10.4 LOS MOGOTES EAST

10.4.1 Background and Summary of Impacts

10.4.1.1 General Information

The proposed Los Mogotes East SEZ has a total area of 5,918 acres (24 km^2). The SEZ is located in Conejos County in south-central Colorado, about 12 mi (19 km) north of the New Mexico border (Figure 10.4.1.1-1). In 2008, the county population was 8,745, while the four-county region surrounding the SEZ—Alamosa, Conejos, Costilla, and Rio Grande Counties— had a total population of 39,759. The largest nearby town is Alamosa, which had a 2008 population of 8,745, located about 22 mi (35 km) to the northeast on U.S. 285. This highway is located about 3 mi (5 km) east of the SEZ. The town of Romeo is located about 3 mi (5 km) directly to the east of the SEZ on U.S. 285. The SLRG Railroad serves the area. The nearest public airport is San Luis Valley Regional Airport located in Alamosa. Santa Fe, New Mexico, is located about 120 mi (193 km) to the south, and Denver, Colorado, is located about 170 mi (274 km) to the northeast.

An existing 69-kV transmission line runs to the SEZ from the east, ending just inside the SEZ boundary. It is assumed that this existing transmission line could potentially provide access to the transmission grid from the SEZ (see Section 10.4.1.2). As of February 2010, there were no pending solar project applications on the proposed SEZ.

The proposed Los Mogotes East SEZ is located in the southwestern San Luis Valley, part of the San Luis Basin, a large, high-elevation basin within the Rocky Mountains. The San Juan Mountains to the west and the Sangre de Cristo Range to the east form the rim of the basin. The proposed SEZ is located on a flat alluvial fan with no surface water features, except for a shallow drainage system that discharges into Romeo Ditch, an irrigation ditch that serves agricultural areas to the east. There is no development on the land, which is currently used for grazing. Scrubland vegetation reflects the arid climate, which produces an annual average rainfall of about 8 in. (20 cm). Large groundwater reserves underlie the area in several aquifers. Little commercial or industrial activity exists in the surrounding area, while agricultural areas lie to the east.

The proposed Los Mogotes East SEZ and other relevant information are shown in Figure 10.4.1.1-1. The criteria used to identify the SEZ as an appropriate location for solar energy 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, ACECs, SRMAs, and NLCS lands (see Section 2.2.2.2 for the complete list of exclusions). Although these classes of restricted lands were excluded from the proposed Los Mogotes East SEZ, other restrictions might be appropriate. The analyses in the following sections address the affected environment and potential impacts associated with utility-scale solar energy

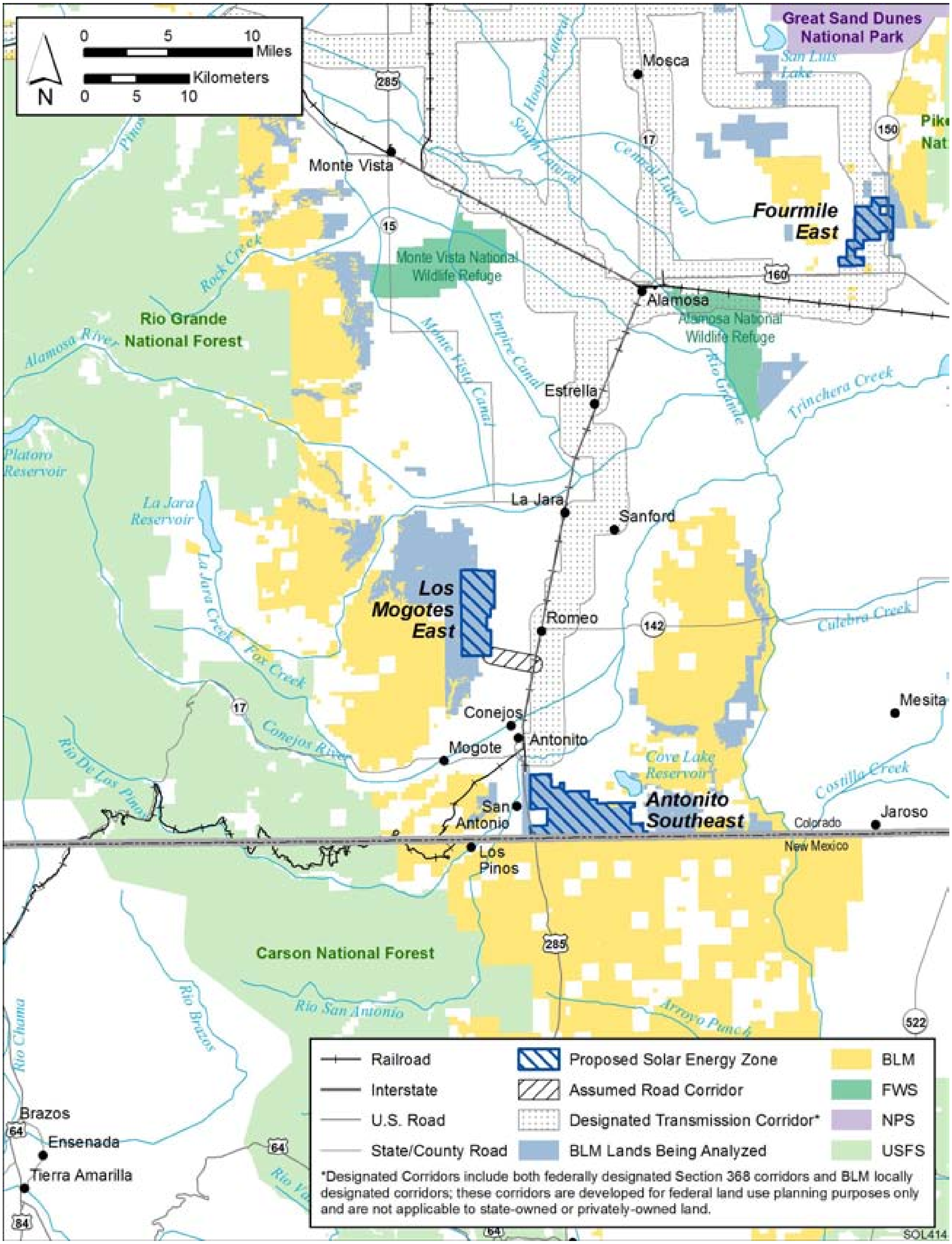

FIGURE 10.4.1.1-1 Proposed Los Mogotes East SEZ

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 Los Mogotes East SEZ encompassed 5,909 acres (24 km^2). Subsequent to the study area scoping period, the boundaries of the proposed Los Mogotes East SEZ were altered slightly to include some small higher slope areas internal to and at the borders of the site. Although these higher slope areas would not be amenable to solar development, inclusion in the SEZ would facilitate straightforward administration of the entire area by the BLM. The revised SEZ is approximately 9 acres (0.04 km^2) larger than the original SEZ area as published in June 2009.

10.4.1.2 Development Assumptions for the Impact Analysis

Maximum development of the proposed Los Mogotes East SEZ is assumed to be 80% of the total SEZ area over a period of 20 years, a maximum of 4,734 acres (19 km^2). These values are shown in Table 10.4.1.2-1. Full development of the Los Mogotes East SEZ would allow development of facilities with an estimated total of 526 MW of electrical power capacity if power tower, dish engine, or PV technologies were used, assuming 9 acres/MW (0.04 km^2/MW) of land required, and an estimated 947 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 69-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 69-kV capacity of that line would be inadequate for 526 to 947 MW of new capacity (note that a 500-kV line can approximately accommodate the load of one 700-MW facility). At full build-out capacity, it is clear that substantial new transmission and or upgrades of existing transmission lines would be required to bring electricity from the proposed Los Mogotes 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 infrastructure construction and of line upgrades for various resources are discussed in Chapter 5. Project-specific analyses would need to identify the impacts of new transmission construction and line upgrades for any projects proposed within the SEZ.

For purposes of analysis in this PEIS, it was assumed that no additional acreage would be disturbed for transmission line access because an existing 69-kV transmission line is located adjacent to the SEZ. Establishing a connection to the existing 69-kV line would not involve the construction of a new transmission line outside of the SEZ. If a connecting transmission line was constructed to a different location in the future, site developers would need to determine the impacts from construction and operation of that line. Additionally, developers would need to determine the impacts of line upgrades if they are needed.

TABLE 10.4.1.2-1 Proposed Los Mogotes East SEZ—Assumed Development Acreages, Maximum Solar MW Output, Access Roads, and Transmission Line ROWs

Total Acreage and Assumed Development 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 BLM Designated Corridor[e]
5,918 acres and 4,734 acres[a]	526 MW[b] 947 MW[c]	3 mi[d] (U.S. 285)	Adjacent and 69 kV	0 acres and 22 acres	NA[f]

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

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

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

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

[f] NA = no BLM-designated corridor is near the proposed Los Mogotes East SEZ.

U.S. 285 lies about 3 mi (5 km) to the east of the proposed Los Mogotes East SEZ. Assuming construction of new access road to reach U.S. 285 would be needed to support construction and operation of solar facilities, approximately 22 acres (0.09 km^2) of land disturbance would occur (a 60-ft [18.3-m] wide ROW was assumed), as summarized in Table 10.4.1.2-1.

10.4.1.3 Summary of Major Impacts and Proposed SEZ-Specific Design Features

In this section, the impacts and proposed SEZ-specific design features assessed in Sections 10.4.2 through 10.4.21 for the proposed Los Mogotes East SEZ are summarized in tabular form. Table 10.4.1.3-1 is a comprehensive list of impacts discussed in these sections; the reader may reference the applicable sections for detailed support of the impact assessment. Section 10.4.22 discusses potential cumulative impacts from solar energy development in the proposed SEZ.

Only those design features specific to the proposed Los Mogotes East SEZ are included in Sections 10.4.2 through 10.4.21 and in the summary table. The detailed programmatic design features for each resource area 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 10.4.1.3-1 Summary of Impacts of Solar Energy Development within the Proposed Los Mogotes East SEZ and Proposed SEZ-Specific Design Features[a]

Resource Area	Environmental Impacts—Proposed Los Mogotes East SEZ	SEZ-Specific Design Features
Lands and Realty	Full development of the SEZ (80% of the total area) could disturb up to 4,734 acres (19 km^2); utility-scale solar energy development would be a new and discordant land use to the area. Solar development would exclude most other uses of the public lands from the SEZ.	None.
	Access to BLM, state, and private lands to the west of the SEZ could be affected by solar energy development if provision is not made to retain public access through the SEZ.	None.
	About 22 acres (0.09 km^2) of private land would be disturbed in construction of a new 3-mi (5-km) road corridor to connect to U.S.285.	None.
Specially Designated Areas and Lands with Wilderness Characteristics	The Los Mogotes ACEC is located within 1 mi (1.6 km) of the SEZ and could be affected by its development, with increased vehicular traffic and disturbance that could impair its value to wildlife.	Impacts on the wildlife values of the Los Mogotes ACEC would likely not be mitigable.
	The Los Caminos Antiguos Scenic Byway passes within 3 mi (5 km) of the SEZ, and about 8 mi (13 km) is within the sensitive visual zone of 1 to 5 mi (0.6 to 8 km). Any impact of development of the SEZ on the byway and byway users is not known, but it would be highly visible.	None.
	The SEZ is located within the recently (2009) designated Sangre de Cristo NHA.	Early consultation should be initiated with the entity responsible for developing the management plan for the Sangre de Cristo NHA to understand how development of the SEZ could be consistent with NHA plans/goals.

TABLE 10.4.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Los Mogotes East SEZ	SEZ-Specific Design Features
Specially Designated Areas and Lands with Wilderness Characteristics *(Cont.)*	The SEZ is within 1 mi (1.6 km) of the route of the West Fork of the North Branch of the Old Spanish Trail, and development of the SEZ would have a major impact on the historic and visual integrity of the trail.	Pending completion of a study on the significance and definition of management needs (if any) of the West Fork of the North Branch of the Old Spanish National Historic Trail, solar development should be restricted to areas that do not have the potential to adversely affect the setting of the trail. After the study is completed, if management actions are warranted for this portion of the trail, solar energy development should be consistent with protection of identified values of the trail.
Rangeland Resources: Livestock Grazing	The Ciscom Flat allotment would likely be cancelled, and the Capulin and Little Mogotes allotments would be reduced, resulting in 475 AUMs being lost. Four grazing permittees would be impacted.	It may be possible to mitigate the loss of livestock grazing from the Capulin and Little Mogotes permits by changing management of the allotments and/or providing new range improvements (e.g., fences, water development) elsewhere in the allotments. It also may be possible to mitigate some or all of the loss by altering allotment boundaries or possibly offering an exchange of allotments with other un-occupied allotments.
Rangeland Resources: Wild Horses and Burros	None.	None.
Recreation	Current recreational users would be displaced from the SEZ but impacts would be minor.	None.
Military and Civilian Aviation	None.	None.

TABLE 10.4.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Los Mogotes East SEZ	SEZ-Specific Design Features
Geologic Setting and Soil Resources	Impacts on solar resources would occur mainly as a result of ground-disturbing activities (e.g., grading, excavating, and drilling) especially 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)	None.	None.
Water Resources	Ground-disturbance activities could affect surface water quality due to surface runoff, sediment erosion, and contaminant spills. Construction activities may require up to 964 ac-ft of (1.2 million m^3) of water during peak construction year. Construction activities would generate as high as 74 ac-ft (91,300 m^3) of sanitary wastewater. Assuming full development of the SEZ, normal operations would use the following amounts of water: • For parabolic trough facilities (947-MW capacity), 675 to 1,433 ac-ft/yr (0.8 million to 1.8 million m^3/yr) for dry-cooled systems and 4,747 to 14,216 ac-ft/yr (5.9 million to 17.5 million m^3/yr) for wet-cooled systems; • For power tower facilities (526-MW capacity), 374 to 795 ac-ft/yr (0.5 million to 1.0 million m^3/yr) for dry-cooled systems and	Wet-cooling options would not be feasible; other technologies should incorporate water conservation measures. Land disturbance activities should avoid impacts to the extent possible near ephemeral washes on site and surrounding wetlands. 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. Groundwater rights must be obtained from the Division 3 Water Court in coordination with the Colorado Division of Water Resources, existing water right holders, and applicable water conservation districts.

TABLE 10.4.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Los Mogotes East SEZ	SEZ-Specific Design Features
Water Resources *(Cont.)*	2,636to 7,897 ac-ft/yr (3.2 million to 9.7 million m^3/yr) for wet-cooled systems; • For dish engine facilities (526-MW capacity), 269 ac-ft/yr (331,800 m^3/yr); and • For PV facilities (526-MW capacity), 27 ac-ft/yr (33,300 m^3/yr). Assuming full development of the SEZ, normal operations would generate up to 13 ac-ft/yr (16,000 m^3/yr) of sanitary wastewater. Assuming full development of the SEZ, operation of solar energy facilities using wet-cooling systems (e.g., some parabolic trough and power tower facilities) would generate 149 to 269 ac-ft/yr (0.2 million to 0.3 million m^3/yr) of cooling system blowdown wastewater.	Groundwater monitoring and production wells should be constructed in accordance with state standards. Stormwater management plans and BMPs should comply with standards developed by the Colorado Department of Public Health and Environment. Water for potable uses would have to meet or be treated to meet water quality standards according to *Colorado Revised Statutes* 25-8-204.
Vegetation[b]	Construction would result in the removal of all vegetation within facility footprints; re-establishment of shrub or grassland communities would be difficult. Invasive plant species could become established in disturbed areas, potentially resulting in widespread habitat degradation. Land disturbance could result in deposition of dust on nearby plant communities and adversely affect their characteristics. Grading, introduction of contaminants, groundwater withdrawal, construction of access roads could result in direct impacts on wetlands near or downgradient from the SEZ, resulting in disruption of surface water flow, changes in groundwater discharge and sedimentation. The results could potentially affect wetland function and degrade or eliminate wetland 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 semidesert shrub steppe and semidesert grassland habitats 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. All dry wash habitats within the SEZ and all wetland and dry wash habitats within the assumed access road corridor should be avoided to the extent practicable, and any impacts minimized and mitigated. A buffer area should be maintained around

TABLE 10.4.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Los Mogotes East SEZ	SEZ-Specific Design Features
Vegetation[b] *(Cont.)*		wetlands and dry washes to reduce the potential for impacts on these habitats. Appropriate engineering controls should be used to minimize impacts on wetland, dry wash, and riparian habitats, including downstream occurrences, resulting from surface water runoff, erosion, sedimentation, altered hydrology, or accidental spills, and fugitive dust deposition. Maintaining sediment and erosion controls along drainages would reduce the potential for impacts on wetlands near or downgradient from the SEZ. Appropriate buffers and engineering controls would be determined through agency consultation. Groundwater withdrawals should be limited to reduce the potential for indirect impacts on wetlands or springs near or downgradient from the SEZ associated with groundwater discharge, such as the wetlands along the Conejos River.
Wildlife: Amphibians and Reptiles[b]	Small impacts on amphibians and reptiles could occur from development on the SEZ.	Wash habitats within the SEZ should be avoided to the extent practicable. Appropriate engineering controls should be used to minimize impacts on palustrine wetlands surrounding the SEZ resulting from surface water runoff, erosion, sedimentation, accidental spills, or fugitive dust deposition to these habitats. The access road should be sited and constructed to minimize impacts on wetlands (if present within the finalized access road location).

TABLE 10.4.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Los Mogotes East SEZ	SEZ-Specific Design Features
Wildlife: Birds[b]	Small impacts on landbirds could occur from development on the SEZ. Impacts on shorebirds, wading birds, and waterfowl are not expected because of the absence of surface waters within the SEZ. Raptors would be affected as the result of any loss of habitat used by their prey. Impacts on the mourning dove would be small. Other upland gamebirds do not occur on the SEZ.	The requirements contained within the 2010 Memorandum of Understanding between the BLM and USFWS to promote the conservation of migratory birds will be followed. Take of golden eagles and other raptors should be avoided. Mitigation regarding the golden eagle should be developed in consultation with the USFWS and the CDOW. A permit may be required under the Bald and Golden Eagle Protection Act. The access road should be sited and constructed to minimize impacts on wetlands and riparian areas (if present within the finalized access road location). Appropriate engineering controls should be used to minimize impacts resulting from surface water runoff, erosion, sedimentation, accidental spills, or fugitive dust deposition. If present, prairie dog colonies (which could provide habitat or a food source for some bird species) should be avoided to the extent practicable.
Wildlife: Mammals[b]	Impacts on small game, furbearers, and small mammals from habitat disturbance and long-term habitat reduction/fragmentation would be small. Impacts on American black bear, bighorn sheep, and cougar are expected to be small. Loss of overall range of elk, mule deer, and pronghorn would be small.	Prairie dog colonies should be avoided to the extent practicable. This could reduce impacts on species such as the desert cottontail and thirteen-lined ground squirrel. Construction should be curtailed during winter when big game species are present.

TABLE 10.4.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Los Mogotes East SEZ	SEZ-Specific Design Features
Wildlife: Mammals[b] *(Cont.)*	All of the SEZ is within the winter and severe winter range of elk; however, this is a small portion of their range. But because the SEZ is located somewhat centrally within the range, its loss could be considered a small fragmentation impact. The loss of nearly 3.7% of pronghorn severe winter range and 2.8% of a winter concentration area as a result of solar energy development would have a moderate impact on these pronghorn habitats.	Where big game winter ranges intersect or are within close proximity to the SEZ, use of motorized vehicles and other human disturbances should be controlled (e.g., through temporary road closures when big game are present). Development in the 135-acre (0.55 km^2) portion of the SEZ that overlaps the mule deer winter range should be avoided. Loss of pronghorn winter concentration area should be minimized.
Aquatic Biota[b]	Removal of vegetation and disturbance of surface soils to construct solar energy facilities would likely increase the amount of sediment in nearby wetland areas, negatively affecting aquatic biota, although the nearest wetland habitat is relatively small. Contaminants such as fuels, lubricants, or pesticides/herbicides could have a considerable impact on water quality and aquatic biota. Because of the distance to perennial streams, ponds, or reservoirs, the potential to introduce contaminants is small. Because there are no permanent water bodies or wetlands within the Los Mogotes East SEZ or in the assumed access road corridor, there would be no direct impacts on aquatic habitats from the construction of solar energy facilities. Withdrawing water from the La Jara Reservoir, La Jara Creek, Fox Creek, Conejos River, or other perennial water features for power plant cooling water, washing mirrors, or other needs, could affect water levels, and as a consequence, aquatic organisms in those water bodies.	Undisturbed buffer areas and sediment and erosion controls should be maintained around drainages associated with wetland areas located in the immediate vicinity of the SEZ

TABLE 10.4.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Los Mogotes East SEZ	SEZ-Specific Design Features
Special Status Species[b]	Potentially suitable habitat for 51 special status species occurs in the affected area of the Los Mogotes East SEZ. For all special status species, less than 1% of the potentially suitable habitat in the region occurs in the area of direct effects.	Pre-disturbance surveys should be conducted within the SEZ and access road corridor to determine the presence and abundance of special status species; disturbance to occupied habitats for these species should be avoided or minimized to the extent practicable. If avoiding or minimizing impacts to occupied habitats is not possible, translocation of individuals from areas of direct effects (where appropriate); 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. Avoiding or minimizing disturbance of grassland, marsh, meadow, and woodland habitat in the area of direct effects could reduce impacts on 24 special status species. Coordination with the USFWS and CDOW should be conducted to address the potential for impacts on the Gunnison's prairie dog and northern leopard frog – species that are either candidates or under review for listing under the ESA. Coordination would identify an appropriate survey protocol, avoidance measures, and, potentially, translocation or compensatory mitigation.

TABLE 10.4.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Los Mogotes East SEZ	SEZ-Specific Design Features
Special Status Species[b] *(Cont.)*		Harassment or disturbance of federally listed species, candidates for federal listing, BLM-designated sensitive species, state-listed species, rare 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 CDOW.
Air Quality and Climate	*Construction:* Temporary exceedances of AAQS for PM_{10} and $PM_{2.5}$ concentration levels at the SEZ boundaries and in the immediate surrounding area during the construction of solar facilities. These concentrations would decrease quickly with distance. Modeling indicates that emissions from construction activities could exceed Class I PSD PM_{10} increments at the nearest federal Class I area (the Great Sand Dunes Wilderness Area, about 35 mi [57 km] north-northeast of the proposed SEZ), but the potential impacts would be moderate and temporary. In addition, construction emissions from the engine exhaust of heavy equipment and vehicles could affect AQRV (e.g., visibility and acid deposition) at nearby Class I areas. *Operations:* Positive impact due to avoided emission of air pollutants from combustion-related power generation: 1.9 to 3.5% of total SO_2, NO_x, Hg, and CO_2 emissions from electric power systems in the state of Colorado (up to 2,194 tons SO_2, 2,529 tons NO_x, 0.014 tons Hg, and 1,639,000 tons CO_2).	None.

TABLE 10.4.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Los Mogotes East SEZ	SEZ-Specific Design Features
Visual Resources	Large visual impacts on the SEZ and surrounding lands within the SEZ viewshed due to major modification of the character of the existing landscape; potential additional impacts from construction and operation of transmission lines and access roads within the transmission line and road viewsheds. Viewshed analyses indicate visibility of power towers from many locations within the San Luis Valley, including residences, businesses, tourist destinations, and historic properties, as well as major and minor roadways, with substantial opportunities for extended viewing duration due to power tower height above potential screening. The SEZ is located 1.0 mi (1.6 km) from the route of the West Fork of the North Branch of the Old Spanish Trail at the point of closest approach. Where screening is absent, because of the short distance, strong visual contrasts could be observed by trail users near the point of closest approach. Minimal to strong visual contrasts could be observed from points on the trail farther from the SEZ. The SEZ is 8.8 mi (14.2 km) at the point of closest approach west-southwest of the San Luis Hills WSA. Weak to moderate visual contrasts could be observed by WSA visitors. The SEZ is 2.6 mi (4.3 km) at the point of closest approach east of the Los Caminos Antiguos Scenic Byway. Where screening is absent, weak to strong visual contrasts could be observed by byway users. The communities of Antonito, Romeo, Sanford, La Jara, and Conejos are located within the viewshed of the SEZ, between 3 and 8 mi (5 and 13 km) from the SEZ although slight variations in topography and vegetation provide full or partial screening in some locations. Where screening is absent, Romeo could experience strong visual contrasts.	The development of power tower facilities should be prohibited within the SEZ.

TABLE 10.4.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Los Mogotes East SEZ	SEZ-Specific Design Features
Visual Resources *(Cont.)*	Residents, workers, and visitors to these communities may experience visual impacts from solar energy facilities located within the SEZ (as well as any associated access roads and transmission lines) as they travel area roads, including U.S. 285 and CO 17, portions of which are included in the Los Caminos Antiguos Scenic Byway.	
Acoustic Environment	*Construction:* For construction of a solar facility located near the southeastern SEZ boundary, estimated noise levels at the nearest residence located about 0.4 mi (0.6 km) from the SEZ boundary would be about 52 dBA, which is higher than typical daytime mean rural background level of 40 dBA. In addition, an estimated 49 dBA L_{dn} at this residence is below the EPA guidance of 55 dBA L_{dn} for residential areas. *Operations:* For operation of a parabolic trough or power tower facility located near the southeastern SEZ boundary, the predicted noise level would be about 45 dBA at the nearest residence, which is above the typical daytime mean rural background level of 40 dBA. If the operation were limited to daytime, 12 hours only, a noise level of about 44 dBA L_{dn} would be estimated for the nearest residence, which is well below the EPA guideline of 55 dBA L_{dn} for residential areas. However, in the case of 6-hour TES, the estimated nighttime noise level at the nearest residence would be 55 dBA, which is fairly higher than the typical nighttime mean rural background level of 30 dBA. The day-night average noise level is estimated to be about 57 dBA L_{dn}, which is a little 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 at the nearest residence would be about 49 dBA, which is higher than the typical daytime mean rural background level of 40 dBA. On the basis of 12-hour daytime operation, the estimated 47 dBA L_{dn} at this residence would be 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 nearby residences to the north and east 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 the residences, limiting operations to a few hours after sunset, and/or installing fan silencers. Dish engine facilities within the SEZ should be located more than 1 to 2 mi (1.6 to 3 km) from nearby residences around the SEZ (i.e., the facilities should be located in the western area 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.

TABLE 10.4.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Los Mogotes East SEZ	SEZ-Specific Design Features
Paleontological Resources	Few, if any, impacts on significant paleontological resources in a large percentage of the Los Mogotes East SEZ are likely to occur. A more detailed look at the geological deposits of the SEZ is needed to verify that a PFYC of Class I is accurate and appropriate for 88% of the SEZ. There could be impacts in the eastern 12% of the SEZ. A more detailed look at the geological deposits and their depth and a paleontological survey may be needed for this portion of the SEZ and any area to the east of the SEZ considered for road access.	Avoidance of PFYC Class 4/5 areas is recommended for development within the SEZ and for access road placement. Where avoidance of these areas is not possible, a paleontological survey may be required.
Cultural Resources	Direct impacts on significant cultural resources could occur; however, a cultural resource survey would need to be conducted within the SEZ and along any proposed access corridors to identify archaeological sites, historic structures or features, and traditional cultural properties and to determine whether any are eligible for listing in the NRHP. Further evaluation is needed to determine the effects of solar energy development on the West Fork of the North Branch of the Old Spanish Trail. On the basis of preliminary visual analysis, the Cumbres & Toltec Scenic Railroad Corridor located south of the SEZ would not be adversely affected by solar energy development, with the possible exception of visual impacts from the installation of a power tower or other similarly tall structures. Indirect impacts on cultural resources, such as vandalism or theft, are unlikely as a result of new road access to the east. Any new corridors to the south or west would need to be evaluated.	A PA may need to be developed among the BLM, DOE, Colorado SHPO, ACHP, and the Trail Administration for the Old Spanish Trail to consistently address impacts on significant cultural resources from solar energy development within the San Luis Valley. Additional coordination with the CTSR Commission is recommended to address possible mitigation measures for reducing visual impacts on the Cumbres and Toltec Scenic Railroad

TABLE 10.4.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Los Mogotes East SEZ	SEZ-Specific Design Features
Native American Concerns	It is possible that there will be Native American concerns about potential visual and noise effects of solar energy development in the proposed SEZ on culturally significant locations within the valley as consultation continues and additional analyses are undertaken. Effects on traditionally important plants and animals are also possible.	The need for and nature of SEZ-specific design features would be determined during government-to-government consultation with the affected Tribes.
Socioeconomics	Loss of grazing area could result in the loss of 1 job and less than $0.1 million in income; loss of $74 annually in grazing fees. *Construction:* 218 to 2,885 total jobs; $11.6 million to $153.7 million income in ROI. *Operations:* 15 to 323 annual jobs; $0.5 to $10.2 million annual income in ROI.	None.
Environmental Justice	Minority populations identified within the New Mexico portion of the 50-mi (80-km) radius around the proposed SEZ could be disproportionately affected by the construction and operation of solar facilities. Potential adverse impacts could result from noise and dust during construction; increased traffic related to construction; operations noise; visual impacts of generation and auxiliary facilities to areas of traditional or cultural significance; restricted access to animals and vegetation on developed lands; curtailed mineral, energy, and forestry development in the region; and property value impacts.	None.
Transportation	U.S. 285 provides a regional traffic corridor that could experience moderate impacts from projects that may have up to 1,000 daily workers, with an additional 2,000 vehicle trips per day (maximum). Local road improvements might be necessary on the county roads between U.S. 285 and the SEZ so as not to overwhelm the local roads near any site access point(s).	None.

1 **Footnotes are on next page.**

TABLE 10.4.1.3-1 (Cont.)

Abbreviations: AAQS = ambient air quality standards; ACHP = Advisory Council on Historic Preservation; AQRV = air quality-related value; AUM = animal unit month; BLM = Bureau of Land Management; CEQ = Council on Environmental Quality; CO_2 = carbon dioxide; CO = Colorado State Highway; CR = County Road; DOE = U.S. Department of Energy; DoD = U.S. Department of Defense; EPA = U.S. Environmental Protection Agency; ESA = Endangered Species Act; Hg = mercury; MTR = military training route; NO_x = nitrogen oxides; NRHP = *National Register of Historic Places*; PA = Programmatic Agreement; $PM_{2.5}$ = 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; SEZ = solar energy zone; SHPO = State Historic Preservation Office; SO_2 = sulfur dioxide; TES = thermal energy storage; USFS = U.S. Forest Service; USFWS = U.S. Fish and Wildlife Service; WSA = Wilderness Study Area.

[a] The detailed programmatic design features for each resource area 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 Los Mogotes East SEZ.

[b] The scientific names of all plants, wildlife, and aquatic biota are provided in Sections 10.4.1.10 through 10.4.1.12.

10.4.2 Lands and Realty

10.4.2.1 Affected Environment

The proposed Los Mogotes East SEZ is surrounded on the east by private lands that have been primarily developed for irrigated agriculture. Homesites are also scattered throughout this adjacent area. Although the SEZ itself contains only BLM-administered lands, two parcels of state-owned land that total about 1,100 acres (4.4 km^2) abut the SEZ on the north and south. Access to the SEZ and areas west of the SEZ is readily available via three county roads from U.S. 285. A 69-kV transmission line terminates a short distance from the SEZ. There are no existing ROW authorizations within the SEZ. The overall character of the SEZ is rural and undeveloped.

There are currently no solar development applications within the Los Mogotes East SEZ; however, there is one solar facility operating in the San Luis Valley on private land near Mosca, about 40 mi (64 km) north of the SEZ. There is ongoing interest in developing additional solar energy facilities on private lands in the valley.

10.4.2.2 Impacts

10.4.2.2.1 Construction and Operations

This analysis assumes that 4,734 acres (19 km^2), or 80%, of the proposed Los Mogotes East SEZ could be developed for utility-scale solar energy production over a 20-year period. This development would establish an industrial area that would exclude most other existing and potential uses from the site. Because the character of the area is currently rural and undeveloped, utility-scale solar energy development would introduce a new and discordant land use to the area. If solar development was to occur, many existing and potential uses of the public lands in the SEZ would be foregone, perhaps in perpetuity. It is also possible that with landowner agreement state and private lands located near the SEZ also could be developed in the same or a complementary manner as the public lands in the SEZ.

Should the proposed Los Mogotes East SEZ be identified as an SEZ, the BLM would still have discretion to authorize ROWs in the area until solar energy development was authorized, and then any future ROWs would have to be compatible with the rights granted for solar energy facilities. It is not anticipated that approval of solar energy development would have a significant impact on ROW availability in the area.

Access to BLM, state, and private lands to the west of the SEZ could be affected by solar energy development if provision is not made to retain legal access through the SEZ.

10.4.2.2.2 Transmission Facilities and Other Off-Site Infrastructure

Availability of transmission from the Los Mogotes SEZ to load centers will be an important consideration for future development in SEZs. The nearest existing transmission line is a 69-kV line adjacent to the SEZ. It is possible that a new transmission line could be constructed from the SEZ to this existing line, but the 69-kV capacity of that line would be inadequate for 865 to 1,557 MW of new capacity. At full build-out capacity of the proposed SEZ, it is clear that substantial new transmission and or upgrades of existing transmission lines would be required to bring electricity to load centers; however, at this time the location and size of such new transmission facilities are unknown. Generic impacts of transmission and associated infrastructure construction and of line upgrades for various resources are discussed in Chapter 5. Project-specific analyses would need to identify the specific impacts of new transmission construction and line upgrades for any projects proposed within the SEZ.

Because the SEZ is 3 mi (5 km) from the nearest state or interstate highway, it is assumed that a new road would need to be constructed to U.S. 285 east of the SEZ, disturbing approximately 22 acres (0.09 km^2) of private land.

10.4.2.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features would be required. 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 impacts on authorizations within the SEZ under the BLM Lands and Realty Program.

10.4.3 Specially Designated Areas and Lands with Wilderness Characteristics

10.4.3.1 Affected Environment

There are no specially designated areas within the proposed Los Mogotes East SEZ. However, the SEZ is located on the floor of the San Luis Valley, and numerous specially designated areas are located within the viewshed of the site (see Figure 10.4.3.2-1), many of which are elevated above the SEZ, and some of which are in close proximity to the SEZ. These areas are discussed below. No lands with wilderness characteristics have been identified within 25 mi (40 km) of the SEZ.

Three ACECs—San Luis Hills, Los Mogotes, and Cumbres & Toltec—are located in Colorado, and the San Antonio Gorge ACEC is located in New Mexico. The San Luis Hills, Cumbres & Toltec, and San Antonio Gorge ACECs are within the viewshed of the SEZ (see Section 10.4.14), and scenic values were identified at least as one of the resource values supporting designation as an ACEC. The Los Mogotes ACEC, which is about 1 mi (1.6 km) west of the SEZ, was designated for its wildlife values.

Two BLM-administered WSAs—San Antonio in New Mexico and San Luis Hills in Colorado—are within 10 to 12 mi (16 to 19 km) of the SEZ, and visitors to those areas would be able to see development within the SEZ.

Portions of two designated USFS-administered wilderness areas—South San Juan in Colorado and Cruces Basin in New Mexico—are in the viewshed of the SEZ. The SEZ is also visible from several roadless areas within the Rio Grande and Carson National Forests located to the west and south of the SEZ.

Portions of U.S. 285 and CO 17 and CO 159 have been designated as the Los Caminos Antiguos Scenic Byway by both the state and BLM. This scenic byway passes within 3 mi (5 km) of the SEZ and is in full view of the SEZ for more than 20 mi (32 km) of its length in the San Luis Valley.

The SEZ is located within the boundaries of the recently (2009) designated Sangre de Cristo NHA. The NHA includes three Colorado counties—Alamosa, Conejos, and Costilla.

The route of the West Fork of the North Branch of the Old Spanish Trail parallels within 1 mi (1.6 km) the eastern boundary of the SEZ. Studies are currently ongoing regarding the significance of this portion of the trail and if found warranted, it could be included in the National Trail System. See Section 10.4.17 for additional information on this trail.

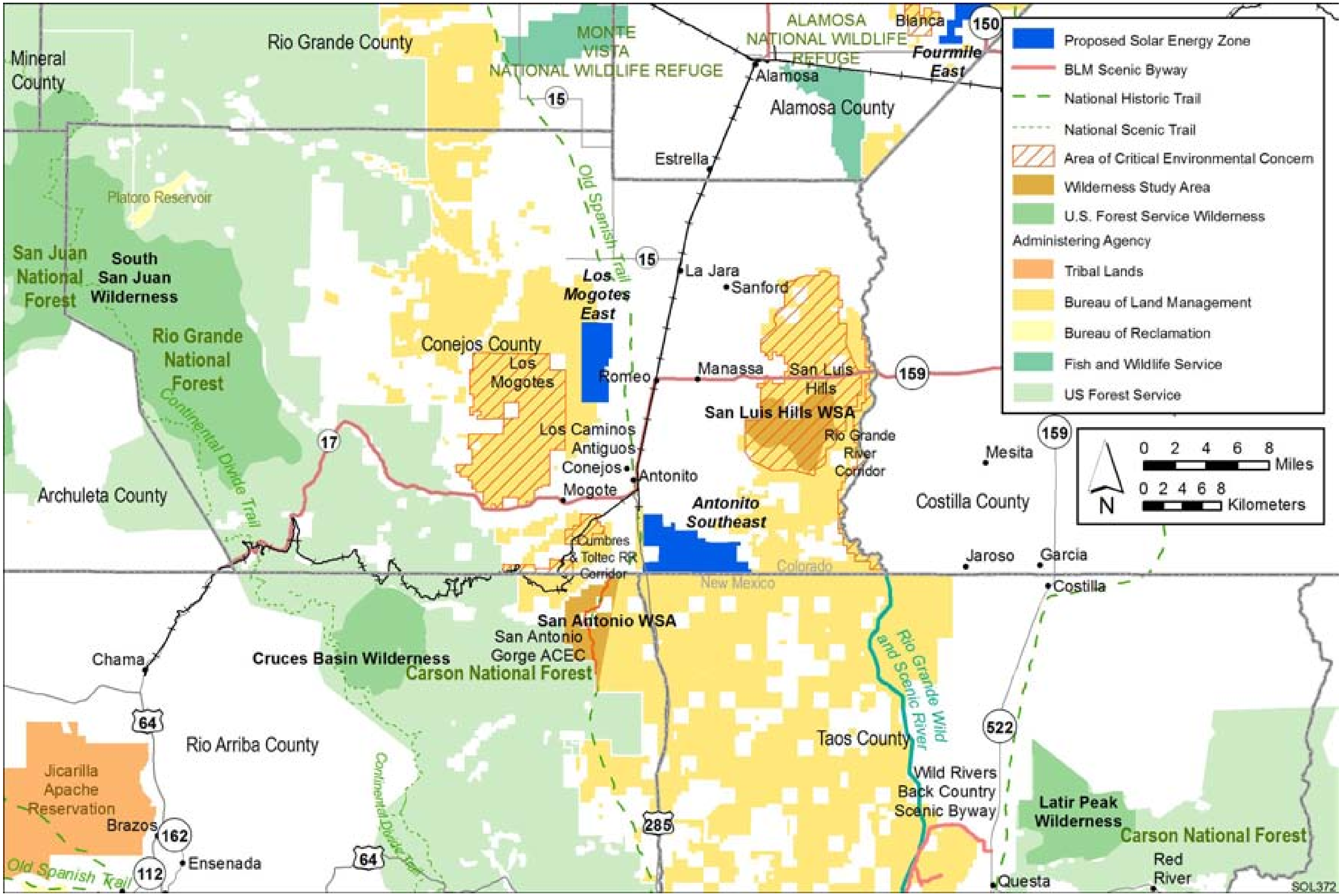

FIGURE 10.4.3.2-1 Specially Designated Areas in the Vicinity of the Proposed Los Mogotes East SEZ

10.4.3.2 Impacts

10.4.3.2.1 Construction and Operations

The primary potential impacts on the specially designated areas near the SEZ would be visual impacts of solar energy development that could affect scenic and/or recreation resources or wilderness characteristics of the areas. The visual impacts could be associated with direct views of the solar facilities, including transmission facilities; glint and glare from reflective surfaces; steam plumes; hazard lighting of tall structures; and night lighting of the facilities. For WSAs, visual impacts from solar development would be most likely to cause the loss of outstanding opportunities for solitude and primitive and unconfined recreation. While the visibility of solar facilities from specially designated areas is relatively easy to determine, the effect of this visibility is difficult to quantify and would vary by solar technology employed, the specific area being affected, and the perception of individuals viewing solar facilities while engaging in recreation activities g in areas within sight of the SEZ. Solar energy facilities, especially if the SEZ is fully developed, would be an important visual component in the viewshed from portions of some of these specially designated areas. Viewshed analysis for this SEZ has shown that the visibility of shorter solar energy facilities would be less in some areas than power tower facilities. Section 10.4.14 provides detail on all viewshed analyses for this SEZ. Potential impacts discussed below are general, and assessment of the visual impact of solar energy projects must be conducted 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 effect on an individual's perception of impact. From a visual analysis perspective, the most sensitive viewing distances generally are from 0 to 5 mi (0 to 8 km), but could be farther depending on other factors including the viewing height above or below a solar energy development area; the size of the solar development area; and the purpose for which people visit an area. Individuals seeking a wilderness or scenic experience within these specially designated areas could be expected to be more adversely affected than those simply traveling along the highway with another destination in mind. In the case of the Los Mogotes East SEZ, the flat terrain and the low-lying location of the SEZ in relation to portions of some of the surrounding specially designated areas would highlight the industrial-like development in the SEZ.

The occurrence of glint and glare at solar facilities could potentially cause large though temporary increases in brightness and visibility of the facilities. The visual contrast levels projected for sensitive visual resource areas that were used 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. Figure 10.4.3.2-1 shows the location of the areas discussed below.

ACECs

- The Cumbres & Toltec ACEC was established to protect the viewshed of the scenic train route that passes through the ACEC. The principle "users" for this ACEC are people who ride the train and view these lands during their train ride. The nearest boundary of the SEZ is 7 mi (11 km) from the ACEC. Because of the distance, and vegetative and topographic screening, visitors on the train within the ACEC would not have continuous views of development within the SEZ. Based on visual analysis it is anticipated that scenic resources in the ACEC would be minimally affected by development within the SEZ, but there is potential that the scenic train ride experience for some visitors could be diminished.

- Much of the San Luis Hills ACEC, which is east of the SEZ, is elevated above the SEZ and visitors within portions of the ACEC would have a full view of solar development although the minimum distance from the SEZ to the ACEC is about 9 mi (15 km). Because of the distance and the presence of agricultural development between the ACEC and the SEZ, the potential for visual impact on users of the ACEC would be lessened and is expected to be minimal.

- The San Antonio Gorge ACEC is 11 mi (18 km) south of the SEZ. Because of the distance from the SEZ and since much of the canyon is incised and likely does not have a view of the SEZ, it is unlikely that development in the SEZ would have any impact on users of the ACEC.

- The Los Mogotes ACEC is located 1 mi (1.6 km) west of the SEZ and likely would be adversely affected by development of the SEZ, which would add additional disturbance into an area that at present is relatively undisturbed. Improved access to the SEZ could lead to additional vehicular traffic and human disturbance within the ACEC that could impair its overall value to wildlife.

WSAs

- The San Luis Hills WSA is included within the exterior boundaries of the ACEC of the same name described above, and that description also applies to the WSA. The closest boundary of the WSA to the SEZ is also 9 mi (15 km) from the SEZ. Largely because of the distance between the WSA and the SEZ and the existing agricultural and other human development visible from the WSA, it is not anticipated that solar development of the SEZ would have a significant impact on the wilderness characteristics of the WSA or on the experience of wilderness visitors.

