Construction of utility-scale solar energy facilities within the SEZ would preclude its use for other purposes and would introduce a new and discordant land use to the area. In addition, it is possible that 640 acres (2.6 km^2) of state lands, as well as 980 acres (4 km^2) of Reclamation Withdrawn lands, within the external boundaries of the SEZ could be developed in a similar fashion. The BOR parcel is within in a solar ROW application that includes the eastern half of the SEZ.

Seven solar projects and 11 wind projects with ROW applications totaling over 124,000 acres (502 km^2) are proposed within a 50-mi (80-km) radius of the Imperial East SEZ (see Table 9.1.22.2-2 and Figure 9.1.22.2-1). One of the solar applications is a fast-track project that includes about 6,500 acres (26 km^2) (see Section 9.1.22.2.1). Should this proposed level of development occur along with accompanying transmission lines, roads, and other infrastructure within the geographic extent being considered for this SEZ, the character of the CDCA could be dramatically changed. While development of other renewable energy projects could occur, due to the relatively small size of the SEZ the contribution to cumulative impacts from utility-scale solar projects in the SEZ is expected to be minor.

9.1.22.4.2 Specially Designated Areas and Lands with Wilderness Characteristics

The Imperial Sand Dunes Recreation Area, several ACECs, the Juan Bautista de Anza National Historic Trail, and the All-American Canal Mitigation Wetlands are the only specially designated areas that are in close proximity to the proposed Imperial East SEZ. No significant impacts associated with development of the SEZ were identified. Construction of utility-scale solar energy facilities within the SEZ in combination with potential and likely development of other renewable energy projects, accompanying infrastructure, and other foreseeable developments within the geographic extent of effects would not likely cumulatively contribute to the visual impacts on these specially designated areas. The ACECs adjacent to the SEZ were identified as being potentially susceptible to damage from an increase in the amount of human traffic in or near them, and additional effects from activities away from the SEZ are not likely to contribute to an increase in the level of potential impact.

9.1.22.4.3 Rangeland Resources

The SEZ is not included within a grazing allotment. Therefore, utility-scale solar development would not affect livestock grazing.

Because the proposed Imperial East SEZ is about 20 mi (32 km) or more from the nearest wild horse or burro HMA, solar energy development would not contribute to cumulative impacts on wild horses and burros managed by the BLM.

9.1.22.4.4 Recreation

Because of the nature of the land in the SEZ, there is very little recreation use occurring there; therefore, the impact of solar energy development within the SEZ on recreation use is expected to be minimal and would not contribute significantly to any cumulative loss of recreation opportunities in the geographic area.

9.1.22.4.5 Military and Civilian Aviation

The proposed Imperial East SEZ is entirely covered by two MTRs and an SUA. These 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 would create safety issues and would conflict with military training activities. The DoD has indicated a concern for any facilities taller than 100 ft (30 m) above ground level in this area, which would include power towers. With potential solar development occurring throughout the region, not only in SEZs, maintaining a large-picture view of the overall effects on the system of MTRs will be necessary to avoid cumulative effects.

The Mexicali airport in Mexico about 5 mi (8 km) southwest of the SEZ is the only regional airport close enough to be potentially affected by solar facilities in the SEZ. With mitigations in place, there would be no contribution to cumulative impacts on civilian aviation facilities.

9.1.22.4.6 Soil Resources

Ground-disturbing activities (e.g., grading, excavating, and drilling) during the construction phase of a solar project, including any new associated transmission lines, would contribute to the soil loss due to erosion. Construction of new roads or improvements to existing roads within the SEZ 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 from construction and operation of other new or existing geothermal energy facilities that lie within 10 mi (16 km) to the northwest of the facility (Figure 9.1.22.2-1). As discussed in Section 9.1.7.3, 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. Because of the generally low level of soil disturbance activities within the geographic extent of effects and with the expected design features in place, cumulative impacts from the disturbance of soils would be small.