- The San Antonio WSA includes the San Antonio Gorge ACEC but, unlike the ACEC, visitors within most of the WSA would have a full view of the SEZ, although the distance ranges from 11 to 16 mi (18 to 26 km). Because of the distance between the WSA and SEZ, impacts on wilderness characteristics and the experience of wilderness visitors would be minimal.

Wilderness and Roadless Areas

- Portions of the South San Juan and Cruces Basin WAs and numerous roadless areas would have long-distance views of development within the SEZ of about 20 mi (32 km). Although solar facilities in the SEZ would be visible, because of the distance, there would be little to no effect on wilderness characteristics or on the experience of wilderness visitors.

Los Caminos Antiguos Scenic Byway

- Vehicle passengers on about 29 mi (47 km) of the scenic byway would have a clear view of solar development within the SEZ. A portion of the byway passes within 3 mi (5 km) of the SEZ, and about 8 mi (13 km) of the highway is within the most visually sensitive zone from 0 to 5 mi (0 to 8 km). The potential impact of development of the SEZ on the byway and byway users is not known, but the SEZ would be highly visible.

Sangre de Cristo National Heritage Area (NHA)

- The NHA was recently designated, and planning for it is not yet complete; thus it is difficult to assess the impact that solar development in the SEZ might have. However, an NHA is described as a place where natural, cultural, historic, and scenic resources combine to form a cohesive, nationally important landscape arising from patterns of human activity shaped by geography (NPS 2008). This definition implies that visual impacts from solar energy development could be of concern.

West Fork of the North Branch of the Old Spanish Trail

- Solar development within the SEZ could be within 1 mi (1.6 km) of the route of the trail and would have a major impact on the historic and visual integrity of the trail. Until the ongoing trail study is complete, it is not possible to know whether this segment of the trail will be found to have significant values that should be preserved or what potential management actions may be required. See Section 10.4.17 for additional information on the trail.

10.4.3.2.2 Transmission Facilities and Other Off-Site Infrastructure

Section 10.4.2.2.2 presents a discussion of transmission facilities. In addition, should a new transmission line be required, there is potential for additional impact on the West Fork of the North Branch of the Old Spanish Trail.

Three miles (5 km) of new road constructed east of the site would add minimally to the visual impact on specially designated areas associated with the SEZ facilities.

10.4.3.3 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 may be potential visual impacts on travelers on the scenic byway and impacts on the NHA. Impacts on these two areas would be better determined or mitigated once ongoing studies and planning are complete and could be considered as part of a project specific proposal. Additionally, impacts on the wildlife values of the Los Mogotes ACEC would likely not be mitigable.

Proposed design features specific to the proposed Los Mogotes East SEZ include the following:

- Early consultation should be initiated with the entity responsible for developing the management plan for the Sangre de Cristo NHA to understand how development of the SEZ could be consistent with NHA plans/goals.

- Pending completion of a study on the significance and definition of management needs (if any) of the West Fork of the North Branch of the Old Spanish Trail, solar development should be restricted to areas that do not have the potential to adversely affect the setting of the trail. After the study is completed, if management actions are warranted for this portion of the trail, solar energy development should be consistent with protection of identified values of the trail.

10.4.4 Rangeland Resources

Rangeland resources include livestock grazing and wild horses and burros, both of which are managed by the BLM. These resources and possible impacts on them from solar development within the proposed Los Mogotes East SEZ are discussed in Sections 10.4.4.1 and 10.4.4.2.

10.4.4.1 Livestock Grazing

10.4.4.1.1 Affected Environment

The SEZ includes portions of three seasonal grazing allotments: Ciscom Flat (#14212), Capulin (#14207), and Little Mogotes (#24222). The allotments are used by four permittees and support a total forage production of 2,337 AUMs per year. There are livestock management facilities, including fences and watering places, in the area. Table 10.4.4.1-1 summarizes key acreage and production data for these allotments.

10.4.4.1.2 Impacts

Construction and Operations

Should utility-scale solar development occur in the SEZ, grazing would be excluded from the areas developed as provided for inBLM grazing regulations (43 CFR Part 4100). This would include reimbursement of permittees for their portion of the value for any range improvements in the area removed from the grazing allotment. The impact of this change in the grazing permits would depend on several factors, including (1) how much of an allotment the permittee might lose to development, (2) how important the specific land lost is to the permittee's overall operation, and (3) the amount of actual forage production that would be lost by the permittee.

The Ciscom Flat allotment is largely contained within the proposed area of the SEZ, and 84% of public lands in the allotment would be affected by solar development. If full solar development occurred in the SEZ, the BLM grazing permit for the Ciscom Flat allotment would probably be cancelled and the permittee would be displaced.

At full SEZ development, about 8% of the public lands in the Capulin allotment and about 16% of the public lands in the Little Mogotes allotment would be affected by solar energy development. The grazing permits for these two allotments would be modified to exclude portions of the allotments, and there likely would be a small to moderate impact on those operations. Because of the relatively small amount of land that would be removed from these two allotments and depending on the significance of those lands to the operation of the allotments, it might be possible to redistribute livestock use throughout the remaining portions of the allotments and to avoid a flat percentage reduction in use comparable to the percentage

TABLE 10.4.4.1-1 Grazing Allotments within the Proposed Los Mogotes East SEZ

Allotment	Total Acres[a]	% Total in SEZ[b]	State Acres/ Authorized AUMs	Active BLM AUMs	No. of Permittees
Ciscom Flat	4,320	84	640/70	191	1
Capulin	8,790	8	640/14	742	1
Little Mogotes	13,803	16	640/81	1,404	2

[a] Total acres, including public and state land, and AUMs, is from the BLM Rangeland Administration System report (BLM 2008b). To convert acres to km^2, multiply by 0.004047.

[b] Represents the percentage of public land in the allotment, within the SEZ.

loss in land area of the permit. On the basis of the probable cancellation of the Ciscom Flat allotment and the possible reduction in AUMs comparable to the acreage loss from the other two allotments, about 475 AUMs would be lost from the public lands. Section 10.4.19.2.1 provides more information on the economic impact of this loss of grazing capacity.

Each of the BLM allotments contains one state-owned section of land. However, cancellation/modification of the BLM grazing permits would not prevent these areas from continuing to be leased for grazing.

Although the impacts on the Ciscom Flat permittee would depend on the specific situation, there likely would be an adverse economic impact, and possibly an adverse social impact since for many permittees since operating grazing allotments on public lands has been a long-standing tradition. It is possible that solar development proponents could purchase all or portions of the existing grazing allotment both to facilitate solar operations and to minimize the impact on the existing public land permittees.

Transmission Facilities and Other Off-Site Infrastructure

It is anticipated that road and transmission facility construction east of the SEZ would not cause additional impact on livestock grazing on the three allotments.

10.4.4.1.3 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, could minimize disruption of grazing operations; however, it may not be possible to fully mitigate the economic loss to the holders of grazing permits and the social impacts from loss of grazing rights.

A proposed design feature specific to the proposed Los Mogotes East SEZ is as follows:

- Since the Capulin and Little Mogotes allotments are relatively large, it may be possible to mitigate the loss of livestock grazing from these allotments by changing management of the allotments and/or providing new range improvements (e.g., fences, watering places) elsewhere in the allotments. It also may be possible to mitigate some or all of the loss by altering allotment boundaries or possibly offering an exchange of allotments with other unoccupied allotments.

10.4.4.2 Wild Horses and Burros

10.4.4.2.1 Affected Environment

Section 4.4.2 discusses wild horses (*Equus caballus*) and burros (*E. asinus*) that occur within the six-state study area. Four wild horses HMAs are located in Colorado; two are in New Mexico, but none are near the proposed Los Mogotes East SEZ. The closest wild horse HMA to the SEZ is the Carracas Mesa HMA in New Mexico, which is about 70 mi (274 km) west of the SEZ. Located about 12 mi (19 km) south of the SEZ in New Mexico is the Punche Valley HA, which is a 70,809-acre (287-km^2) area (including 16,606 acres [67 km^2] of private lands) that historically was wild horse habitat but has not been designated for long-term management of wild horses. In FY 2009, the BLM estimated there were no horses or burros within the HA. There have been occasional reports of horses sited in the Antonito Southeast SEZ which is adjacent to the HA and is about 8 mi (13 km) southeast of the Los Mogotes East SEZ, but there have been no reports of horses in the Los Mogotes East SEZ.

10.4.4.2.2 Impacts

Because the closest wild horse HMA is more than 70 mi (225 km) from the Los Mogotes East SEZ, solar energy development would not affect wild horses and burros that are managed by the BLM.

10.4.4.2.3 SEZ-Specific Design Features and Design Feature Effectiveness

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

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10.4.5 Recreation

10.4.5.1 Affected Environment

The proposed Los Mogotes East SEZ is flat, and the quality of its natural features would not generally attract recreational users from distant locations. Although there are no recreation data specific to the area, the area is used by local residents for general outdoor recreation, including horseback riding, OHV and backcountry driving, and hunting. Principle species of interest to hunters would likely include deer and pronghorn antelope. Rabbits, doves, and quail are also hunted in the area. The area has been designated in the San Luis Valley Travel Management Plan as Limited, Designated Roads and Trails. The area can be accessed via county roads that connect to U.S. 285. Three road/trail segments within the SEZ have been identified as Open Motorized Road and are available for OHV or vehicular travel and also provide access to areas west of the SEZ. There are also several low-quality dirt roads that wind through portions of the area but that are not designated for motorized use. Recreational use of the SEZ area is minimal.

The CTSR operates between May and October on an established rail line that runs from Antonito, Colorado, to Chama, New Mexico (CTSR 2010). The railroad passes within 6 mi (10 km) of the southern border of the SEZ, and solar development on the site would be visible to railroad passengers.

10.4.5.2 Impacts

10.4.5.2.1 Construction and Operations

Recreational visitors would lose the use of any portions of the SEZ developed for solar energy production. Access through areas developed for solar power production could be closed or rerouted. There would not be a significant loss of recreation use if the SEZ was developed, but some users would be displaced. Numerous areas of public land in reasonably close proximity to the area could provide alternative sites for displaced users.

Solar development within the SEZ would affect public access along OHV routes designated open and available for public use. Such open routes crossing areas granted ROWs for solar facilities would be redesignated as closed (see Section 5.5.1 for more details on how routes coinciding with proposed solar facilities would be treated).

Development of the SEZ would be visible from short portions of the CTSR, but, depending on the solar technologies employed and because the SEZ is at the edge of the most sensitive visual area, the potential impact on recreation visitors riding the train would be minor.

10.4.5.2.2 Transmission Facilities and Other Off-Site Infrastructure

It is anticipated that road and transmission facility construction would occur east of the SEZ and would not cause additional impact to recreation resources.

10.4.5.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features would be required to protect recreational resources. Some recreational use would be lost from the area and would not be mitigated. Access to areas of the SEZ that are undeveloped, and to areas west of the SEZ, could be effectively maintained through application of the programmatic design features described in Appendix A, Section A.2.2.

10.4.6 Military and Civilian Aviation

10.4.6.1 Affected Environment

The proposed Los Mogotes East SEZ is not affected by any MTRs. The nearest civilian airport is at Alamosa about 20 mi (32 km) from the SEZ.

10.4.6.2 Impacts

Recent information from the military indicates that there are no concerns about solar development in the proposed Los Mogotes East SEZ. Because of the distance to the nearest civilian airport there would be no impacts on civil aviation.

10.4.6.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features would be necessary to protect military or civilian aviation uses. The programmatic design features described in Appendix A, Section A.2.2, would require early coordination with the DoD to identify and mitigate, if possible, potential impacts on the use of MTRs.

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10.4.7 Geologic Setting and Soil Resources

10.4.7.1 Affected Environment

10.4.7.1.1 Geologic Setting

Regional Geology

The proposed Los Mogotes East SEZ is located in the southern part of the San Luis Valley, an alluvium-filled basin within the Southern Rocky Mountain physiographic province in south-central Colorado (Figure 10.4.7.1-1). The San Luis Valley is part of the San Luis Basin, an axial basin of the Rio Grande rift (see Section 4.7). The Rio Grande rift is a north-trending, tectonic feature that extends from south-central Colorado to northern Mexico. Basins in the rift zone generally follow the course of the Rio Grande (river) and are bounded by normal faults that define the rift zone margins (Burroughs 1974, 1981; Emery 1979).

The San Luis Basin is an east-tilting half graben flanked by the San Juan Mountains to the west and the Sangre de Cristo Range to the east. It is generally divided into five physiographic subdivisions: the Alamosa Basin, the San Luis Hills, the Taos Plateau, the Costilla Plains, and the Culebra Reentrant (Burroughs 1981; Figure 10.4.7.1-2). The proposed Los Mogotes East SEZ sits above the Tertiary basalts of the Hinsdale Formation (along the eastern front of the San Juan Mountains) near the southwestern margin of the Alamosa Basin (Figure 10.4.7.1-3). The basalts of the Hinsdale Formation (Miocene) are associated with early rifting in the valley (about 27 million years ago) and covered ash-flow tuffs of the San Juan volcanic field along the western margin of the valley before the volcanic field was uplifted and eroded (Brister and Gries 1994). Basin fill sediments occur below the basalt and just beyond the eastern border of the SEZ, thickening to the east. These sediments are the major source of groundwater in the region.

Exposed sediments in the San Luis Valley consist mainly of modern alluvial deposits and the fluviolacustrine clays and sands of the Alamosa Formation (Figure 10.4.7.1-4). Eolian deposits, such as those of the Great Sand Dunes National Monument, occur along the base of the Sangre de Cristo Mountains on the eastern side of the valley. The Rio Grande alluvial fan (at the base of the San Juan Mountains where the Rio Grande enters the valley) lies northwest of the town of Alamosa. The San Luis Hills, consisting of northeast-trending flat-topped mesas and irregular hills, are a prominent feature of the southern part of the valley.

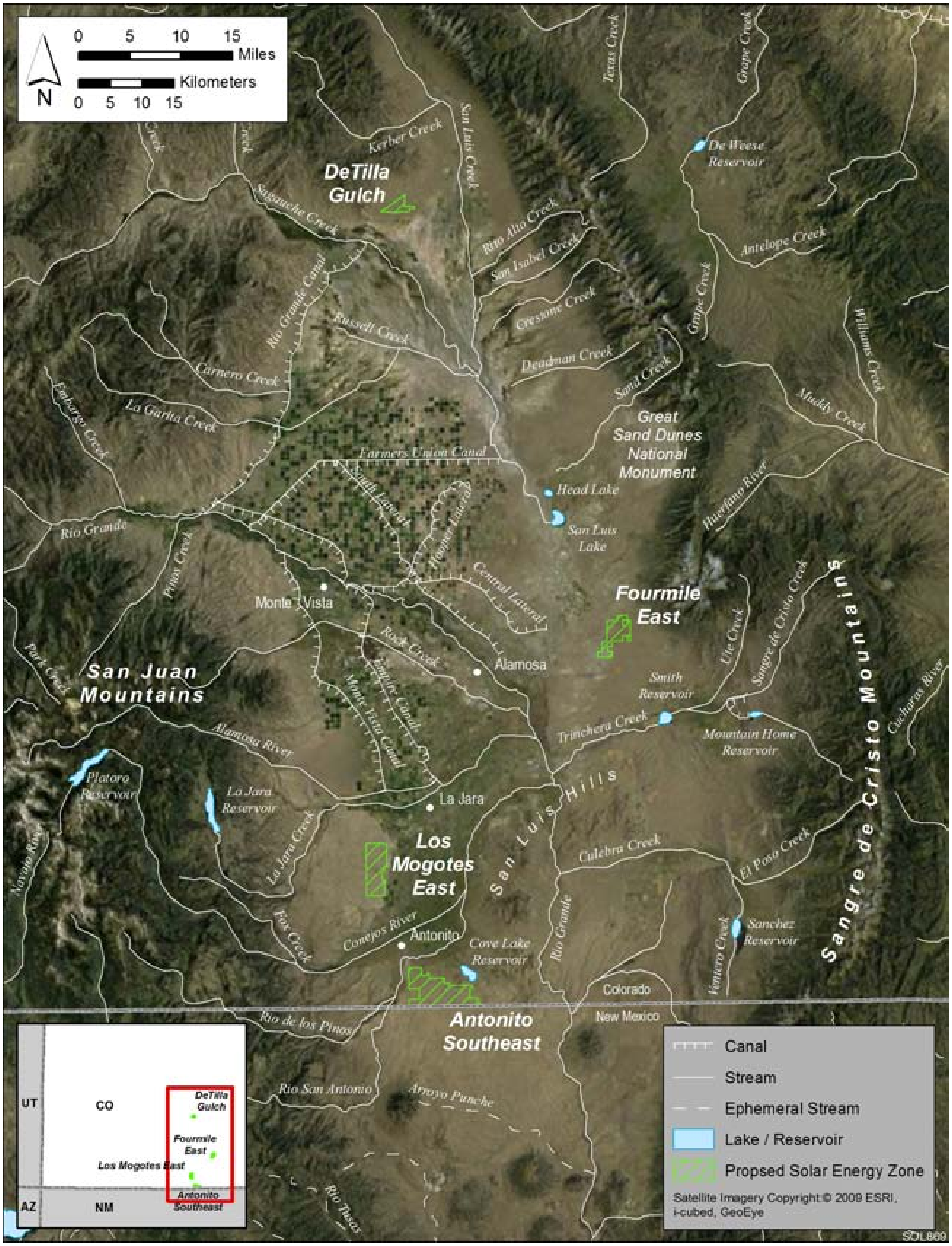

FIGURE 10.4.7.1-1 Physiographic Features of the San Luis Valley

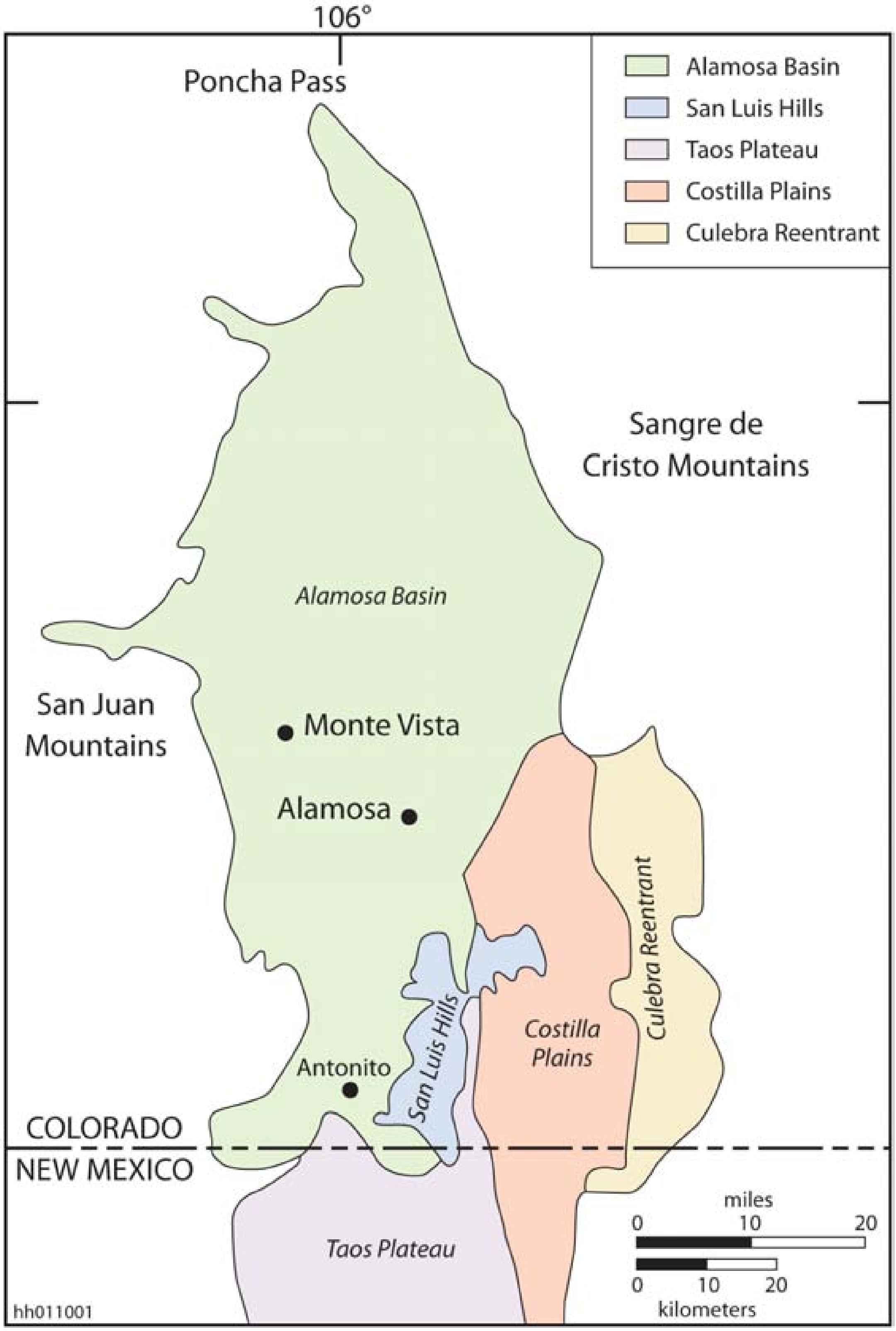

FIGURE 10.4.7.1-2 Physiographic Subdivisions within the San Luis Basin (modified from Burroughs 1981)

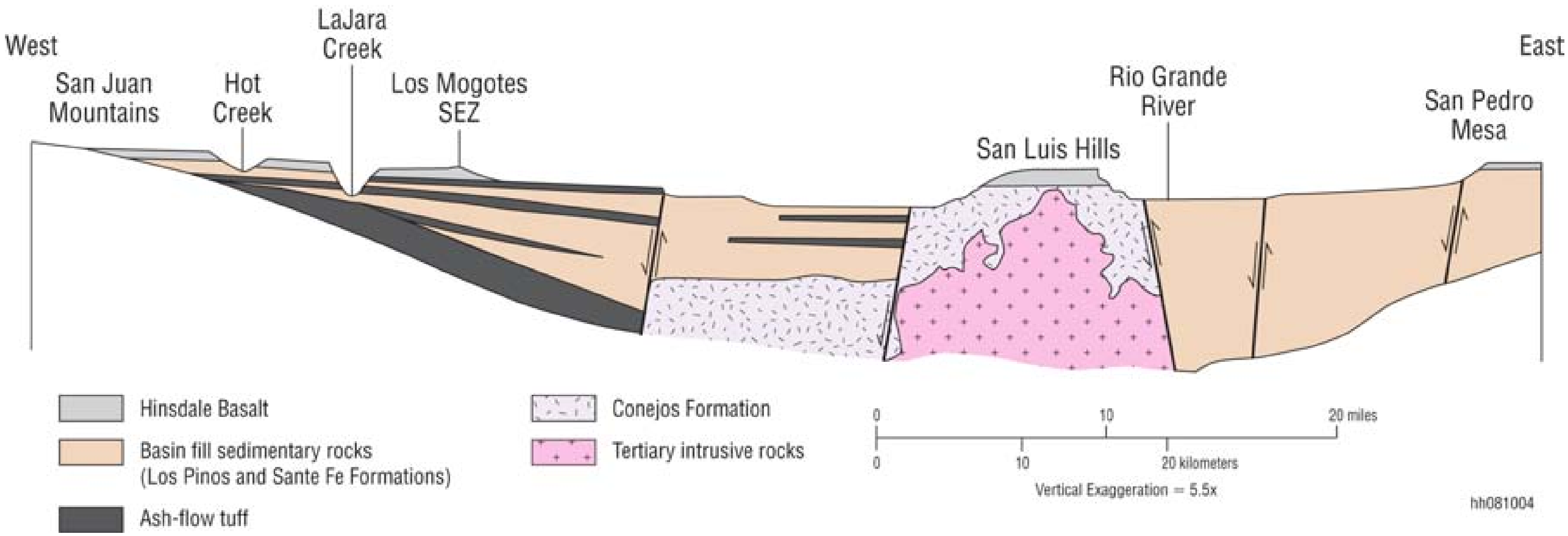

FIGURE 10.4.7.1-3 Generalized Geologic Cross Section (West to East) across the Southern Part of the Alamosa Basin (modified from Thompson et al. 1991)

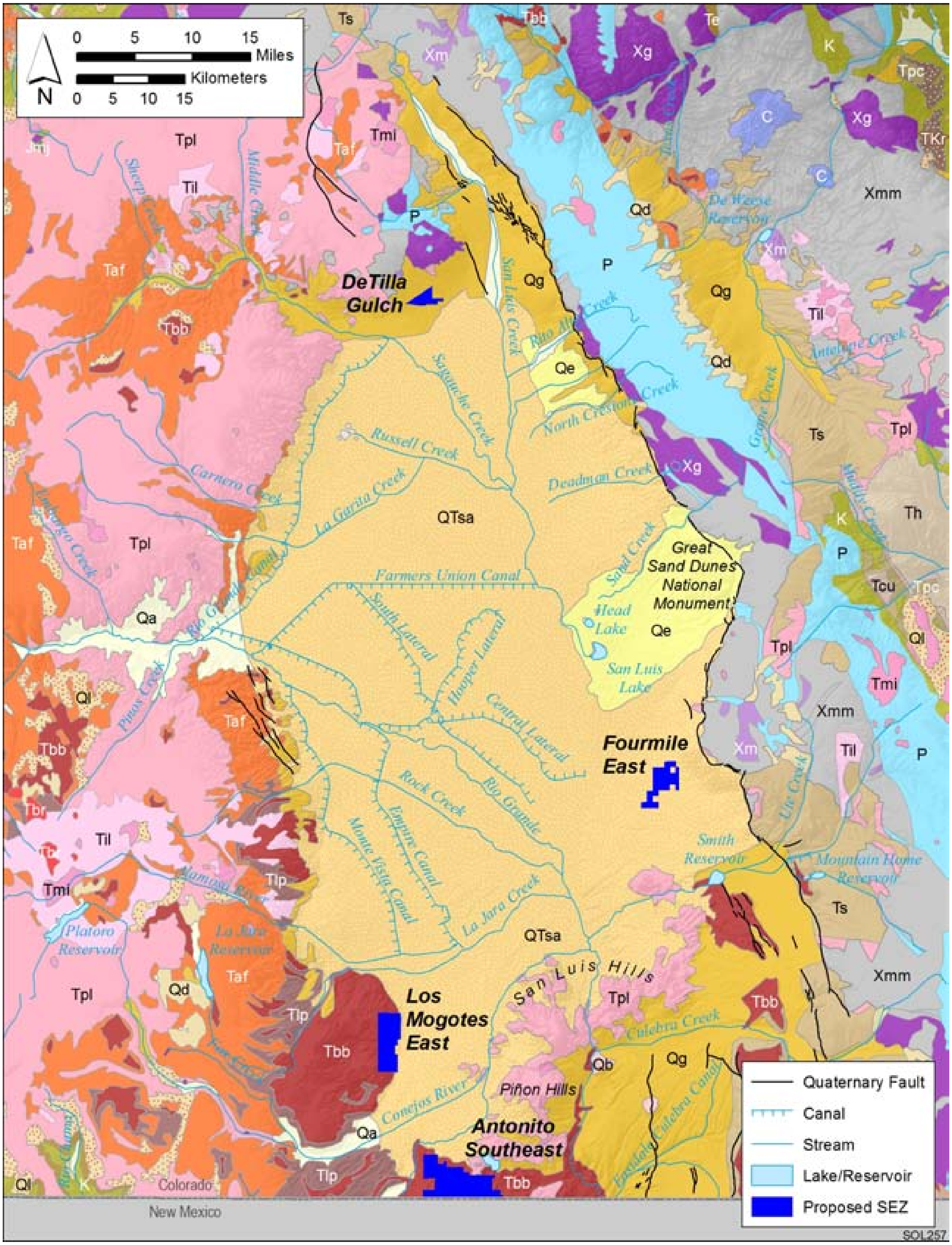

FIGURE 10.4.7.1-4 Geologic Map of the San Luis Valley and Vicinity (adapted from Stoeser et al. 2007 and Tweto 1979)

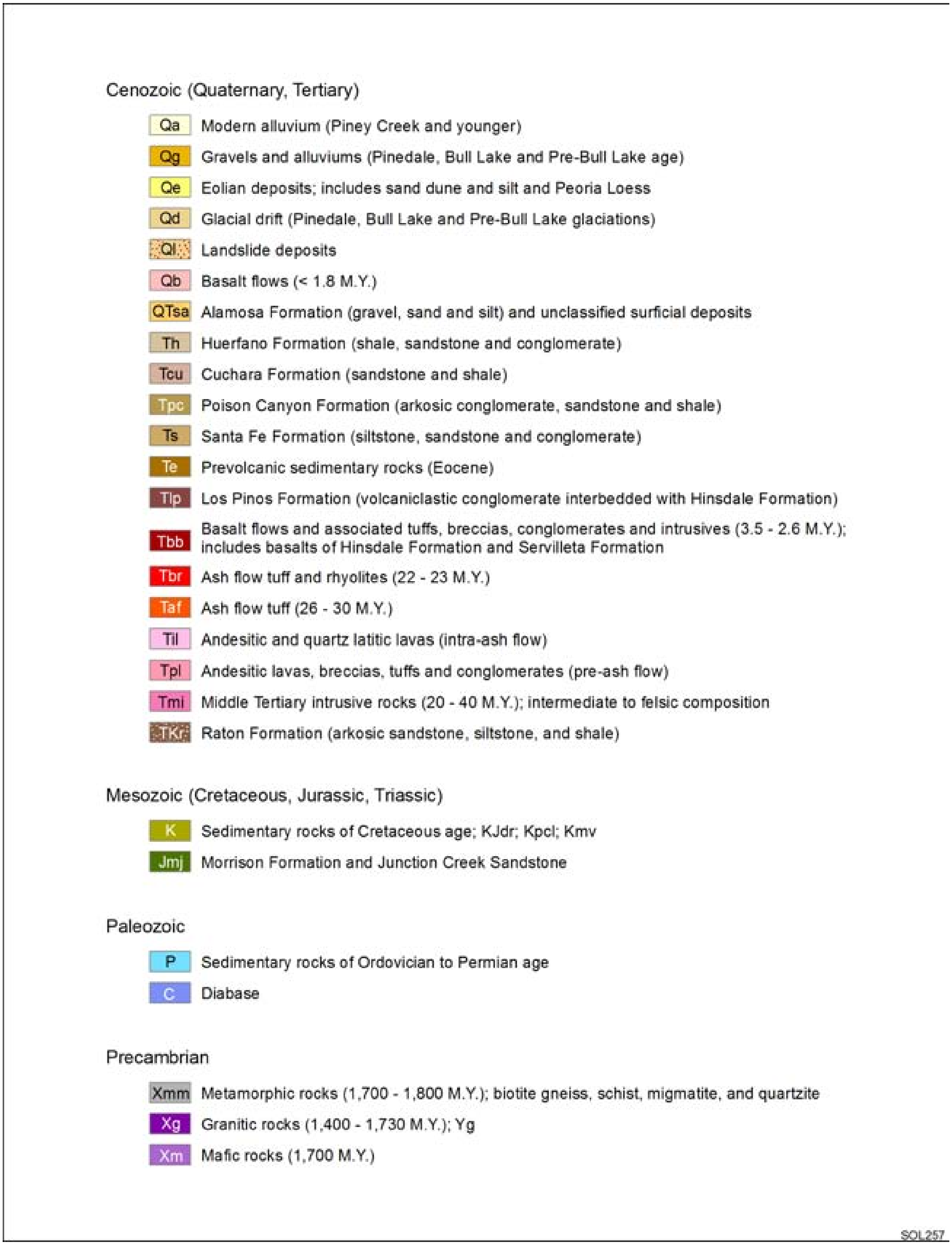

FIGURE 10.4.7.1-4 (Cont.)

Topography

The San Luis Valley is an elongated basin with a north-south trend and an area of about 2.0 million acres (8,288 km^2). Slopes of more than 50 ft/mi (24.5 m/km) occur on the alluvial fan deposits along the valley sides; the valley floor has more gentle slopes of about 6 ft/mi (2.9 m/km). Maximum relief from the mountain peak to the valley floor is about 6,800 ft (2,073 m); relief from the heads of alluvial fans to the valley floor is about 500 ft (152 m). The valley floor is broad and flat; topographic features include the basalt hills and mesas of the San Luis Hills and the dune fields of the Great Sand Dunes. Playa lakes are present in the north part of the valley (Leonard and Watts 1989; Emery 1979).

The proposed Los Mogotes East SEZ is about 17 mi (27 km) west of the Rio Grande in Conejos County (Figure 10.4.7.1-1). Its terrain is relatively flat with a gentle dip to the east (Figure 10.4.7.1-5). An unnamed drainage feature and its tributaries run from west to east across the southern portion of the SEZ (sections 13, 14, 23, 24, 25, and 26); the drainage discharges to an irrigation ditch (Romero Ditch) that serves croplands to the east. Elevations range from about 7,710 ft (2,350 m) along the site's eastern boundary to 7,956 ft (2,425 m) just outside of its western boundary. The highest point in the area is 8,038 ft (2,450 m) in the southwestern corner of the SEZ.

Geologic Hazards

The types of geologic hazards that could potentially affect solar project sites and potentially applicable mitigation measures to address them are discussed in Sections 5.7.3 and 5.7.4. The following sections provide a preliminary assessment of these hazards at the proposed Los Mogotes 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. Seismic activity associated with earthquakes in Colorado is low to moderate, with a slightly higher risk in and around the Rio Grande rift zone (Kirkham and Rogers 1981). The rift zone is an extensional stress regime and consists of a series of grabens (fault-bounded basins) that extend along the northeast-oriented rift axis. It is currently dormant; however, earthquakes could potentially occur as a result of movement along existing normal faults within and along the boundaries of the San Luis Basin (Blume and Sheehan 2002).

No known Quaternary faults occur within the proposed Los Mogotes East SEZ. The closest Quaternary faults are the group of minor faults located in the foothills near Monte Vista, about 24 mi (41 km) to the north-northwest of the SEZ in Rio Grande County at the western edge of the Rio Grande rift (Figure 10.4.7.1-6). Offsets of Pleistocene alluvial fan deposits place the most recent movement along the fault at less than 1.6 million years ago. Downward displacement is to the southwest and southeast of the fault line (Kirkham 1998).

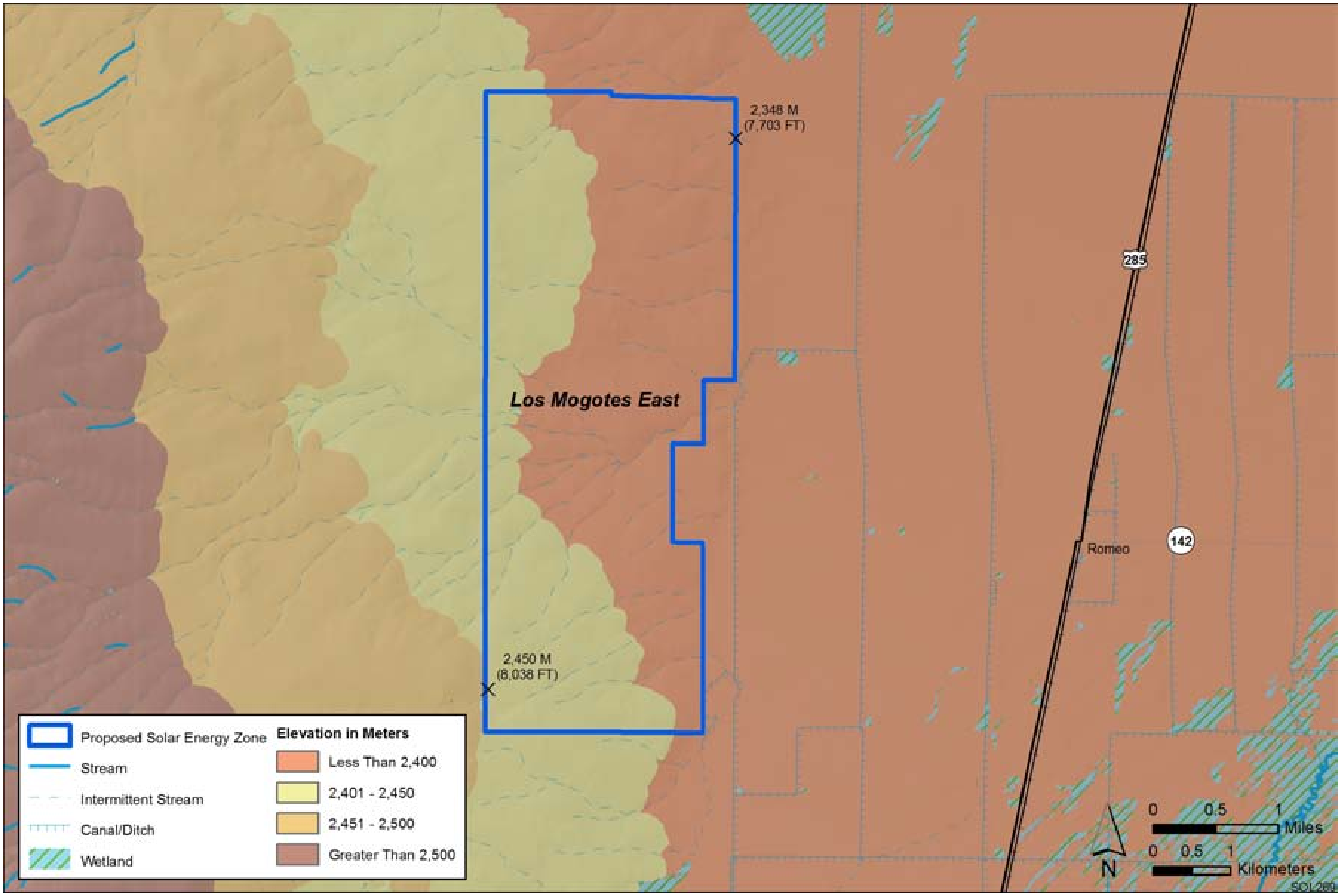

FIGURE 10.4.7.1-5 General Terrain of the Proposed Los Mogotes East SEZ

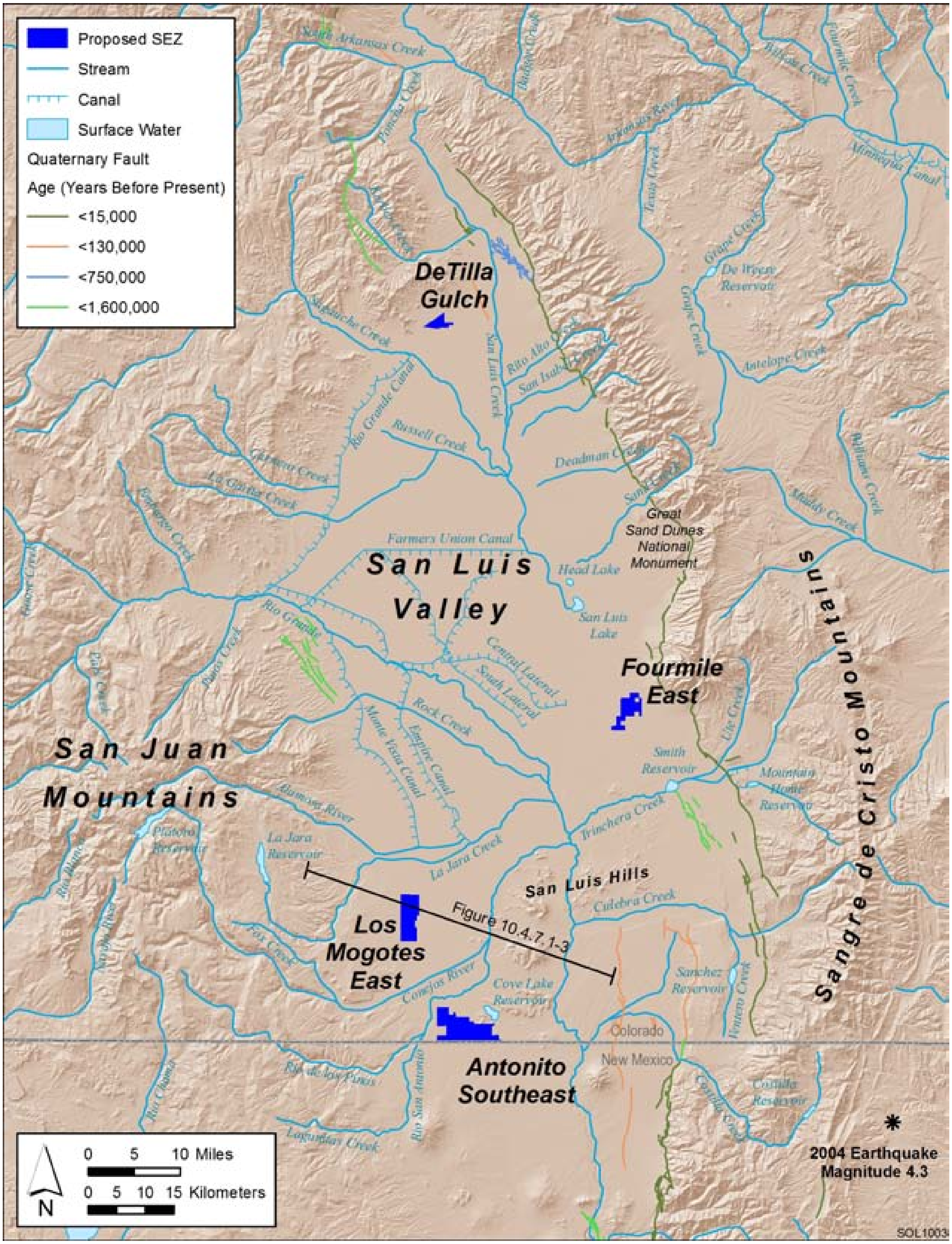

FIGURE 10.4.7.1-6 Quaternary Faults in the San Luis Valley (USGS and CGS 2009; USGS 2010a,b)

From June 1, 2000 to May 31, 2010, 25 earthquakes were recorded within a 61-mi (100-km) radius of the proposed Los Mogotes East SEZ. The largest earthquake during that period occurred on August 1, 2004 (it is also the largest recorded earthquake since 1988). It was located about 60 mi (95 km) southeast of the SEZ in the Sangre de Cristo Mountains (New Mexico) and registered a moment magnitude (Mw)[1] of 4.3 (Figure 11.2.7.1-6). During this period, 13 (52%) of the recorded earthquakes within a 61-mi (100-km) radius of the SEZ had magnitudes greater than 3.0 (USGS 2010a).

Liquefaction. The proposed Los Mogotes East SEZ is located within an area where the peak horizontal acceleration with a 10% probability of exceedance in 50 years is between 0.05 and 0.06 g. Shaking associated with this level of acceleration is generally perceived as moderate; however, the potential for damage to structures is very light (USGS 2008). Given the low intensity of ground shaking and the low incidence of historic seismicity in the San Luis Valley, the potential for liquefaction in valley sediments is also likely to be low.