9.1.22.4.7 Minerals (Fluids, Solids, and Geothermal Resources)

No locatable mining claims or oil and gas leases occur within the proposed Imperial East SEZ. Public land in the SEZ was closed in June 2009 to locatable mineral entry pending the outcome of this PEIS. The area remains open for discretionary mineral leasing, including leasing for oil and gas and other salable minerals. About 60% of the SEZ is included within a KGA. There is an operating geothermal plant about 3 mi (2.4 km) northwest of the SEZ.

Solar energy development in the proposed SEZ would foreclose opportunities for future mineral development that would be inconsistent with solar energy facilities as long as they are in place. However, since there are no oil and gas leases in the area nor does the area contain existing mining claims, it is assumed there would be no loss of locatable mineral production there in the future. The impact of the loss of surface development of geothermal resources on 3,462 acres (14 km^2) within the KGRA would be a minor impact, while the cumulative impacts from the solar energy development in the proposed SEZ on mineral resources would be small.

9.1.22.4.8 Water Resources

The water requirements for various technologies if they were to be employed on the proposed SEZ to develop utility-scale solar energy facilities are described in Section 9.1.9.2. If the SEZ were to be fully developed over 80% of its available land area, the amount of water needed during the peak construction year for all evaluated solar technologies would be 1,382 to 2,047 ac-ft (1.9 to 2.5 million m^3), mainly for fugitive dust control. During operations, the amount of water needed for all evaluated solar technologies would range from 26 to 13,746 ac-ft/yr (0.03 to 17 million m^3), with PV representing the lower end of this range. Such water use requirements would be sustainable for technologies using dry-cooling, dish engine, and PV systems. However, water use estimates for wet-cooling technologies could potentially cause groundwater drawdown and could potentially disrupt groundwater flow patterns in the Imperial Valley. Drawdown could worsen land subsidence that has been occurring in the valley and could cause cracks in the newly lined All-American Canal and affect water quantities and rights of the IID (Section 9.1.9.2.2).

There are currently two pending applications for development of a solar energy project within the Imperial East SEZ—applications CACA 49884 and CACA 50174 for proposed 100 MW and 400 MW of CSP, respectively (Figure 9.1.22.2-1 and Table 9.1.22.2-1). While these two applications effectively cover the entire SEZ, their combined output of 500 MW is about one-half the maximum estimated 916-MW build-out capacity of the SEZ based on gross assumptions for output per available acre for solar trough technology. On the basis of technology-specific water use rates (Section 9.1.9) and solar trough technology, the combined facilities could require up to 7,200 ac-ft/yr (8.9 million m^3/yr) if wet cooled, or 500 ac-ft/yr (0.6 million m^3/yr) if dry cooled, assuming 60% operating time in each case. Impacts on the Imperial Valley aquifer could be significant under the wet-cooling scenario, but would be sustainable under the dry-cooling scenario.

While the Imperial aquifer beneath the proposed SEZ is thought to be in equilibrium, balancing current withdrawals with recharge, it is estimated that the newly lined portion of the All-American Canal near the southern boundary of the proposed SEZ will eliminate up to 67,700 ac-ft/yr (83.5 million m^3/yr) of recharge to the aquifer (Section 9.1.9.1.2). In addition, an approved geothermal lease agreement, CACA 018092X, is about 7 mi (11 km) northwest of the proposed SEZ (Figure 9.1.22-1), which could result in further withdrawals from the aquifer for cooling water. Contributions to cumulative impacts on groundwater from solar development in the SEZ should be viewed in the context of groundwater dynamics that are heavily affected by irrigation water returns and leakage from the All-American Canal. In this already highly influenced context, cumulative impacts on groundwater from currently foreseeable projects within the geographic extent of effects are expected to be variable but small overall.

Similarly, with respect to wastewaters, the small quantities of sanitary wastewater that would be generated during the construction and operation of the potential utility-scale solar energy facilities within the proposed Imperial East 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.

9.1.22.4.9 Vegetation

The proposed Imperial East SEZ is located within the Sonoran Basin and Range ecoregion (EPA 2007), which supports creosotebush (*Larrea tridentata)*-bur sage (*Ambrosia* sp.) plant communities with large areas of palo verde (*Parkinsonia* sp.) cactus shrub and saguaro cactus (*Carnegiea gigantea*) communities. One wetland mapped by the *National Wetlands Inventory* extends into the south-central portion of the SEZ, south of State Route 98

(USFWS 2009). The wetland is supported by seepage from the All-American Canal, located to the south (Figure 9.1.1.10-2) of the SEZ and is classified as a palustrine wetland with a scrub-shrub plant community that is temporarily flooded. Wetlands within the 5-mi (8-km) indirect impact area include those associated with the canal. If utility-scale solar energy projects were constructed within the SEZ, all vegetation within the footprints of the facilities would likely be removed during land-clearing and land-grading operations. The plant communities affected could include any of the communities occurring on the SEZ.

With respect to other, ongoing actions, a large portion of the Imperial Valley has been converted to agricultural land via irrigation, beginning about 3 mi (5 km) west of the SEZ. This conversion has had the largest overall ongoing impact on vegetation in Imperial County. Past impacts on major cover types located in the central Imperial Valley would have been large due to the extensive land area converted. The major cover type affected would have been the Sonora-Mojave Creosotebush-White Bursage Desert Scrub, which is still dominant in undeveloped areas. In addition, changes in wetland boundaries may occur in some areas subsequent to the lining of portions of the All-American Canal and associated wetland mitigation programs (BOR 2006).

Other renewable energy projects proposed within a 50-mi (80-km) radius of the Imperial East SEZ include two producing geothermal facilities located about 3 mi (5 km) to the north and a third authorized geothermal lease located about 6 mi (10 km) to the northwest of the SEZ. Additionally, there are as many as 7 proposed solar projects and 11 proposed wind projects with pending applications on public land within a 50-mi (80-km) radius of the SEZ, including two solar applications within the SEZ (Section 9.1.22.2 and Figure 9.1.22.2-1). Renewable energy projects, particularly solar, would have the greatest future potential to affect vegetation due to the large acreages that might be cleared. However, only one solar application and no wind applications are located within 20 mi (32 km) of the SEZ. The magnitude of such effects would depend 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.

Since the major cover type present on the SEZ, Sonora-Mojave Creosotebush-White Bursage Desert Scrub, is still abundant within the geographic extent of effects, outside of the agricultural areas, and a relatively small fraction of this area would be further affected by foreseeable actions, cumulative impacts on this cover type from foreseeable developments are expected to be small. Minor cover types, including the dune habitat in the eastern portion of the SEZ and extending eastward, and riparian woodland/shrubland habitats along the southern edge of the SEZ and extending to the All-American Canal could incur greater cumulative impacts due to their sensitivity and the rareness of these cover types within the geographic extent of effects. Programmatic design features would be adopted to protect these areas.

In addition, the cumulative effects of fugitive dust generated during the construction of the 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.

9.1.22.4.10 Wildlife and Aquatic Biota

As many as 158 species of amphibians (1 species), reptiles (27 species), birds (90 species), and mammals (40 species) occur in and around the proposed Imperial East SEZ (Section 9.1.11). The construction of utility-scale solar energy projects in the SEZ and any associated transmission lines and roads in or near the SEZ would have an impact 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, impacted species with broad distributions and occurring 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 dune and riparian areas).

In addition, up to 7 other solar projects, 11 wind projects, and 1 geothermal project have pending applications on public lands within 50 mi (80 km) of the SEZ, including two within the proposed Imperial East SEZ (Section 9.1.22.2 and Figure 9.1.22.2-1). Renewable energy projects, particularly solar, would have the greatest future potential to affect wildlife due to the large areas covered by such projects. However, only one solar application and no wind applications are within 20 mi (32 km) of the SEZ. The magnitude of cumulative impacts from renewable energy projects would depend on actual development and accompanying transmission lines, roads, and other infrastructure within the geographic extent of effects. Since many of the wildlife species have extensive available habitat within the geographic extent of effects and a relatively small fraction of the area would be affected by foreseeable projects, the cumulative impact on most wildlife species is expected to be small. Programmatic design features would be used to reduce the impacts from solar energy projects and thus reduce the overall cumulative impacts on wildlife. However, cumulative impacts on wildlife species within dune or riparian habitats, such as exist on or near the SEZ, might be somewhat higher due to the sensitivity and scarcity of these habitats.