Volcanic Hazards. The San Juan Mountains west of the San Luis Valley are the largest erosional remnant of a nearly continuous volcanic field that stretched across the Southern Rockies during the Tertiary period (Lipman et al. 1970). Extensive volcanic activity occurred in this volcanic field about 35 to 30 million years ago, during which time lavas and breccias of intermediate composition were erupted from numerous scattered central volcanoes. About 30 million years ago, volcanic activity associated with large calderas throughout the central and western part of the San Juan Mountains changed to explosive ash-flow eruptions that deposited several miles (kilometers) of lava and ash throughout the area. Once extension began in the Rio Grande rift, about 27 million years ago, volcanic activity was predominantly basaltic. Flood basalts erupted intermittently from fissures in the rift valley from 26 to 14 million years ago. Examples include the Miocene basalts of the Hinsdale Formation, which occur along the western edge of the San Luis Valley and in the San Luis Hills, and the younger basalt flows (e.g., the Servilleta Basalt) of the Taos Plateau in the southern part of the valley (Lipman et al. 1970; Lipman and Mehnert 1979, Thompson et al. 1991; Brister and Gries 1994; Lipman 2006).

Although there are numerous volcanic vents and historic flows in the San Luis Valley region and volcanic activity has occurred as recently as 2 million years ago on the Taos Plateau, there is currently no evidence of volcanic eruptions or unrest in south-central Colorado.

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

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[1] 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 2010b).

There has been no land subsidence monitoring within San Luis Valley to date; however, the potential for subsidence (due to compaction) does exist because groundwater levels are in decline. There is no subsidence hazard related to underground mining because there are no inactive coal mines in Conejos County. Although subsidence features (e.g., sinkholes and fissures) due to the flowage or dissolution of evaporite bedrock have been documented in Colorado, they are not known to occur in south-central Colorado (CGS 2001).

Other Hazards. Other potential hazards at the proposed Los Mogotes East SEZ include those associated with soil compaction (restricted infiltration and increased runoff), expanding clay soils (destabilization of structures), and hydro-compactible or collapsible soil (settlement). Disturbance of soil crusts and desert pavement on soil surfaces (if present) may increase the likelihood of soil erosion by wind.

Alluvial fan surfaces, such as those that occur along the valley margins, can be the sites of damaging high-velocity "flash" floods and debris flows during periods of intense and prolonged rainfall. The nature of the flooding and sedimentation processes (e.g., stream flow versus debris flow fans) depends on the specific morphology of the fan (National Research Council 1996). Section 10.4.9.1.1 provides further discussion of flood risks within the Los Mogotes East SEZ.

10.4.7.1.2 Soil Resources

Soils within the proposed Los Mogotes East SEZ are predominantly very stony and cobbly loams of the Travelers and Garita Series, which together make up about 98% of the soil coverage at the site (Figure 10.4.7.1-7). Soil map units within the Los Mogotes East SEZ are described in Table 10.4.7.1-1. Parent material consists of sediments weathered from basalt (beyond the western site border, soils are derived from alluvial sources). Soils within the SEZ are characterized as shallow and deep and well to excessively well-drained. Most of the soils on the site have moderate to high surface-runoff potential and moderate to moderately 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 but the playa soils, which were not rated. The susceptibility to wind erosion is low to moderate, with as much as 86 tons of soil per acre eroded by wind per year. All soils within the SEZ have features that are favorable for fugitive dust formation (NRCS 2009).

The Garita cobbly loam occurs on the steeper slopes (3 to 25%) of intermittent drainages throughout the site. Very stony loams of the Travelers Series also occur on steeper slopes along the southern portion of the site's western boundary. None of the soils within the SEZ are rated as hydric.[2] Flooding of soils at the site is not likely and occurs with a frequency of less than once in 500 years. All soils at the site are vulnerable to compaction. Less than 3% of the soils (Luhon and Monte loams) are classified as prime farmland, if irrigated (NRCS 2009).

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2 A hydric soil is a soil that formed under conditions of saturation, flooding, or ponding (NRCS 2009).

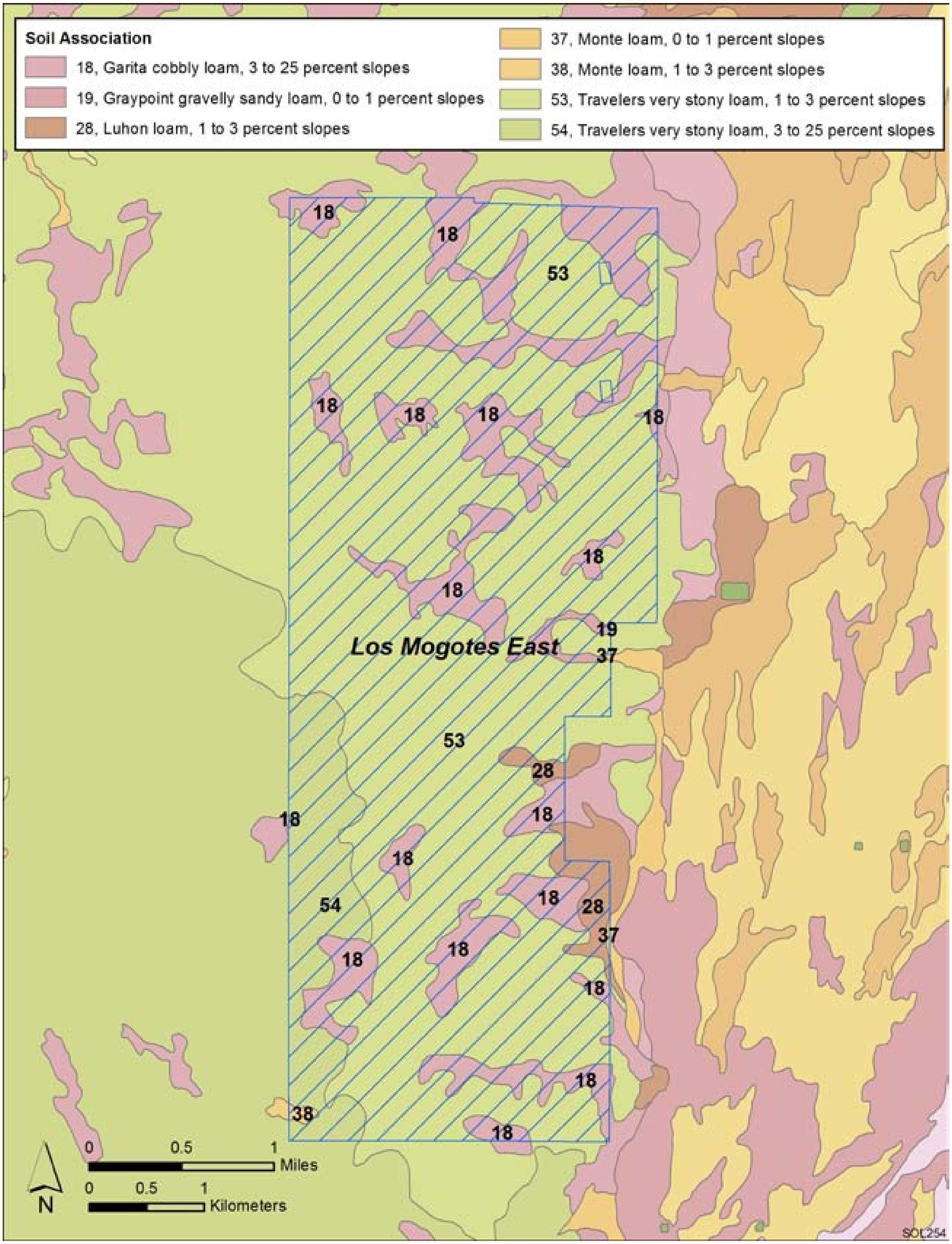

FIGURE 10.4.7.1-7 Soil Map for the Proposed Los Mogotes East SEZ (NRCS 2008)

TABLE 10.4.7.1-1 Summary of Soil Map Units within the Proposed Los Mogotes East SEZ

Map Unit Symbol	Map Unit Name	Water Erosion Potential[a]	Wind Erosion Potential	Description	Area in acres[b] (percent of SEZ)
53	Travelers very stony loam (1 to 3%)	Slight	Low (WEG 8)[c]	Nearly level soils on mesas and hillslopes capped by basalts, andesite, and/or rhyolite. Parent material consists of thin calcareous sediments weathered from basalt. Shallow and well to somewhat excessively drained, with high surface runoff potential (low infiltration rate) and moderate to moderately rapid permeability. Available water capacity is very low. Used mainly as rangeland. Susceptible to compaction.	4,249 (72)
18	Garita cobbly loam (3 to 25%)	Slight	Moderate (WEG 4)	Nearly level to gently sloping soils on alluvial fans and fan terraces. Parent material consists of thick calcareous and gravelly alluvium derived from basalt. Deep and well drained, with moderate surface runoff potential and moderate permeability. Available water capacity is low. Used mainly as native pastureland. Susceptible to compaction.	1,075 (18)
53	Travelers very stony loam (3 to 25%)	Slight	Low (WEG 8)	Nearly level to gently sloping soils on mesas and hill slopes capped by basalts, andesite, and/or rhyolite. Parent material consists of thin calcareous material weathered from basalt. Shallow and well to somewhat excessively drained, with high surface runoff potential (low infiltration rate) and moderate to moderately rapid permeability. Available water capacity is very low. Used mainly as rangeland. Susceptible to compaction.	454 (8)
28	Luhon loam (1 to 3%)	Slight	Moderate (WEG 4)	Nearly level soils on alluvial fans and valley side slopes. Parent material consists of mixed calcareous alluvium. Deep and well drained with moderate surface runoff potential and moderate permeability. Available water capacity is high. Used mainly as native pastureland; prime farmland if irrigated.[d] Susceptible to compaction; severe rutting hazard.	90 (2)

TABLE 10.4.7.1-1 (Cont.)

Map Unit Symbol	Map Unit Name	Water Erosion Potential[a]	Wind Erosion Potential	Description	Area (percent of SEZ)
19	Graypoint gravelly sandy loam (0 to 1%)	Slight	Moderate (WEG 4)	Nearly level soils on broad fans and fan terraces. Formed in alluvium derived from basalt. Deep and somewhat poorly drained, with moderate surface runoff potential and moderate permeability. Shrink-swell potential is low to moderate. Available water capacity is low. Used mainly as rangeland and irrigated cropland, pasture, and hay land. Susceptible to compaction.	32 (<1)
37, 38	Monte loam (0 to 3%)	Slight	Moderate (WEG 4)	Nearly level soils on alluvial fans and floodplains. Parent material consists of alluvium derived from rhyolite and latite. Soils are deep and well drained, with moderate surface runoff potential and moderate permeability. Available water capacity is high. Used mainly for native rangeland and irrigated cropland; prime farmland if irrigated. Susceptible to compaction; severe rutting hazard.	7 (<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 slop and soil erosion factor K and represent soil loss caused by sheet or rill erosion where 50 to 75 percent of the surface has been exposed by ground disturbance. A rating of "slight" indicates that erosion is unlikely under ordinary climatic conditions.

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

[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 4, 86 tons per acre per year; WEG 8, 0 tons per acre 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.

Source: NRCS (2009)

10.4.7.2 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 facilities 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 time frame.

10.4.7.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features were identified for soil resources at the proposed Los Mogotes East SEZ. Implementing the programmatic design features described under both Soils and Air Quality 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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10.4.8 Minerals (Fluids, Solids, and Geothermal Resources)

10.4.8.1 Affected Environment

The San Luis Basin in which the SEZ is located is identified as an oil and gas producing region (Burnell 2008). Currently there are no oil and gas leases in the SEZ although all of the area was leased for oil and gas at one time (BLM and USFS 2010b). There is currently no oil or gas produced in Conejos County (Burnell 2008). The San Luis Basin area has been identified in the BLM's San Luis Valley RMP (BLM 1991) as an area of low potential for oil and gas development. The area is open for discretionary mineral leasing, including leasing for oil and gas.

There are no mining claims in the SEZ (BLM and USFS 2010a), and these lands were closed to locatable mineral entry in June,2009, pending the outcome of this PEIS.

The San Luis Basin is also a region of known and potential geothermal resources, and interest in the area for possible electrical generation based on geothermal resources has increased (Burnell 2008). Several geothermal springs and wells have been developed in portions of the basin, the nearest at La Jara, about 6 mi (10 km) northeast of the proposed Los Mogotes East SEZ (Laney and Brizzee 2005). No geothermal leasing or development has occurred within the SEZ (BLM and USFS 2010b).

10.4.8.2 Impacts

If the area is identified as an SEZ, it would continue to be closed to all incompatible forms of mineral development.Since the area does not contain existing mining claims, it is assumed that valuable locatable minerals are not present on the site and there would be no loss of locatable mineral production in the future

Although the San Luis Basin in which the SEZ is located is identified as an oil and gas production area, since there are no oil and gas leases in the area and the BLM has determined that the area has low potential for oil and gas production, it is assumed there would be minimal or no effect on oil and gas resources if the area was developed for solar energy production. Additionally, oil and gas development that uses directional drilling to access resources under the area (should any be found) could be allowed.

Solar energy development of the SEZ would preclude future surface use of the site to produce geothermal energy but would not preclude the possibility of accessing geothermal resources, should any be found, through directional drilling. Because of the lack of current geothermal development within the SEZ and the potential to still access geothermal resources, solar development of the SEZ would have no impact on development of geothermal resources.

If the area is identified as an SEZ, some mineral uses might be allowed. For example, 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 and would not interfere with solar energy operations.

10.4.8.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features would be necessary to protect mineral resources. 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 impacts on mineral leasing.

10.4.9 Water Resources

10.4.9.1 Affected Environment

The proposed Los Mogotes East SEZ is located in the San Luis Valley, which is in the Rio Grande Headwaters subbasin of the Rio Grande hydrologic region (USGS 2010c). The San Luis Valley covers approximately 2 million acres (8,094 km^2) and is bounded by the San Juan Mountains to the west and the Sangre de Cristo Mountains to the east. The northern portion of the San Luis Valley is internally drained toward San Luis Lake and referred to as the "closed basin" (see inset of Figure 10.4.9.1-1) while the southern portion of the valley drains to the Rio Grande (Topper et al. 2003, Mayo et al. 2007). The proposed Los Mogotes East SEZ is located in the southern portion of the San Luis Valley and has surface elevations ranging from 7,710 to 8,030 ft (2,350 to 2,448 m) with a general west to east drainage pattern. The climate of the San Luis Valley is arid, with evaporation rates often exceeding precipitation amounts (Robson and Banta 1995). The average annual precipitation and snowfall amounts in the southern San Luis Valley are on the order of 7 and 25 in. (18 and 64 cm), respectively (WRCC 2010a). Precipitation and snowfall amounts are much greater in the surrounding mountains and on the order of 27 and 237 in. (69 and 602 cm), respectively, at elevations greater than 10,000 ft (3,048 m) (WRCC 2010b). Pan evaporation rates are estimated to be 54 in./yr (137 cm/yr) in the San Luis Valley (Cowherd et al. 1988, WRCC 2010c) with evapotranspiration rates potentially exceeding 40 in./yr (102 cm/yr) (Mayo et al. 2007; Emery 1994; Leonard and Watts 1989).

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

No permanent surface water bodies occur on the proposed Los Mogotes East SEZ. Several ephemeral washes drain across the site in a west to east direction as they come off the San Juan Mountains. The La Jara Reservoir is located 15 mi (24 km) to the northwest, with La Jara Creek running west to east parallel to the northern boundary of the SEZ. The Alamosa River also flows from west to east approximately 5 mi (8 km) north of the proposed SEZ. Mining activities in the headwaters of the Alamosa River has resulted in sediments and floodplain soils, as well as nearby irrigated farm fields, having elevated heavy metals concentrations (Csiki and Martin 2008). The Conejos River is located 5 mi (8 km) to the south of the SEZ (Figure 10.4.9.1-1).

Flood hazards have not been identified (Zone D) for Conejos County (FEMA 2009). Intermittent flooding may occur along the ephemeral washes with temporary ponding and erosion. Peak flows in the Conejos River are on the order of 1,000 to 2,000 ft^3/s (28 to 56 m^3/s) coming out of the San Juan Mountains (USGS 2010b, stream gauge 08246500). Given the distance to the SEZ, it is unlikely that flooding in the Conejos River would affect the proposed Los Mogotes East SEZ.

The NWI identifies several small palustrine wetlands with emergent vegetation surrounding the proposed Los Mogotes East SEZ. These wetlands are intermittently flooded, thus they are dry for most of the year. In addition, there is a large concentration of palustrine

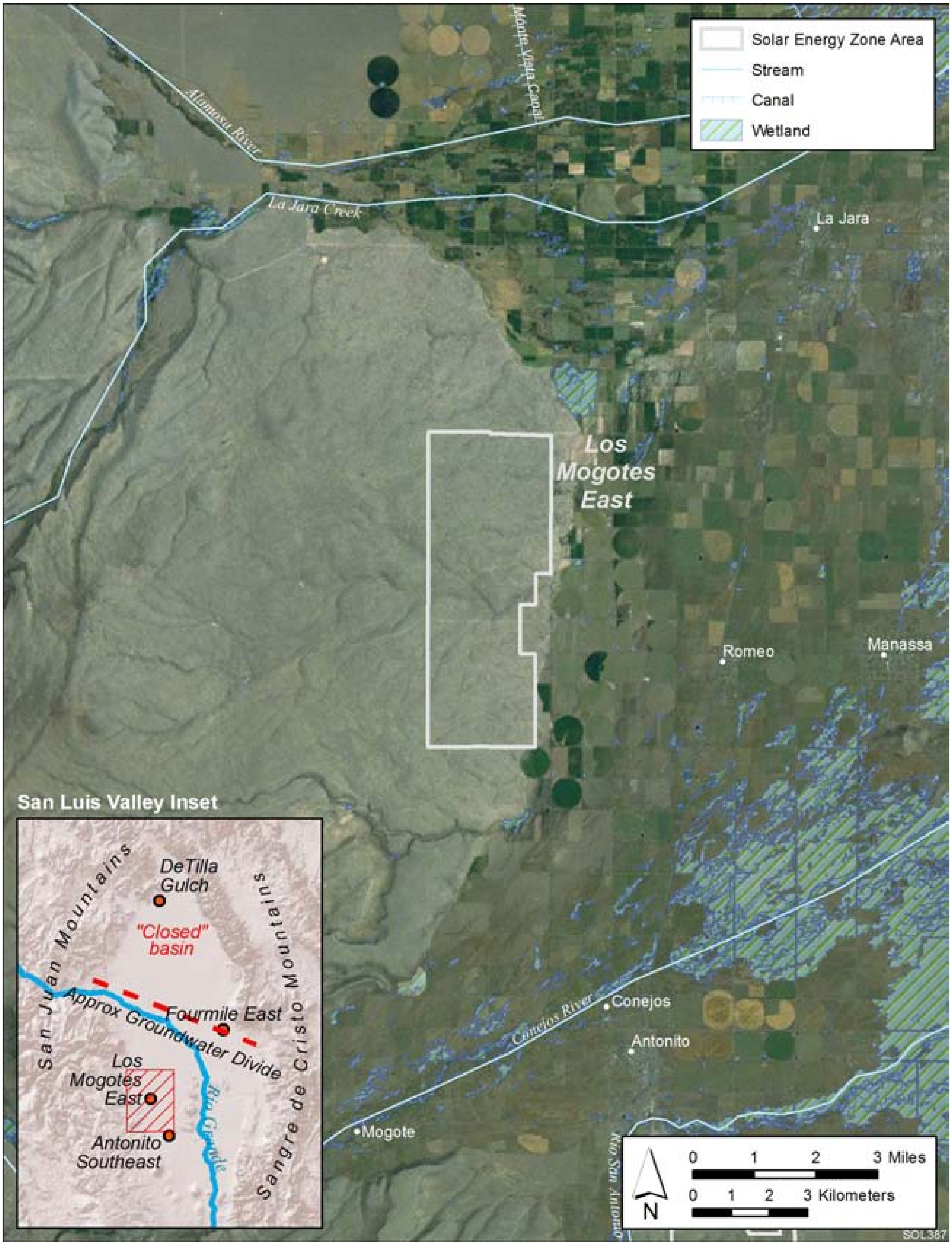

FIGURE 10.4.9.1-1 Surface Water Features in the San Luis Valley

wetlands along the riparian areas of the Conejos River. These wetlands range from being temporally to seasonally flooded (USFWS 2009b). Further information on these wetlands is described in Section 10.4.

10.4.9.1.2 Groundwater

Groundwater in the San Luis Valley is primarily in basin fill deposits ranging from 8,000 to 30,000 ft (2,438 to 9,144 m) in thickness and consisting of unconsolidated to moderately consolidated deposits of gravel, sands, and clays of Tertiary and Quaternary age (Robson and Banta 1995, Mayo et al. 2007). These basin fill deposits consist of two hydrogeologic units, the upper unconfined aquifer and the lower confined aquifer, which are separated by a series of confining clay layers and unfractured volcanic rocks (Brendle 2002). The unconfined aquifer covers most of the valley floor and occurs in unconsolidated valley sediments up to depths of 200 ft (61 m) (Mayo et al. 2007). The deeper confined aquifer covers about half of the valley floor and occurs in the unconsolidated sediments interlayered with basalt flows ranging in depth from 50 to 30,000 ft (15 to 9,100 m) (Emery 1994; Mayo et al. 2007). Groundwater flow in the upper unconfined aquifer follows the surface drainage divide in the San Luis Valley, with flows towards San Luis Lake in the northern portion of the valley (referred to as the closed basin) and flows towards the Rio Grande in the southern portion of the valley; however, flow is not separated in the lower confined aquifer, which in general flows towards the closed basin portion of the valley (Mayo et al. 2007).

Aquifers in the San Luis Valley are predominantly recharged by snowmelt runoff from higher elevations of the surrounding mountain ranges along the valley rim (Robson and Banta 1995), as well as by irrigation return flows, subsurface inflow, and seepage from streams (Emery 1994). The upper unconfined aquifer receives upward groundwater flows from the lower confined aquifer in some regions of the valley, but the conceptual model of leakage between the aquifers is not fully realized (Mayo et al. 2007). Because of the low precipitation rates and high evaporation rates in the valley, precipitation within the valley is not a significant recharge source (with only about 1% of the annual precipitation reaching the aquifers) (Robson and Banta 1995). Groundwater discharge is primarily through groundwater extractions, evapotranspiration, and surface water discharge to the Rio Grande (Emery 1994; Mayo et al. 2007). Estimates of groundwater recharge and discharge processes are variable depending upon assumptions made in performing a water balance, but total groundwater recharge and discharge for the entire San Luis Valley are on the order of 2.8 million ac-ft/yr (3.5 billion m^3/yr) (SLV Development Resources Group 2007).

The proposed Los Mogotes East SEZ is located to the west of the San Luis Hills on a thin, discontinuous veneer of alluvial sediments underlain by basalt (see Section 10.4.7.1 for further details) (Miggins et al. 2002; Machette and Thompson 2007). The confining clay layer found in the majority of the central region of the San Luis Valley ends approximately 1 mi (1.6 km) east of the proposed SEZ in the agricultural fields area as shown in Figure 10.4.9.1-1 (Colorado DWR 2010a). The basalt is not fractured enough near the surface to yield sufficient groundwater at it acts as a confining unit under the proposed SEZ. The thickness of the basalt under the site has not been characterized but is expected to vary with the old terrain of the valley at the time the basalt filled the valley, about 3.7 million years ago (Machette and Thompson 2007). Available monitoring well information is primarily available in areas east of the proposed SEZ, so further characterization of the unconfined and confined aquifers within the proposed Los Mogotes East SEZ would need to be assessed during the site characterization phase. Monitoring wells in the unconfined aquifer within 1 mi (1.6 km) to the east of the SEZ boundary drilled to depths from 30 to 50 ft (9 to 15 m) show some seasonal variations in groundwater surface elevations (rising during winter-spring and falling during summer-fall) with depths to groundwater ranging from 15 to 35 ft (5 to 11 m) below the surface (USGS 2010d; well numbers 371329106015401 and 370936106040505). The general groundwater flow pattern in the unconfined aquifer is towards the east following the Conejos River and La Jara Creek (RGWCD 2010; well numbers RGWCD59a, RGWCD73, RGWCD84, RGWCD88). Monitoring wells in the confined aquifer are located more than 4 mi (6 km) north and east of the proposed SEZ under the clay layer confining unit that indicate artesian conditions and a general flow direction from west to east (RGWCD 2010; well numbers CON01, CON02, CON03).

Water quality in the aquifers of the San Luis Valley varies according to location, with good water quality along the valley edges to poor water quality in the vicinity of the natural depression around San Luis Lake (Topper et al. 2003). Total dissolved solids (TDS) concentrations are generally less than 300 mg/L in the southern portion of the San Luis Valley in the unconfined aquifer and less than 200 mg/L in the lower confined aquifer (Mayo et al. 2007).

10.4.9.1.3 Water Use and Water Rights Management

In 2005, water withdrawals in Conejos County were estimated to be 402,680 ac-ft/yr (497 million m^3/yr), of which about 94% was from surface water sources (streams, springs, and irrigation canals and laterals). The largest water use category was irrigation, at 386,965 ac-ft/yr (477 million m^3/yr) composing 96% of the water use, which was principally supplied by surface waters. Groundwater withdrawals were primarily used for supporting aquaculture at 13,740 ac-ft/yr (16.9 million m^3/yr), irrigation at 7,712 ac-ft/yr (9.5 million m^3/yr), and public water supply at 1,614 ac-ft/yr (2.0 million m^3/yr) (Kenny et al. 2009).

Colorado administers its water rights using the Doctrine of Prior Appropriation as its cornerstone with water rights being granted by a water court system and administered by the Colorado Division of Water Resources (BLM 2001). Surface waters in much of Colorado were over-appropriated before the turn of the twentieth century, groundwater was not actively managed until mid 1960, and the Water Rights Determination and Administration Act of 1969 (C.R.S. §§37-92-101 through §§37-92-602) required that surface waters and groundwater be managed together (Colorado DWR 2010b).

The proposed Los Mogotes East SEZ is located in Colorado Division of Water Resources' Division 3 management zone (Rio Grande Basin) where both surface water and groundwater rights are over-appropriated. Securing water supplies for utility-scale solar energy projects in the Rio Grande Basin requires the purchase of an augmentation certificate (where available) or existing water rights and transferring to a new point of diversion (surface diversion or new well). Any transfer of existing water rights will be carried out through the Division 3

Water Court which includes a review process by the Colorado Division of Water Resources with respect to the location of the new diversion and its potential impacts to senior water rights, aquifer conditions, and surface water flows (Colorado District Court 2004, Colorado DWR 2008). An additional burden for new water diversions in this region is the need for a plan for augmentation[3] to protect senior water rights (typically surface water rights) with respect to any potential depletions in terms of timing, location, amount, and quality (Colorado DWR 2008).

A major element of water management in the San Luis Valley is the Rio Grande Compact of 1938, which obligates Colorado to deliver a specified quantity of water (dependent on natural supply) in the Rio Grande as it crosses the Colorado–New Mexico state line (Colorado District Court 2004). Since its inception, several U.S. Supreme Court and Colorado Supreme Court decisions (e.g., *Texas v. Colorado* 1968; *Alamosa-La Jara Water Users Protection Association v. Gould* 1983) have imposed that the Colorado Division of Water Resources develop rules and regulations regarding surface water and groundwater appropriations within the Rio Grande Basin. The process of modifying and adopting new rules and regulations regarding surface water and groundwater rights is still ongoing. Recently in 2008, the San Luis Valley Rules Advisory Committee was established to develop new rules and regulations regarding groundwater use and water rights administration in the Rio Grande Basin (Wolfe 2008). Many issues concerning the Colorado Division of Water Resources' attempts to develop a management plan for surface waters and groundwater in the Rio Grande Basin are summarized in Case Numbers 06CV64 & 07CW52 brought before the Division 3 Water Court (Colorado District Court 2010).

The new rules and regulations governing surface water and groundwater in the Rio Grande Basin are not final; however, they will impose limits on groundwater withdrawals in order to reduce groundwater extractions to a sustainable level and help sustain treaty obligations (Colorado District Court 2010, Colorado DWR 2010c). The viability of any solar energy project will depend upon its ability to secure water rights, which would need to be done by coordinating with the Colorado Division of Water Resources, existing water right holders, and potentially some of the water conservation districts that operate in the San Luis Valley that provide augmentation water and will potentially be subdistrict groundwater managers depending upon court decisions that are pending (Colorado District Court 2010, McDermott 2010). The transfer of water rights will most likely involve agricultural surface and groundwater rights, which have been estimated to have a consumptive water use of between 150 and 250 ac-ft/yr (185,000 and 308,400 m^3/yr) for a 125 (0.5 km^2) acre farm (SLV Development Resources Group 2007). The transfer of agricultural water rights for solar energy development will result in agricultural fields being put out of production and will significantly alter land use in the San Luis Valley.

Additional factors that solar projects will need to consider with respect to obtaining and transferring water rights include the location of the water right, whether it is a surface water or groundwater source, and the seniority of the water right. However, the biggest challenge in

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[3] Plan for augmentation means a detailed program, which may be either temporary or perpetual in duration, to increase the supply of water available for beneficial use in a division or portion thereof by the development of new or alternate means or points of diversion, by a pooling of water resources, by water exchange projects, by providing substitute supplies of water, by the development of new sources of water, or by any other appropriate means. *Colorado Revised Statutes* 37-92-103 (9).

transferring water rights for solar energy projects will be coming up with a suitable augmentation plan, which will either be accomplished through the water courts, a groundwater management plan, or a substitute water supply plan (for temporary water uses) depending upon court decisions regarding groundwater management in the San Luis Valley that are expected in the near future (Colorado District Court 2010, Colorado DWR 2010c, McDermott 2010). Securing additional water supply sources for an augmentation plan reduces the amount of available water resources in the Rio Grande Basin. According to recent applications processed through the water court, it would be very difficult for any project seeking an amount of water over approximately 1,000 ac-ft/yr (1.2 million m^3/yr) to be successful in obtaining needed water rights (McDermott 2010).

10.4.9.2 Impacts

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

10.4.9.2.1 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 would be minimized through the implementation of programmatic design features described in Appendix A, Section A.2.2. The proposed Los Mogotes East SEZ has several ephemeral washes throughout, and several small palustrine wetlands surround the site. Siting of facilities and stormwater management plans need to address the potential impacts of increased runoff and sedimentation in the region of these washes and wetlands. Additionally, the surface sediments of the proposed Los Mogotes East SEZ would need to be assessed for potential heavy metal contamination given its proxmity to agricultural fields that have used irrigation water from the Alamosa River.

10.4.9.2.2 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 Los Mogotes East SEZ include the following:

- On the basis of a total area of less than 10,000 acres (40 km^2), it is assumed that only 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 disturbance for an individual solar facility during the peak construction year is 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 51% of the SEZ total area during the peak construction year; and

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

Site Characterization. During site characterization, water would be used mainly for dust suppression 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 controlling fugitive dust and for the workforce potable water supply. Because there are no significant surface water bodies on the proposed Los Mogotes East SEZ, the water requirements for construction activities could be met by either trucking water to the site or by using on-site groundwater resources. Water requirements for dust suppression and the potable water supply during construction are shown in Table 10.4.9.2-1 and could be as high as 964 ac-ft (1.2 million m^3). In addition, the generation of up to 74 ac-ft (91,300 m^3) of sanitary wastewater would need to be treated either on-site or sent to an off-site facility.

Groundwater wells would have to yield an estimated 425 to 597 gpm (1,609 to 2,260 L/min) to meet the estimated construction water requirements. In the San Luis Valley, current well yields for large production wells are as high as 2,000 gpm (7,571 L/min); however, the majority of well yields are less than 200 gpm (757 L/min) (RGWCD 2010). The effects of

TABLE 10.4.9.2-1 Estimated Water Requirements during the Peak Construction Year for the Proposed Los Mogotes East SEZ

Activity	Parabolic Trough	Power Tower	Dish Engine	PV
Water use requirements[a]				
Fugitive dust control (ac-ft)[b,c]	612	919	919	919
Potable supply for workforce (ac-ft)	74	45	19	9
Total water use requirements (ac-ft)	686	964	938	928
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 54 in./yr (137 cm/yr) (Cowherd et al. 1988; WRCC 2010c).

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

groundwater withdrawal and the availability of existing water rights needed to meet construction water needs would have to be assessed during the site characterization phase.

Normal Operations. During normal operations, water would be required for mirror/panel washing, the workforce potable water supply, and cooling (parabolic trough and power tower only) (Table 10.4.9.2-2). At full build-out capacity, water needs for mirror/panel washing are estimated to range from 26 to 473 ac-ft/yr (32,000 to 583,400 m^3/yr). As much as 13 ac-ft/yr (16,000 m^3/yr) would be needed for the potable water supply.

Cooling water is required for only the parabolic trough and power tower technologies. Water needs for cooling are a function of the type of cooling used—dry versus wet. 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 10.4.9.2-2 for the parabolic trough and power tower technologies are attributable to the assumptions of acreage per MW. As a result, the water usage for the more energy-dense parabolic trough technology is estimated to be almost twice as large as that for the power tower technology.

The maximum total water usage during one year of normal operations would be greatest for those technologies using the wet-cooling option and is estimated to be as high as 14,216 ac-ft/yr (17.5 million m^3/yr) (Table 10.4.9.2-2). Water usage for dry-cooling systems would be as high as 1,433 ac-ft/yr (1.8 million m^3/yr), about 10 times less than for wet cooling. Water needs for normal operations could be met by trucking in water from an off-site source

TABLE 10.4.9.2-2 Estimated Water Requirements during Normal Operations at the Proposed Los Mogotes East SEZ

Activity	Parabolic Trough	Power Tower	Dish Engine	PV
Full build-out capacity (MW)[a,b]	947	526	526	526
Water use requirements				
Mirror/panel washing (ac-ft/yr)[c,d]	473	263	263	26
Potable supply for workforce (ac-ft/yr)	13	6	6	1
Dry-cooling (ac-ft/yr)[e]	189–947	105–526	NA[f]	NA
Wet-cooling (ac-ft/yr)[e]	4,261–13,730	2,367–7,628	NA	NA
Total water use requirements				
Non-cooled technologies (ac-ft/yr)	NA	NA	269	27
Dry-cooled technologies (ac-ft/yr)	675–1,433	374–795	NA	NA
Wet-cooled technologies (ac-ft/yr)	4,747–14,216	2,636–7,897	NA	NA
Wastewater generated				
Blowdown (ac-ft/yr)[f]	269	149	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/MW; wet-cooling value assumes 4.5 to 14.5 ac-ft/yr/MW (range in these values represents 30 and 60% operating times) (DOE 2009a).

[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.

for low water use technologies (e.g., dish engine or PV) or from groundwater at the site, if it is available (see Sections 10.4.9.1.2 and 10.4.9.1.3). For example, a dish engine facility would require about 269 ac-ft/yr (331,800 m^3/yr), including water needed for mirror washing and the workforce potable water supply. For a constant rate of withdrawal, this quantity of water could be obtained from a groundwater well with a pump rate of about 167 gpm (632 L/min). For a parabolic trough system using wet cooling with an operational time of 60% (maximum water use scenario), a groundwater yield of approximately 8,800 gpm (33,300 L/min) would be needed, which is approximately four times larger than the largest production wells in the San Luis Valley (RGWCD 2010). Based on water use requirements, wet-cooling technologies would not be feasible given their high water needs. In addition, any large groundwater withdrawals could adversely affect water flow in the Conejos River, which receives groundwater from the unconfined and confined aquifers.

The availability of water rights and the impacts associatedwith groundwater withdrawals would need to be assessed during the site characterization phase of a proposed solar project. Less water would be needed for any of the four solar technologies if the full build-out capacity was reduced. The analysis of water use for the various solar technologies assumed a single technology for full build-out. Water use requirements for development scenarios that assume a mixture of solar technologies can be estimated by using water use factors described in Appendix M.9.

Normal operations at the proposed Los Mogotes East SEZ would produce up to 13 ac-ft/yr (16,000 m^3/yr) of sanitary wastewater (Table 10.4.9.2-2) that would need to be either treated on-site or sent to an off-site facility. In addition, parabolic trough or power tower projects using wet cooling would discharge cooling system blowdown water that would need to be treated either on- or off-site. The quantity of water discharged would range from 149 to 269 ac-ft/yr (184,000 to 332,000 m^3/yr) (Table 10.4.9.2-2). Any on-site treatment of wastewater would have to ensure that treatment ponds are effectively lined in order to prevent any groundwater contamination.

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

10.4.9.2.3 Off-Site Impacts: Roads and Transmission Lines

The proposed Los Mogotes East SEZ is located adjacent to a 69-kV transmission line and about 3 mi (5 km) from U.S. 285, as described in Section 10.4.1.1.2. 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. Water needed for road modification and transmission line construction activities (e.g., for soil compaction, dust suppression, and potable supply for workers) could be trucked to the construction area from an off-site source. As a result, water impacts due to water use would be negligible. Impacts on surface water and groundwater quality resulting from spills would be minimized by implementing the mitigation measures described in Section 5.9.3 (e.g., cleaning up spills as soon as they occur). Ground-disturbing activities that have the potential to increase sediment and dissolved solid loads in downstream waters would be conducted following the mitigation measures outlined in Section 5.9.3 to minimize impacts associated with alterations to natural drainage pathways and hydrologic processes.

10.4.9.2.4 Summary of Impacts on Water Resources

The impacts on water resources from solar energy development at the proposed Los Mogotes East SEZ are associated with land disturbance effects to the natural hydrology, water quality concerns, and water use requirements for the various solar energy technologies. Land disturbance activities can cause localized erosion and sedimentation issues, as well as alter groundwater recharge and discharge processes. The proposed SEZ contains several ephemeral washes throughout, and several small palustrine wetlands surround the site. Alterations to the natural drainage pattern of the site should be avoided to the extent possible in order to minimize erosion and sedimentation impacts, as well as the disruption of wildlife habitat and clogging of groundwater recharge areas.

Water in the Rio Grande Basin is managed strictly because of its scarcity, treaty obligations, and its necessity for supporting agriculture in the San Luis Valley. Both surface water and groundwater rights are over-appropriated, so water requirements for solar energy development would have to be met through the purchase of senior water rights. Water withdrawals in the basin are managed to control discharge to the Rio Grande system, in accordance with the Rio Grande Compact, so water withdrawals under purchased water rights would need to result in no net impact on the basin. In addition, applications for new points of groundwater diversion would have to demonstrate no impact on adjacent surface and groundwater rights holders. Since current water rights are used primarily for irrigation, the purchase and diversion of groundwater rights for solar energy facilities would put some agricultural lands out of production. For example, assuming a 125-acre (0.5-km^2) farm has a consumptive use of 200 ac-ft/yr (246,700 m^3/yr) (see Section 10.4.9.1.3), the water requirements for full build-out with dry-cooled parabolic trough technology would need to fallow 896 acres (3.6 km^2) of agricultural fields, whereas PV technology would need to fallow only 17 acres (0.07 km^2). This is a hypothetical example only and does not take into account securing water rights needed for an augmentation plan either. However, the cost of obtaining the land-associated water rights and augmentation water could be high enough to render projects seeking large amounts of water to be unfeasible (Gibson 2010, McDermott 2010).

The scarcity and strict management of water resources in the San Luis Valley suggest that utility-scale solar energy facilities that require more than 1,000 ac-ft/yr (1.2 million m^3/yr) would have a difficult time securing water rights (McDermott 2010). Considering the estimated water use requirements for the four solar energy technologies presented in Table 10.4.9.2-2, technologies using wet cooling are not feasible and dry-cooling technologies would need to use water conservation measures to try and reduce water needs. Impacts associated with groundwater withdrawals are primarily addressed by the thorough process involved in obtaining water rights in the Rio Grande Basin, which is primarily overseen by the Colorado Division of Water Resources and the Division 3 Water Court (see Section 10.4.9.1.3). Securing water rights in the Rio Grande Basin is a complex and expensive process, so dish engine and PV technologies are the preferable solar energy technologies for the proposed Los Mogotes East SEZ because of their low water use requirements.

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

Proposed design features specific to the proposed Los Mogotes East SEZ include the following:

- Wet-cooling options would not be feasible; other technologies should incorporate water conservation measures;

- Land disturbance activities should avoid impacts to the extent possible near ephemeral washes on site and surrounding wetlands;

- 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;

- Groundwater rights must be obtained from the Division 3 Water Court in coordination with the Colorado Division of Water Resources, existing water right holders, and applicable water conservation districts;

- Groundwater monitoring and production wells should be constructed in accordance with state standards (Colorado DWR 2005);

- Stormwater management plans and BMPs should comply with standards developed by the Colorado Department of Public Health and Environment (CDPHE 2008); and

- Water for potable uses would have to meet or be treated to meet water quality standards in according to *Colorado Revised Statutes* 25-8-204.

10.4.10 Vegetation

This section addresses vegetation that could occur or is known to occur within the potentially affected area of the proposed Los Mogotes 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 the SEZ and a 60-ft (18-m) wide portion of an assumed access road corridor. The area of indirect effects was defined as the area within 5 mi (8 km) of the SEZ boundary and within the 1-mi (1.6-km) wide assumed access road corridor 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 because they are not expected to be needed for facilities on the Los Mogotes East SEZ with the proximity of an existing line.

Indirect effects considered in the assessment included effects from surface runoff, dust, and accidental spills from the SEZ, but do not include ground-disturbing activities. The potential degree of indirect effects would decrease with increasing distance away from the SEZ. This area of indirect effect was identified on the basis of professional judgment and was considered sufficiently large to bound the area that would potentially be subject to indirect effects. The affected area is the area bounded by the areas of direct and indirect effects. Because there is some overlap between the area of indirect effect of the SEZ and the area affected by the access road corridor, the size of the affected area is somewhat less than the sum of the areas of direct and indirect effects. These areas are defined and the impact assessment approach is described in Appendix M.

10.4.10.1 Affected Environment

The proposed Los Mogotes East SEZ is located primarily within the San Luis Alluvial Flats and Wetlands Level IV ecoregion. Although most areas within this ecoregion have been converted to irrigated cropland, remaining shrubland communities include shadscale (*Atriplex confertifolia*), fourwing saltbush (*Atriplex canescens*), and greasewood (*Sarcobatus vermiculatus*) (Chapman et al. 2006). The northwestern portion of this SEZ is located within the San Luis Shrublands and Hills Level IV ecoregion, which supports shrublands, grasslands, and, on upper elevations of the San Luis Hills, pinyon-juniper woodlands. The dominant species of the shrubland communities in this ecoregion are big sagebrush (*Artemisia tridentata*), rubber rabbitbrush (*Ericameria nauseosa*), and winterfat (*Krascheninnikovia lanata*). Grassland species include western wheatgrass (*Pascopyrum smithii*), green needlegrass (*Nassella viridula*), blue grama (*Bouteloua gracilis*), and needle-and-thread (*Hesperostipa comata*). These ecoregions are located within the Arizona/New Mexico Plateau Level III ecoregion, which is described in Appendix I. Land areas surrounding the SEZ lie within the San Luis Alluvial Flats and Wetlands and the San Luis Shrublands and Hills Level IV ecoregions. Annual precipitation in the vicinity of the SEZ is low, averaging 7.3 in. (18.5 cm) at Manassa, Colorado (see Section 10.4.13).

Land cover types, described and mapped under the SWReGAP (USGS 2005) 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 Los Mogotes East SEZ are shown in Figure 10.4.10.1-1. Table 10.4.10.1-1 provides the surface area of each land cover type within the potentially affected area.

Lands within the proposed Los Mogotes East SEZ are classified primarily as Inter-Mountain Basins Semi-Desert Shrub Steppe. Additional cover types within the SEZ include Inter-Mountain Basins Semi-Desert Grassland, Inter-Mountain Basins Mixed Salt Desert Scrub, and Inter-Mountain Basins Greasewood Flat. Less than 1 acre (<0.01 km^2) of Agriculture occurs within the SEZ.