Similarly, aquatic biota present in wetlands along the southern border of the SEZ, extending southward to the All-American Canal, would be of concern for cumulative impacts. Historically, these wetlands developed only after the construction of the All-American Canal in the 1930s (Cohn 2004) and continue to be supported by water seepage from the canal. Cumulative impacts on these wetlands and associated aquatic biota could occur because of reduction in seepage water supply resulting from lining the canal, drawdown of groundwater by solar facilities, and the possibility of off-site impacts from ground disturbance within the SEZ. Increased future demands on water from the Colorado River, which supplies the All-American Canal, could also affect surface water levels in the canal and, as a consequence wetlands and aquatic organisms. Avoidance of wetlands within the SEZ and off-site and implementation of development best management practices could minimize the effects of ground disturbance on these wetlands. Also, it is assumed that water for solar energy development would not come from the All-American Canal, and therefore water levels in the associated wetlands should not be affected.

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

Six special status species are known to occur within the affected area of the Imperial East SEZ: California black rail, giant Spanish-needle, sand food, flat-tailed horned lizard, Yuma clapper rail, and Yuma hispid cotton rat. The USFWS determined that the desert tortoise is absent from the affected area. The flat-tailed horned lizard, proposed for listing as an ESA-threatened species, is known to occur in the vicinity of the SEZ, while potentially suitable habitat (desert dune and pavement) occurs on the SEZ (Section 9.1.12.1.2). Numerous additional species occurring on or in the vicinity of the SEZ are listed as threatened or endangered by the states of California or Arizona, or listed as a sensitive species by the BLM. Programmatic design features that could 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 and minimization of erosion, sedimentation, and dust deposition. In addition, translocation could be used to minimize take of individuals.

A number of reasonably foreseeable future actions are possible in the geographic extent of effects of the proposed Imperial East SEZ, including seven solar and eleven wind project applications. Many of the same sensitive species or suitable habitat identified within or around the Imperial East SEZ would likely occur in or around the proposed locations of these potential projects. The actual species of concern or suitable habitat would be identified in biological surveys that would need to be performed as project applications move forward. Effects on identified species or suitable habitat would be assessed in required environmental reviews. Approved 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 be built within the next 20 to 30 years in 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 the dune, wetland, and riparian woodland habitats present on the Imperial East SEZ, which are scarce habitats sensitive to the effects of development. Most of the identified foreseeable actions are located more than 20 mi (32 km) from the SEZ and would not affect substantial portions of sensitive habitats present on or near the SEZ. Thus cumulative impacts from such future projects are expected to be small. However, considering habitat loss from the conversion of much of the central Imperial Valley to agriculture, total cumulative impacts on sensitive species from past and future actions could be moderate.

9.1.22.4.12 Air Quality and Climate

While solar energy generates minimal emissions compared with fossil fuels, the site preparation and construction activities associated with solar energy facilities would produce some emissions, mainly particulate matter (fugitive dust) and emissions from vehicles and construction equipment. When these emissions are combined with those from other projects near solar energy development or when they are added to natural dust generation from winds and windstorms, 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. The dust generation from the construction activities can be controlled by implementing aggressive dust control measures, such as increased watering frequency, or road paving or treatment.

Several other renewable energy projects are proposed or planned within the air basin shared by the proposed Imperial East SEZ (Section 9.1.22.2.1 and Figure 9.1.22.2-1). A total of 7 solar and 11 wind proposals are pending within 50 mi (80 km) of the Imperial East SEZ. These projects potentially in combination with others with pending applications could produce periods of elevated particulate emissions within the 50-mi (80-km) geographic extent of effects. Since the proposed solar projects, which involve the greatest area of ground disturbance, are more than 20 mi (32 km) from the proposed Imperial East SEZ and are widely separated, cumulative impacts are expected to be 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 from fossil fuels that results in higher levels of emissions. As discussed in Section 9.1.13, air emissions from operating solar energy facilities are relatively minor, while the displacement of criteria air pollutant, VOC, TAP, and GHG emissions currently produced from fossil fuels could be relative large. For example, if the Imperial East SEZ were fully developed with solar facilities over up to 80% of its area, the quantity of pollutants avoided could be up to 1.5% of all emissions from the current electric power systems in California.

9.1.22.4.13 Visual Resources

The Imperial Valley is flat and is characterized by wide-open views. A lack of obstructions allow visibility for 50 mi (80 km) or more under favorable atmospheric conditions, while occasional poor air quality can limit visibility. The SEZ presents a flat, open landscape, mostly treeless, but with shrubs tall enough in some areas to provide partial screening of views. The landscape is visually dominated by the strong horizon line; the closest visible mountain ranges are too far away to significantly affect the visual values in the vicinity of the SEZ. Cultural modifications on and around the site detract markedly from its scenic quality. These distractions include the presence of major and minor roads, transmission lines, communications towers, and the All-American Canal and its associated infrastructure. The VRI values for the SEZ and immediate surroundings are VRI Class III, indicating moderate relative visual values, and VRI Class IV, indicating low relative visual values. The inventory indicates low scenic quality for the SEZ and its immediate surroundings, with moderate sensitivity for the SEZ and its immediate surroundings (Section 9.1.14.1).

Development of utility-scale solar energy projects within the SEZ would contribute to the cumulative visual impacts in the general vicinity of the SEZ. However, the exact nature of the visual impact and the design features that would be appropriate would depend on the specific project locations within the SEZ and on the solar technologies used for the project. Such impacts and potential design features would be considered in visual analyses conducted for future specific 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 could 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.

Because of the large size of utility-scale solar energy development, other pending renewable energy applications on public lands in the area, and the generally flat, open nature of the proposed SEZ, 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. 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 North Algodones Dunes scenic ACECs. Other sensitive visual resource areas, including a congressionally designated WA, national historic trail, the CDCA, and I-8 and State Route 98, would be subject to mostly minor or 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 7 other solar projects and 11 wind projects have pending applications on public lands within 50 mi (80 km) of the SEZ. The overall extent of cumulative effects of renewable energy development in the area would depend on the number of projects that actually are built. However, since most of the pending applications would be more than 20 mi (32 km) from the proposed SEZ, it may be concluded that the general visual character of the landscape within the geographic extent of effects would not be fundamentally altered. Locally, the SEZ would be transformed from primarily rural desert to utility-scale solar development. The facilities would also be viewable by motorists on I-8 and State Route 98, as well as from the sensitive areas mentioned above. Views from these locations are currently visually affected by transmission line corridors, the All-American Canal, towns, and other infrastructure, as well as the road system itself. Thus, cumulative visual impacts in the region from future solar and other renewable energy development in the region would be small, while total impacts, including those from past developments, would be moderate, due to the moderate visual sensitivity of the region.

In addition to cumulative visual impacts associated with views of particular future development, as additional facilities are added several projects might become visible from one location, or in succession, as viewers move through the landscape, such as driving on local roads. In general, the new developments would vary in appearance, and depending on the number and type of facilities, the resulting visual disharmony could add to the cumulative visual impact.

9.1.22.4.14 Acoustic Environment

The areas around the proposed Imperial East SEZ and in Imperial County, in general, are relatively quiet. The existing noise sources include road traffic from I-8 and State Route 98, industrial activities at hydroelectric power plants and geothermal facilities, agricultural activities, activities and events at nearby communities, and aircraft flyovers, including military, commercial, and private airplanes, crop dusters, and Border Patrol helicopters. The construction of solar energy facilities could increase the noise levels over short durations because of the noise generated by construction equipment 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 of the SEZ, particularly at night when the noise is more discernable because of relatively low background levels. However, such cumulative impacts are unlikely due to attenuation of noise with distance and the sparse population of the region.