Winterfat and Greene's rabbitbrush (*Chrysothamnus greenei*) were observed to be the dominant species in some areas of the SEZ in July 2009. Large areas of the SEZ support a shrub steppe community, while other areas of the SEZ support a shrub-dominated community with few associated grasses. Sensitive habitats on the SEZ include ephemeral dry washes. The area has had a long history of livestock grazing, and the plant communities present within the SEZ have likely been affected by grazing.

Lands within the access road corridor include 12 cover types. Agriculture is the predominant cover type in the corridor; Invasive Annual and Biennial Forbland and Inter-Mountain Basins Semi-Desert Shrub Steppe are also common cover types. Additional cover types include a wide variety of woodland, shrubland and grassland types (Table 10.4.10.1-1).

The area surrounding the SEZ, within 5 mi (8 km), includes 26 cover types, which are listed in Table 10.4.10.1-1. The predominant cover types are Agriculture and Inter-Mountain Basins Semi-Desert Shrub Steppe.

Numerous ephemeral dry washes occur within the SEZ and access road corridor. 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. However, a number of the intermittent streams that cross the SEZ support riparian habitats of grasses and scattered shrubs. Squawbush (*Rhus trilobata*) was observed on the SEZ in July 2009 in the upper margins of riparian areas. The NWI does not identify any wetlands within the SEZ; however, all or portions of 12 wetlands occur within the assumed access road corridor, and total 43 acres (0.17 km^2) (Figure 10.4.10.1-2) (USFWS 2009b). NWI maps are produced from high-altitude imagery and are subject to uncertainties inherent in image interpretation (USFWS 2009b). Seven of these wetlands are classified as excavated aquatic bed wetlands while five support emergent plant communities. Emergent plant communities are composed primarily of herbaceous species rooted in shallow water or saturated soil. These range from temporarily flooded to seasonally flooded and occur primarily within the Agriculture cover type with a small portion in Invasive Annual and Biennial Forbland.

A number of small wetlands occur near the SEZ, outside of the access road corridor. Most of these wetlands are classified as palustrine wetlands with emergent plant communities and hydrologic regimes that range from intermittently flooded (surface water is usually absent

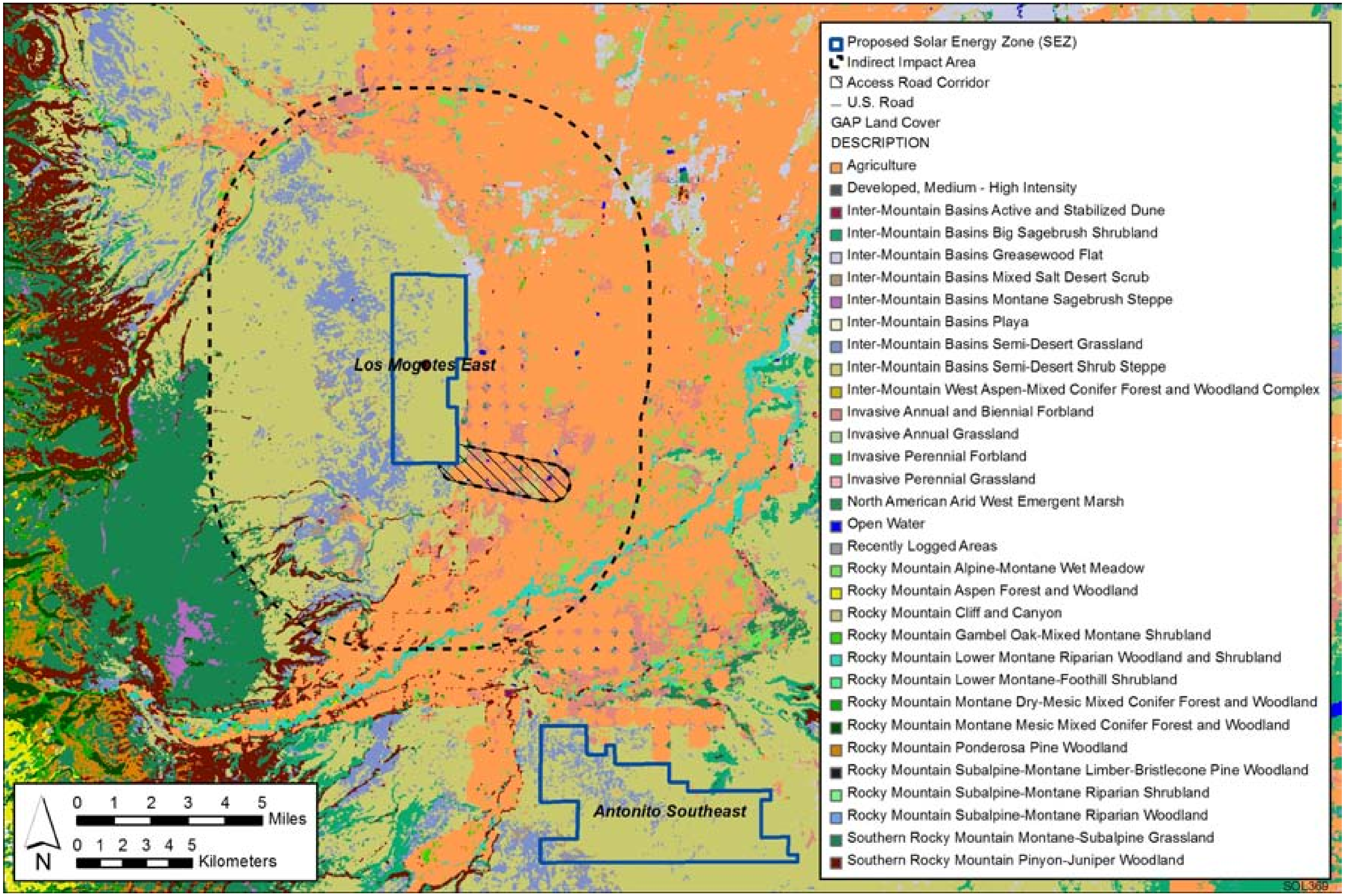

FIGURE 10.4.10.1-1 Land Cover Types within the Proposed Los Mogotes East SEZ (Source: USGS 2004)

1 **TABLE 10.4.10.1-1 Land Cover Types within the Potentially Affected Area of the Proposed Los Mogotes East SEZ and Potential Impacts**

	Area of Cover Type Affected (acres)[b]			
Land Cover Type[a]	Within SEZ (Direct Effects)[c]	Corridor and Outside SEZ (Indirect Effects)[d]	Assumed Access Road (Direct Effects)[e]	Overall Impact Magnitude[f]
S079 Inter-Mountain Basins Semi-Desert Shrub Steppe: Generally consists of perennial grasses with an open shrub and dwarf shrub layer.	5,439 acres[g] (0.8%, 2.2%)	34,970 acres (5.0%)	3 acres (<0.1%)	Small
S090 Inter-Mountain Basins Semi-Desert Grassland: Consists of perennial bunchgrasses as dominants or co-dominants. Scattered shrubs or dwarf shrubs may also be present.	428 acres (0.6%, 1.6%)	6,906 acres (10.2%)	<1 acre (<0.1%)	Small
S065 Inter-Mountain Basins Mixed Salt Desert Scrub: Generally consists of open shrublands which include at least one species of Atriplex along with other shrubs. Perennial grasses dominate a sparse to moderately dense herbaceous layer.	19 acres (1.4%, 1.8%)	557 acres (40.9%)	0 acres	Moderate
S096 Inter-Mountain Basins Greasewood Flat: Dominated or co-dominated by greasewood (*Sarcobatus vermiculatus*) and generally occurring in areas with saline soils, a shallow water table, and intermittent flooding, although remaining dry for most growing seasons. This community type generally occurs near drainages or around playas. These areas may include, or may be co-dominated by, other shrubs, and may include a graminoid herbaceous layer.	8 acres (<0.1%,<0.1%)	1,145 acres (0.5%)	<1 acre (<0.1%)	Small
N80 Agriculture: Areas where pasture/hay or cultivated crops account for more than 20% of total vegetation cover.	<1 acre (<0.1%, <0.1%)	42,014 acres (6.8%)	12 acres (<0.1%)	Small

TABLE 10.4.10.1-1 (Cont.)

	Area of Cover Type Affected (acres)[b]			
Land Cover Type[a]	Within SEZ (Direct Effects)[c]	Corridor and Outside SEZ (Indirect Effects)[d]	Assumed Access Road (Direct Effects)[e]	Overall Impact Magnitude[f]
D09 Invasive Annual and Biennial Forbland: Areas dominated by annual and biennial non-native forb species.	0 acres	5,434 acres (10.1%)	5 acres (<0.1%)	Small
S102 Rocky Mountain Alpine-Montane Wet Meadow: Occurs on wet soils in very low-velocity areas along ponds, lakes, streams, and toeslope seeps. This cover type is dominated by herbaceous species and often occurs as a mosaic of several plant associations. The dominant species are often grass or grass-like plants.	0 acres	1,409 acres (1.3%)	<1 acre (<0.1%)	Small
S085 Southern Rocky Mountain Montane-Subalpine Grassland: Typically occurs as a mosaic of two or three plant associations on well-drained soils. The dominant species is usually a bunchgrass.	0 acres	851 acres (0.3%)	<1 acre (<0.1%)	Small
S054 Inter-Mountain Basins Big Sagebrush Shrubland: Dominated by basin big sagebrush (*Artemisia tridentata tridentata*), Wyoming big sagebrush (*Artemisia tridentata wyomingensis*), or both. Other shrubs may be present. Perennial herbaceous plants are present but not abundant.	0 acres	690 acres (0.1%)	<1 acre (<0.1%)	Small
N11 Open Water: Plant or soil cover is generally less than 25%.	0 acres	80 acres (0.4%)	<1 acre (<0.1%)	Small

TABLE 10.4.10.1-1 (Cont.)

	Area of Cover Type Affected (acres)[b]			
Land Cover Type[a]	Within SEZ (Direct Effects)[c]	Corridor and Outside SEZ (Indirect Effects)[d]	Assumed Access Road (Direct Effects)[e]	Overall Impact Magnitude[f]
S038 Southern Rocky Mountain Pinyon-Juniper Woodland: Occurs on dry mountains and foothills. The dominant trees are twoneedle pinyon (*Pinus edulis*) or oneseed juniper (*Juniperus monosperma*), or both. Rocky Mountain juniper (*Juniperus scopulorum*) may be a dominant in higher elevation occurrences. An understory may be absent or dominated by shrubs or graminoids.	0 acres	1,346 acres (0.4%)	<1 acre (<0.1%)	Small
S046 Rocky Mountain Gambel Oak-Mixed Montane Shrubland: Occurs on dry foothills and lower mountain slopes. Gambel oak (*Quercus gambelii*) may be the only dominant species or share dominance with other shrubs.	0 acres	184 acres (0.1%)	<1 acre (<0.1%)	Small
D06 Invasive Perennial Grassland: Dominated by non-native perennial grasses.	0 acres	41 acres (1.8%)	<1 acre (<0.1%)	Small
S093 Rocky Mountain Lower Montane Riparian Woodland and Shrubland: Occurs on streambanks, islands, and bars, in areas of annual or episodic flooding, and often occurs as a mosaic of tree-dominated communities with diverse shrubs.	0 acres	863 acres (3.0%)	0 acres	Small
S036 Southern Rocky Mountain Ponderosa Pine Woodland: Occurs on dry slopes. Ponderosa pine (*Pinus ponderosa*, primarily var. *scopulorum*, and var. *brachyptera*) is the dominant species. Other tree species may be present. The understory is usually shrubby and grasses may be present.	0 acres	67 acres (<0.1%)	0 acres	Small

TABLE 10.4.10.1-1 (Cont.)

	Area of Cover Type Affected (acres)[b]			
Land Cover Type[a]	Within SEZ (Direct Effects)[c]	Corridor and Outside SEZ (Indirect Effects)[d]	Assumed Access Road (Direct Effects)[e]	Overall Impact Magnitude[f]
S012 Inter-Mountain Basins Active and Stabilized Dune: Includes Dune and sandsheet areas that are unvegetated or sparsely vegetated, with up to 30% plant cover, but generally less than 10%. Plant communities consist of patchy or open grassland, shrubland, or shrub steppe, with species often adapted to the shifting sandy substrate.	0 acres	62 acres (0.3%)	0 acres	Small
D07 Invasive Perennial Forbland: Dominated by non-native perennial forb species.	0 acres	34 acres (20.5%)	0 acres	Small
S006 Rocky Mountain Cliff and Canyon and Massive Bedrock: Occurs on steep cliffs, narrow canyons, rock outcrops, and scree and talus slopes. This cover type includes barren and sparsely vegetated areas (less than 10% cover) with scattered trees and/or shrubs, or with small dense patches. Herbaceous plant cover is limited.	0 acres	16 acres (0.1%)	0 acres	Small
N22 Developed, Medium–High Intensity: Includes housing and commercial/industrial development. Impervious surfaces compose 50 to 100% of the total land cover.	0 acres	12 acres (0.9%)	0 acres	Small
S032 Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland: Occurs on mountain slopes, canyon sideslopes, and ridgetops. Shrub and graminoid species are generally present.	0 acres	12 acres (<0.1%)	0 acres	Small

TABLE 10.4.10.1-1 (Cont.)

	Area of Cover Type Affected (acres)[b]			
Land Cover Type[a]	Within SEZ (Direct Effects)[c]	Corridor and Outside SEZ (Indirect Effects)[d]	Assumed Access Road (Direct Effects)[e]	Overall Impact Magnitude[f]
N21 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.	0 acres	11 acres (0.8%)	0 acres	Small
S100 North American Arid West Emergent Marsh: Occurs in natural depressions, such as ponds, or bordering lakes, or slow-moving streams or rivers. Alkalinity is highly variable. The plant community is characterized by herbaceous emergent, submergent, and floating leaved species.	0 acres	4 acres (0.1%)	0 acres	Small
S091 Rocky Mountain Subalpine-Montane Riparian Shrubland: Occurs along low-gradient streams, alluvial terraces, and floodplains; around seeps, fens, and isolated springs on hillslopes; and in above-treeline snowmelt-fed basins. This cover type often occurs as a mosaic of shrub and herbaceous communities.	0 acres	3 acres (<0.1%)	0 acres	Small
S023 Rocky Mountain Aspen Forest and Woodland: Dominated by quaking aspen (*Populus tremuloides)*, with or without a significant presence of conifers. The understory may consist of only herbaceous species or multiple shrub and herbaceous layers.	0 acres	2 acres (<0.1%)	0 acres	Small
D03 Recently Mined or Quarried: Includes open pit mines and quarries.	0 acres	2 acres (0.4%)	0 acres	Small

TABLE 10.4.10.1-1 (Cont.)

	Area of Cover Type Affected (acres)[b]			
Land Cover Type[a]	Within SEZ (Direct Effects)[c]	Corridor and Outside SEZ (Indirect Effects)[d]	Assumed Access Road (Direct Effects)[e]	Overall Impact Magnitude[f]
D08 Invasive Annual Grassland: Dominated by non-native annual grass species.	0 acres	1 acre (0.4%)	0 acres	Small

[a] Land cover descriptions are from USGS (2005). Full descriptions of land cover types, including plant species, can be found in Appendix J. Some wetlands within the assumed access road corridor are not mapped as wetland cover types by SWReGAP.

[b] Area in acres, determined from USGS (2004).

[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. Some wetlands within the assumed access road corridor are not mapped as wetland cover types by SWReGAP.

[d] Area of indirect effects was assumed to be the area adjacent to the SEZ within 5 mi (8 km) of the SEZ boundary and within a 1-mi (1.6-km) wide assumed access road corridor 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. It 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] For the access road, direct effects were estimated within a 3-mi (5-km) long, 60-ft (18-m) wide ROW for an assumed access road connecting to the nearest highway. Impacts are for the area of the cover type within the assumed ROW, the percentage that area represents of all occurrences of that cover type within the SEZ region.

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

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

1

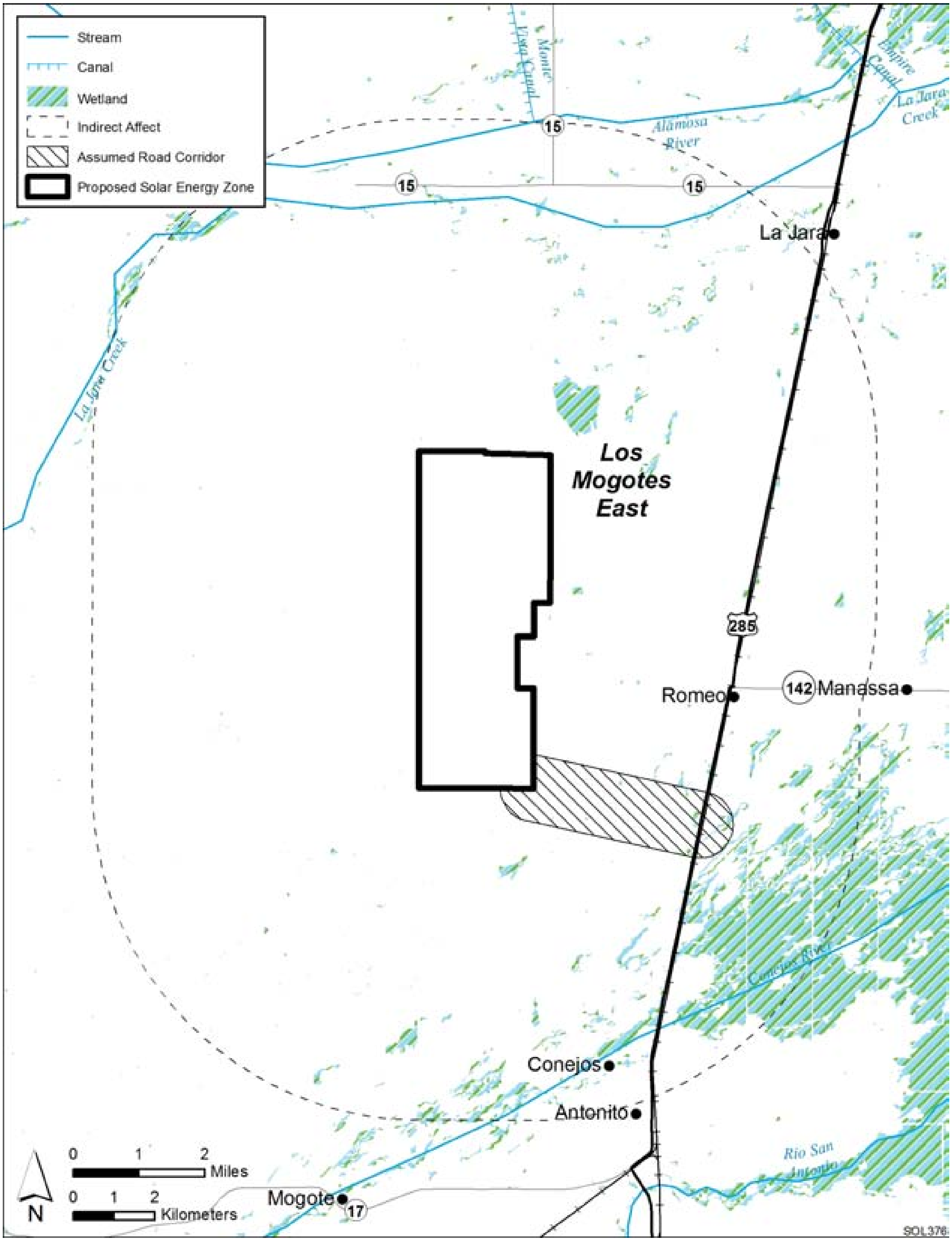

FIGURE 10.4.10.1-2 Wetlands within the Proposed Los Mogotes East SEZ (Source: USFWS 2009a)

but may be present for variable periods) to seasonally flooded (surface water is present for extended periods, particularly early in the growing season, but is usually absent by the end of the growing season). Several support only a sparse plant cover. Wetlands to the west of the SEZ are primarily associated with ephemeral streams, which flow to the east. These wetlands primarily occur within the Inter-Mountain Basins Semi-Desert Shrub Steppe cover type. Many of the small wetlands east of the SEZ are excavated ponds that support floating aquatic plant communities.

A large palustrine wetland with emergent plant communities occurs 0.5 mi (0.8 km) northeast of the SEZ. This 268-acre (1.08-km^2) wetland receives surface water flows from the northern portion of the SEZ (Figure 10.4.10-2). La Jara Creek, with emergent and scrub shrub wetlands, lies downstream of this wetland. Extensive palustrine wetlands are associated with the Conejos River to the south and southeast of the SEZ. These wetlands primarily support emergent plant communities and range from being temporarily flooded (when surface water is present for brief periods during the growing season, but the water table is usually located well below the soil surface) to being seasonally flooded; however, forested and scrub/shrub wetlands also occur, especially near stream channels. These wetlands include Rocky Mountain Alpine-Montane Wet Meadow and Rocky Mountain Lower Montane Riparian Woodland and Shrubland cover types. See Section 10.4.9.1.1 for a description of the hydrological characteristics of wetlands in the vicinity of the SEZ.

The State of Colorado maintains an official state list of weed species that are designated noxious species. Table 10.4.10.1-2 provides a summary of the noxious weed species regulated in Colorado that are known to occur in Conejos County. No species included in Table 10.4.10.1-2 was observed on the SEZ.

TABLE 10.4.10.1-2 Colorado Noxious Weeds Occurring in Conejos County[a]

Common Name	Scientific Name	Status
Black henbane	*Hyoscyamus niger*	List B
Bull thistle	*Cirsium vulgare*	List B
Hoary cress	*Cardaria draba*	List B
Leafy spurge	*Euphorbia esula*	List B
Oxeye daisy	*Chrysantheum leucanthemum*	List B
Perennial pepperweed	*Lepidium latifolium*	List B
Russian knapweed	*Acroptilon repens*	List B
Scotch thistle	*Onopordum acanthium*	List B
Yellow toadflax	*Linaria vulgaris*	List B
Canada thistle	*Cirsium arvense*	List B
Musk thistle	*Carduus nutans*	List B
Field bindweed	*Convolvulus arvensis*	List C

[a] County occurrence was determined from USDA (2010).

Source: CDA (2010).

The Colorado Department of Agriculture classifies noxious weeds into one of three lists (CDA 2010):

- "List A species in Colorado that are designated by the Commissioner for eradication."

- "List B weed species are species for which the Commissioner, in consultation with the state noxious weed advisory committee, local governments, and other interested parties, develops and implements state noxious weed management plans designed to stop the continued spread of these species."

- "List C weed species are species for which the Commissioner, in consultation with the state noxious weed advisory committee, local governments, and other interested parties, will develop and implement state noxious weed management plans designed to support the efforts of local governing bodies to facilitate more effective integrated weed management on private and public lands. The goal of such plans will not be to stop the continued spread of these species but to provide additional education, research, and biological control resources to jurisdictions that choose to require management of List C species."

Nineteen noxious weeds and invasive plant species are known or suspected to occur in the San Luis Valley Resource Area, which includes the proposed Los Mogotes East SEZ (Table 10.4.10.1-3).

Species that are known to occur near the SEZ include Russian knapweed, hoary cress, musk thistle, Canada thistle, field bindweed, black henbane, perennial pepperweed, and yellow toadflax (BLM 2010a). The only species from Table 10.4.10.1-3 on List A, Hydrilla, is an aquatic species and not known to occur in the vicinity of the SEZ.

10.4.10.2 Impacts

The construction of solar energy facilities within the proposed Los Mogotes 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 (4,734 acres [19.2 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 (caused, for example, 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

TABLE 10.4.10.1-3 Noxious Weeds and Invasive Plants in the San Luis Valley Resource Area

Common Name	Scientific Name	Status
Leafy spurge	*Euphorbia esula*	List B
Black henbane	*Hyoscyamus niger*	List B
Dalmatian toadflax	*Linaria dalmatica, L. genistifolia*	List B
Scotch thistle	*Onopordum acanthium, O. tauricum*	List B
Spotted knapweed	*Centaurea maculosa*	List B
Russian knapweed	*Acroptilon repens*	List B
Canada thistle	*Cirsium arvense*	List B
Field bindweed	*Convolvulus arvensis*	List C
Hoary cress	*Cardaria draba*	List B
Perennial pepperweed	*Lepidium latifolium*	List B
Yellow toadflax	*Linaria vulgaris*	List B
Houndstongue	*Cynoglossum officinale*	List B
Russian olive	*Elaeagnus angustifolia*	List B
Cheatgrass	*Bromus tectorum*	List C
Oxeye daisy	*Chrysantheum leucanthemum*	List B
Salt cedar	*Tamarix chinensis, T. parviflora, T. ramosissima*	List B
Russian thistle/Kochia	*Bassia prostrata*	Not listed
Hydrilla	*Hydrilla verticillata*	List A
Eurasian water milfoil	*Myriophyllum spicatum*	List B

Source: BLM (2010).

elimination of a community or the replacement of one community type for another. The proper implementation of programmatic design features, however, would reduce indirect effects to a minor/small level of impact.

Possible impacts on vegetation from solar energy development that are encountered within the SEZ or along related ROWs are described in more detail in Section 5.10.1. 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. SEZ-specific design features are described in Section 10.4.10.3.

10.4.10.2.1 Impacts on Native Species

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

Solar facility construction and operation would primarily affect communities of the Inter-Mountain Basins Semi-Desert Shrub Steppe cover type. Additional cover types within the SEZ that would be affected include Inter-Mountain Basins Semi-Desert Grassland, Inter-Mountain Basins Mixed Salt Desert Scrub, and Inter-Mountain Basins Greasewood Flat. Although the Agriculture cover type occurs within the SEZ, these areas likely support few native plant communities. The potential impacts on land cover types resulting from solar energy development in the proposed Los Mogotes East SEZ are summarized in Table 10.4.10.1-1. Most of these cover types are relatively common in the SEZ region. Full development of the SEZ would result in moderate impacts on Inter-Mountain Basins Mixed Salt Desert Scrub. This cover type is relatively uncommon, representing 0.03% of the land area within the SEZ region. Full development of the SEZ would result in small impacts on all other cover types in the affected area.

Re-establishment of shrub or grassland communities in temporarily disturbed areas would likely be very difficult because of the arid conditions and may 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 5.6.1. Specific to the affected area of the proposed Los Mogotes East SEZ, approximately 43 acres (0.17 km^2) of wetland habitat occur within the assumed access road corridor and could be affected by construction within the ROW. No wetlands have been identified within the SEZ.

Grading could result in direct impacts on the wetlands within the access road corridor if fill material is placed within wetland areas. Grading near wetlands in the corridor 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 the corridor or near the SEZ, such as the large wetland northeast of 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. The wetlands located to the west are primarily associated with streams upgradient from the SEZ and would be unlikely to be affected by altered surface water or groundwater flows or water quality changes. Wetlands located downgradient could potentially be affected by project construction activities, either by surface water or groundwater impacts. Communities associated with greasewood flats communities, riparian habitats, or other periodically flooded areas within or downstream from solar projects or the access road corridor could also be affected by ground-disturbing activities. Grading could also affect dry washes within the SEZ or corridor, 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 10.4.9 for further discussion of washes.

Although the use of groundwater within the Los Mogotes 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 10.4.9). Plant communities supported by groundwater discharge, such as those along the Conejos River, could become degraded or lost as a result of groundwater flow alterations.

The deposition of fugitive dust from disturbed soils onto habitats outside a solar project area could result in reduced productivity or changes in plant community composition. Communities that would be most likely affected northeast of the SEZ, the predominant downwind direction, are those of the Inter-Mountain Basins Semi-Desert Shrub Steppe cover type, as well as Agriculture. Inter-Mountain Basins Greasewood Flat, Invasive Annual and Biennial Forbland, Inter-Mountain Basins Semi-Desert Grassland, Rocky Mountain Alpine-Montane Wet Meadow, Southern Rocky Mountain Montane-Subalpine Grassland, Inter-Mountain Basins Big Sagebrush Shrubland, Inter-Mountain Basins Active and Stabilized Dune, Rocky Mountain Gambel Oak-Mixed Montane Shrubland, Rocky Mountain Ponderosa Pine Woodland, Rocky Mountain Lower Montane Riparian Woodland and Shrubland, and Southern Rocky Mountain Pinyon-Juniper Woodland also occur to the northeast.

10.4.10.2.2 Impacts from Noxious Weeds and Invasive Plant Species

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

Noxious weed species that are known to occur in San Luis Valley near the SEZ include Russian knapweed, hoary cress, musk thistle, Canada thistle, field bindweed, black henbane, perennial pepperweed, and yellow toadflax. Additional species known to occur in Conejos County or the San Luis Valley Resource Area are given in Table 10.4.10.1-2 and Table 10.4.10.1-3, respectively. Approximately 4,956 acres (20.06 km^2) of Invasive Annual and Biennial Forbland, 39 acres (0.16 km^2) of Invasive Perennial Grassland, 34 acres (0.14 km^2) of Invasive Perennial Forbland, and 1 acre (0.004 km^2) of Invasive Annual Grassland occur within 5 mi (8 km) of the SEZ. Land disturbance from project activities and indirect effects of construction and operation could result in the expansion of these invasive species populations.

Past or present land uses may affect the susceptibility of plant communities to the establishment of noxious weeds and invasive species. Existing roads, transmission lines, grazing, 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. Disturbed areas, including 42,014 acres (170.0 km^2) of Agriculture, 12 acres (0.05 km^2) of Developed, Medium–High Intensity, 11 acres (0.04 km^2) of Developed, Open Space – Low Intensity, and 2 acres (0.008 km^2) of Recently Mined or Quarried occur within the area of indirect effects and may contribute to the establishment of noxious weeds and invasive species.

10.4.10.3 SEZ-Specific Design Features and Design Feature Effectiveness

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

- An Integrated Vegetation Management Plan, addressing invasive species control, and an Ecological Resources Mitigation and Monitoring Plan, addressing habitat restoration should be approved and implemented to increase the potential for successful restoration of semidesert shrub steppe and semidesert grassland habitats 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.

- All dry wash habitats within the SEZ and all wetland and dry wash habitats within the assumed access road corridor should be avoided to the extent practicable, and any impacts minimized and mitigated. A buffer area should be maintained around wetlands and dry washes to reduce the potential for impacts on these habitats.

- Appropriate engineering controls should be used to minimize impacts on wetland, dry wash, and riparian habitats, including downstream occurrences, resulting from surface water runoff, erosion, sedimentation, altered hydrology, or accidental spills, and fugitive dust deposition. Maintaining sediment and erosion controls along drainages would reduce the potential for impacts on wetlands near or downgradient from the SEZ. Appropriate buffers and engineering controls would be determined through agency consultation.

- Groundwater withdrawals should be limited to reduce the potential for indirect impacts on wetlands or springs near the SEZ associated with groundwater discharge, such as the wetlands along the Conejos River.

If these SEZ-specific design features are implemented, it is anticipated that a high potential for impacts from invasive species and impacts on wetlands, springs, dry washes, and riparian habitats would be reduced to a minimal potential for impact. Residual impacts on wetlands or springs could result from remaining groundwater withdrawal; however, it is anticipated that these impacts would be avoided in the majority of instances.

10.4.11 Wildlife and Aquatic Biota

This section addresses wildlife (amphibians, reptiles, birds, and mammals) and aquatic biota that could potentially occur within the potentially affected area of the proposed Los Mogotes East SEZ. Wildlife known to occur within 50 mi (80 km) of the SEZ (i.e., the SEZ region) were determined from the Colorado Natural Diversity Information Source Species Page (CDOW 2009) and the SWReGAP (USGS 2007). Land cover types potentially suitable for each species were determined from the SWReGAP (USGS 2004, 2005, 2007). Big game activity areas were determined from Colorado Natural Diversity Information Source Data (CDOW 2008). 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 would occur) and included the SEZ and a 60-ft (18-m) wide portion of an assumed 3-mi (4.8-km) long access road. The maximum developed area within the SEZ would be 4,734 acres (19.2 km^2).

The area of indirect effects was defined as the area within 5 mi (8 km) of the SEZ boundary, which includes the 1-mi (1.6-km) wide assumed access road 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 in the SEZ or transmission line construction area). Potentially suitable habitat for a species within the SEZ greater than the maximum of 4,734 acres (19.2 km^2) of direct effects was also included as part of the area of indirect effects. The potential degree of indirect effects would decrease with increasing distance away from the SEZ. The 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. These areas of direct and indirect effects are defined and the impact assessment approach is described in Appendix M. No area of direct or indirect effects was assumed for a new access road because of the proximity of an existing state highway to the SEZ.

The primary habitat type within the affected area is semiarid shrub-steppe (Section 10.4.10), although aquatic and riparian habitats occur along the Alamosa River, the Conejos River, and La Jara Creek within the area of indirect effects (Figure 10.4.10.1-1). No permanent water bodies occur within the proposed Los Mogotes East SEZ, but several washes cross the site. Several small, palustrine wetlands that may contain surface water for variable periods of time throughout the year occur surround the SEZ, while a large concentration of temporarily to seasonally flooded palustrine wetlands occurs along the riparian areas of the Conejos River (Section 10.4.9.1.1).

10.4.11.1 Amphibians and Reptiles

10.4.11.1.1 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 Los Mogotes East SEZ. The list of amphibian and reptile species potentially present in the SEZ area was determined from the Colorado Natural Diversity Information Source (CDOW 2009) and habitat information was determined from CDOW (2009), USGS (2007), and NatureServe (2010). Land cover types suitable for each species were determined from SWReGAP (USGS 2004, 2005, 2007). See Appendix M for additional information on the approach used.

Based on the distribution and habitat preferences of amphibian species in southern Colorado (SWReGAP 2007; CDOW 2009), seven amphibian species could be associated with the aquatic and wetland habitats located near the proposed Los Mogotes East SEZ: the bullfrog (*Rana catesbeiana*), New Mexico spadefoot (*Spea multiplicata*), northern leopard frog (*Rana pipiens*), tiger salamander (*Ambystoma tigrinum*), plains spadefoot (*Spea bombifrons*), western chorus frog (*Pseudacris triseriata*), and Woodhouse's toad (*Bufo woodhousii*). Based on habitat preferences of the amphibian species, Woodhouse's toad would be expected to occur within the SEZ (USGS 2007; Stebbins 2003). Amphibian surveys would need to be conducted to confirm which species occur within the area and whether any amphibian species occur near the wetlands within the SEZ.

Reptile species that could occur within the proposed Los Mogotes East SEZ include the fence lizard (*Sceloporus undulatus*), gopher snake (*Pituophis catenifer*), western rattlesnake (*Crotalus viridis*), short-horned lizard (*Phrynosoma hernandesi*), and western terrestrial garter snake (*Thamnophis elegans*) (CDOW 2009; NMDGF 2009; Stebbins 2003).

Table 10.4.11.1-1 provides habitat information and the types and overall area of suitable land cover for representative amphibian and reptile species that could occur in the SEZ.

10.4.11.1.2 Impacts

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 inAppendix A, Section A.2.2, and through the applicaton of any additional mitigation. Section 10.4.11.1.3, below, identifies SEZ-specific design features of particular relevance to the proposed Los Mogotes East SEZ.

The assessment of impacts on amphibian and reptile species is based on available information on the presence of species in the affected area as presented in Section 10.4.11.1.1, 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

TABLE 10.4.11.1-1 Habitats, Potential Impacts, and Potential Mitigation for Representative Amphibian and Reptile Species That Could Occur on or in the Affected Area of the Proposed Los Mogotes East SEZ

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]			Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
		Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	
Amphibians					
Woodhouse's toad (*Bufo woodhousii*)	Mesic areas near streams and rivers. Often in agricultural areas and river floodplains. Prefers sandy areas. Can move several hundred meters between breeding and nonbreeding habitats. About 2,601,500 acres of potentially suitable habitat occurs in the SEZ region.	4,734 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat)	86,400 acres of potentially suitable habitat (3.3% of available potentially suitable habitat)	17 acres of potentially suitable habitat lost and 1,495 acres of potentially suitable habitat in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Lizards					
Fence lizard (*Sceloporus undulatus*)	Sunny, rocky habitats of cliffs, talus, old lava flows and cones, canyons, and outcrops. Various vegetation adjacent or among rocks include montane forests, woodlands, semidesert shrubland, and various forbs and grasses. About 1,800,000 acres[h] of potentially suitable habitat occurs in the SEZ region.	4,734 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	45,346 acres of potentially suitable habitat (2.5% of available potentially suitable habitat)	4 acres of potentially suitable habitat in area of potential direct effect and 348 acres of potentially suitable habitat in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Many-lined skink (*Eumeces multivirgatus*)	Mesic areas along streams and dense grassland edges of playas. Also loose sandy soils and prairie dog colonies; occasionally vacant lots in cities and residential areas. Most abundant where there is water or moist subsoil. About 801,500 acres of potentially suitable habitat occurs in the SEZ region.	428 acres of potentially suitable habitat lost (0.05% of available potentially suitable habitat)	8,312 acres of potentially suitable habitat (1.0% of available potentially suitable habitat)	0.4 acre of potentially suitable habitat in area of potential direct effect and 33.6 acres of potentially suitable habitat in area of indirect effect	Small overall impact.. Avoidance of prairie dog colonies would reduce the potential for impact.

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TABLE 10.4.11.1-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Lizards (Cont.)					
Short-horned lizard (*Phrynosoma hernandesi*)	Short-grass prairies, sagebrush, semidesert shrublands, shale barrens, pinyon-juniper and pine-oak woodlands, oak-grass associations, and open conifer forests in mountainous areas. About 3,137,900 acres of potentially suitable habitat occurs in the SEZ region	428 acres of potentially suitable habitat lost (0.01% of available potentially suitable habitat)	12,233 acres of potentially suitable habitat (0.4% of available potentially suitable habitat)	1 acre of potentially suitable habitat in area of potential direct effect and 98 acres of potentially suitable habitat in area of indirect effect	Small overall impact.
Snakes					
Gophersnake (*Pituophis catenifer*)	Plains grasslands, sandhills, riparian areas, marshes, edges of ponds and lakes, rocky canyons, semidesert and mountain shrublands, montane woodlands, rural and suburban areas, and agricultural areas. Likely inhabits pocket gopher burrows in winter. About 2,050,400 acres of potentially suitable habitat occurs in the SEZ region.	428 acres of potentially suitable habitat lost (0.02% of available potentially suitable habitat)	50,081acres of potentially suitable habitat (2.4% of available potentially suitable habitat)	13 acres of potentially suitable habitat in area of potential direct effect and 1,165 acres of potentially suitable habitat in area of indirect effect	Small overall impact.
Western rattlesnake (*Crotalus viridis*)	Most terrestrial habitats. Typically inhabits plains grasslands, sandhills, semidesert and mountain shrublands, riparian areas, and montane woodlands. About 3,555,900 acres of potentially suitable habitat occurs in the SEZ region.	4,734 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat)	87,328 acres of potentially suitable habitat (2.5% of available potentially suitable habitat)	16 acres of potentially suitable habitat in area of potential direct effect and 1,498 acres of potentially suitable habitat in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.

TABLE 10.4.11.1-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Snakes (Cont.)					
Western terrestrial garter snake (*Thamnophis elegans*)	Most terrestrial and wetland habitats near bodies of water, but can be found many miles from water. About 2,713,600 acres of potentially suitable habitat occurs in the SEZ region.	4,734 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat)	38,382 acres of potentially suitable habitat (1.4% of available potentially suitable habitat)	4 acres of potentially suitable habitat in area of potential direct effect and 349 acres of potentially suitable habitat in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.

a Potentially suitable habitat was determined by using SWReGAP habitat suitability and 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.

b Maximum area of potentially suitable habitat that could be affected relative to availability within the SEZ region. Habitat availability for each species within the region was determined by using SWReGAP habitat suitability and land cover models. This approach probably overestimates the amount of suitable habitat in the project area.

c Direct effects within the SEZ consist of the ground-disturbing activities associated with construction and the maintenance of an altered environment associated with operations. A maximum of 4,734 acres of direct effect within the SEZ was assumed.

d Area of indirect effects was assumed to be the area adjacent to the SEZ within 5 mi (8 km) of the SEZ boundary. Potentially suitable habitat within the SEZ greater than the maximum of 4,734 acres of direct effect was also added to the area of indirect effect. Indirect effects include effects from surface runoff, dust, noise, lighting, and so on from the SEZ, but do not include ground-disturbing activities. The potential degree of indirect effects would decrease with increasing distance away from the SEZ.

e For access road development, direct effects were estimated within a 3-mi (4.8-km), 60-ft (18-m) wide access road ROW from the SEZ to the nearest existing highway. As the access road corridor exists within the area of indirect effects for the SEZ, no additional area of indirect effects were determined for the access road.

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

1 **Footnotes continued on next page.**

TABLE 10.4.11.1-1 (Cont.)

[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 acres to km^2, multiply by 0.004047.

Sources: CDOW (2009); NatureServe (2010); NDCNR (2002); USGS (2004, 2005, 2007).

impacts more thoroughly. These assessments and consultations could result in additional required actions to avoid or mitigate impacts on amphibians and reptiles (see Section 10.4.11.1.3).

In general, impacts on amphibians and reptiles would result from habitat disturbance (i.e., habitat reduction, fragmentation, and alteration) and from disturbance, injury, or mortality to individuals. Table 10.4.11.1-2 summarizes the potential magnitude of impacts on representative amphibian and reptile species resulting from solar energy development on the Los Mogotes East SEZ. Based on the impacts on amphibian and reptiles summarized in Table 10.4.11.1-1, direct impacts on amphibian and reptile species would be small, as 0.3% or less of potentially suitable habitats identified for each species in the SEZ region would be lost. Larger areas of potentially suitable habitats for amphibians and reptile species occur within the area of potential indirect effects (e.g., up to 2.5% of potentially available habitat for the fence 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.

10.4.11.1.3 SEZ-Specific Design Features and Design Feature Effectiveness

The successful 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 could be avoided (e.g., washes). Indirect impacts could be reduced to negligible levels by implementing programmatic design features, especially those engineering controls that would reduce runoff, sedimentation, spills, and fugitive dust. While some SEZ-specific design features are best established when project details are considered, design features that can be identified at this time include the following:

- Wash habitats within the SEZ should be avoided to the extent practicable.

- Appropriate engineering controls should be used to minimize impacts on palustrine wetlands surrounding the SEZ resulting from surface water runoff, erosion, sedimentation, accidental spills, or fugitive dust deposition to these habitats.

- The access road should be sited and constructed to minimize impacts on wetlands (if present within the finalized access road location).

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, because 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.

10.4.11.2 Birds

10.4.11.2.1 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 Los Mogotes East SEZ. The list of bird species potentially present in the SEZ area was determined from the Colorado Natural Diversity Information Source (CDOW 2009) and habitat information was determined from CDOW (2009), USGS (2007) and NatureServe (2010). Land cover types suitable for each species were determined from SWReGAP (USGS 2004, 2005, 2007). See Appendix M for additional information on the approach used.

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. Within the proposed Los Mogotes East SEZ, waterfowl, wading birds, and shorebirds are uncommon because of the lack of aquatic and wetland habitats. The Alamosa River, the Conejos River, La Jara Creek, and Monte Vista Canal, which occur within the 5-mi (8-km) area of indirect effects adjacent to the SEZ, provide habitat more suitable for waterfowl, wading birds, and shorebirds. The mountain plover (*Charadrius montanus*) may occur on the SEZ. This special status species is discussed in Section 10.4.12.

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 migrant species that are common or abundant within Conejos County and that are expected to occur within the proposed Los Mogotes East SEZ include the Brewer's blackbird (*Euphagus cyanocephalus*), Brewer's sparrow (*Spizella breweri*), common nighthawk (*Chordeiles minor*), horned lark (*Eremophila alpestris*), vesper sparrow (*Pooecetes gramineus*), and western meadowlark (*Sturnella neglecta*) (CDOW 2009; USGS 2007).