9.1.22.4.15 Paleontological Resources

The potential for impacts on significant paleontological resources at the Imperial East SEZ in Imperial Valley is unknown. The specific sites selected for future projects would be surveyed if determined necessary by the BLM, and paleontological resources encountered would be avoided or mitigated to the extent possible. A similar process would be employed at other foreseeable developments in the area, and no significant cumulative impacts on paleontological resources are expected.

9.1.22.4.16 Cultural Resources

While much of the proposed Imperial East SEZ has not been surveyed for cultural resources, the area along the All-American Canal south of the SEZ has been found to contain a high density of both prehistoric and historic cultural remains, and the canal itself is an important historic resource. Direct impacts on significant cultural resources during site preparation and construction activities could occur in the SEZ; however, further investigation would be needed, including a cultural resource survey of the entire area of potential effect to identify historic properties (i.e., cultural resources eligible for listing in the NRHP). It is possible that the development of utility-scale solar energy projects in the SEZ, when added to other potential 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 most adverse effects on significant cultural resources within the geographic extent of effects could be mitigated to some degree. However, avoidance of all historic properties and mitigation of all adverse effects on historic properties may not be possible.

9.1.22.4.17 Native American Concerns

Government-to-government consultation has been initiated with federally recognized Tribes whose traditional use areas include the Imperial East SEZ area in order to identify Tribal concerns regarding solar energy development within the SEZ. Among their concerns is the impairment of culturally and religiously important landscapes, and adverse effects 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. Continued government-to-government consultation with area Tribes is necessary to effectively consider and address the cumulative impacts of solar energy development in the Imperial East SEZ on resources important to Tribes.

9.1.22.4.18 Socioeconomics

Solar energy development projects in the proposed Imperial East 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, police protection, and health care facilities). Impacts from solar development would be most intense during facility construction, but of greatest duration during operations. Construction would temporarily increase the number of workers in the area needing housing and services in combination with temporary workers involved in other new projects in the area, including other renewable energy projects. The number of workers involved in the construction of solar projects in the peak construction year could range from about 130 to 1,680, 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 210 (solar PV) to as high as 2,830 (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 occurring at the same time. It is a reasonable expectation that this condition would occur within a 50-mi (80-km) radius of the SEZ occasionally over the 20-year or more solar development period. Potential future projects within the geographic extent of effects, including those with pending applications on public land (Section 9.1.22.2.1), would employ additional construction workers within the next several years. These new workers are not likely strain local resources given their wide geographic distribution.

Annual impacts during the operation of solar facilities would be less, but of 20- to 30-year duration, 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 10 to 200, with approximately 13 to 290 total jobs created in the region. Additional operation workers would be needed at other future renewable energy projects in the geographic extent of effects, including those with pending applications on public land (Section 9.1.22.2.1). Population increases resulting from renewable energy development within 50 mi (80 km) of the Imperial East SEZ would contribute to general population growth trends in the region in recent years. The socioeconomic impacts overall 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 likely be considered large enough to require specific mitigation measures.

9.1.22.4.19 Environmental Justice

Minority populations but no low-income populations have been identified within 50 mi (80 km) of the proposed SEZ in either California or Arizona, as defined under CEQ guidelines. However, it is not expected that solar development within the proposed Imperial East SEZ would contribute to cumulative impacts on minority populations.

9.1.22.4.20 Transportation

During construction activities, there could be up to 1,000 workers commuting to a single construction site at the SEZ, which could double the daily traffic load on State Route 98 near the junction with I-8 at the eastern end of the SEZ and have small to moderate cumulative impacts in combination with existing traffic levels and increases from additional future projects in the area. Local road improvements may be necessary near site access points. Any impacts from construction activities would be temporary. 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.

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9.1.23 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.

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