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. Species expected to occur within the SEZ include the American kestrel (*Falco sparverius*), golden eagle (*Aquila chrysaetos*), red-tailed hawk (*Buteo jamaicensis*), short-eared owl (*Asio flammeus*), Swainson's hawk (*Buteo swainsoni*), and turkey vulture (*Cathartes aura*). Special status birds of prey species are discussed in Section 10.4.12

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. The mourning dove (*Zenaida macroura*) is the only upland game bird species expected to occur within the proposed Los Mogotes East SEZ. No activity areas mapped for various upland game bird species, such as the wild turkey (*Meleagris gallopavo*), occur within 5 mi (8 km) of the SEZ (CDOW 2008).

Table 10.4.11.2-1 provides habitat information and the types and overall area of potentially suitable land cover for most of the representative bird species mentioned above.

10.4.11.2.2 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 application of any additional mitigation measures. Section 10.4.11.2.3, below, identifies design features of particular relevance to the proposed Los Mogotes 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 10.4.11.2.1, following the analysis approach described in Appendix M. Additional NEPA assessments and coordination with federal or 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 10.4.11.2.3).

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 10.4.11.2-1 summarizes the potential impacts on representative bird species resulting from solar energy development in the proposed Los Mogotes East SEZ. Direct impacts on bird species would be small, because only 0.3% or less of potentially suitable habitats identified for each species would be lost (Table 10.4.11.2-1). Larger areas of potentially suitable habitat for bird species occur within the area of potential indirect effects (e.g., up to 5.1% of available potentially suitable habitat for the northern rough-winged swallow). Other impacts on birds could result from collision with the access road and buildings, surface water and sediment runoff from

TABLE 10.4.11.2-1 Habitats, Potential Impacts, and Potential Mitigation for Representative Bird Species That Could Occur on or in the Affected Area of the Proposed Los Mogotes East SEZ

		Maximum Area of Potential Habitat Affected[b]			
Common Name (Scientific Name)	Habitat[a]	Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Neotropical Migrants					
Brewer's blackbird (*Euphagus cyanocephalus*)	Meadows, grasslands, riparian areas, agricultural and urban areas, and occasionally in sagebrush in association with prairie dog colonies and other shrublands. Requires dense shrubs for nesting. Roosts in marshes or dense vegetation. In winter, most often near open water and farmyards with livestock. About 1,741,300 acres of potentially suitable habitat occurs in the SEZ region.	436 acres of potentially suitable habitat lost (0.03% of available potentially suitable habitat)	52,028 acres of potentially suitable habitat (3.0% of available potentially suitable habitat)	13 acres of potentially suitable habitat in area of potential direct effect and 1,189 acres of potentially suitable habitat in area of indirect effect	Small overall impact. Avoidance of prairie dog colonies would further reduce the potential for impact. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Brewer's sparrow (*Spizella breweri*)	Breeds in sagebrush shrublands. Also occurs in mountain mahogany or rabbitbrush. During migration, frequents woody, brushy, or weedy agricultural and urban areas. Inhabits sagebrush and shrubby desert habitat during winter. About 766,300 acres of potentially suitable habitat occurs in the SEZ region.	447 acres of potentially suitable habitat lost (0.06% of available potentially suitable habitat)	9,161 acres of potentially suitable habitat (1.2% of available potentially suitable habitat)	0.4 acre of potentially suitable habitat in area of potential direct effect and 37.6 acres of potentially suitable habitat in area of indirect effect	Small overall impact. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

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TABLE 10.4.11.2-1 (Cont.)

		Maximum Area of Potential Habitat Affected[b]			
Common Name (Scientific Name)	Habitat[a]	Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Neotropical Migrants (Cont.)					
Common nighthawk (*Chordeiles minor*)	Grasslands, sagebrush, semidesert shrublands, open riparian and ponderosa pine forests, pinyon-juniper woodlands, and agricultural and urban areas. Also occurs in other habitats when foraging. About 2,637,000 acres of potentially suitable habitat occurs in the SEZ region.	4,734 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat)	86,424 acres of potentially suitable habitat (3.3% of available potentially suitable habitat)	16 acres of potentially suitable habitat in area of potential direct effect and 1,496 acres of potentially suitable habitat in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Horned lark (*Eremophila alpestris*)	Breeds in grasslands, sagebrush, semidesert shrublands, and alpine tundra. During migration and winter, inhabits the same habitats other than tundra, and also occurs in agricultural areas. Usually occurs where plant density is low and there are exposed soils. About 2,150,200 acres of potentially suitable habitat occurs in the SEZ region.	4,734 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat)	85,977 acres of potentially suitable habitat (4.0% of available potentially suitable habitat)	16 acres of potentially suitable habitat in area of potential direct effect and 1,464 acres of potentially suitable habitat in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 10.4.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Vesper sparrow (*Pooecetes gramineus*)	Breeds in grasslands, open shrublands mixed with grasslands, and open pinyon-juniper woodlands. Occurs in open riparian and agricultural areas during migration. About 2,484,300 acres of potentially suitable habitat occurs in the SEZ region.	4,734 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat)	90,292 acres of potentially suitable habitat (3.6% of available potentially suitable habitat)	21 acres of potentially suitable habitat in area of potential direct effect and 1,967 acres of potentially suitable habitat in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Western meadowlark (*Sturnella neglecta*)	Agricultural areas, especially in winter. Also inhabits native grasslands, croplands, weedy fields, and less commonly in semidesert and sagebrush shrublands. About 1,953,600 acres of potentially suitable habitat occurs in the SEZ region.	4,734 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat)	87,656 acres of potentially suitable habitat (4.5% of available potentially suitable habitat)	16 acres of potentially suitable habitat in area of potential direct effect and 1,515 acres of potentially suitable habitat in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 10.4.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Birds of Prey					
American kestrel (*Falco sparverius*)	Wide variety of open to semi-open habitats including agricultural areas, grasslands, riparian forest edges, and urban areas. Occurs in most habitats, especially during migration. About 4,300,400 acres of potentially suitable habitat occurs in the SEZ region.	4,734 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat)	89,372 acres of potentially suitable habitat (2.1% of available potentially suitable habitat)	16 acres of potentially suitable habitat in area of potential direct effect and 1,515 acres of potentially suitable habitat in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Golden eagle (*Aquila chrysaetos*)	Grasslands, shrublands, pinyon-juniper woodlands, and ponderosa pine forests. Occasionally in most other habitats, especially during migration and winter. Nests on cliffs and sometimes trees in rugged areas, with breeding birds ranging widely over surrounding areas. About 4,762,400 acres of potentially suitable habitat occurs in the SEZ region.	4,734 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat)	90,664 acres of potentially suitable habitat (1.9% of available potentially suitable habitat)	17 acres of potentially suitable habitat in area of potential direct effect and 1,526 acres of potentially suitable habitat in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Bald and Golden Eagle Protection Act.

TABLE 10.4.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Birds of Prey (Cont.)					
Red-tailed hawk (*Buteo jamaicensis*)	Wide variety of habitats from deserts, mountains, and populated valleys. Open areas with scattered, elevated perch sites such as scrub desert, plains and montane grassland, agricultural fields, pastures urban parklands, broken coniferous forests, and deciduous woodland. Nests on cliff ledges or in tall trees. About 3,176,400 acres of potentially suitable habitat occurs in the SEZ region.	4,734 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat)	84,620 acres of potentially suitable habitat (2.7% of available potentially suitable habitat)	12 acres of potentially suitable habitat in area of potential direct effect and 1,152 acres of potentially suitable habitat in area of indirect effect)	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Swainson's hawk (*Buteo swainsoni*)	Grasslands, agricultural areas, shrublands, and riparian forests. Nests in trees in or near open areas. Migrants occur often occur in treeless areas. Large flocks often occur in agricultural areas near locust infestations. About 1,737,900 acres of potentially suitable habitat occurs in the SEZ region.	4,734 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	84,926 acres of potentially suitable habitat (4.9% of available potentially suitable habitat)	16 acres of potentially suitable habitat in area of potential direct effect and 1,459 acres of potentially suitable habitat in area of indirect effect	Small overall impact.. Avoidance of nest trees would further reduce the potential for impact.
Turkey vulture (*Cathartes aura*)	Occurs in areas of pastured rangeland, non-intensive agriculture, or wild areas with rock outcrops suitable for nesting. Migrates and forages over most open habitats. Will roost communally in trees, exposed boulders, and occasionally access road support towers. About 1,080,300 acres of potentially suitable habitat occurs in the SEZ region.	19 acres of potentially suitable habitat lost (<0.01% of available potentially suitable habitat)	43,671 acres of potentially suitable habitat (4.0% of available potentially suitable habitat)	12 acres of potentially suitable habitat in area of potential direct effect and 1,128 acres of potentially suitable habitat in area of indirect effect	Small overall impact.

TABLE 10.4.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Birds of Prey (Cont.)					
Western burrowing owl (*Athene cunicularia*)	Well-drained grasslands, prairies, steppes, deserts, and agricultural lands. Nests in prairie dog colonies. About 1,932,000 acres of potentially suitable habitat occurs in the SEZ region.	4,734 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat)	83,786 acres of potentially suitable habitat (4.3% of available potentially suitable habitat)	4 acres of potentially suitable habitat in area of potential direct effect and 359 acres of potentially suitable habitat in area of indirect effect	Small overall impact.. Avoidance of prairie dog colonies would further reduce the potential for impact.
Upland Game Birds					
Mourning dove (*Zenaida macroura*)	Habitat generalist, occurring in grasslands, shrublands, croplands, lowland and foothill riparian forests, ponderosa pine forests, and urban and suburban areas. Rarely in aspen and other forests, coniferous woodlands, and alpine tundra. Nests on ground or in trees. Winters mostly in lowland riparian forests adjacent to cropland. About 3,071,900 acres of potentially suitable habitat occurs in the SEZ region	4,734 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat)	93,404 acres of potentially suitable habitat (3.0% of available potentially suitable habitat)	21 acres of potentially suitable habitat in area of potential direct effect and 1,957 acres of potentially suitable habitat in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.

[a] Potentially suitable habitat was determined by using SWReGAP habitat suitability and 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.

[b] Maximum area of potentially suitable habitat that could be affected relative to availability within the SEZ region. Habitat availability for each species within the region was determined by using SWReGAP habitat suitability and land cover models. This approach probably overestimates the amount of suitable habitat in the project area.

[c] Direct effects within the SEZ consist of the ground-disturbing activities associated with construction and the maintenance of an altered environment associated with operations. A maximum of 4,734 acres of direct effect within the SEZ was assumed.

Footnotes continued on next page.

TABLE 10.4.11.2-1 (Cont.)

[d] Area of indirect effects was assumed to be the area adjacent to the SEZ within 5 mi (8 km) of the SEZ boundary. Potentially suitable habitat within the SEZ greater than the maximum of 4,734 acres of direct effect was also added to the area of indirect effect. Indirect effects include effects from surface runoff, dust, noise, lighting, and so on from the SEZ, but do not include ground-disturbing activities. The potential degree of indirect effects would decrease with increasing distance away from the SEZ.

[e] For access road development, direct effects were estimated within a 3-mi (4.8-km), 60-ft (18-m) wide access road ROW from the SEZ to the nearest existing highway. As the access road corridor exists within the area of indirect effects for the SEZ, no additional area of indirect effects were determined for the access road.

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

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

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

Sources: CDOW (2009); NatureServe (2009); NDCNR (2002); USGS (2004, 2005, 2007).

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.

10.4.11.2.3 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, especially species that depend on habitat types that could be avoided (e.g., washes). Indirect impacts could be reduced to negligible levels by implementing programmatic design features, especially those engineering controls that would reduce runoff, sedimentation, spills, and fugitive dust. While some SEZ-specific design features important to reducing impacts on birds are best established when project details are considered, some design features can be identified at this time, as follows:

- For solar energy facilities within the SEZ, the requirements contained within the 2010 Memorandum of Understanding between the BLM and USFWS to promote the conservation of migratory birds will be followed.

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

- The access road should be sited and constructed to minimize impacts on wetlands and riparian areas (if present within the finalized access road location).

- Appropriate engineering controls should be used to minimize impacts resulting from surface water runoff, erosion, sedimentation, accidental spills, or fugitive dust deposition.

- If present, prairie dog colonies (which could provide habitat or a food source for some bird species) should be avoided to the extent practicable.

If these SEZ-specific design features are implemented in addition to other 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 potentially suitable habitats in the SEZ region. However, because 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.

10.4.11.3 Mammals

10.4.11.3.1 Affected Environment

This section addresses mammal species that are known to occur, or for which potentially suitable habitat occurs, on or within the potentially affected area of the proposed Los Mogotes East SEZ. The list of mammal species potentially present in theSEZ area was determined from the Colorado Natural Diversity Information Source (CDOW 2009) and habitat information was determined from CDOW (2009), USGS (2007), and NatureServe (2010). Land cover types suitable for each species were determined from SWReGAP (USGS 2004, 2005, 2007). See Appendix M for additional information on the approach used. The following discussion emphasizes big game and other mammal species that (1) have key habitats within or near the SEZ, (2) are important to humans (e.g., big game, small game, and furbearer species), and/or (3) are representative of other species that share similar habitats.

Big Game

The big game species that could occur within the area of the proposed Los Mogotes East SEZ include American black bear (*Ursus americanus*), bighorn sheep (*Ovis canadensis*), cougar (*Puma concolor*), elk (*Cervis canadensis*), mule deer (*Odocoileus hemionus*), and pronghorn (*Antilocapra americana*) (CDOW 2009). Table 10.4.11.3-1 provides a description of the various activity areas that have been mapped for the big game species in Colorado. Table 10.4.11.3-2 provides habitat information for representative big game species that could occur within the proposed Los Mogotes East SEZ.

The following paragraphs present an overview of the big game species (Section 4.10.2.3 presents more detailed information on the big game species).

American Black Bear. The Los Mogotes East SEZ is located within the American black bear's overall range but does not overlap with its mapped summer or fall concentration areas (CDOW 2008). The closest distances of the SEZ to these American black bear activity areas are fall concentration area, 6 mi (10 km), and summer concentration area, 9 mi (15 km). Because the American black bear inhabits montane shrublands and forests and subalpine forests at moderate elevations in Colorado (CDOW 2009), it is not expected to frequent the Los Mogotes East SEZ.

TABLE 10.4.11.3-1 Descriptions of Big Game Activity Areas in Colorado

Activity Area	Activity Area Description
Concentration area	That part of the overall range where densities are at least 200% greater than they are in the surrounding area during a season other than winter.
Fall concentration area	That part of the overall range occupied from August 15 until September 30 for the purpose of ingesting large quantities of mast and berries to establish fat reserves for the winter hibernation period. Applies to the American black bear.
Migration corridor	Specific mappable site through which large numbers of animals migrate and the loss of which would change migration routes.
Overall range	Area that encompasses all known seasonal activity areas for a population.
Production area	That part of the overall range occupied by females from May 15 to June 15 for calving. Applies to ungulates.
Resident population area	Area used year-round by a population (i.e., an individual could be found in any part of the area at any time of the year).
Severe winter range	That part of the winter range where 90% of the individuals are located when the annual snowpack is at its maximum and/or temperatures are at a minimum during the two worst winters out of ten. Applies to ungulates.
Summer concentration area	That portion of the overall range where individuals congregate from mid-June through mid-August.
Summer range	That portion of the overall range where 90% of the individuals are located between spring green-up and the first heavy snowfall.
Winter concentration area	That part of the winter range where densities are at least 200% greater than in surrounding winter range during an average of five winters out of ten.
Winter range	That part of the overall range where 90% of the individuals are located during an average of five winters out of ten from the first heavy snowfall to spring green-up.

Source: CDOW (2008).

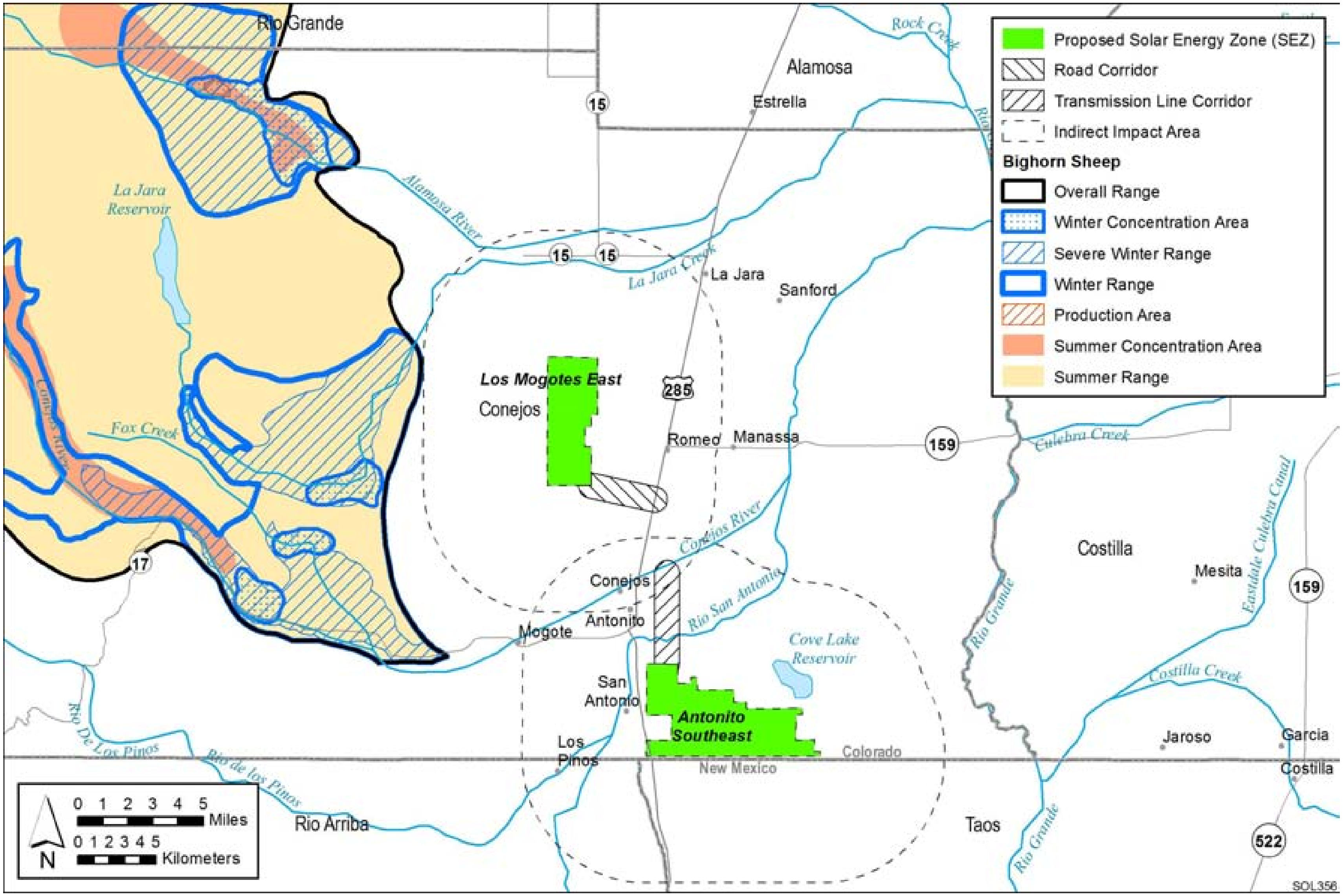

FIGURE 10.4.11.3-1 Bighorn Sheep Activity Areas within the Region That Encompasses the Proposed Los Mogotes East SEZ (Source: CDOW 2008)

Bighorn Sheep. No mapped activity areas for the bighorn sheep occur in the Los Mogotes East SEZ (Figure 10.4.11.3-1). Several bighorn sheep activity areas occur about 5 mi (8 km) from the SEZ: overall range, 5 mi (8 km); winter range, 5.0 mi (8.0 km); severe winter range, 5 mi (8 km); and summer range, 5 mi (8 km). All these activity areas are west of the Los Mogotes East SEZ (Figure 10.4.11.3-1). Since bighorn sheep typically inhabit mountains and foothills in Colorado (CDW 2009), they are not expected to frequent the Los Mogotes East SEZ.

Cougar. The proposed Los Mogotes East SEZ occurs within the overall range of the cougar (CDOW 2008). Within Colorado, cougars mostly occur in rough, broken foothills and canyon country, often in association with montane forests, shrublands, and pinyon-juniper woodlands (CDOW 2009). Thus, they are not expected to frequent the SEZ.

Elk. The proposed Los Mogotes East SEZ occurs within the overall range, winter range, and severe winter range of the elk (Figure 10.4.11.3-2). The SEZ also occurs 3 mi (5 km) east of a winter concentration area and 4 mi (6 km) northwest of a resident population area (Figure 10.4.11.3-2). No other mapped elk activity areas occur within 5 mi (8 km) of the SEZ.

Mule Deer. The proposed Los Mogotes East SEZ occurs within the overall range and winter range of the mule deer. Other mapped mule deer activity areas that occur within 5 mi (8 km) of the SEZ are severe winter range, 3 mi (5 km) southwest of the SEZ, and a resident population area, 3 mi (5 km) southeast of the SEZ (Figure 10.4.11.3-3).

Pronghorn. The proposed Los Mogotes East SEZ occurs within the overall range, winter range, severe winter range, and a winter concentration area of the pronghorn Figure 10.4.11.3-4). No other mapped pronghorn activity areas occur within 5 mi (8 km) of the Los Mogotes East SEZ.

Other Mammals

A number of furbearers and small game species occur within the area of the proposed Los Mogotes East SEZ. Among those species that are fairly common to abundant within Conejos County and that could occur within the area of the Los Mogotes East SEZ are the American badger (*Taxidea taxus*, fairly common), coyote (*Canis latrans*, common), desert cottontail (*Sylvilagus audubonii*, abundant), red fox (*Vulpes vulpes*, common), striped skunk (*Mephitis mephitis*, common), and white-tailed jackrabbit (*Lepus townsendii*, common) (CDOW 2009). Most of these species are hunted or trapped.

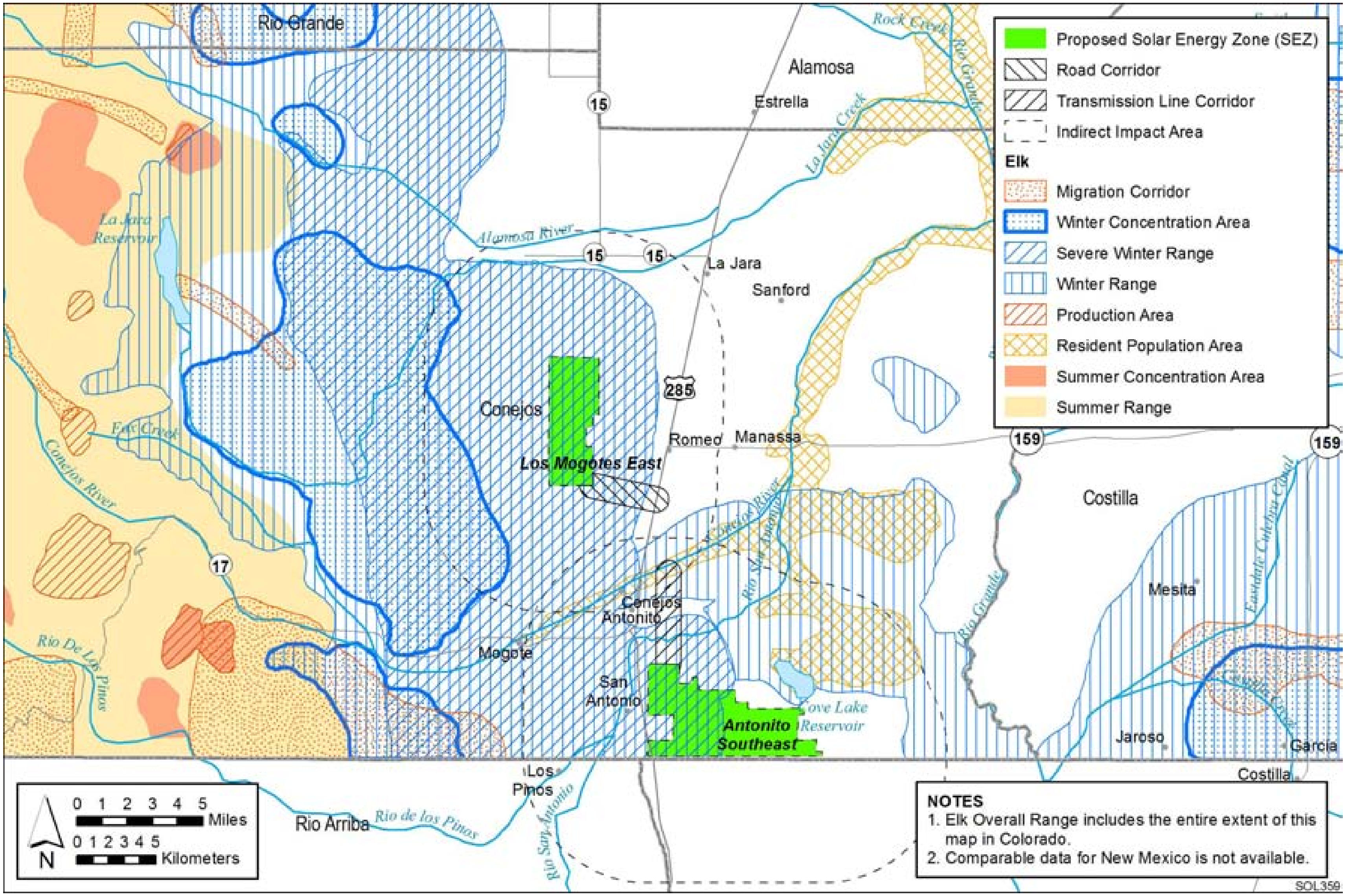

FIGURE 10.4.11.3-2 Elk Activity Areas within the Region That Encompasses the Proposed Los Mogotes East SEZ (Source: CDOW 2008)

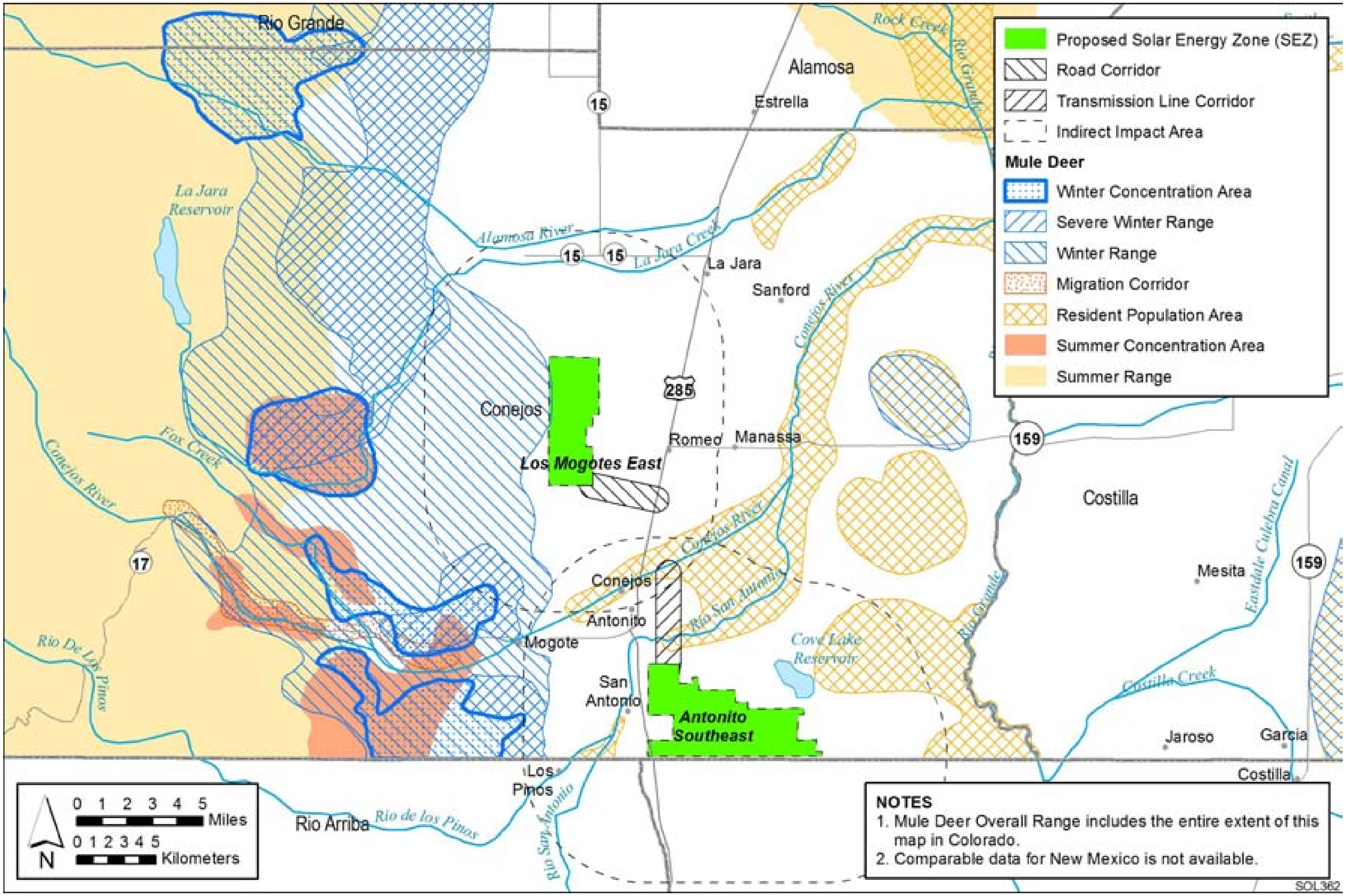

FIGURE 10.4.11.3-3 Mule Deer Activity Areas within the Region That Encompasses the Proposed Los Mogotes East SEZ (Source: CDOW 2008)

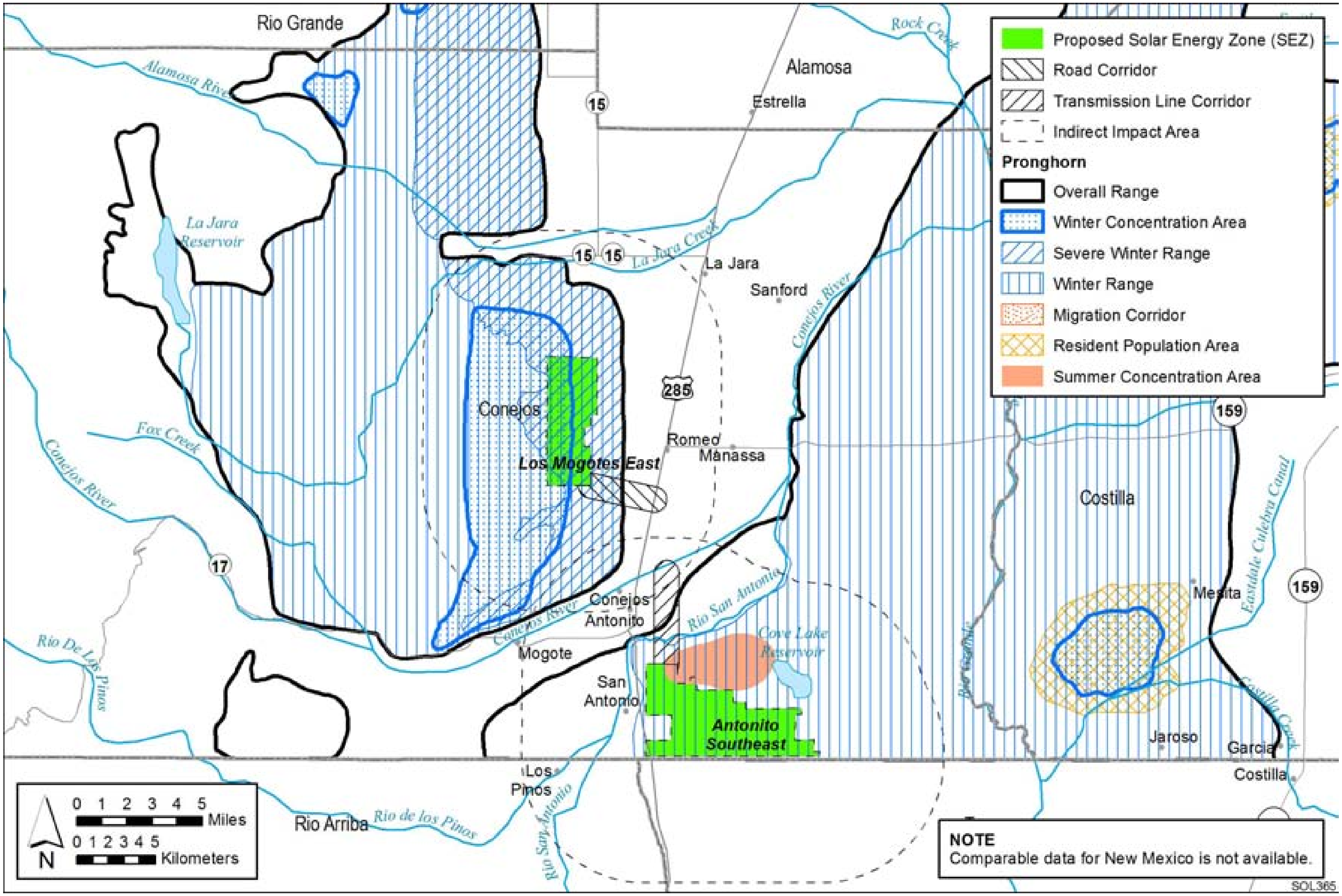

FIGURE 10.4.11.3-4 Pronghorn Activity Areas within the Region That Encompasses the Proposed Los Mogotes East SEZ (Source: CDOW 2008)

The small nongame mammal species generally include bats, rodents, and shrews. Those species that are common or abundant within Conejos County and that could occur within the area of the proposed Los Mogotes East SEZ include the big brown bat (*Eptesicus fuscus*, abundant), deer mouse (*Peromyscus maniculatus*, abundant), least chipmunk (*Tamias minimus*, common), little brown myotis (*Myotis lucifugus*, abundant), northern pocket gopher (*Thomomys talpoides*, common), Ord's kangaroo rat (*Dipodomys ordii*, abundant), thirteen-lined ground squirrel (*Spermophilus tridecemlineatus*, common), and western small-footed myotis (*Myotis ciliolabrum*, common). The Gunnison's prairie dog (*Cynomys gunnisoni*) is fairly common in the county and is also expected to occur within the semidesert habitat found within the SEZ (CDOW 2009). Because of its special status (candidate for listing under the ESA), the species is discussed in Section 10.4.12.

Table 10.4.11.3-2 provides habitat information for these other mammal species that could occur within the proposed Los Mogotes East SEZ.

10.4.11.3.2 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 throughthe application of any additional mitigation measures. Section 10.4.11.3.3 below identifies SEZ-specific mitigation measures of particular relevance to the proposed Los Mogotes East SEZ.

The assessment of impacts on mammal species is based on available information on the presence of species in the affected area as presented in Section 10.4.11.3.1, 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 10.4.11.3.3).

Table 10.4.11.3-2 summarizes the potential impacts on representative mammal species resulting from solar energy development (with the implementation of required programmatic design features) in the proposed Los Mogotes East SEZ.

American Black Bear

Based on potentially suitable land cover, up to 428 acres (1.7 km^2) of potentially suitable American black bear habitat could be lost by solar energy development within the proposed Los Mogotes East SEZ and another 1 acre (0.004 km^2) by access road construction. This represents 0.02% of potentially suitable American black bear habitat within the SEZ region. More than 12,200 acres (49 km^2) of potentially suitable American black bear habitat occurs within the area of indirect effects. Because desert-like shrublands are not the preferred habitat for the American black bear, it is unlikely that impacts on the SEZ would represent an actual loss of occupied

TABLE 10.4.11.3-2 Habitats, Potential Impacts, and Potential Mitigation for Representative Mammal Species That Could Occur on or in the Affected Area of the Proposed Los Mogotes East SEZ

		Maximum Area of Potential Habitat Affected[b]			
Common Name (Scientific Name)	Habitat[a]	Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Big Game					
American black bear (*Ursus americanus*)	Montane shrublands and forests, and subalpine forests at moderate elevations. Fairly common in Conejos County. About 2,641,300 acres[h] of potentially suitable habitat occurs in the SEZ region.	428 acres[g] of potentially suitable habitat lost (0.02% of available habitat)	12,246 acres of habitat (0.5% of available potentially suitable habitat)	1 acre of potentially suitable habitat in area of potential direct effect and 98 acres of potentially suitable habitat in area of indirect effect	Small overall impact.
Bighorn sheep (*Ovis canadensis*)	Prefers high-visibility habitat dominated by grass, low shrubs, and rock cover, areas near open escape terrain, and topographic relief. Due to human influence, typically occurs only on steep, precipitous terrain, although some herds have habituated to areas adjacent to busy highways. Common in Conejos County. About 3,303,400 acres of potentially suitable habitat occurs in the SEZ region.	4,734 acres of potentially suitable habitat lost (0.1% of available habitat)	41,304 acres of habitat (1.3% of available potentially suitable habitat)	4 acres of potentially suitable habitat in area of potential direct effect and 386 acres of potentially suitable habitat in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Cougar (*Puma concolor*)	Most common in rough, broken foothills and canyon country, often in association with montane forests, shrublands, and pinyon-juniper woodlands. Uncommon in Conejos County. About 3,902,800 acres of potentially suitable habitat occurs in the SEZ region.	4,734 acres of potentially suitable habitat lost (0.1% of available habitat)	47,236 acres of habitat (1.2% of available potentially suitable habitat)	4 acres of potentially suitable habitat in area of potential direct effect and 382 acres of potentially suitable habitat in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.

TABLE 10.4.11.3-2 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigationg[g]
Big Game (Cont.)					
Elk (*Cervis canadensis*)	Semi-open forest, mountain meadows, foothills, plains, valleys, and alpine tundra. Uses open spaces such as alpine pastures, marshy meadows, river flats, brushy clean cuts, forest edges, and semidesert areas. Abundant in Conejos County. About 3,008,600 acres of potentially suitable habitat occurs in the SEZ region.	0.0 acres of potentially suitable habitat lost (0.0% of available habitat)	4,499 acres of habitat (0.1% of available potentially suitable habitat)	1 acre of potentially suitable habitat in area of potential direct effect and 76 acres of potentially suitable habitat in area of indirect effect	Small to no overall impact.
Mule deer (*Odocoileus hemionus*)	Most habitats including coniferous forests, desert shrub, chaparral, and grasslands with shrubs. Greatest densities in shrublands on rough, broken terrain that provide abundant browse and cover. Common in Conejos County. About 4,409,500 acres of potentially suitable habitat occurs in the SEZ region.	4,734 acres of potentially suitable habitat lost (0.1% of available habitat)	89,299 acres of habitat (2.0% of available potentially suitable habitat)	16 acres of potentially suitable habitat in area of potential direct effect and 5,878 acres of potentially suitable habitat in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Pronghorn (*Antilocapra americana*)	Grasslands and semidesert shrublands on rolling topography that affords good visibility. Most abundant in shortgrass or midgrass prairies and least common in xeric habitats. Common in Conejos County. About 2,458,600 acres of potentially suitable habitat occurs in the SEZ region.	4,734 acres of potentially suitable habitat lost (0.2% of available habitat)	86,229 acres of habitat (3.5% of available potentially suitable habitat)	16 acres of potentially suitable habitat in area of potential direct effect and 1,487 acres of potentially suitable habitat in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.

TABLE 10.4.11.3-2 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigationg[g]
Small Game and Furbearers					
American badger (*Taxidea taxus*)	Open grasslands and deserts, meadows in subalpine and montane forests, alpine tundra. Most common in areas with abundant populations of ground squirrels, prairie dogs, and pocket gophers. About 3,865,200 acres of potentially suitable habitat occurs in the SEZ region.	4,734 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat)	49,757 acres of potentially suitable habitat (1.3% of available potentially suitable habitat)	4 acres of potentially suitable habitat in area of potential direct effect and 411 acres of potentially suitable habitat in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Coyote (*Canis latrans*)	All habitats at all elevations. 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 4,964,800 acres of potentially suitable habitat occurs in the SEZ region.	4,734 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat)	95,787 acres of potentially suitable habitat (1.9% of available potentially suitable habitat)	22 acres of potentially suitable habitat in area of potential direct effect and 2,007 acres of potentially suitable habitat in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Desert cottontail (*Sylvilagus audubonii*)	Grasslands, especially in prairie dog colonies. Also in other habitats such as montane shrublands, riparian lands, semidesert shrublands, pinyon-juniper woodlands, and various woodland-edge habitats. Can occur in areas with minimal vegetation as long as adequate cover is present. About 3,014,800 acres of potentially suitable habitat occurs in the SEZ region.	4,734 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat)	88,434 acres of potentially suitable habitat (2.9% of available potentially suitable habitat)	16 acres of potentially suitable habitat in area of potential direct effect and 1,478 acres of potentially suitable habitat in area of indirect effect	Small overall impact. Avoidance of prairie dog colonies would further reduce the potential for impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.

TABLE 10.4.11.3-2 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigationg[g]
Small Game and Furbearers (Cont.)					
Red fox (*Vulpes vulpes*)	Most common in open woodlands, pasturelands, riparian, and agricultural lands. It prefers areas with a mixture of these vegetation types occurring in small mosaics with good development of ground cover. Also common in open space and other undeveloped areas adjacent to cities. Also occurs in mountains in montane and subalpine meadows and alpine and forest edges usually near water. About 3,962,200 acres of potentially suitable habitat occurs in the SEZ region.	4,734 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat)	88,929 acres of potentially suitable habitat (2.2% of available potentially suitable habitat)	16 acres of potentially suitable habitat in area of potential direct effect and 1,524 acres of potentially suitable habitat in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Striped skunk (*Mephitis mephitis*)	Occurs in most habitats other than alpine tundra. Common at lower elevations, especially in and near cultivated fields and pastures. Generally inhabits open country in woodlands, brush areas, and grasslands, usually near water. Dens under rocks, logs, or buildings. About 4,248,700 acres of potentially suitable habitat occurs in the SEZ region.	4,734 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat)	90,058 acres of potentially suitable habitat (2.1% of available potentially suitable habitat)	16 acres of potentially suitable habitat in area of potential direct effect and 1,513 acres of potentially suitable habitat in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.

TABLE 10.4.11.3-2 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b] Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigationg[g]
Small Game and Furbearers (Cont.)					
White-tailed jackrabbit (*Lepus townsendii*)	Occurs mostly in prairies, open parkland, and alpine tundra. Also occurs in semidesert shrublands and may migrate to such areas from other habitats in winter. About 2,533,700 acres of potentially suitable habitat occurs in the SEZ region.	4,734 acres of potentially suitable habitat lost (0.2 % of available potentially suitable habitat)	46,715 acres of potentially suitable habitat (1.8% of available potentially suitable habitat)	4 acres of potentially suitable habitat in area of potential direct effect and 406 acres of potentially suitable habitat in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Nongame (Small) Mammals					
Deer mouse (*Peromyscus maniculatus*)	Most habitats (except well-developed wetlands) that contain cover including burrows of other animals, rock cracks and crevices, surface debris and litter, and man-made structures. About 4,444,600 acres of potentially suitable habitat occurs in the SEZ region.	4,734 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat)	90,732 acres of potentially suitable habitat (2.0% of available potentially suitable habitat)	17 acres of potentially suitable habitat in area of potential direct effect and 1,526 acres of potentially suitable habitat in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Least chipmunk (*Tamias minimus*)	Low-elevation semidesert shrublands, montane shrublands and woodlands, forest edges, and alpine tundra. About 3,804,800 acres of potentially suitable habitat occurs in the SEZ region.	4,734 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat)	47,562 acres of potentially suitable habitat (1.3% of available potentially suitable habitat)	4 acres of potentially suitable habitat in area of potential direct effect and 362 acres of potentially suitable habitat in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.

TABLE 10.4.11.3-2 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]			Overall Impact Magnitude[f] and Species-Specific Mitigationg[g]
		Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	
Nongame (Small) Mammals (Cont.)					
Northern pocket gopher (*Thomomys talpoides*)	Various habitats such as agricultural and pasture lands, semidesert shrublands, and grasslands. Most common in meadows and grasslands. About 3,917,200 acres of potentially suitable habitat occurs in the SEZ region.	4,734 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat)	88,250 acres of potentially suitable habitat (2.3% of available potentially suitable habitat)	16 acres of potentially suitable habitat in area of potential direct effect and 1,510 acres of potentially suitable habitat in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Ord's kangaroo rat (*Dipodomys ordii*)	Various habitats ranging from semidesert shrublands and pinyon-juniper woodlands to shortgrass or mixed prairie and silvery wormwood. Also occurs in dry, grazed, riparian areas where vegetation is sparse. Most common on sandy soils that allow for easy digging and construction of burrow systems. About 1,844,500 acres of potentially suitable habitat occurs in the SEZ region.	4,734 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	39,163 acres of potentially suitable habitat (2.1% of available potentially suitable habitat)	4 acres of potentially suitable habitat in area of potential direct effect and 338 acres of potentially suitable habitat in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Thirteen-lined ground squirrel (*Spermophilus tridecemlineatus*)	Short and mid-length grasslands. Also occur in other habitats that are heavily grazed, mowed, or otherwise modified, including prairie dog colonies. About 2,161,500 acres of potentially suitable habitat occurs in the SEZ region.	4,734 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat)	77,767 acres of potentially suitable habitat (3.6% of available potentially suitable habitat)	16 acres of potentially suitable habitat in area of potential direct effect and 1,462 acres of potentially suitable habitat in area of indirect effect	Small overall impact.. Avoidance of prairie dog colonies would further reduce the potential for impacts.

TABLE 10.4.11.3-2 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Outside SEZ (Indirect Effects)[d]	Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Nongame (Small) Mammals (Cont.)					
Western small-footed myotis (*Myotis ciliolabrum*)	Broken terrain of canyons and foothills, commonly in areas with tree or shrub cover. Summer roosts include rock crevices, caves, dwellings, burrows, among rocks, under bark, and beneath rocks scattered on the ground. About 4,233,500 acres of potentially suitable habitat occurs in the SEZ region.	4,734 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat)	89,478 acres of potentially suitable habitat (2.1% of available potentially suitable habitat)	16 acres of potentially suitable habitat in area of potential direct effect and 1,515 acres of potentially suitable habitat in area of indirect effect	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.

a Potentially suitable habitat was determined by using SWReGAP habitat suitability and 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.

b Maximum area of potentially suitable habitat that could be affected relative to availability within the SEZ region. Habitat availability for each species within the region was determined by using SWReGAP habitat suitability and land cover models. This approach probably overestimates the amount of suitable habitat in the project area.

c Direct effects within the SEZ consist of the ground-disturbing activities associated with construction and the maintenance of an altered environment associated with operations. A maximum of 4,734 acres of direct effect within the SEZ was assumed.

d Area of indirect effects was assumed to be the area adjacent to the SEZ within 5 mi (8 km) of the SEZ boundary. Potentially suitable habitat within the SEZ greater than the maximum of 4,734 acres of direct effect was also added to the area of indirect effect. Indirect effects include effects from surface runoff, dust, noise, lighting, and so on from the SEZ, but do not include ground-disturbing activities. The potential degree of indirect effects would decrease with increasing distance away from the SEZ.

e For access road development, direct effects were estimated within a 3-mi (4.8-km), 60-ft (18-m) wide access road ROW from the SEZ to the nearest existing highway. As the access road corridor exists within the area of indirect effects for the SEZ, no additional area of indirect effects were determined for the access road.

Footnotes continued on next page.

TABLE 10.4.11.3-2 (Cont.)

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

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

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

Sources: CDOW (2009); NatureServe (2009); NDCNR (2002); USGS (2004, 2005, 2007).

habitat. Overall, impacts on the American black bear from solar energy development in the proposed Los Mogotes East SEZ would be small.

Bighorn Sheep

Based on potentially suitable land cover, up to 4,734 acres (19.2 km^2) of potentially suitable bighorn sheep habitat could be lost by solar energy development within the proposed Los Mogotes East SEZ and another 4 acres (0.02 km^2) by access road construction. This represents about 0.1% of potentially suitable bighorn sheep habitat within the SEZ region. More than 41,300 acres (167 km^2) of potentially suitable bighorn sheep habitat occurs within the area of indirect effects. Overall, impacts on bighorn sheep from solar energy development in the SEZ would be small.

Cougar

Based on potentially suitable land cover, up to 4,734 acres (19.2 km^2) of potentially suitable cougar habitat could be lost by solar energy development within the proposed Los Mogotes East SEZ and another 4 acres (0.02 km^2) by access road construction. This represents about 0.1% of potentially suitable cougar habitat within the SEZ region. More than 47,200 acres (191 km^2) of potentially suitable cougar habitat occurs within the area of indirect effects. Overall, impacts on cougar from solar energy development in the SEZ would be small.

Elk

Based on potentially suitable land cover, no elk habitat would be lost by solar energy development within the proposed Los Mogotes East SEZ and only 1 acre (0.004 km^2) by access road construction. About 4,500 acres (18.2 km^2) of potentially suitable elk habitat occurs within the area of indirect effects. Based on mapped activity areas, 4,734 acres (19.2 km^2) of elk overall range, winter range, and severe winter range could be directly affected by SEZ development (Table 10.4.11.3-3). Direct loss of overall range would account for about 0.1% of the overall range occurring within Colorado portion of the SEZ region; direct loss of winter range would account for 0.3% of the winter range within the Colorado portion of the SEZ region; and direct loss of severe winter range would account for 0.9% of the severe winter range within the Colorado portion of the SEZ region.. No direct impacts on other mapped activity areas for the elk would occur (Table 10.4.11.3-4). Overall, impacts on elk from solar energy development in the SEZ would be small.

Mule Deer

Based on potentially suitable land cover, up to 4,734 acres (191 km^2) of potentially suitable mule deer habitat could be lost by solar energy development within the proposed Los Mogotes East SEZ and another 16 acres (0.06 km^2) by access road construction. This represents

TABLE 10.4.11.3-3 Potential Magnitude of Impacts on Elk Activity Areas Resulting from Solar Energy Development within the Proposed Los Mogotes East SEZ

	Amount of Activity Area Affected				
Activity Area[a]	Within SEZ (Direct Effects)[b]	Outside SEZ (Indirect Effects)[b]	Assumed Access Road Corridor[d]	Amount of Activity Area within SEZ Region[e]	Overall Impact Magnitude[f]
Overall range	4,734 acres[g] (0.1% of overall range)	94,815 acres (2.8% of overall range)	22 acres of overall range in area of potential direct effect and 2,034 acres in area of indirect effect	3,357,402 acres	Small
Summer range	0 acres	0 acres	0 acres	1,531,363 acres	None
Summer concentration area	0 acres	0 acres	0 acres	316,326 acres	None
Winter range	4,734 acres (0.3% of winter range)	70,936 acres (5.2% of winter range)	16 acres of winter range in area of potential direct effect and 1,487 acres in area of indirect effect	1,362,815 acres	Small
Winter concentration area	0 acres	10,642 acres (2.3% of winter concentration area)	0 acres	458,293 acres	None
Severe winter range	4,734 acres (0.9% of severe winter range)	67,310 acres (12.5% of severe winter range)	16 acres of severe winter range in area of potential direct effect and 1,487 acres in area of indirect effect	537,780 acres	Small
Production area	0 acres	0 acres	0 acres	269,007 acres	None
Migration corridor	0 acres	0 acres	0 acres	166,476 acres	None

TABLE 10.4.11.3-3 (Cont.)

Activity Area[a]	Amount of Activity Area Affected: Within SEZ (Direct Effects)[b]	Outside SEZ (Indirect Effects)[c]	Assumed Access Road Corridor[d]	Amount of Activity Area within SEZ Region[e]	Overall Impact Magnitude[f]
Resident population area	0 acres	2,010 acres (1.7% of resident population area)	0 acres	118,256 acres	None

[a] Activity areas are described in Table 10.4.11.3-1.

[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 4,734 acres (19.2 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. Indirect effects include effects from surface runoff, dust, noise, lighting, etc., from the SEZ, but do not include ground-disturbing activities. The potential degree of indirect effects would decrease with increasing distance away from the SEZ boundary or access road line ROW.

[d] For the access road, direct effects were estimated within a 3-mi (5-km) long, 60-ft (18-m) wide corridor for an assumed new access road connecting to the nearest existing U.S. highway. Indirect effects were estimated within a 1-mi (1.6-km) wide corridor to the existing highway, less the assumed area of direct effects.

[e] The SEZ region is the area within a 50-mi (80-km) radius of the center of the SEZ. Activity area data available only for the Colorado portion of the SEZ region.

[f] Overall impact magnitude categories were based on professional judgment and include (1) *small*: ≤1% of activity area for the species would be potentially lost; (2) *moderate*: >1 but ≤10% of activity area for the species would be lost; and (3) *large*: >10% of activity area for the species would be lost. Note that much greater weight was given to the magnitude of direct effects because those effects would be difficult to mitigate. Programmatic design features would reduce most indirect effects to negligible levels.

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

Source: CDOW (2008)

about 0.1% of potentially suitable mule deer habitat within the SEZ region. More than 86,000 acres (348 km^2) of potentially suitable mule deer habitat occurs within the area of indirect effects. Based on mapped activity areas, 4,734 acres (191 km^2) of mule deer overall range and 135 acres (0.5 km^2) of mule deer winter range could be directly affected by solar energy development in the SEZ (Table 10.4.11.3-4). Direct loss of overall range would account for about 0.1% of the overall range occurring within Colorado portion of the SEZ region; and direct loss of winter range would account for about 0.01% of the winter range occurring within Colorado portion of the SEZ region. No direct impacts on other mapped activity areas for the mule deer would occur (Table 10.4.11.3-4). Overall, impacts on mule deer from solar energy development in the SEZ would be small.

TABLE 10.4.11.3-4 Potential Magnitude of Impacts on Mule Deer Activity Areas Resulting from Solar Energy Development within the Proposed Los Mogotes East SEZ

	Amount of Activity Area Affected				
Activity Area[a]	Within SEZ (Direct Effects)[b]	Outside SEZ (Indirect Effects)[c]	Assumed Access Road Corridor[d]	Amount of Activity Area within SEZ Region[e]	Overall Impact Magnitude[f]
Overall range	4,734 acres[g] (0.1% of overall range)	94,815 acres (2.8% of overall range)	22 acres of overall range in area of potential direct effect and 2,034 acres in area of indirect effect	3,357,402 acres	Small
Summer range	0 acres	0 acres	0 acres	1,657,325 acres	None
Summer concentration area	0 acres	0 acres	0 acres	122,458 acres	None
Winter range	135 acres (0.01% of winter range)	32,061 acres (3.5% of winter range)	0 acres	905,746 acres	Small
Winter concentration area	0 acres	161 acres (0.02% of winter concentration area)	0 acres	99,234 acres	None
Severe winter range	0 acres	3,402 acres (0.08% of severe winter range)	0 acres	415,526 acres	None
Migration corridor	0 acres	0 acres	0 acres	26,104 acres	None
Resident population area	0 acres	4,116 acres (2.3% of resident population area)	0 acres	182,733 acres	None

[a] Activity areas are described in Table 10.4.11.3-1.

[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 4,734 acres (19.2 km^2) would be developed in the SEZ.

Footnotes continued on next page.

TABLE 10.4.11.3-4 (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. Indirect effects include effects from surface runoff, dust, noise, lighting, etc., from the SEZ, but do not include ground-disturbing activities. The potential degree of indirect effects would decrease with increasing distance away from the SEZ boundary or access road ROW.

[d] For the access road, direct effects were estimated within a 3-mi (5-km) long, 60-ft (18-m) wide corridor for an assumed new access road connecting to the nearest existing U.S. highway. Indirect effects were estimated within a 1-mi (1.6-km) wide corridor to the existing highway, less the assumed area of direct effects.

[e] The SEZ region is the area within a 50-mi (80-km) radius of the center of the SEZ. Activity area data available only for the Colorado portion of the SEZ region.

[f] Overall impact magnitude categories were based on professional judgment and include (1) *small*: ≤1% of activity area for the species would be potentially lost; (2) *moderate*: >1 but ≤10% of activity area for the species would be lost; and (3) *large*: >10% of activity area for the species would be lost. Note that much greater weight was given to the magnitude of direct effects because those effects would be difficult to mitigate. Programmatic design features would reduce most indirect effects to negligible levels.

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

Source: CDOW (2008).

Pronghorn

Based on potentially suitable land cover, up to 4,734 acres (191 km^2) of potentially suitable pronghorn habitat could be lost by solar energy development within the proposed Los Mogotes East SEZ and another 16 acres (0.0.6 km^2) by access road construction. This represents about 0.2% of potentially suitable pronghorn habitat within the SEZ region. Over 86,000 acres (348 km^2) of potentially suitable pronghorn habitat occurs within the area of indirect effects. Based on mapped pronghorn activity areas, solar development in the proposed Los Mogotes East SEZ would directly affect 4,734 acres (191 km^2) of pronghorn overall range, winter range, and severe winter range (about 0.4, 0.5, and 3.7%, respectively, of each range occurring within the Colorado portion of the SEZ region); and 3,145 acres (12.7 km^2) of winter concentration area (about 2.8% of the winter concentration area occurring within the Colorado portion of the SEZ region) (Table 10.4.11.3-5). No direct impacts on other pronghorn activity areas would occur. Overall, impacts on pronghorn from solar energy development in the SEZ would be small to moderate.

Other Mammals

Direct impacts on small game, furbearers, and nongame (small) mammal species would be small, because only 0.3% or less of potentially suitable habitats identified for each species would be lost by solar energy development in the proposed Los Mogotes East SEZ (Table 10.4.11.3-2). Larger areas of potentially suitable habitat for these species occur within the area of potential indirect effects (e.g., up to 3.6% of available potentially available habitat for the thirteen-lined ground squirrel).

TABLE 10.4.11.3-5 Potential Magnitude of Impacts on Pronghorn Activity Areas Resulting from Solar Energy Development within the Proposed Los Mogotes East SEZ

	Amount of Activity Area Affected				
Activity Area[a]	Within SEZ (Direct Effects)[b]	Outside SEZ (Indirect Effects)[c]	Assumed Access Road Corridor[d]	Amount of Activity Area within SEZ Region[e]	Overall Impact Magnitude[f]
Overall range	4,734 acres[g] (0.4% of overall range)	57,475 acres (5.1% of overall range)	10 acres of overall range in area of potential direct effect and 959 acres in area of indirect effect	1,131,671 acres	Small
Summer concentration area	0 acres	0 acres	0 acres	50,468 acres	None
Winter range	4,734 acres (0.5% of winter range)	57,475 acres (5.9% of winter range)	10 acres of winter range in area of potential direct effect and 959 acres of habitat in area of indirect effect	975,990 acres	Small
Winter concentration area	3,145 acres (2.8% of winter concentration area)	24,669 acres (21.6% of winter concentration area)	0 acres	114,140 acres	Moderate
Severe winter range	4,734 acres (3.7% severe winter range)	27,649 acres (21.4% of severe winter range)	10 acres of severe winter range in area of potential direct effect and 959 acres in area of indirect effect	129,343 acres	Moderate
Resident population area	0 acres	0 acres	0 acres	50,485 acres	None

a Activity areas are described in Table 10.4.11.3-1.

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 4,734 acres (19.2 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. Indirect effects include effects from surface runoff, dust, noise, lighting, etc., from the SEZ, but do not include ground-disturbing activities. The potential degree of indirect effects would decrease with increasing distance away from the SEZ boundary or access road ROW.

Footnotes continued on next page.

[d] For the access road, direct effects were estimated within a 3-mi (5-km) long, 60-ft (18-m) wide corridor for an assumed new access road connecting to the nearest existing U.S. highway. Indirect effects were estimated within a 1-mi (1.6-km) wide corridor to the existing highway, less the assumed area of direct effects.

[e] The SEZ region is the area within a 50-mi (80-km) radius of the center of the SEZ. Activity area data available only for the Colorado portion of the SEZ region.

[f] Overall impact magnitude categories were based on professional judgment and include (1) *small*: ≤1% of activity area for the species would be potentially lost; (2) *moderate*: >1 but ≤10% of activity area for the species would be lost; and (3) *large*: >10% of activity area for the species would be lost. Note that much greater weight was given to the magnitude of direct effects because those effects would be difficult to mitigate. Programmatic design features would reduce most indirect effects to negligible levels.

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

Source: CDOW (2008).

Summary

Based on land cover analyses, direct impacts on mammal species would be small for all species, as only 0.3% or less of potentially suitable habitat for the representative mammal species would be lost (Table 10.4.11.3-2). Larger areas of potentially suitable habitat for mammal species occur within the area of potential indirect effects (e.g., up to 3.6% for the thirteen-lined ground squirrel). Based on mapped activity areas, direct impacts on big game species would be mostly small to none, although moderate impacts on pronghorn winter concentration area and severe winter range could occur. 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 required 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 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.

10.4.11.3.3 SEZ-Specific Design Features and Design Feature Effectiveness

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

- Prairie dog colonies should be avoided to the extent practicable to reduce impacts on species such as desert cottontail and thirteen-lined ground squirrel.

- Construction should be curtailed during winter when big game species are present.

- Where big game winter ranges intersect or are close to the SEZ, motorized vehicles and other human disturbances should be controlled (e.g., through temporary road closures when big game are present)..

- Development in the 135-acre (0.55-km^2) portion of the SEZ that overlaps the mule deer winter range should be avoided.

- Loss of pronghorn winter concentration area should be minimized.

If these SEZ-specific design features are implemented in addition to programmatic design features, impacts on mammals could be reduced. Any residual impacts are anticipated to be small given the relative abundance of suitable habitats in the SEZ region.

10.4.11.4 Aquatic Biota

10.4.11.4.1 Affected Environment

This section addresses aquatic habitats and biota that are known to occur on the Los Mogotes 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. It was assumed that an access road 3-mi (5-km) long would be constructed to connect to U.S. 285 east of the SEZ to support construction and operation of solar facilities. The area of direct effects was considered to be the entire SEZ area and the area of the new road corridor. A 1-mi (1.6-km) wide corridor was identified for the new access road to account for uncertainty in the actual path of the road. 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. The area of potential indirect impacts for the access road was considered to be included within the 1-mi (1.6-km) wide corridor identified above.

There are no permanent water bodies or perennial streams within the assumed area of potential direct effects associated with the Los Mogotes East SEZ, although rain events may give rise to ephemeral pools on occasion. In addition, the NWI does not identify any wetlands within the SEZ. A number of washes pass through the SEZ; they are usually dry but convey water during precipitation events. These washes do not extend directly to nearby perennial streams, and no significant aquatic habitats are present in them.

Approximately 19 mi (31 km) of perennial stream habitat associated with three streams (the Alamosa River, the Conejos River, and La Jara Creek) falls within the assumed area of indirect effects (Figure 10.4.11.3-1). Of these three streams, La Jara Creek is the closest to the boundaries of the SEZ, approximately 4 mi (6 km) to the north. Water in La Jara Creek is largely regulated by La Jara Reservoir, which is about 14 mi (23 km) northwest of the SEZ. La Jara Creek, immediately downstream of the reservoir, supports a coolwater trout fishery containing brown trout. Approximately 9 mi (14 km) of the lower portion of La Jara Creek passes through the indirect effects area for the Los Mogotes East SEZ.

A 5-mi (8-km) section of the Conejos River passes through the area of indirect effects associated with the Los Mogotes East SEZ. At its nearest point, the Conejos River is more than 4 mi (6 km) from the southeastern SEZ boundary. Upstream of the area of indirect effects, beginning near the confluence with Fox Creek, the Conejos River supports a coolwater trout fishery. The coolwater portions of the river are at least 10 mi (16 km) southwest of and upgradient from the SEZ boundary.

A 4-mi (6-km) segment of the lower Alamosa River between County Road 10 and U.S. 285 passes through the northern extent of the area of indirect effects assumed for the Los Mogotes East SEZ (Figure 10.4.11.3-1). This segment of the river is usually dry during late fall, winter, and early spring when water for irrigation is being captured and held within Terrace Reservoir (CWCB 2005). Consequently, the development of aquatic communities is limited, and fish populations cannot be maintained in this segment of the Alamosa River. Further upstream, where water is present year-round, water quality and the presence of aquatic biota have been severely affected by contamination associated with past mining activities (CWCB 2005).

A number of small wetlands occur outside the SEZ but within the assumed area of indirect effects (Sections 10.4.9.1.1 and 10.4.10.1). Based upon the classification of these wetlands, surface water is usually absent but may be present for variable periods during the year. There is a more extensive network of palustrine wetlands beginning about 3 mi (5 km) south and southeast (Section 10.4.9.1.1). These wetlands are primarily associated with the Conejos River.

Outside of the area of indirect effects but within 50 mi (80.5 km) of the SEZ, there are approximately 1,063 mi (1,711 km) of perennial streams, 281 mi (452 km) of intermittent streams, and 191 mi (307 km) of canals.

There are approximately 10,900 acres (44 km^2) of lake and reservoir habitat within 50 mi of the SEZ, although there are no lakes or reservoirs within the areas considered for analysis of direct or indirect effects. The nearest such habitat is the 1,650-acre (6.7-km^2) La Jara Reservoir, approximately 14 mi (23 km) to the northwest of the SEZ.

10.4.11.4.2 Impacts

Because surface water habitats are a unique feature in the arid landscape of this area, the maintenance and protection of such habitats may be particularly important. Invertebrates supported by such habitats serve as food sources for various species of vertebrates. In addition, surface water features can serve as drinking water sources, migratory stopovers, and feeding stations for shorebirds.

The types of impacts on aquatic habitats and biota that could occur from development of utility-scale solar energy facilities are identified in Section 5.10.2.4. Aquatic habitats, including wetland areas, present on or near the Los Mogotes East SEZ could be affected by solar energy development in a number of ways, including (1) direct disturbance, (2) deposition of sediments, (3) changes in water quantity, and (4) degradation of water quality.

Although direct disturbance of aquatic habitats has the greatest potential to negatively affect populations of aquatic biota, indirect effects (e.g., caused by surface runoff or dust from the SEZ) have the potential to degrade affected aquatic communities and may reduce biodiversity by promoting the decline or elimination of species sensitive to disturbance or by providing competitive advantages to nonnative species. High impact levels could result in the elimination of specific types of organisms from affected areas. The proper implementation of programmatic design features, however, would reduce indirect effects to a minor/small level of impact.

Because there are no permanent water bodies, perennial streams, or wetlands associated with the Los Mogotes East SEZ, there would be no direct impacts on aquatic habitats from construction of utility-scale solar energy facilities within the SEZ.

Disturbance of land areas at the SEZ in order to construct solar energy facilities could increase the amount of sediment in nearby wetland areas because of deposition of water- and airborne soils from disturbed areas. Because there is a relatively small amount of wetland habitat less than 3 mi (5 km) away, it is likely that only a small portion of the airborne dust associated with SEZ activities would settle in wetlands. Introduction of waterborne sediments to nearby drainages could be controlled through commonly used mitigation measures, such as settling basins and silt fences, or by directing water draining from the developed areas away from these surface water features. Maintaining undisturbed areas around the perimeter of the SEZ would further reduce the potential for waterborne sediments to become deposited in areas outside the SEZ.

In arid environments, reductions in the quantity of water in aquatic habitats are of particular concern. Reductions in runoff could occur as a result of solar energy facility development if the topography within the catchment basins is altered. Water quantity could also be affected if significant amounts of surface water or groundwater are utilized for power plant cooling water, for mirror washing, or for other needs. The greatest need for water would occur if technologies employing wet cooling, such as parabolic trough or power tower, are developed at the site; the associated impacts would ultimately depend on the water source used (including groundwater from various depth aquifers). There are no water bodies in the immediate vicinity of the SEZ that would be capable of meeting significant water needs. Withdrawing water from the La Jara Reservoir, La Jara Creek, the Conejos River, or 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.

As described in Section 5.10.2.4, 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. However, because the nearest perennial streams, ponds, or reservoirs are more than 4 mi (6 km) from the Los Mogotes East SEZ, the potential for solar energy development activities within the SEZ to introduce contaminants into those water bodies would be negligible.

In summary, there are no aquatic habitats within the Los Mogotes East SEZ or in the presumed access road corridor that would be directly affected by development or operation of solar energy facilities. Within the area of potential indirect effects, there is a small amount of aquatic habitat associated with perennial streams and wetlands. Because these habitat features are in different drainages from the SEZ in most cases and because the amount of such habitat within the area of indirect effects is much less than 1% of the amount of similar habitat features within 50 mi (80 km) of the SEZ, the potential for impacts would be small.

10.4.11.4.3 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 on aquatic biota and aquatic habitats from development and operation of solar energy facilities. While some SEZ-specific design features are best established whenproject details are considered, a design feature that can be identified at this time is as follows:

- Undisturbed buffer areas and sediment and erosion controls should be maintained around drainages associated with wetland areas located in the immediate vicinity of the SEZ.

If this SEZ-specific design feature is implemented in addition to programmatic design features 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 potential impacts on aquatic biota and habitats from solar energy development at the Los Mogotes East SEZ would be negligible.

10.4.12 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 Los Mogotes East SEZ. Special status species include the following types of species[4]:

- Species listed as threatened or endangered under the ESA;

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

- Species that are listed by the State of Colorado[5];

- Species that are listed by the BLM as sensitive; and

- Species that have been ranked by the state of Colorado as S1 or S2, or species of concern by the states of Colorado or the USFWS; hereafter referred to as "rare" species.

Special status species known to occur within 50 mi (80 km) of the Los Mogotes East SEZ center (i.e., the SEZ region) were determined from natural heritage records available through NatureServe Explorer (NatureServe 2010), information provided by the Colorado Natural Heritage Program (CNHP 2009), Colorado Division of Wildlife (CDOW 2009), the Southwest Regional Gap Analysis Project (SWReGAP) (USGS 2004, 2005, 2007), and the USFWS Environmental Conservation Online System (ECOS) (USFWS 2010). Information reviewed consisted of county-level and USGS 7.5-minute quad-level occurrences provided by the CDOW, CNHP, NMDGF, and NatureServe, as well as modeled land cover types and predicted suitable habitats for the species within the 50-mi (80-km) region as determined from SWReGAP. The 50 mi (80 km) SEZ region intersects Alamosa, Archuleta, Conejos, Costilla, Huerfano, Mineral, Rio Grande, and Saguache Counties in Colorado, as well as Rio Arriba and Taos Counties in New Mexico. However, the SEZ and affected area occur only in Conejos County, Colorado. See Appendix M for additional information on the approach used to identify species that could be affected by development within the SEZ.

10.4.12.1 Affected Environment

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). For the Los Mogotes East SEZ, the area of direct effect included the SEZ and the areas within the access

[4] 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.

[5] State-listed species for Colorado are those species protected under *Colorado Revised Statutes* 33-2-101.

road corridor where ground-disturbing activities are assumed to occur. No new transmission lines are expected to be needed to serve development on the SEZ due to the proximity of existing transmission infrastructure (refer to Section 10.4.1.2 for development assumptions). The area of indirect effects was defined as the area within 5 mi (8 km) of the SEZ boundary and the portion of the access road corridor where ground-disturbing activities would not occur but that could be indirectly affected by activities in the area of direct effect. Indirect effects considered in the assessment included effects from surface runoff, dust, noise, lighting, and accidental spills from the SEZ and access road, but do not include ground-disturbing activities. The potential magnitude of indirect effects would decrease with increasing distance away from the SEZ. This area of indirect effect was identified on the basis of professional judgment and was considered sufficiently large to bound the area that would potentially be subject to indirect effects. The affected area includes both the direct and indirect effects areas.

The primary habitat types within the affected area are agriculture and semiarid shrub steppe (see Section 10.4.10). Potentially unique habitats in the affected area in which special status species may reside include rocky cliffs and outcrops, sand dunes, and woodlands. As discussed in Section 10.4.11.4, there are no permanent water bodies or perennial streams within the Los Mogotes East SEZ; however, portions of the Alamosa River, Conejos River, and La Jara Creek intersect the area of indirect effects within 5 mi (8 km) of the SEZ. In addition, small palustrine emergent wetlands may occur within the access road corridor and within the area of indirect effects (Figure 10.4.12.1-1).

All special status species known to occur within the proposed Los Mogotes East SEZ region (i.e., within 50 mi [80 km] of the center of the SEZ) and their status, nearest location, and habitats are listed in Appendix J. Of these species, there are 51 that could occur 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 10.4.12.1-1. 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 SWReGAP 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 over 20 mi (32 km) away from the SEZ.

Quad-level occurrences for the following seven special status species intersect the affected area of the Los Mogotes East SEZ: rock-loving aletes, Rio Grande chub, bald eagle, ferruginous hawk, mountain plover, Gunnison's prairie dog, and Townsend's big-eared bat. According to the CNHP, no other species have been recorded in the affected area. There are no groundwater-dependent species in the vicinity of the SEZ based upon CNHP records, comments provided by the USFWS (Stout 2009), and the evaluation of groundwater resources in the Los Mogotes East SEZ region (Section 10.4.9).

TABLE 10.4.12.1-1 Habitats, Potential Impacts, and Potential Mitigation for Special Status Species That Could Be Affected by Solar Energy Development on the Proposed Los Mogotes East SEZ

				Maximum Area of Potential Habitat Affected[c]			
Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Within SEZ (Direct Effects)[d]	Road Corridor (Direct Effects)[e]	Outside SEZ (Indirect Effects)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Plants							
Aztec milkvetch	*Astragalus proximus*	CO-S2	Rocky Mountain ponderosa pine woodland, Colorado Plateau pinyon-juniper woodland, Intermountain-basins, semidesert shrub-steppe, and Rocky Mountain Gambel oak-mixed montane shrublands at elevations between 5,400 and 7,300 ft[i]. Nearest known occurrences are 11 mi[j] from the SEZ. About 1,537,154 acres[k] of potentially suitable shrubland habitat occur within the SEZ region.	5,439 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	4 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	35,916 acres of potentially suitable habitat (2.3% of available potentially suitable habitat)	Small overall impact. Pre-disturbance surveys and avoiding or minimizing disturbance of occupied habitats in the areas of direct effects; 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.s
Blue-eyed grass	*Sisyrinchium demissum*	CO-S2	Moist areas, springs, streambanks, meadows, and forest seeps at elevations between 1,600 and 9,500 ft. Nearest occurrences are approximately 22 mi from the SEZ. About 91,667 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	0 acres	868 acres of potentially suitable habitat (0.9% of available potentially suitable habitat)	Small overall impact; no direct impact. No species-specific mitigation is warranted.

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TABLE 10.4.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Road Corridor (Direct Effects)[e]	Outside SEZ (Indirect Effects)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Plants (Cont.)							
Bodin milkvetch	*Astragalus bodinii*	CO-S2	Open forest clearings in association with aspen, pinyon-juniper, and ponderosa pine woodlands. Nearest known occurrences are 13 mi from the SEZ. Occurrences within the region are known from elevations between 7,500 and 7,875 ft. About 1,100,773 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	<1 acre of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	1,390 acres of potentially suitable habitat (0.1% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance of woodlands in the sroad corridor could reduce impacts. See Aztec milkvetch for a list of potential mitigations applicable to all special status plant species.
Brandegee's milkvetch	*Astragalus brandegeei*	BLM-S; CO-S1	Sandy or gravelly banks, flats, and stony meadows within pinyon-juniper woodlands. Substrates are usually sandstone with granite or occasional basalt. Elevation ranges between 5,400 and 8,800 ft. Nearest occurrences are located 8 mi southwest of the SEZ. About 769,336 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	<1 acre of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	1,389 acres of potentially suitable habitat (0.2% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance of meadows and woodlands in the road corridor could reduce impacts. See Aztec milkvetch for a list of potential mitigations applicable to all special status plant species.

TABLE 10.4.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Road Corridor (Direct Effects)[e]	Outside SEZ (Indirect Effects)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Plants (Cont.)							
Colorado larkspur	*Delphinium ramosum* var. *alpestre*	CO-S2	Meadows, aspen woodlands, and sagebrush scrub communities at elevations between 6,900 and 10,500 ft. Nearest known occurrences are approximately 50 mi from the SEZ. About 1,076,791 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	<1 acre of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	2,020 acres of potentially suitable habitat (0.2% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance of meadows and woodlands in the road corridor could reduce impacts. See Aztec milkvetch for a list of potential mitigations applicable to all special status plant species.
Fragile rockbrake	*Cryptogramma stelleri*	BLM-S; CO-S2	Moist soils on shaded limestone cliffs at elevations greater than 7,000 ft, and often in association with mosses. The nearest known occurrences are located in the San Juan Mountains, approximately 20 mi to the west of the SEZ. About 19,646 acres of potentially suitable habitat occurs within the SEZ region in the San Juan Mountains.	0 acres	0 acres	16 acres of potentially suitable habitat (0.1% of available potentially suitable habitat)	Small overall impact; no direct impact. No species-specific mitigation is warranted.

TABLE 10.4.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Road Corridor (Direct Effects)[e]	Outside SEZ (Indirect Effects)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Plants (Cont.)							
Grassy slope sedge	*Carex oreocharis*	CO-S1	Regionally endemic to the southern Rocky Mountains. Granitic soils on dry slopes at elevations between 7,200 and 10,800 ft. Nearest known occurrences are approximately 35 mi from the SEZ. About 319,357 acres of potentially suitable habitat occurs within the SEZ region in the San Juan Mountains.	0 acres	<1 acre of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	805 acres of potentially suitable habitat (0.3% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance of grassy slopes in the road corridor could reduce impacts. See Aztec milkvetch for a list of potential mitigations applicable to all special status plant species.
Gray's Townsend-daisy	*Townsendia glabella*	CO-S2	Endemic to Colorado where known occurrences are restricted to Archuleta, La Plata, and Montezuma Counties within a range of 915 mi^2. Steeply sloping shale slopes with pines between 6,900 and 8,500 ft. Nearest occurrences are approximately 48 mi from the SEZ. About 746,522 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	<1 acre of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	1,389 acres of potentially suitable habitat (0.2% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance of woodlands in the road corridor could reduce impacts. See Aztec milkvetch for a list of potential mitigations applicable to all special status plant species.

TABLE 10.4.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Road Corridor (Direct Effects)[e]	Outside SEZ (Indirect Effects)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Plants (Cont.)							
James' cat's-eye	*Oreocarya cinerea* var. *Pustulosa*	CO-S1	Gypsum and sandy substrates within sagebrush, pinyon-juniper, oak mountain brush, and ponderosa pine communities at elevations between 5,400 and 8,500 ft. Nearest known occurrences are approximately 15 mi from the SEZ. About 1,373,293 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	<1 acre of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	2,230 acres of potentially suitable habitat (0.2% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance of woodlands in the road corridor could reduce impacts. See Aztec milkvetch for a list of potential mitigations applicable to all special status plant species.
Least moonwort	*Botrychium simplex*	CO-S1	Open habitats, including pastures, meadows, orchards, prairies, wetlands, fens, sand dunes, and in lake and stream edge vegetation. Nearest known occurrences are 35 mi from the SEZ. About 691,076 acres of potentially suitable habitat occurs within the SEZ region.	428 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat)	1 acre of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	9,956 acres of potentially suitable habitat (1.4% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance of grasslands and meadows in the area of direct effects could reduce impacts. See Aztec milkvetch for a list of potential mitigations applicable to all special status plant species.

TABLE 10.4.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Road Corridor (Direct Effects)[e]	Outside SEZ (Indirect Effects)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Plants (Cont.)							
Leathery grape fern	*Botrychium multifidum*	CO-S1	Wet meadows, forest edges, lake shores, stony lake margins, and trail sides at elevations between 6,300 and 11,500 ft. Sites are usually flat, open, and have acidic soils that are seasonally wet. Nearest known occurrences are approximately 35 mi from the SEZ. About 278,653 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	<1 acre of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	2,228 acres of potentially suitable habitat (0.8% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance of meadows in the road corridor could reduce impacts. See Aztec milkvetch for a list of potential mitigations applicable to all special status plant species.
Many-flowered gilia	*Ipomopsis multiflora*	CO-S1	Open sites, desert shrublands, and woodlands. Nearest known occurrences are approximately 12 mi from the SEZ. About 3,928,911 acres of potentially suitable habitat occurs within the SEZ region.	5,893 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat)	4 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	45,954 acres of potentially suitable habitat (1.3% of available potentially suitable habitat)	Small overall impact. Small overall impact. See Aztec milkvetch for a list of potential mitigations applicable to all special status plant species.
Many-stemmed spider-flower	*Cleome multcaulis*	BLM-S; CO-S2; FWS-SC	San Luis Valley on saturated soils created by waterfowl management on public lands. Primarily known from the Blanca Wetlands as near as 25 mi northeast of the SEZ. About 4,025 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	0 acres	4 acres of potentially suitable habitat (0.1% of available potentially suitable habitat)	Small overall impact; no direct impact. No species-specific mitigation is warranted.

TABLE 10.4.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Road Corridor (Direct Effects)[e]	Outside SEZ (Indirect Effects)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Plants (Cont.)							
Marsh cinquefoil	*Comarum palustre*	CO-S1	Lake shores, bogs, swamps, and streambanks in mucky, peaty soil. Nearest known occurrences are approximately 25 mi from the SEZ. About 274,628 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	<1 acre of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	2,244 acres of potentially suitable habitat (0.8% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance of marsh habitat in the road corridor could reduce impacts. See Aztec milkvetch for a list of potential mitigations applicable to all special status plant species.
Mingan's moonwort	*Botrychium minganense*	CO-S1	Dense forest to open meadow and from summer-dry meadows to permanently saturated fens and seeps but most common in moist meadows and woodlands in association with riparian corridors. Recorded sites are often associated with old (>10 year) disturbances. Nearest known occurrences are approximately 30 mi from the SEZ. About 2,342,624 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	<1 acre of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	3,806 acres of potentially suitable habitat (0.2% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance of meadows in the road corridor could reduce impacts. See Aztec milkvetch for a list of potential mitigations applicable to all special status plant species.

TABLE 10.4.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Road Corridor (Direct Effects)[e]	Outside SEZ (Indirect Effects)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Plants (Cont.)							
Mountain whitlow-grass	*Draba rectifructa*	CO-S2	Openings in sagebrush ponderosa pine, aspen, spruce-fir, lodgepole pine, and moderately moist alpine meadow communities at elevations between 6,400 and 9,600 ft. Nearest known occurrences are approximately 22 mi from the SEZ. About 1,366,929 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	<1 acre of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	1,426 acres of potentially suitable habitat (0.1% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance of meadows and woodlands in the road corridor could reduce impacts. See Aztec milkvetch for a list of potential mitigations applicable to all special status plant species.
New Mexico butterfly weed	*Oenothera coloradensis* ssp. *neomexicana*	CO-S1	A small forb that grows in subirrigated alluvial soils on level or slightly sloping terrain. Occurs in floodplains, drainage bottoms, and old stream channels at elevations between 5,000 and 6,000 ft. Nearest occurrences are approximately 50 mi from the SEZ. About 29,044 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	0 acres	863 acres of potentially suitable habitat (3.0% of available potentially suitable habitat)	Small overall impact; no direct impact. No species-specific mitigation is warranted.

TABLE 10.4.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Road Corridor (Direct Effects)[e]	Outside SEZ (Indirect Effects)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Plants (Cont.)							
New Mexico cliff fern	*Woodsia neomexicana*	CO-S2	Cliffs and rocky slopes usually on sandstone or igneous substrates. Elevations range between 7,875 and 11,500 ft. Nearest occurrences are from the Sangre de Cristo Mountains, approximately 45 mi east of the SEZ. About 19,646 acres of potentially suitable habitat occurs within the SEZ region in the San Juan Mountains.	0 acres	0 acres	16 acres of potentially suitable habitat (0.1% of available potentially suitable habitat)	Small overall impact; no direct impact. No species-specific mitigation is warranted.
Northern moonwort	*Botrychium pinnatum*	CO-S1	Grassy slopes, streambanks, and woodlands at elevations below 8,200 ft. Nearest known occurrences are approximately 30 mi from the SEZ. About 384,370 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	<1 acre of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	809 acres of potentially suitable habitat (0.2% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance of grassy slopes and woodlands in the road corridor could reduce impacts. See Aztec milkvetch for a list of potential mitigations applicable to all special status plant species.

TABLE 10.4.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Road Corridor (Direct Effects)[e]	Outside SEZ (Indirect Effects)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Plants (Cont.)							
Philadelphia fleabane	*Erigeron philadelphicus*	CO-S1	Woodland openings and margins, marshes edges, creek sides, roadsides, ditch banks, lawns, low prairies, and other open, disturbed sites at elevations below 9,500 ft. Nearest known occurrences are approximately 40 mi from the SEZ. About 189,288 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	5 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	5,931 acres of potentially suitable habitat (3.1% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance of meadows, grasslands, and woodlands in the road corridor could reduce impacts. See Aztec milkvetch for a list of potential mitigations applicable to all special status plant species.
Prairie violet	*Viola pedatifida*	CO-S2	Rocky sites within prairies, open woodlands, and forest openings at elevations between 5,800 and 8,800 ft Nearest known occurrences are approximately 50 mi from the SEZ. About 1,523,791 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	<1 acre of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	1,582 acres of potentially suitable habitat (0.1% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance of grasslands and woodlands in the road corridor could reduce impacts. See Aztec milkvetch for a list of potential mitigations applicable to all special status plant species.

TABLE 10.4.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Road Corridor (Direct Effects)[e]	Outside SEZ (Indirect Effects)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Plants (Cont.)							
Retrorse sedge	*Carex retrorsa*	CO-S1	Perennially wet areas, with a strong preference for banks along small channels, small to mid-size depressional wetlands, open mudflats at pond margins, and surface drying mud. Occurs at elevations between 5,000 and 10,000 ft. Nearest known occurrences are approximately 35 mi from the SEZ. About 62,623 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	0 acres	4 acres of potentially suitable habitat (<0.1% of available potentially suitable habitat)	Small overall impact; no direct impact. No species-specific mitigation is warranted.
Ripley's milkvetch	*Astragalus ripleyi*	BLM-S; CO-S2; FWS-SC	Mixed conifer and shrubland habitats on rocky substrates at elevations above 8,000 ft. The nearest known occurrences are located 9 mi to the west of the SEZ. About 375,332 acres of potentially suitable habitat occurs within the SEZ region in the San Juan Mountains.	0 acres	<1 acre of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	12 acres of potentially suitable habitat (<0.1% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance of woodlands in the road corridor could reduce impacts. See Aztec milkvetch for a list of potential mitigations applicable to all special status plant species.

TABLE 10.4.12.1-1 (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]: Road Corridor (Direct Effects)[e]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Plants (Cont.)							
Rock sandwort	*Alsinanthe stricta*	CO-S1	Moist, granitic gravel sedge meadows, heath, alpine or arctic tundra at elevations between 300 and 12,500 ft. Nearest occurrences are within the Sangre de Cristo Mountians approximately 45 mi east of the SEZ. About 197,830 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	<1 acre of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	1,361 acres of potentially suitable habitat (0.7% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance of meadows in the road corridor could reduce impacts. See Aztec milkvetch for a list of potential mitigations applicable to all special status plant species.
Rock-loving aletes[l]	***Neoparrya lithophila***	BLM-S; CO-S2	Endemic to southcentral Colorado on igneous rock outcrops on north-facing cliffs and ledges. Found within pinyon-juniper woodlands at elevations greater than 7,000 ft. Quad-level occurrences intersect the affected area approximately 5 mi west of the SEZ. About 366,037 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	<1 acre of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	1,338 acres of potentially suitable habitat (0.4% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance of woodlands in the area of direct effects could reduce impacts. See Aztec milkvetch for a list of potential mitigations applicable to all special status plant species.

TABLE 10.4.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Road Corridor (Direct Effects)[e]	Outside SEZ (Indirect Effects)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Plants (Cont.)							
Rocky Mountain bladderpod	*Lesquerella calcicola*	CO-S2	Shale bluffs, limy hillsides, gypseous knolls and ravines, and various calcareous substrates at elevations between 5,000 and 7,500 ft. Nearest known occurrences are approximately 11 mi from the SEZ. About 19,646 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	0 acres	16 acres of potentially suitable habitat (0.1% of available potentially suitable habitat)	Small overall impact; no direct impact. No species-specific mitigation is warranted.
Rocky Mountain blazing-star	*Liatris ligulistylis*	CO-S1	Dry, rocky slopes, rocky woodlands, gravelly ground in valleys, pine barrens, aspen clearings, granite depressions, stream sides, prairies, and open moist sites at elevations below 7,900 ft. Nearest known occurrences are approximately 18 mi from the SEZ. About 2,645,165 acres of potentially suitable habitat occurs within the SEZ region.	5,867 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat)	4 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	44,464 acres of potentially suitable habitat (1.7% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance of grasslands, meadows, wetlands, and woodlands in the area of direct effects could reduce impacts. See Aztec milkvetch for a list of potential mitigations applicable to all special status plant species.

TABLE 10.4.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Road Corridor (Direct Effects)[e]	Outside SEZ (Indirect Effects)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Plants (Cont.)							
Slender sedge	*Carex lasiocarpa*	CO-S1	Very wet sites, including sedge meadows, fens, bogs, lakeshores, and streambanks. A dominant species of boreal wetlands where it often forms large floating mats. Nearest known occurrences are approximately 40 mi from the SEZ. About 220,055 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	<1 acre of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	2,228 acres of potentially suitable habitat (1.0% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance of meadows in the road corridor could reduce impacts. See Aztec milkvetch for a list of potential mitigations applicable to all special status plant species.
Smith whitlow-grass	*Draba smithii*	CO-S2	Endemic to the mountains of southern Colorado. Talus slopes providing shaded and protected crevices at elevations between 8,000 and 11,000 ft. Nearest known occurrences are from the western escarpment of the Sangre de Cristo Mountains, approximately 35 mi northeast of the SEZ. About 55,759 acres of potentially suitable habitat occurs within the SEZ region in the San Juan Mountains.	0 acres	0 acres	16 acres of potentially suitable habitat (<0.1% of available potentially suitable habitat)	Small overall impact; no direct impact. No species-specific mitigation is warranted.

TABLE 10.4.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Road Corridor (Direct Effects)[e]	Outside SEZ (Indirect Effects)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Plants (Cont.)							
Tundra saxifrage	*Muscaria monticola*	CO-S1	Rock outcrops, crevices, talus, scree slopes, rocky tundra, fellfields, nunataks, and streambanks at elevations below 14,700 ft. Nearest known occurrences are approximately 50 mi east of the SEZ in the Sangre de Cristo Mountains. About 62,209 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	0 acres	16 acres of potentially suitable habitat (<0.1% of available potentially suitable habitat)	Small overall impact; no direct impact. No species-specific mitigation is warranted.
Variegated scouringrush	*Hippochaete variegata*	CO-S1	Wet meadows, bogs, alluvial thickets, and sandy soil of river banks, ditches or lakes. Nearest known occurrences are approximately 50 mi west of the SEZ. About 278,653 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	<1 acre of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	2,228 acres of potentially suitable habitat (0.8% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance of meadows in the road corridor could reduce impacts. See Aztec milkvetch for a list of potential mitigations applicable to all special status plant species.

TABLE 10.4.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Road Corridor (Direct Effects)[e]	Outside SEZ (Indirect Effects)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Plants (Cont.)							
Western moonwort	*Botrychium hesperium*	CO-S2	Early successional habitats that undergo periodic disturbance. These include grassy mountain slopes, snow fields, road ditches, and gneiss outcrops and cliffs, as well as old fields at elevations between 650 and 11,300 ft. Nearest known occurrences are 17 mi from the SEZ. About 111,691 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	5 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	4,490 acres of potentially suitable habitat (4.0% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance of grasslands in the road corridor could reduce impacts. See Aztec milkvetch for a list of potential mitigations applicable to all special status plant species.

TABLE 10.4.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Road Corridor (Direct Effects)[e]	Outside SEZ (Indirect Effects)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Arthropods							
Great Basin silverspot butterfly	*Speyeria nokomis nokomis*	BLM-S; CO-S1	Streamside meadows and open seepage areas associated with violets (Viola spp.). Nearest potentially suitable habitat is located on BLM lands in the La Jara Front Range approximately 9 mi northwest of the SEZ. About 502,789 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	<1 acre of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	2,165 acres of potentially suitable habitat (0.4% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance of meadows in the road corridor could reduce impacts. Pre-disturbance surveys and avoiding or minimizing disturbance of occupied habitats in the area of direct effects or compensatory mitigation of direct effects on occupied habitats could reduce impacts.

TABLE 10.4.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Road Corridor (Direct Effects)[e]	Outside SEZ (Indirect Effects)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Arthropods (Cont.)							
Sphinx moth	*Sphinx dollii*	CO-S2	Madrean oak woodland, arid brushlands, and desert foothills with woody broad-leafed shrubs.Nearest occurrences are from the Great Sand Dunes National Park, approximately 40 mi northeast of the SEZ. About 1,364,041 acres of potentially suitable habitat occurs within the SEZ region.	5,458 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	4 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	35,189 acres of potentially suitable habitat (2.6% of available potentially suitable habitat)	Small overall impact. Pre-disturbance surveys and avoiding or minimizing disturbance of occupied habitats in the area of direct effects or compensatory mitigation of direct effects on occupied habitats could reduce impacts.
Fish							
Rio Grande chub	***Gila pandora***	BLM-S; CO-S1	Clear, cool, fast-flowing water over rubble or gravel substrates. The nearest known occurrences are located in the Conejos River, approximately 4 mi south of the SEZ. About 742 mi of potentially suitable habitat occurs in the SEZ region.	0 acres	0 acres	19 mi (2.6% of available potentially suitable habitat)	Small overall impact; no direct impact. No species-specific mitigation is warranted.

TABLE 10.4.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Road Corridor (Direct Effects)[e]	Outside SEZ (Indirect Effects)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Fish (Cont.)							
Rio Grande sucker	*Catostomus plebeius*	CO-E; CO-S1	Restricted to streams of the Rio Grande Basin. Channels and backwaters near rapidly flowing waters. The nearest known occurrences are located in the Alamosa River in the Rio Grande National Forest, approximately 15 mi northwest of the SEZ. About 874 mi of potentially suitable habitat occurs in the SEZ region.	0 acres	0 acres	19 mi (2.2% of available potentially suitable habitat)	Small overall impact; no direct impact. No species-specific mitigation is warranted.
Amphibians							
Northern leopard frog	*Rana pipiens*	ESA-UR; BLM-S; CO-SC	Low gradient creeks, moderate gradient rivers, pools, springs, canals, floodplains, reservoirs, shallow lakes, and wet meadows (especially with rooted aquatic vegetation), and fields. Known to occur in Conejos County, Colorado. About 37,500 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	0 acres	400 acres of potentially suitable habitat (1.1% of available potentially suitable habitat)	Small overall impact; no direct impact. No species-specific mitigation is warranted.
Reptiles							
Milk snake	*Lampropeltis triangulum*	BLM-S	Shortgrass prairie, sandhills, shrubby hillsides, pinyon-juniper woodlands, and arid river valleys at elevations below 8,000 ft. The species is known to occur in Conejos County, Colorado. About 752,029 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	0 acres	685 acres of potentially suitable habitat (<0.1% of available potentially suitable habitat)	Small overall impact; no direct impact. No species-specific mitigation is warranted.

TABLE 10.4.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Road Corridor (Direct Effects)[e]	Outside SEZ (Indirect Effects)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Birds							
American peregrine falcon	*Falco peregrinus anatum*	BLM-S; CO-SC; CO-S2; FWS-SC	Year-round resident in the SEZ region. Open spaces associated with high, near vertical cliffs and bluffs above 200 ft in height overlooking rivers. Nearest occurrences are from the Rio Grande National Forest approximately17 mi northwest of the SEZ. About 3,653,800 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	13 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	47,723 acres of potentially suitable habitat (1.3% of available potentially suitable habitat)	Small overall impact; direct impact on foraging habitat only. Avoidance of direct impacts on foraging habitat is not feasible because suitable foraging habitat is widespread in the area of direct effects.
Bald eagle	***Haliaeetus leucocephalus***	CO-T; CO-S1	Year-round resident in the SEZ region. Seldom seen far from water, especially larger rivers, lakes, and reservoirs. Occurs locally in semiarid shrubland habitats where there is an abundance of small mammal prey. Quad-level occurrences intersect the affected area approximately 5 mi east of the SEZ. About 1,645,504 acres of potentially suitable habitat occurs within the SEZ region.	5,358 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	16 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	69,426 acres of potentially suitable habitat (4.2% of available potentially suitable habitat)	Small overall impact; direct impact on foraging habitat only. Avoidance of direct impacts on foraging habitat is not feasible because suitable foraging habitat is widespread in the area of direct effects
Barrow's goldeneye	*Bucephala islandica*	BLM-S; CO-S2	Winter resident in the SEZ region on larger lakes and rivers. Known to occur in the San Luis Valley. About 149,000 acres of potentially suitable habitat occurs in the SEZ region.	0 acres	0 acres	2,300 acres of potentially suitable habitat (1.5% of available potentially suitable habitat)	Small overall impact; no direct impact. No species-specific mitigation is warranted.

TABLE 10.4.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Road Corridor (Direct Effects)[e]	Outside SEZ (Indirect Effects)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Birds (Cont.)							
Ferruginous hawk	***Buteo regalis***	BLM-S; CO-SC	Summer resident in the affected area, but year-round resident in the SEZ region. Grasslands, sagebrush, and saltbrush habitats, as well as the periphery of pinyon-juniper woodlands throughout the San Luis Valley. Quad-level occurrences intersect the affected area approximately 5 mi west of the SEZ. About 1,388,420 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	12 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	43,448 acres of potentially suitable habitat (3.1% of available potentially suitable habitat)	Small overall impact on foraging and nesting habitat. Pre-disturbance surveys and avoiding or minimizing disturbance of occupied nests and habitats in the area of direct effects or compensatory mitigation of direct effects on occupied habitats could reduce impacts.
Mountain plover	***Charadrius montanus***	BLM-S; CO-SC; CO-S2	Summer resident in the SEZ region. Prairie grasslands and arid plains and fields. Nests in shortgrass prairies associated with prairie dogs, bison, and cattle. Known to occur within 5 mi southeast of the SEZ. About 1,344,723 acres of potentially suitable habitat occurs within the SEZ region.	5,918 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	16 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	82,764 acres of potentially suitable habitat (6.2% of available potentially suitable habitat)	Small overall impact on foraging and nesting habitat. Pre-disturbance surveys and avoiding or minimizing disturbance of occupied nests and habitats in the area of direct effects or compensatory mitigation of direct effects on occupied habitats could reduce impacts.

TABLE 10.4.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Road Corridor (Direct Effects)[e]	Outside SEZ (Indirect Effects)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Birds (Cont.)							
Short-eared owl	*Asio flammeus*	CO-S2	Year-round resident in the SEZ region. Grasslands, agricultural areas, and marshes. Rarely observed in sagebrush shrubland or pinyon-juniper woodland. Nearest occurrences are approximately 15 mi from the SEZ. About 2,082,766 acres of potentially suitable habitat occurs within the SEZ region.	5,918 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	16 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	78,518 acres of potentially suitable habitat (3.8% of available potentially suitable habitat)	Small overall impact on foraging and nesting habitat. Pre-disturbance surveys and avoiding or minimizing disturbance of occupied nests and habitats in the area of direct effects or compensatory mitigation of direct effects on occupied habitats could reduce impacts.
Southwestern willow flycatcher	*Empidonax traillii extimus*	ESA-E; CO-E	Nests in thickets, scrubby and brushy areas, open second growth, swamps, and open woodlands in the Alamosa National Wildlife Refuge along the Rio Grande, approximately 18 mi northeast of the SEZ. About 426,247 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	0 acres	3,459 acres of potentially suitable habitat (0.8% of available potentially suitable habitat)	Small overall impact; no direct impact. No species-specific mitigation is warranted.

TABLE 10.4.12.1-1 (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]: Road Corridor (Direct Effects)[e]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Birds (Cont.)							
Western burrowing owl	*Athene cunicularia hypugaea*	BLM-S; CO-T; FWS-SC	Open grasslands and prairies, as well as disturbed sites such as golf courses, cemeteries, and airports throughout the SEZ region. Nests in burrows constructed by mammals (prairie dog, badger, etc.). Known to occur in Conejos County, Colorado. About 2,036,700 acres of potentially suitable habitat occurs in the SEZ region.	5,918 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	16 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	83,900 acres of potentially suitable habitat (4.1% of available potentially suitable habitat)	Small overall impact on foraging and nesting habitat. Pre-disturbance surveys and avoiding or minimizing disturbance of occupied burrows and habitats in the area of direct effects or compensatory mitigation of direct effects on occupied habitats could reduce impacts.
Mammals							
Big free-tailed bat	*Nyctinomops macrotis*	BLM-S; CO-S1; FWS-SC	Year-round resident in the SEZ region. Roosts in rock crevices on cliff faces or in buildings. Forages primarily in coniferous forests and arid shrublands to feed on moths. May occur in the San Luis Valley. About 2,648,405 acres of potentially suitable habitat occurs within the SEZ region.	5,918 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat)	16 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	84,845 acres of potentially suitable habitat (3.2% of available potentially suitable habitat)	Small overall impact; direct impact on foraging habitat only. Avoidance of direct impacts on foraging habitat is not feasible because suitable foraging habitat is widespread in the area of direct effects.

TABLE 10.4.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Road Corridor (Direct Effects)[e]	Outside SEZ (Indirect Effects)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Mammals (Cont.)							
Gunnison's prairie dog	***Cynomys gunnisoni***	ESA-C; CO-SC	Mountain valleys, plateaus, and open brush habitats in the project area at elevations between 6,000 and 12,000 ft. Known to occur in the San Luis Valley about 5 mi south and west of the SEZ. About 1,831,120 acres of potentially suitable habitat occurs within the SEZ region.	5,540 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	3 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	38,614 acres of potentially suitable habitat (2.1% of available potentially suitable habitat)	Small overall impact. Pre-disturbance surveys and avoiding or minimizing disturbance of active colonies in the area of direct effects; translocation of individuals from areas of direct effect; or compensatory mitigation of direct effects on occupied habitats scould reduce impacts. Mitigation should be developed in coordination with the USFWS and CDOW.

TABLE 10.4.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Road Corridor (Direct Effects)[e]	Outside SEZ (Indirect Effects)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Mammals (Cont.)							
Pale Townsend's big-eared bat	***Corynorhinus townsendii pallescens***	BLM-S; CO-S2; CO-SC; FWS-SC	Year-round resident in the SEZ region. Forages in semiarid shrublands, pinyon-juniper woodlands, and montane forests to elevations of 9,500 ft. Roosts in caves, mines, rock crevices, under bridges, or within buildings. Known to occur in the San Luis Valley about 5 mi east of the SEZ. About 2,682,530 acres of potentially suitable habitat occurs within the SEZ region.	5,918 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat)	16 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	85,742 acres of potentially suitable habitat (3.2% of available potentially suitable habitat)	Small overall impact; direct impact on foraging habitat only. Avoidance of direct impacts on foraging habitat is not feasible because suitable foraging habitat is widespread in the area of direct effects.
Spotted bat	*Euderma maculatum*	BLM-S; CO-S2	Year-round resident in the SEZ region. Forages in ponderosa pine forests, pinyon-juniper woodlands, and open semiarid shrublands. Roosts in exposed rocky cliff faces. May occur in the San Luis Valley in the SEZ region of the SEZ. About 1,145,531 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	0 acres	1,162 acres of potentially suitable habitat (0.1% of available potentially suitable habitat)	Small overall impact; no direct impact. No species-specific mitigation is warranted.

TABLE 10.4.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]			Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
				Within SEZ (Direct Effects)[d]	Road Corridor (Direct Effects)[e]	Outside SEZ (Indirect Effects)[f]	
Mammals (Cont.)							
Yuma myotis	*Myotis yumanensis yumanensis*	BLM-S; FWS-SC	Year-round resident in the SEZ region. Primarily associated with canyonlands and mesas at lower elevations. Forages in relatively dry shrubland habitats. Roosts in rock crevices, buildings, and mines. Known to occur in Conejos County, Colorado. About 2,234,328 acres of potentially suitable habitat occurs within the SEZ region.	5,871 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	4 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	44,809 acres of potentially suitable habitat (2.0% of available potentially suitable habitat)	Small overall impact; direct impact on foraging habitat only. Avoidance of direct impacts on foraging habitat is not feasible because suitable foraging habitat is widespread in the area of direct effect.s

[a] BLM-S = listed as a sensitive species by the BLM; CO-E = listed as endangered by the State of Colorado; CO-S1 = ranked as S1 in the State of Colorado; CO-S2 = ranked as S2 in the State of Colorado; CO-SC = species of special concern in the State of Colorado; CO-T = listed as threatened by the State of Colorado; ESA-C = candidate for listing under the ESA; ESA-E = listed as endangered under the ESA; FWS-SC = USFWS species of concern.

[b] For plant and invertebrate species, potentially suitable habitat was determined using SWReGAP land cover types. For fish species, potentially suitable habitat was determined from USFWS ECOS, USFWS Recovery Plans, and USFS Conservation Assessments. For reptile, bird, and mammal species, potentially suitable habitat was determined using SWReGAP habitat suitability 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 potential habitat that could be affected relative to availability within the SEZ region. Habitat availability for each species within the SEZ region was determined using SWReGAP habitat suitability and land cover models. This approach probably overestimates the amount of suitable habitat in the project area. No new transmission line developments are assumed to be needed due to the proximity of existing transmission 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] For access road development, direct effects were estimated within a 60-ft (18-m) wide, 3-mi (5-km) long access road from the SEZ to the nearest state highway. Direct impacts within this area were determined from the proportion of potentially suitable habitat within the 1-mi (1.6-km) wide road corridor.

Footnotes continued on next page.

TABLE 10.4.12.1-1 (Cont.)

[f] Area of indirect effects was assumed to be the area adjacent to the SEZ within 5 mi (8 km) of the SEZ boundary and the portion of the access road corridor where ground-disturbing activities would not occur. Indirect effects include effects from surface runoff, dust, noise, lighting, and so on from facilities. The potential degree of indirect effects would decrease with increasing distance away from the SEZ.

[g] Overall impact magnitude categories were based on professional judgment and include (1) small: $\le$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 $\le$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; large: >10% of a population or its habitat would be lost and the activity would result in a large, measurable, and destabilizing change in carrying capacity or population size in the affected area. Note that much greater weight was given to the magnitude of direct effects because those effects would be difficult to mitigate. Programmatic design features would reduce most indirect effects to negligible levels.

[h] 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.

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

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

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

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

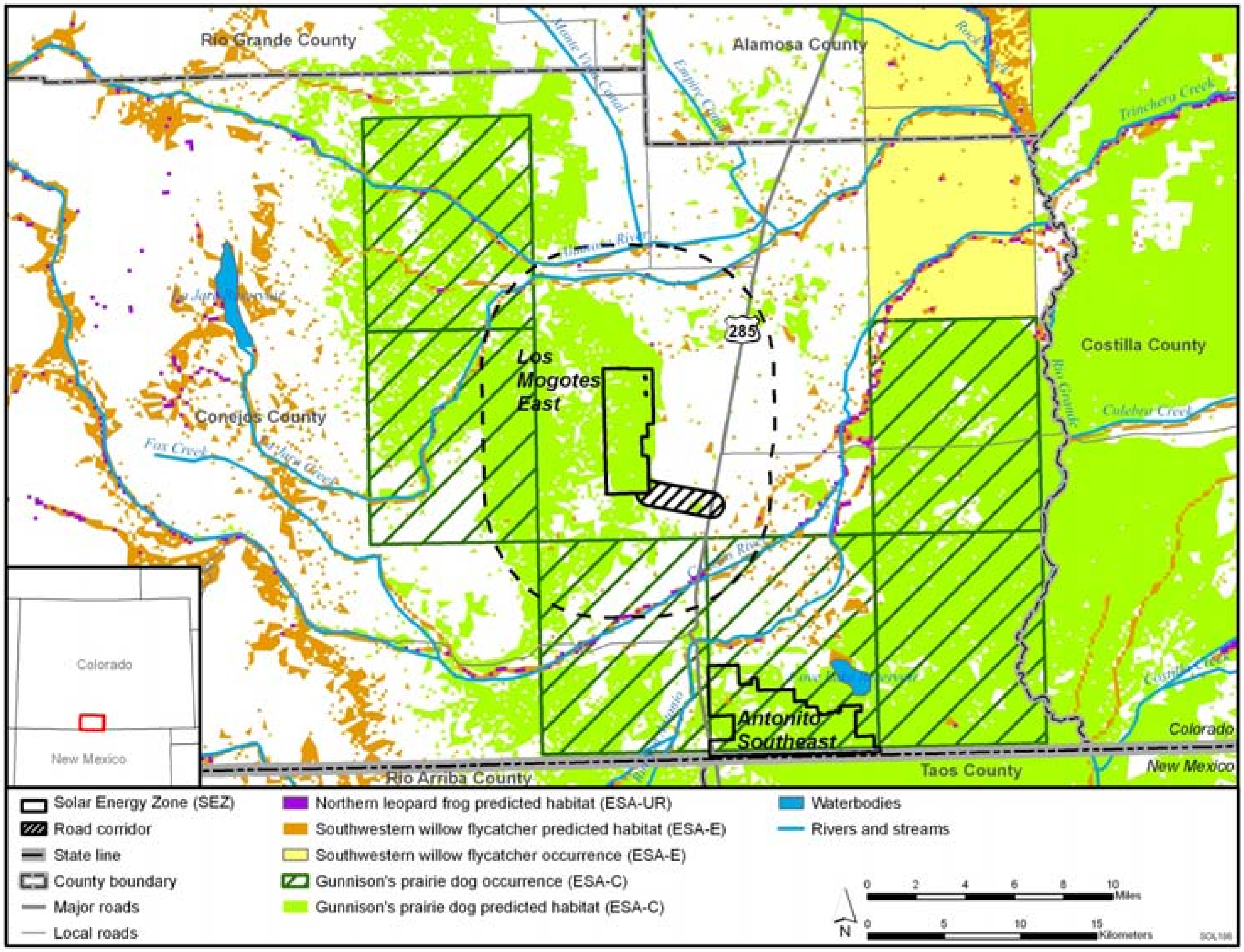

FIGURE 10.4.12.1-1 Locations of Species Listed as Endangered, Threatened, Candidates for Listing, or Species under Review for Listing under the ESA That May Occur in the Proposed Los Mogotes East SEZ Affected Area (Sources: CNHP 2009; NatureServe 2010; USGS 2007)

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

In scoping comments on the proposed Los Mogotes East SEZ, the USFWS did not identify any ESA-listed species that may occur within the affected area of the SEZ (Stout 2009). However, one species listed under the ESA, the southwestern willow flycatcher, has the potential to occur within the affected area of the proposed Los Mogotes East SEZ on the basis of observed occurrences near the affected area and the presence of apparently suitable habitat in the area of indirect effects (Table 10.4.12.1-1; Figure 10.4.12.1-1). Basic information on life history, habitat needs, and threats to this species is provided in Appendix J.

The southwestern willow flycatcher is known to breed in riparian habitats along the Rio Grande in the Alamos National Wildlife Refuge, approximately 18 mi (29 km) northeast of the Los Mogotes East SEZ. This area is considered to be outside of the areas of direct and indirect effects. According to the CNHP, the species has not been recorded on the SEZ or within the affected area, and, according to the SWReGAP habitat suitability model for the southwestern willow flycatcher, potentially suitable habitat does not occur on the SEZ or within the access road corridor. However, potentially suitable habitat does occur outside of the SEZ in the area of indirect effects, particularly along riparian habitats associated with the Alamosa River, the Conejos River, and La Jara Creek (Table 10.4.12.1-1; Figure 10.4.12.1-1). Designated critical habitat for this species does not occur in the SEZ region.

10.4.12.1.2 Species That Are Candidates for Listing under the ESA

In scoping comments on the proposed Los Mogotes East SEZ, the USFWS did not identify any candidate species for listing under the ESA that may occur in the affected area of the SEZ (Stout 2009). However, there is one candidate species, the Gunnison's prairie dog, which may occur near the Los Mogotes East SEZ (Table 10.4.12.1-1). The known and potential distribution of this species relative to the SEZ is shown in Figure 10.4.12.1-1. In Appendix J, basic information is provided on life history, habitat needs, and threats to populations of this species.

Gunnison's prairie dog occurs in the San Luis Valley and has been recorded in the vicinity of the Los Mogotes East SEZ. According to the CNHP, quad-level occurrences of this species intersect the western and southern portions of the affected area outside of the SEZ. Suitable habitat for the species exists on the SEZ, and Gunnison's prairie dog burrows were observed on the SEZ during a site visit in July 2009. According to the SWReGAP habitat suitability model, potentially suitable habitat for this species occurs throughout the affected area and SEZ region (Table 10.4.12.1-1; Figure 10.4.12.1-1).

10.4.12.1.3 Species That Are under Review for Listing under the ESA

In scoping comments on the proposed Los Mogotes East SEZ, the USFWS did not identify any species under review for listing under the ESA that may occur in the affected area of the SEZ (Stout 2009). However, the northern leopard frog, which is under review for ESA listing in the western United States, may occur near the SEZ (Table 10.4.12.1-1). The known or potential distribution of this species relative to the SEZ is shown in Figure 10.4.12.1-1. In Appendix J, basic information is provided on life history, habitat needs, and threats to populations of this species.

The northern leopard frog is an amphibian widely distributed throughout North America. The western distinct population segment (DPS) of the northern leopard frog, which includes populations in Colorado, is currently under review for ESA listing. Within this DPS, the species is known to occur in various wetland communities, including creeks, rivers, pools, springs, canals, and flooded fields. The northern leopard frog is known to occur in Conejos County, Colorado. According to the SWReGAP habitat suitability model for the species, suitable habitat does not occur on the SEZ or within the access road corridor. However, potentially suitable habitat is predicted to occur within the area of indirect effects (Table 10.4.12.1-1).

10.4.12.1.4 BLM-Designated Sensitive Species

There are 18 BLM-designated sensitive species that may occur in the affected area of the proposed Los Mogotes East SEZ (Table 10.4.12.1-1). These BLM-designated sensitive species include the following (1) plants: Brandegee's milkvetch, fragile rockbrake, many-stemmed spider-flower, Ripley's milkvetch, and rock-loving aletes; (2) arthropods: Great Basin silverspot butterfly; (3) fish: Rio Grande chub; (4) amphibians: northern leopard frog; (5) reptiles: milk snake; (6) birds: American peregrine falcon, Barrow's goldeneye, ferruginous hawk, mountain plover, and western burrowing owl; and (7) mammals: big free-tailed bat, pale Townsend's big-eared bat, spotted bat, and Yuma myotis. 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 10.4.12.1-1. The northern leopard frog is discussed in Section 10.4.12.1.3 because it is under review for listing under the ESA. The remaining 17 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.

Brandegee's Milkvetch

The Brandegee's milkvetch is a perennial forb that is known from disjunct locations in Arizona, Colorado, New Mexico, and Utah. The species inhabits sandy or gravelly banks, flats, and rocky meadows within pinyon-juniper woodlands at elevations between 5,400 and 8,800 ft (1,645 and 2,680 m). The nearest quad-level occurrences of this species are approximately 8 mi (13 km) southwest of the Los Mogotes East SEZ. According to the SWReGAP land cover model, potentially suitable habitat for this species does not occur on the SEZ; however, potentially suitable pinyon-juniper woodland and mesic meadow habitats may occur in the access road corridor and area of indirect effects (Table 10.4.12.1-1).

Fragile Rockbrake

The fragile rockbrake is a perennial forb that is widespread across North America, Europe, and Asia. The species inhabits moist soils on shaded limestone cliffs at elevations greater than 7,000 ft (2,130 m). Nearest quad-level occurrences of this species are from the San Juan Mountains, approximately 20 mi (32 km) west of the Los Mogotes East SEZ. According to the SWReGAP land cover model, potentially suitable habitat for this species does not occur on the SEZ or access road corridor. However, potentially suitable rocky cliffs and outcrops may occur within the area of indirect effects (Table 10.4.12.1-1).

Many-Stemmed Spider-Flower

The many-stemmed spider-flower is an annual forb that is known from disjunct locations from central Wyoming, south-central Colorado, southeast Arizona, and southwest Texas. The species inhabits saturated soils of saline depressions, such as alkali sinks, alkaline meadows, and playa margins. Within the San Luis Valley of south-central Colorado, the species is known from saturated soils created by waterfowl management on public lands. Nearest quad-level occurrences of this species are from the Blanca Wetlands, approximately 25 mi (40 km) northeast of the Los Mogotes East SEZ. According to the SWReGAP land cover model, potentially suitable habitat for this species does not occur on the SEZ or access road corridor. However, potentially suitable marsh habitat may occur within the area of indirect effects (Table 10.4.12.1-1).

Ripley's Milkvetch

The Ripley's milkvetch is a perennial forb that is restricted to a range of less than 1,000 mi^2 (<2,590 km^2) in Conejos County, Colorado, and Taos and Rio Arriba Counties, New Mexico. The species inhabits mixed conifer woodlands on rocky volcanic substrates at elevations above 8,000 ft (2,440 m). Nearest quad-level occurrences of this species are approximately 9 mi (14 km) west of the Los Mogotes East SEZ. According to the SWReGAP land cover model, potentially suitable habitat for this species does not occur on the SEZ; however, potentially suitable pinyon-juniper woodland habitat may occur within the access road corridor and area of indirect effects (Table 10.4.12.1-1).

Rock-Loving Aletes

The rock-loving aletes is a perennial forb that is endemic to south-central Colorado. The species occurs on volcanic rock substrates such as outcrops, cracks, or ledges. It is associated with pinyon-juniper woodlands on these substrates at elevations greater than 7,000 ft (2,130 m). Quad-level occurrences of this species intersect the affected area approximately 5 mi (8 km) west of the Los Mogotes SEZ. According to the SWReGAP land cover model, potentially suitable habitat for this species does not occur on the SEZ; however, potentially suitable pinyon-juniper woodland habitat may occur within the access road corridor and area of indirect effects.

Potentially suitable rocky cliffs and outcrops may also occur in the area of indirect effects (Table 10.4.12.1-1).

Great Basin Silverspot Butterfly

The Great Basin silverspot butterfly occurs in northeastern Arizona, western Colorado, northern New Mexico, and eastern Utah. Within Colorado, this species occurs in isolated populations in streamside meadows and open seepage areas associated with violets (*Viola* spp.). Quad-level occurrence records for this species are known from the La Jara Front Range, approximately 9 mi (14 km) northwest of the Los Mogotes East SEZ. According to the SWReGAP land cover model, potentially suitable habitat for this species does not occur on the SEZ; however, potentially suitable mesic meadow habitat may occur within the access road corridor and area of indirect effects (Table 10.4.12.1-1).

Rio Grande Chub

The Rio Grande chub occurs in the Conejos River approximately 4 mi (6 km) south of the Los Mogotes East SEZ. The species is considered extirpated from the main stem Rio Grande (USFS 2005), but it is known to occur in tributary streams and some impoundments in the San Luis Valley. No suitable habitat for the species occurs on the SEZ or within the access road corridor; however, potentially suitable habitat occurs in the area of indirect effects within the Alamosa River, Conejos River, and La Jara Creek (Table 10.4.12.1-1).

Milk Snake

The milk snake occurs in a variety of habitats, including shortgrass prairie, sandhills, shrubby hillsides, woodlands, and river valleys. This species is known to occur in Conejos County, Colorado. According to the SWReGAP habitat suitability model, suitable habitat for this species does not occur on the Los Mogotes East SEZ or within the assumed access road corridor; however, potentially suitable habitat may occur in the area of indirect effects (Table 10.4.12.1-1).

American Peregrine Falcon

The American peregrine falcon occurs throughout the western United States in areas with high vertical cliffs and bluffs that overlook large open areas such as deserts, shrublands, and woodlands. Nests are usually constructed on rock outcrops and cliff faces. Foraging habitat varies from shrublands and wetlands to farmland and urban areas. The nearest quad-level occurrences of this species are from the Rio Grande National Forest, approximately 17 mi (27 km) northwest of the Los Mogotes East SEZ (Table 10.4.12.1-1). According to the SWReGAP habitat suitability model, suitable habitat for the American peregrine falcon does not occur on the SEZ. However, potentially suitable year-round foraging and summer nesting habitat may occur on the access road corridor and throughout portions of the area of indirect effects. On the basis of an evaluation of SWReGAP land cover types, however, potentially suitable nesting habitat (cliffs or outcrops) does not occur within the area of direct effects but approximately 16 acres (<0.1 km^2) of cliff and rock outcrop habitat that may be potentially suitable nesting habitat occurs in the area of indirect effects.

Barrow's Goldeneye

The Barrow's goldeneye is a diving duck that occurs in Colorado on larger lakes and rivers. The species is known to occur in the San Luis Valley, and, according to the SWReGAP habitat suitability model, only potentially suitable wintering habitat for the Barrow's goldeneye is predicted to occur within the affected area of the Los Mogotes East SEZ. According to the SWReGAP habitat suitability model, suitable habitat for this species does not occur on the SEZ or within the access road corridor; however, potentially suitable habitat may occur in the area of indirect effects (Table 10.4.12.1-1). The potentially suitable habitat within the area of indirect effects is particularly associated with the Conejos River and La Jara Creek.

Ferruginous Hawk

The ferruginous hawk is a summer resident in the Los Mogotes East SEZ affected area and a year-round resident in portions of the SEZ region. The species inhabits open grasslands, sagebrush flats, desert scrub, and the edges of pinyon-juniper woodlands. Quad-level occurrences of the ferruginous hawk intersect the affected area approximately 5 mi (8 km) west of the Los Mogotes East SEZ. According to the SWReGAP habitat suitability model, suitable habitat for this species does not occur on the SEZ. However, potentially suitable habitat may occur in the access road corridor and within the area of indirect effects (Table 10.4.12.1-1). Most of this suitable habitat is represented by foraging habitat (shrublands). On the basis of an evaluation of SWReGAP land cover types, approximately 12 acres (<0.1 km^2) of forested habitat within the access road corridor and 1,400 acres (6 km^2) of forested habitat within the area of indirect effects may provide potentially suitable nesting habitat for the ferruginous hawk. In addition, approximately 16 acres (<0.1 km^2) of rocky cliffs and outcrops within the area of indirect effects may be potentially suitable nesting habitat.

Mountain Plover

The mountain plover inhabits prairie grasslands and arid plains and fields, and nests in shortgrass prairie habitats associated with prairie dogs, bison, and cattle. The species occurs within the San Luis Valley, and the nearest quad-level occurrences are about 5 mi (8 km) southeast of the Los Mogotes East SEZ. According to the SWReGAP habitat suitability model, potentially suitable summer habitat for this species may occur on the SEZ, access road corridor, and within the area of indirect effects (Table 10.4.12.1-1). The availability of nest sites within the affected area has not been determined.

Western Burrowing Owl

The western burrowing owl occurs in open areas with sparse vegetation where it forages in grasslands, shrublands, open disturbed areas, and nests in burrows typically constructed by mammals. The species is known to occur in the San Luis Valley. According to the SWReGAP habitat suitability model, potentially suitable summer habitat for this species may occur in the SEZ, access road corridor, and in portions of the area of indirect effects (Table 10.4.12.1-1). The availability of nest sites (burrows) within the affected area has not been determined, but Gunnison's prairie dog burrows were observed on the SEZ during a site visit in July 2009, and shrubland habitat that may be suitable for either foraging or nesting occurs throughout the affected area.

Big Free-Tailed Bat

The big free-tailed bat is a year-round resident in the Los Mogotes East SEZ region where it forages in a variety of habitats, including coniferous forests and desert shrublands. The species roosts in rock crevices or in buildings. The species is known to occur in the San Luis Valley of southern Colorado. According to the SWReGAP habitat suitability model, potentially suitable foraging habitat for the big free-tailed bat occurs on the SEZ, access road corridor, and in portions of the area of indirect effects (Table 10.4.12.1-1). On the basis of an evaluation of SWReGAP land cover types, there is no potentially suitable roosting habitat (rocky cliffs and outcrops) in the area of direct effects. However, approximately 16 acres (<0.1 km^2) of rocky cliffs and outcrops within the area of indirect effects may be potentially suitable roosting habitat.

Pale Townsend's Big-Eared Bat

The pale Townsend's big-eared bat is widely distributed throughout the western United States. The species forages year-round in a wide variety of desert and non-desert habitats in the Los Mogotes East SEZ region. The species roosts in caves, mines, tunnels, buildings, and other man-made structures. Quad-level occurrences of this species intersect the affected area approximately 5 mi (8 km) east of the Los Mogotes East SEZ. According to the SWReGAP habitat suitability model, potentially suitable foraging habitat for the pale Townsend's big-eared bat occurs on the SEZ, access road corridor, and in portions of the area of indirect effects (Table 10.4.12.1-1). On the basis of an evaluation of SWReGAP land cover types, there is no potentially suitable roosting habitat (rocky cliffs and outcrops) in the area of direct effects. However, approximately 16 acres (<0.1 km^2) of rocky cliffs and outcrops within the area of indirect effects may be potentially suitable roosting habitat.

Spotted Bat

The spotted bat is a year-round resident in the Los Mogotes East SEZ region where it occurs in desert shrublands, grasslands, and mixed coniferous forests. The species roosts in caves, rock crevices, and buildings. This species is known to occur in Conejos County, Colorado.

According to the SWReGAP habitat suitability model, potentially suitable habitat for the spotted bat does not occur on the SEZ or within the access road corridor. However, potentially suitable habitat may occur in portions of the area of indirect effects (Table 10.4.12.1-1).

Yuma Myotis

The Yuma myotis is a year-round resident in the Los Mogotes East SEZ region where it occurs in canyonlands, mesas, and arid shrubland habitats. The species roosts in mines, rock crevices, and buildings. This species is known to occur in Conejos County, Colorado. According to the SWReGAP habitat suitability model, potentially suitable foraging habitat for the Yuma myotis occurs on the SEZ, access road corridor, and in portions of the area of indirect effects (Table 10.4.12.1-1). On the basis of an evaluation of SWReGAP land cover types, there is no potentially suitable roosting habitat (rocky cliffs and outcrops) in the area of direct effects. However, approximately 16 acres (<0.1 km^2) of rocky cliffs and outcrops within the area of indirect effects may be potentially suitable roosting habitat.

10.4.12.1.5 State-Listed Species

There are five species listed by the State of Colorado that may occur in the Los Mogotes East SEZ affected area (Table 10.4.12.1-1). Three species (southwestern willow flycatcher, western burrowing owl, and spotted bat) were discussed in Section 10.4.12.1.1 and Section 10.4.12.1.3 because of their status under the ESA and BLM. Other state-listed species that may occur in the Los Mogotes East SEZ affected area include the Rio Grande sucker and bald eagle. These two species as related to the SEZ are described in the remainder of this section and are presented in Table 10.4.12.1-1. Additional life history information for these species is provided in Appendix J.

Rio Grande Sucker

The Rio Grande sucker is restricted to streams of the Rio Grande Basin, from south-central Colorado to southern New Mexico. Nearest quad-level occurrences of this species are from the Alamosa River, approximately 15 mi (24 km) northwest of the Los Mogotes East SEZ. The species is not known to occur in the SEZ affected area and suitable habitat does not occur in the area of direct effects. However, potentially suitable habitat may occur in the area of indirect effects in the Alamos River, Conejos River, and La Jara Creek (Table 10.4.12.1-1).

Bald Eagle

The bald eagle is a year-round resident in the San Luis Valley where it is associated with riparian habitats of larger permanent water bodies such as lakes, rivers, and reservoirs. This species also occasionally forages in arid shrubland habitats. Quad-level occurrences of the bald eagle intersect the affected area approximately 5 mi (8 km) east of the Los Mogotes East SEZ.

According to the SWReGAP habitat suitability model, potentially suitable habitat for the bald eagle could occur on the SEZ, within the access road corridor, and throughout the area of indirect effects. Most of this potentially suitable habitat is potentially suitable foraging habitat (shrublands). On the basis of an evaluation of SWReGAP land cover types, potentially suitable nesting habitat (riparian woodlands) for the bald eagle does not occur on the SEZ or within the access road corridor; however, approximately 850 acres (3.5 km^2) of riparian woodlands that may be potentially suitable nesting habitat occur in the area of indirect effects.

10.4.12.1.6 Rare Species

There are 49 species that have a state status of S1 or S2 in Colorado or species of concern by the USFWS or Colorado that may occur in the affected area of the Los Mogotes East SEZ (Table 10.4.12.1-1). Of these species, 29 have not been discussed as ESA-listed (Section 10.4.12.1.1), candidates for listing under the ESA (Section 10.4.12.1.2), under review for ESA listing (Section 10.4.12.1.3), BLM-designated sensitive (Section 10.4.12.1.4), or state-listed (Section 10.4.12.1.5).

10.4.12.2 Impacts

The potential for impacts on special status species from utility-scale solar energy development within the proposed Los Mogotes 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 10.4.12.1 following the analysis approach described in Appendix M. It is assumed that, prior to development, surveys would be conducted to determine the presence of special status species and their habitats in and near areas where ground-disturbing activities would occur. Additional NEPA assessments, ESA consultations, and coordination with state natural resource agencies may be needed to address project-specific impacts more thoroughly. These assessments and consultations could result in additional required actions to avoid, minimize, or mitigate impacts on special status species (see Section 10.4.12.3).

Solar energy development within the Los Mogotes East SEZ could affect a variety of habitats (see Section 10.4.10). Based on CNHP records, occurrences for the following seven special status species intersect the Los Mogotes East SEZ affected area: rock-loving aletes, Rio Grande chub, bald eagle, ferruginous hawk, mountain plover, Gunnison's prairie dog, and pale Townsend's big-eared bat. Suitable habitat for each of these species may occur in the affected area. Other special status species may occur on the SEZ or within the affected area based on the presence of potentially suitable habitat. As discussed in Section 10.4.12.1, this approach to identifying the species that could occur in the affected area probably overestimates the number of species that actually occur in the affected area, and may therefore overestimate impacts on some special status species.

Potential direct and indirect impacts on special status species within the SEZ and in the area of indirect effect outside the SEZ are presented in Table 10.4.12.1-1. In addition, the overall potential magnitude of impacts on each species (assuming programmatic design features are in place) is presented along with any potential species-specific mitigation measures that could further reduce impacts.

Impacts on special status species could occur during all phases of development (construction, operation, and decommissioning and reclamation) of a utility-scale solar energy project within the SEZ. Construction and operation activities could result in short- or long-term impacts on individuals and their habitats, especially if these activities are sited in areas where special status species are known to or could occur. As presented in Section 10.4.1.2, a 3-mi (5-km) access road is needed to serve solar facilities within this SEZ. No new transmission lines are assumed to be needed due to the proximity of existing transmission infrastructure.

Direct impacts would result from habitat destruction or modification. It is assumed that direct impacts would occur only within the SEZ and within the assumed road corridor 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 facilities 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 programmatic 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 programmatic design features especially those engineering controls that would reduce runoff, sedimentation, spills, and fugitive dust.

10.4.12.2.1 Impacts on Species Listed under the ESA

In scoping comments on the proposed Los Mogotes East SEZ, the USFWS did not express concern for impacts of project development within the SEZ on any ESA-listed species (Stout 2009). However, on the basis of CNHP recorded occurrences and the presence of potentially suitable habitat, the southwestern willow flycatcher has the potential to occur in the affected area. The species has not been recorded on the SEZ or in the area of indirect effects, and, according to the SWReGAP habitat suitability model, suitable habitat does not occur on the SEZ or within the access road corridor. However, approximately 3,459 acres (14 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 0.8% of the available potentially suitable habitat in the SEZ region (Table 10.4.12.1-1).

The overall impact on the southwestern willow flycatcher from construction, operation, and decommissioning of utility-scale solar energy facilities within the Los Mogotes East SEZ is considered small because no potentially suitable habitat for this species occurs in the area of direct effects, and only indirect effects are possible. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

10.4.12.2.2 Impacts on Species That Are Candidates for Listing under the ESA

In scoping comments on the proposed Los Mogotes East SEZ, the USFWS did not express concern for impacts of project development within the SEZ to any species that are candidates for listing under the ESA (Stout 2009). However, on the basis of CNHP recorded occurrences and the presence of potentially suitable habitat, the Gunnison's prairie dog could occur in the affected area of the Los Mogotes East SEZ. Quad-level occurrences of this species are known to intersect the affected area of the SEZ, and Gunnison's prairie dog burrows were observed on the SEZ during a site visit in July 2009. According to the SWReGAP habitat suitability model, approximately 5,540 acres (22.5 km^2) of potentially suitable shrubland habitat on the SEZ and 3 acres (<0.1 km^2) of potentially suitable habitat within the assumed road corridor could be directly affected by construction and operations (Table 10.4.12.1-1). This direct impact area represents about 0.3% of available suitable habitat in the SEZ region. About 38,614 acres (156 km^2) of suitable habitat occurs in the area of potential indirect impacts; this area represents about 2.1% of the available suitable habitat in the SEZ region (Table 10.4.12.1-1).

The overall impact on the Gunnison's prairie dog from construction, operation, and decommissioning of utility-scale solar energy facilities within the Los Mogotes East SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents < 1% of potentially suitable habitat in the region. The implementation of programmatic design features may be sufficient to reduce indirect impacts on the Gunnison's prairie dog to negligible levels.

Avoidance of all potentially suitable habitats for the Gunnison's prairie dog is not a feasible means of mitigating impacts because these habitats (shrublands) are widespread throughout the area of direct effect. However, direct impacts could be reduced by avoiding or minimizing disturbance to occupied habitats in the area of direct effects. If avoidance or minimization is not a feasible option, individuals could be translocated from the area of direct effects to protected areas that would not be affected directly or indirectly by future development. Alternatively, or in combination with translocation, a compensatory mitigation plan could be developed and implemented to mitigate direct effects on occupied habitats. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that used one or more of these options could be designed to completely offset the impacts of development. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Development of mitigation for the Gunnison's prairie dog, including development of a survey protocol, avoidance and minimization measures, and, potentially, translocation or compensatory mitigation, should be developed in coordination with the USFWS per Section 7 of the ESA. Consultation with the CDOW should also occur to determine any state mitigation requirements.

10.4.12.2.3 Impacts on Species That Are under Review for Listing under the ESA

In scoping comments on the proposed Los Mogotes East SEZ, the USFWS did not express concern for impacts of project development within the SEZ on any species that are under review for listing under the ESA (Stout 2009). However, on the basis of CNHP recorded occurrences and the presence of potentially suitable habitat, the northern leopard frog has the potential to occur in the affected area and is known to occur in Conejos County, Colorado. According to the SWReGAP habitat suitability model, potentially suitable habitat for the northern leopard frog does not occur on the SEZ or within the access road corridor. However, about 400 acres (1.5 km^2) of suitable habitat occurs in the area of potential indirect effects; this area represents about 1.1% of the available suitable habitat in the region (Table 10.4.12.1-1).

The overall impact on the northern leopard frog from construction, operation, and decommissioning of utility-scale solar energy facilities within the Los Mogotes East SEZ is considered small because no potentially suitable habitat for this species occurs in the area of direct effects, and only indirect effects are possible. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

If deemed necessary, development of mitigation for the northern leopard frog, including development of a survey protocol, avoidance and minimization measures, and, potentially, translocation or compensatory mitigation, should be developed in coordination with the USFWS per Section 7 of the ESA. Consultation with the CDOW should also occur to determine any state mitigation requirements.

10.4.12.2.4 Impacts on BLM-Designated Sensitive Species

Of the 18 BLM-designated sensitive species that could occur in the affected area of the Los Mogotes East SEZ, there is 1 species (northern leopard frog) that was discussed in Section 10.4.12.1.3 because of its pending status under the ESA. Impacts on the remaining BLM-designated sensitive species that have potentially suitable habitat within the affected area are discussed below.

Brandegee's Milkvetch

The Brandegee's milkvetch is known to occur approximately 8 mi (13 km) southwest of the Los Mogotes East SEZ, and potentially suitable habitat occurs in the affected area. According to the SWReGAP land cover model, potentially suitable pinyon-juniper woodland and mesic meadow habitats do not occur on the SEZ. However, less than 1 acre (<0.1 km^2) of potentially suitable pinyon-juniper woodland habitat in the in the access road corridor could be directly affected by construction and operations (Table 10.4.12.1-1). This direct impact area represents less than 0.1% of available suitable habitat in the SEZ region. Approximately 1,389 acres (6 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents 0.2% of the available suitable habitat in the SEZ region (Table 10.4.12.1-1).

The overall impact on the Brandegee's milkvetch from construction, operation, and decommissioning of utility-scale solar energy facilities within the Los Mogotes East SEZ is considered small because less than 1% of potentially suitable habitat for this species occurs in the area of direct effects. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Avoiding or minimizing disturbance of all woodland habitat or occupied habitat in the area of direct effects could reduce direct 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.

Fragile Rockbrake

The fragile rockbrake is known to occur approximately 20 mi (32 km) west of the Los Mogotes East SEZ, and potentially suitable habitat occurs in the affected area. According to the SWReGAP land cover model, potentially suitable rocky cliffs and outcrops do not occur on the SEZ or within the access road corridor. However, approximately 16 acres (< 0.1 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents 0.1% of the available suitable habitat in the SEZ region (Table 10.4.12.1-1).

The overall impact on the fragile rockbrake from construction, operation, and decommissioning of utility-scale solar energy facilities within the Los Mogotes East SEZ is considered small because no potentially suitable habitat for this species occurs in the area of direct effects, and only indirect effects are possible. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Many-Stemmed Spider-Flower

The many-stemmed spider-flower is known to occur approximately 25 mi (40 km) northeast of the Los Mogotes East SEZ, and potentially suitable habitat occurs in the affected area. According to the SWReGAP land cover model, potentially suitable habitat does not occur on the SEZ or within the access road corridor. However, approximately 4 acres (< 0.1 km^2) of potentially suitable marsh habitat may occur in the area of indirect effects; this area represents 0.1% of the available suitable habitat in the SEZ region (Table 10.4.12.1-1).

The overall impact on the many-stemmed spider-flower from construction, operation, and decommissioning of utility-scale solar energy facilities within the Los Mogotes East SEZ is considered small because no potentially suitable habitat for this species occurs in the area of direct effects, and only indirect effects are possible. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Ripley's Milkvetch

The Ripley's milkvetch is known to occur approximately 9 mi (14 km) west of the Los Mogotes East SEZ, and potentially suitable habitat occurs in the affected area. According to the SWReGAP land cover model, potentially suitable habitat does not occur on the SEZ. However, less than 1 acre (<0.1 km^2) of potentially suitable pinyon-juniper woodland habitat in the access road corridor could be directly affected by construction and operations (Table 10.4.12.1-1). This direct impact area represents less than 0.1% of available suitable habitat in the SEZ region. Approximately 12 acres (< 0.1 km^2) of potentially suitable woodland habitat occurs in the area of indirect effects; this area represents less than 0.1% of the available suitable habitat in the SEZ region (Table 10.4.12.1-1).

The overall impact on the Ripley's milkvetch from construction, operation, and decommissioning of utility-scale solar energy facilities within the Los Mogotes East SEZ is considered small because less than 1% of potentially suitable habitat for this species occurs in the area of direct effects. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Avoidance or minimizing disturbance of all woodland habitat or occupied habitat in the area of direct effects could reduce direct impacts on this species. In addition, the implementation of mitigation measures described previously for the Brandegee's milkvetch could further reduce direct impacts on this species. 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.

Rock-Loving Aletes

The rock-loving aletes is known to occur approximately 5 mi (8 km) west of the Los Mogotes East SEZ, and potentially suitable habitat occurs in the affected area. According to the SWReGAP land cover model, potentially suitable habitat does not occur on the SEZ. However, less than 1 acre (<0.1 km^2) of potentially suitable pinyon-juniper woodland habitat in the access road corridor could be directly affected by construction and operations (Table 10.4.12.1-1). This direct impact area represents less than 0.1% of available suitable habitat in the SEZ region. Approximately 1,338 acres (5.5 km^2) of potentially suitable woodland habitat and rocky cliffs and outcrops occurs in the area of indirect effects; this area represents 0.4% of the available suitable habitat in the SEZ region (Table 10.4.12.1-1).

The overall impact on the rock-loving aletes from construction, operation, and decommissioning of utility-scale solar energy facilities within the Los Mogotes East SEZ is considered small because <1% of potentially suitable habitat for this species occurs in the area of direct effects. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Avoiding or minimizing disturbance of all woodland habitat or occupied habitat in the area of direct effects could reduce direct impacts on this species. In addition, the implementation of mitigation measures described previously for the Brandegee's milkvetch could further reduce direct impacts on this species. 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.

Great Basin Silverspot Butterfly

The Great Basin silverspot butterfly is known to occur approximately 9 mi (14 km) northwest of the Los Mogotes East SEZ, and potentially suitable habitat occurs in the affected area of the SEZ. According to the SWReGAP land cover model, potentially suitable habitat does not occur on the SEZ. However, less than 1 acre (<0.1 km^2) of potentially suitable mesic meadow habitat in the in the access road corridor could be directly affected by construction and operations (Table 10.4.12.1-1). This direct impact area represents less than 0.1% of available suitable habitat in the SEZ region. Approximately 2,165 acres (9 km^2) of potentially suitable mesic meadow and marsh habitat occurs in the area of indirect effects; this area represents 0.4% of the available suitable habitat in the SEZ region (Table 10.4.12.1-1).

The overall impact on the Great Basin silverspot butterfly from construction, operation, and decommissioning of utility-scale solar energy facilities within the Los Mogotes East SEZ is considered small because the amount of potentially suitable foraging 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 programmatic design features is expected to be sufficient to reduce indirect impacts on this species to negligible levels.

Avoiding or minimizing disturbance of all meadow habitat in the road corridor could reduce direct impacts on this species. If avoidance or minimization is not a feasible option, a compensatory mitigation plan could be developed and implemented to mitigate direct effects on occupied habitats. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that used one or 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.

Rio Grande Chub

The Rio Grande chub historically inhabited the Conejos River approximately 4 mi (6 km) south of the Los Mogotes East SEZ. The Rio Grande chub is considered extirpated from the main stem Rio Grande (USFS 2005), and suitable habitat for the species does not occur on the SEZ or within the access road corridor. However, approximately 19 mi (30 km) of potentially suitable habitat occurs within the area of indirect effects within the Alamosa River, Conejos River, and La Jara Creek; this habitat represents about 2.6% of the available suitable habitat in the SEZ region (Table 10.4.12.1-1).

The overall impact on the Rio Grande chub from construction, operation, and decommissioning of utility-scale solar energy facilities within the Los Mogotes East SEZ is considered small because no potentially suitable habitat for this species occurs in the area of direct effects, and only indirect effects are possible. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Milk Snake

The milk snake is known to occur in Conejos County, Colorado, although the species is not known to occur in the affected area of the Los Mogotes East SEZ. According to the SWReGAP habitat suitability model, potentially suitable habitat for this species is not expected to occur on the SEZ or within the access road corridor. However, approximately 685 acres (3 km^2) of suitable habitat occurs in the area of potential indirect effects; this area represents less than 0.1% of the available suitable habitat in the region (Table 10.4.12.1-1).

The overall impact on the milk snake from construction, operation, and decommissioning of utility-scale solar energy facilities within the Los Mogotes East SEZ is considered small because no potentially suitable habitat for this species occurs in the area of direct effects, and only indirect effects are possible. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

American Peregrine Falcon

The American peregrine falcon is a year-round resident in the Los Mogotes East SEZ region and is known to occur in the Rio Grande National Forest, approximately 17 mi (27 km) northwest of the SEZ. According to the SWReGAP habitat suitability model, suitable habitat for this species does not occur on the SEZ. However, approximately 13 acres (<0.1 km^2) of potentially suitable habitat in the access road corridor could be directly affected by construction and operations (Table 10.4.12.1-1). This direct impact area represents less than 0.1% of potentially suitable habitat in the SEZ region. About 47,723 acres (193 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 1.3% of the potentially suitable habitat in the SEZ region (Table 10.4.12.1-1). Most of this area could serve as foraging habitat (open shrublands). On the basis of an evaluation of SWReGAP land cover data, potentially suitable nest sites for this species (rocky cliffs and outcrops) do not occur on the access road corridor, but approximately 16 acres (<0.1 km^2) of this habitat may occur in the area of indirect effects.

The overall impact on the American peregrine falcon from construction, operation, and decommissioning of utility-scale solar energy facilities within the Los Mogotes 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 foraging habitat in the SEZ region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts on this species to negligible levels. Avoidance of impacts on all suitable foraging habitat is not a feasible way to mitigate impacts on the American peregrine falcon because potentially suitable shrubland is widespread throughout the area of direct effects and readily available in other portions of the affected area.

Barrow's Goldeneye

The Barrow's goldeneye is a winter resident within the San Luis Valley. According to CNHP, the species has not been recorded on the SEZ or in the area of indirect effects. According to the SWReGAP habitat suitability model, suitable habitat for this species does not occur on the SEZ or within the access road corridor. However, about 2,300 acres (9 km^2) of potentially suitable habitat occurs in the area of potential indirect effects; this area represents about 1.5% of the available suitable habitat in the SEZ region (Table 10.4.12.1-1).

The overall impact on the Barrow's goldeneye from construction, operation, and decommissioning of utility-scale solar energy facilities within the Los Mogotes East SEZ is considered small because no potentially suitable habitat for this species occurs in the area of direct effects, and only indirect effects are possible. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Ferruginous Hawk

The ferruginous hawk is a summer breeding resident in the affected area of the Los Mogotes East SEZ, but is a year-round resident in the region. The species is known to occur approximately 5 mi (8 km) west of the SEZ. According to the SWReGAP habitat suitability model, suitable habitat for this species does not occur on the SEZ. However, approximately 12 acres (<0.1 km^2) of potentially suitable habitat within the assumed access road corridor could be directly affected by construction and operations (Table 10.4.12.1-1). This direct impact area represents less than 0.1% of available suitable habitat in the SEZ region. About 43,448 acres (176 km^2) of potentially suitable habitat occurs in the area of potential indirect effects; this area represents about 3.1% of the available suitable habitat in the region (Table 10.4.12.1-1). Most of this area could serve as foraging habitat (i.e., open shrublands and grasslands). On the basis of an evaluation of SWReGAP land cover data, approximately 12 acres (<0.1 km^2) of woodland habitat within the access road corridor and 1,400 acres (6 km^2) of forested habitat within the area of indirect effects may be potentially suitable nesting habitat for the ferruginous hawk. In addition, approximately 16 acres (<0.1 km^2) of rocky cliffs and outcrops within the area of indirect effects may be potentially suitable nesting habitat.

The overall impact on the ferruginous hawk from construction, operation, and decommissioning of utility-scale solar energy facilities within the Los Mogotes East SEZ is considered small because the amount of potentially suitable foraging 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 programmatic design features is expected to be sufficient to reduce indirect impacts on this species to negligible levels.

Avoidance of direct impacts on all foraging habitat (shrublands) is not feasible because suitable foraging habitat (shrublands) is widespread in the area of direct effect and may be readily available in other portions of the affected area. However, avoiding or minimizing disturbance of all potential nesting habitat (woodlands) or occupied nests within the access road corridor is feasible and could reduce impacts. If avoiding or minimizing disturbance of all suitable nesting habitat or occupied habitat are not feasible options, 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 pre-disturbance surveys for the species and its habitat within the area of direct effects.

Mountain Plover

The mountain plover is a summer breeding resident in the Los Mogotes East SEZ region and is known to occur as near as 5 mi (8 km) southeast of the SEZ. According to the SWReGAP habitat suitability model, approximately 5,918 acres (24 km^2) of potentially suitable habitat on the SEZ and 16 acres (<0.1 km^2) of potentially suitable habitat within the assumed access road corridor could be directly affected by construction and operations (Table 10.4.12.1-1). This direct impact area represents 0.4% of available suitable habitat in the SEZ region. About 82,764 acres (335 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 6.2% of the available suitable habitat in the region (Table 10.4.12.1-1). Most of this area could serve as foraging or nesting habitat. The abundance of suitable nest sites on the SEZ and throughout the affected area has not been determined.

The overall impact on the mountain plover from construction, operation, and decommissioning of utility-scale solar energy facilities within the Los Mogotes 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 programmatic design features is expected to be sufficient to reduce indirect impacts on this species to negligible levels.

Avoidance of all potentially suitable foraging and nesting habitats is not feasible because potentially suitable habitats are widespread throughout the area of direct effect and may be readily available in other portions of the SEZ region. Direct impacts on the mountain plover could be reduced by avoiding or minimizing disturbance to occupied nests and suitable habitat in the area of direct effects. If avoiding or minimizing disturbance of all occupied habitat are not feasible options, 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 pre-disturbance surveys for the species and its habitat within the area of direct effects.

Western Burrowing Owl

The western burrowing owl is a summer breeding resident within the Los Mogotes East SEZ region and is known to occur in Conejos County, Colorado. According to the SWReGAP habitat suitability model, approximately 5,918 acres (24 km^2) of potentially suitable habitat on the SEZ and 16 acres (<0.1 km^2) of potentially suitable habitat in the access road corridor could be directly affected by construction and operations (Table 10.4.12.1-1). This direct impact area represents about 0.3% of potentially suitable habitat in the SEZ region. About 83,900 acres (340 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 4.1% of the potentially suitable habitat in the SEZ region (Table 10.4.12.1-1). 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 Los Mogotes East SEZ is considered small because the amount of potentially suitable foraging and nesting habitat for this species in the area of direct effects represents less than 1% of potentially suitable foraging and nesting habitat in the region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts on this species to negligible levels.

Avoidance of all potentially suitable habitats is not feasible to mitigate impacts on the western burrowing owl because potentially suitable shrubland habitats are widespread throughout the area of direct effect and may be 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 avoiding or minimizing disturbance of all occupied habitat are not feasible options, a compensatory mitigation plan could be developed and implemented to mitigate direct effects. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that used one or both of these options could be designed to completely offset the impacts of development. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance for the species and its habitat within the area of direct effects.

Big Free-Tailed Bat

The big free-tailed bat is a year-round resident within the Los Mogotes East SEZ region and is known to occur in the San Luis Valley. According to the SWReGAP habitat suitability model, approximately 5,918 acres (24 km^2) of potentially suitable foraging habitat on the SEZ and 16 acres (<0.1 km^2) of potentially suitable foraging habitat within the assumed access road corridor could be directly affected by construction and operations (Table 10.4.12.1-1). This direct impact area represents about 0.2% of available suitable foraging habitat in the SEZ region. About 84,845 acres (343 km^2) of potentially suitable foraging habitat occurs in the area of potential indirect impacts; this area represents about 3.2% of the available suitable habitat in the SEZ region (Table 10.4.12.1-1). Most of the potentially suitable habitat in the affected area is foraging habitat represented by desert shrubland. On the basis of an evaluation of SWReGAP land cover types, there is no potentially suitable roosting habitat (rocky cliffs and outcrops) in the area of direct effects; approximately 16 acres (<0.1 km^2) of cliffs and rock outcrops that might be potentially suitable roost habitat occurs in the area of indirect effects.

The overall impact on the big free-tailed bat from construction, operation, and decommissioning of utility-scale solar energy facilities within the Los Mogotes East SEZ is considered small because the amount of potentially suitable foraging 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 programmatic 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.

Pale Townsend's Big-Eared Bat

The pale Townsend's big-eared bat is a year-round resident within the Los Mogotes East SEZ region and is known to occur approximately 5 mi (8 km) east of the SEZ. According to the SWReGAP habitat suitability model, approximately 5,918 acres (24 km^2) of potentially suitable foraging habitat on the SEZ and 16 acres (<0.1 km^2) of potentially suitable foraging habitat within the assumed access road corridor could be directly affected by construction and operations (Table 10.4.12.1-1). This direct impact area represents about 0.2% of available suitable foraging habitat in the SEZ region. About 85,742 acres (347 km^2) of potentially suitable foraging habitat occurs in the area of potential indirect impacts; this area represents about 3.2% of the available potentially suitable foraging habitat in the SEZ region (Table 10.4.12.1-1). Most of the potentially suitable habitat in the affected area is foraging habitat represented by desert shrubland. On the basis of an evaluation of SWReGAP land cover types, there is no potentially suitable roosting habitat (rocky cliffs and outcrops) in the area of direct effects; approximately 16 acres (<0.1 km^2) of cliffs and rock outcrops that might be potentially suitable roost habitat occurs in the area of indirect effects.

The overall impact on the pale Townsend's big-eared bat from construction, operation, and decommissioning of utility-scale solar energy facilities within the Los Mogotes East SEZ is considered small because the amount of potentially suitable foraging 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 programmatic 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.

Spotted Bat

The spotted bat is a year-round resident within the Los Mogotes East SEZ region and is known to occur in Conejos County, Colorado. According to the SWReGAP habitat suitability model, suitable habitat for this species does not occur on the SEZ or within the access road corridor. However, about 1,162 acres (5 km^2) of potentially suitable habitat occurs in the area of potential indirect effect; this area represents about 0.1% of the available suitable habitat in the SEZ region (Table 10.4.12.1-1). Most of the potentially suitable habitat in the affected area is foraging habitat represented by desert shrubland. On the basis of an evaluation of SWReGAP land cover types, approximately 16 acres (<0.1 km^2) of cliffs and rock outcrops that might be potentially suitable roost habitat occurs in the area of indirect effects.

The overall impact on the spotted bat from construction, operation, and decommissioning of utility-scale solar energy facilities within the Los Mogotes East SEZ is considered small because no potentially suitable habitat for this species occurs in the area of direct effects, and only indirect effects are possible. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Yuma Myotis

The Yuma myotis is a year-round resident within the Los Mogotes East SEZ region and is known to occur in Conejos County, Colorado. According to the SWReGAP habitat suitability model, approximately 5,871 acres (23.8 km^2) of potentially suitable foraging habitat on the SEZ and 4 acres (<0.1 km^2) of potentially suitable foraging habitat within the assumed access road corridor could be directly affected by construction and operations (Table 10.4.12.1-1). This direct impact area represents about 0.3% of available suitable foraging habitat in the SEZ region. About 44,809 acres (181 km^2) of potentially suitable habitat occurs in the area of indirect impacts; this area represents about 2.0% of the available potentially suitable foraging habitat in the SEZ region (Table 10.4.12.1-1). Most of the potentially suitable habitat in the affected area is foraging habitat represented by desert shrubland. On the basis of an evaluation of SWReGAP land cover types, there is no potentially suitable roosting habitat (rocky cliffs and outcrops) in the area of direct effects; approximately 16 acres (<0.1 km^2) of cliffs and rock outcrops that might be potentially suitable roost habitat occurs in the area of indirect effects.

The overall impact on the Yuma myotis from construction, operation, and decommissioning of utility-scale solar energy facilities within the Los Mogotes East SEZ is considered small because the amount of potentially suitable foraging 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 programmatic 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.

10.4.12.2.5 Impacts on State-Listed Species

There are five state-listed species that could occur in the affected area of the Los Mogotes East SEZ; three of these species (southwestern willow flycatcher, western burrowing owl, and spotted bat) were discussed in Section 10.4.12.2.1 and Section 10.4.12.2.3 because of their status under the ESA and BLM. Of the remaining state-listed species, the Rio Grande sucker and bald eagle may occur in the affected area due to the presence of suitable habitat. Impacts on these species from solar development within the Los Mogotes East SEZ are discussed below.

Rio Grande Sucker

The Rio Grande sucker is restricted to streams in the Rio Grande Basin and is known to occur in the Alamosa River, approximately 15 mi (24 km) northwest of the Los Mogotes East SEZ. Suitable habitat for this species does not occur on the SEZ or within the access road corridor. However, approximately 19 mi (30 km) of potentially suitable habitat occurs within the area of indirect effects within the Alamosa River, Conejos River, and La Jara Creek; this habitat represents about 2.2% of the available suitable habitat in the region (Table 10.4.12.1-1).

The overall impact on the Rio Grande sucker from construction, operation, and decommissioning of utility-scale solar energy facilities within the Los Mogotes East SEZ is considered small because no potentially suitable habitat for this species occurs in the area of direct effects, and only indirect effects are possible. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Bald Eagle

The bald eagle is a year-round resident within the Los Mogotes East SEZ region and is known to occur approximately 5 mi (8 km) east of the SEZ. According to the SWReGAP habitat suitability model, approximately 5,358 acres (22 km^2) of potentially suitable habitat on the SEZ and 16 acres (<0.1 km^2) of potentially suitable habitat within the assumed access road corridor could be directly affected by construction and operations (Table 10.4.12.1-1). This direct impact area represents 0.3% of available suitable habitat in the SEZ region. About 69,426 acres (281 km^2) of potentially suitable habitat occurs in the area of potential indirect effect; this area represents about 4.2% of the available suitable habitat in the SEZ region (Table 10.4.12.1-1). Most of the potentially suitable habitat in the affected area is foraging habitat represented by desert shrubland. On the basis of an evaluation of SWReGAP land cover types, riparian woodland habitats that could provide nesting sites do not occur within the area of direct effects;

however, approximately 850 acres (3.5 km^2) of riparian woodlands that may be potentially suitable nesting habitat occur in the area of indirect effects.

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

The overall impact on the bald eagle from construction, operation, and decommissioning of utility-scale solar energy facilities within the Los Mogotes 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 foraging habitat in the SEZ region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts on this species to negligible levels. Avoidance of impacts on suitable foraging habitat is not a feasible way to mitigate impacts on the bald eagle because potentially suitable foraging habitat (shrubland) is widespread throughout the area of direct effects and readily available in other portions of the SEZ region.

10.4.12.2.6 Impacts on Rare Species

There are 49 species with a state status of S1 or S2 in the state of Colorado or species of concern by Colorado or the USFWS that may occur in the affected area of the Los Mogotes East SEZ. Impacts have been previously discussed for 20 of these species that are also listed under the ESA (Section 10.4.12.2.1), candidates for listing under the ESA (Section 10.4.12.2.2), under review for ESA listing (Section 10.4.12.2.3) BLM-designated sensitive (Section 10.4.12.2.4), or state-listed species (Section 10.4.12.2.5). Impacts on the remaining 29 rare species that do not have any other special status designation are presented in Table 10.4.12.1-1.

10.4.12.3 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 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 and access road corridor to determine the presence and abundance of special status species, including those identified in Table 10.4.12.1-1; disturbance to occupied habitats for these species should be avoided or minimized to the extent practicable. If avoiding or minimizing impacts to occupied habitats is not possible, translocation of individuals from areas of direct effect (where appropriate); or compensatory mitigation of direct effects on occupied habitats could reduce impacts. A comprehensive mitigation strategy for special status species that used one or more of these options to offset the impacts of development should be developed in coordination with the appropriate federal and state agencies.

- Avoiding or minimizing impacts on grassland habitat in the area of direct effects could reduce impacts on the grassy slope sedge, least moonwort, northern moonwort, Philadelphia fleabane, prairie violet, Rocky Mountain blazing-star, western moonwort, mountain plover, and short-eared owl.

- Avoiding or minimizing impacts on marshes and mesic meadows in the area of direct effects could reduce impacts on the Brandegee's milkvetch, Colorado larkspur, least moonwort, leathery grape fern, marsh cinquefoil, Mingan's moonwort, mountain whitlow-grass, Philadelphia fleabane, rock sandwort, Rocky Mountain blazing-star, slender sedge, variegated scouringrush, and Great Basin silverspot butterfly.

- Avoiding or minimizing impacts on woodland habitat in the area of direct effects could reduce impacts on the Brandegee's milkvetch, Colorado larkspur, Gray's Townsend-daisy, James' cat's-eye, mountain whitlow-grass, northern moonwort, Philadelphia fleabane, prairie violet, Ripley's milkvetch, rock-loving aletes, Rocky Mountain blazing-star, and ferruginous hawk.

- Coordination with the USFWS and CDOW should be conducted to address the potential for impacts on the Gunnison's prairie dog and northern leopard frog—species that are either candidate or under review for listing under the ESA. Coordination would identify an appropriate survey protocol, avoidance measures, and, potentially, translocation or compensatory mitigation.

- Harassment or disturbance of federally listed species, candidates for federal listing, BLM-designated sensitive species, state-listed species, rare 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 USFWS and CDOW.

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

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10.4.13 Air Quality and Climate

10.4.13.1 Affected Environment

10.4.13.1.1 Climate

The proposed Los Mogotes East SEZ is located near central portion of the Conejos County in the south-central Colorado. The SEZ, with an average elevation of about 7,860 ft (2,396 m), is located in the southern part of the San Luis Valley in south-central Colorado. The valley lies in a broad depression between the Sangre de Cristo Mountain Range to the east and the San Juan and La Garita Mountain Range to the west; they converge to the north. As a result of these barriers, the valley experiences an arid climate, which is marked by cold winters and moderate summers, light precipitation, a high rate of evaporation, and abundant sunshine due to the thin atmosphere of its high elevation (NCDC 2009a). Meteorological data collected at the San Luis Valley Regional Airport and Manassa, which are about 17 mi (27 km) north–northeast and 5 mi (8 km) east of the Los Mogotes East SEZ, respectively, are summarized below.

A wind rose from the San Luis Valley Regional Airport in Alamosa, Colorado, for the 5-year period 2004 to 2008 taken at a level of 33 ft (10 m) is presented in Figure 10.4.13.1-1 (NCDC 2009b). During this period, the annual average wind speed at the airport was about 7.4 mph (3.3 m/s), with a relatively weak prevailing wind direction from the southwest (about 7.9% of the time). Winds that ranged from south to west–southwest accounted for about 30.5% of the time and occurred more frequently throughout the year, except in July and August when east-southeast winds prevailed. Wind speeds categorized as calm (less than 1.1 mph [0.5 m/s]) occurred frequently (about one-fifth of the time) because of the stable conditions caused by strong radiative cooling from late night to sunrise. Average wind speeds were highest in spring at 9.6 mph (4.3 m/s); lower in summer and fall at 7.4 mph (3.3 m/s) and 6.7 mph (3.0 m/s), respectively; and lowest in winter at 6.1 mph (2.7 m/s).

In Colorado, topography plays a large role in determining the temperature of any specific location (NCDC 2009c). The San Luis Valley sits at a higher elevation, so temperatures there are lower than at lower elevations of comparable latitude. For the 1893 to 2009 period, the annual average temperature at Manassa was 42.5°F (5.8°C) (WRCC 2009). January was the coldest month, with an average minimum temperature of 2.0°F (–16.7°C), and July was the warmest month with an average maximum of 80.4°F (26.9°C). In summer, daytime maximum temperatures higher than 90°F (32.2°C) were infrequent, and minimums were in the low 40s. On most days of colder months (November through March), the minimum temperatures recorded were below freezing (≤32°F [0°C]); subzero temperatures also were common in January and December. During the same period, the highest temperature, 95°F (35.0°C), was reached in August 1919, and the lowest, –37°F (–38.3°C) was reached in January 1948. Each year, less than 1 day had a maximum temperature of ≥90°F (32.2°C), while about 213 days had minimum temperatures at or below freezing.

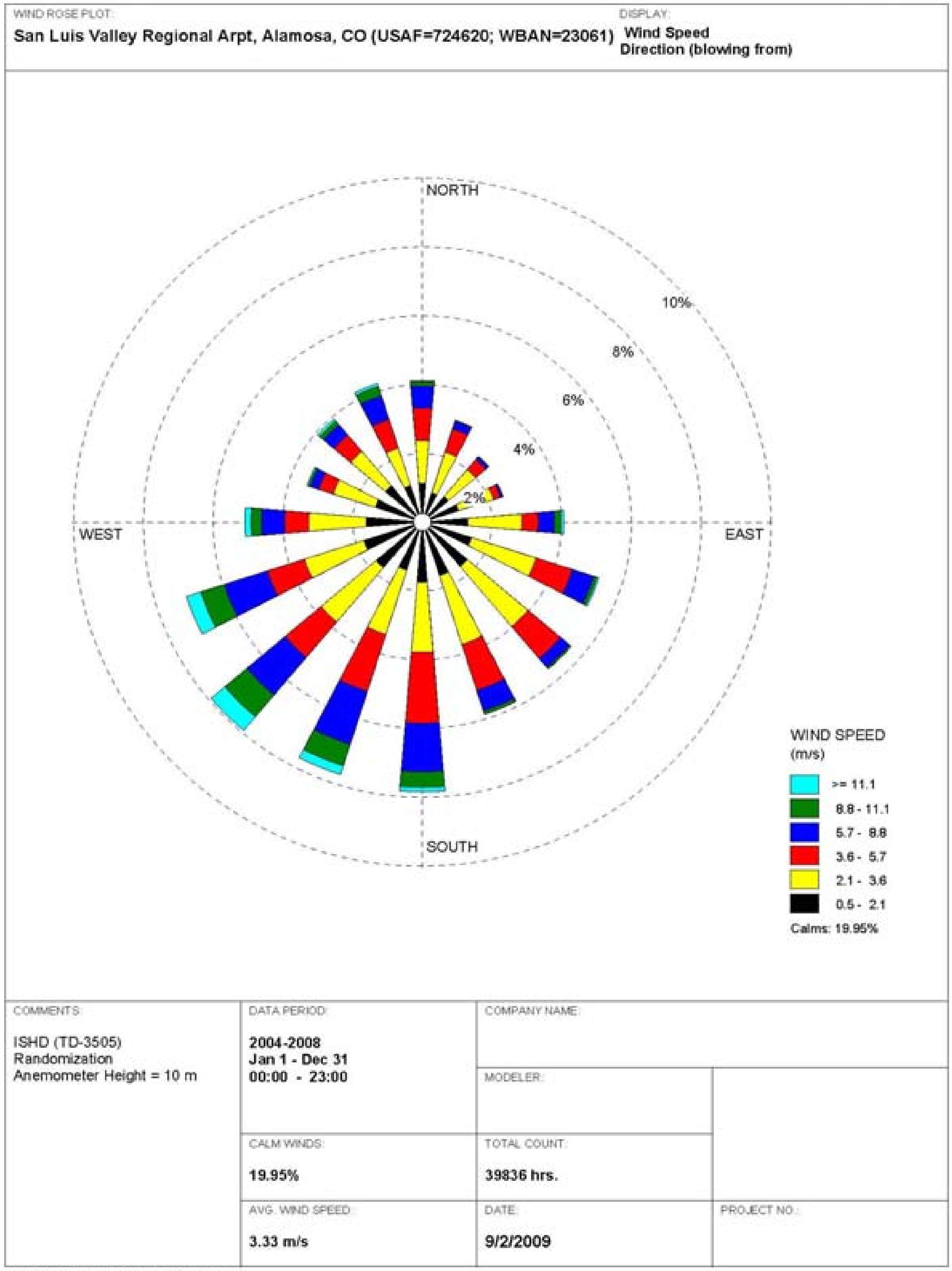

FIGURE 10.4.13.1-1 Wind Rose at 33-ft (10-m) Height at San Luis Valley Regional Airport, Alamosa, Colorado, 2004–2008 (Source: NCDC 2009b)

In Colorado, precipitation patterns are largely controlled by mountain ranges and elevation (NCDC 2009c). Because the San Luis Valley is so far from major sources of moisture and is surrounded by mountain ranges, precipitation is relatively light there. The valley is the driest area in Colorado. For the 1893 to 2009 period, annual precipitation at Manassa averaged about 7.30 in. (18.5 cm) (WRCC 2009). On average, 47 days a year have measurable precipitation (0.01 in. [0.025 cm] or higher). Nearly half of the annual precipitation occurs during summer months when the Southwest Monsoon is most active (NCDC 2009c). Most of it is in the form of scattered, light showers and thunderstorms that develop over the mountains and move into the valley from the southwest. Scattered afternoon thunderstorms can accompany locally heavy rain and occasional hail. Snow occurs mainly in light falls that start as early as September and continue as late as May; most of the snow falls from November through March. The annual average snowfall at Manassa is about 24.6 in. (62.5 cm).

Because the San Luis Valley is so far from major water bodies and because surrounding mountain ranges block air masses from penetrating into the area, severe weather events, such as tornoadoes, are a rarity there (NCDC 2010).

In 1994, one flash flood, which occurred near Manassa, was reported in Conejos County (NCDC 2010); this flash flood did cause minor property damage.

In Conejos County, seven hailstorms in total have been reported since 1961, none of which caused property or crop damage (NCDC 2010). Hail measuring 1.75 in. (4.4 cm) in diameter was reported in 1961. In Conejos County, no high-wind or thunderstorm-wind events have been reported (NCDC 2010). However, considering that these wind events have been reported in Alamosa and Saguache Counties in San Luis Valley, there is a possibility that these winds could occur in Conejos County as well.

No dust storm was reported in Conejos County (NCDC 2010). However, the ground surface of the SEZ is covered predominantly with very stony and cobbly loams, which have relatively low-to-moderate dust storm potential. High winds can trigger large amounts of blowing dust in areas of Conejos County with dry and loose soils with sparse vegetation. Dust storms can deteriorate air quality and visibility and may have adverse effects on health, particularly for people with asthma or other respiratory problems.

Infrequently, remnants from a decayed Pacific hurricane may dump heavy, widespread rains in Colorado (NCDC 2009c). Tornadoes in Conejos County, which encompasses the proposed Los Mogotes East SEZ, occur infrequently. In the period 1950 to June 2010, a total of four tornadoes (0.1 per year) were reported in Conejos County (NCDC 2010). However, most tornadoes occurring in Conejos County were relatively weak (i.e., three were F0 and one was F2 on the Fujita tornado scale), one of which caused minor property damage. These tornadoes occurred near the SEZ, ranging from 4 mi (6 km) to 10 mi (16 km) from the SEZ.

10.4.13.1.2 Existing Air Emissions

Conejos County has only a few industrial emission sources, and the amount of their emissions is relatively low. Because of the sparse population, only a handful of major roads, such as U.S. 285, and several state routes exist in Conejos County. Thus, onroad mobile source emissions are not substantial. Data on annual emissions of criteria pollutants and VOCs in Conejos County, which encompasses the proposed Los Mogotes East SEZ, are presented in Table 10.4.13.1-1 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, fire sources (mostly wildfires) were predominant contributors to all criteria pollutants and accounted for about one-third of VOC emissions. Biogenic sources (i.e., vegetation—including trees, plants, and crops—soils) that releases naturally occurring emissions accounted for about two-thirds of VOC emissions. Area sources accounted for the rest of county emissions of PM_{10} and $PM_{2.5}$, and onroad and nonroad sources were primary contributors to the remainder of the SO_2, NO_x, and CO emissions. In Conejos County, point sources were minor contributors to criteria pollutants and VOCs.

TABLE 10.4.13.1-1 Annual Emissions of Criteria Pollutants and VOCs in Conejos County, Colorado, Encompassing the Proposed Los Mogotes East SEZ, 2002[a]

Pollutant[b]	Emissions (tons/yr)
SO_2	928
NO_x	4,073
CO	160,018
VOCs	21,966
PM_{10}	16,041
$PM_{2.5}$	13,126

[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 VOCs = volatile organic compounds.

Source: WRAP (2009).

In 2005, Colorado produced about 118 MMt of *gross*[6] carbon dioxide equivalent (CO_2e)[7] emissions (Strait et al. 2007). Gross GHG emissions in Colorado increased by about 35% from 1990 to 2005, which was twice as fast as the national rate (about 16%). In 2005, electricity use (36.4%) and transportation (23.8%) were the primary contributors to gross GHG emission sources in Colorado. Fossil fuel use (in the residential, commercial, and nonfossil industrial sectors) and fossil fuel production accounted for about 18% and 8.6%, respectively, of total state emissions. Colorado's *net* emissions were about 83.9 MMt CO_2e, considering carbon sinks from forestry activities and agricultural soils throughout the state. The EPA (2009a) also estimated that in 2005, CO_2 emissions from fossil fuel combustion were 94.34 MMt, which was comparable to the state's estimate. The electric power generation (43%) and transportation (31%) sectors accounted for about three-fourths of the CO_2 total, and the residential, commercial, and industrial sectors accounted for the remainder.

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

[7] 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.

10.4.13.1.3 Air Quality

Colorado State Ambient Air Quality Standards (SAAQS) include six criteria pollutants: SO_2, NO_2, CO, O_3, PM_{10}, and Pb (5 *Code of Colorado Regulations* 1001-14, CDPHE 2008). The Colorado SAAQS are identical to the National Ambient Air Quality Standards (NAAQS) for annual NO_2, CO, 1-hour O_3, and 24-hour PM_{10} (EPA 2010), but Colorado has no standards for 1-hour, 24-hour, and annual SO_2, 1-hour NO_2, 8-hour O_3, $PM_{2.5}$, and calendar-quarter and rolling 3-month Pb. Colorado has more stringent standards than the NAAQS for 3-hour SO_2 and 1-month Pb, and it still maintains an annual average PM_{10} standard, for which the national standard was revoked by the EPA on December 18, 2006. The NAAQS/SAAQS for criteria pollutants are presented in Table 10.4.13.1-2.

Conejos County, which encompasses the proposed Los Mogotes East SEZ, is located administratively within the San Luis Intrastate AQCR (Title 40, Part 81, Section 176 of the *Code of Federal Regulations* [40 CFR 81.176]), which is exactly the same as Colorado State AQCR 8, along with other counties in and around the San Luis Valley, such as Alamosa, Costilla, Mineral, Rio Grande, and Saguache Counties. Currently, Colorado State AQCR 8 is designated as being in unclassifiable/attainment for all criteria pollutants (40 CFR 81.306).

Because of the low population density, low level of industrial activities (except for agriculture-related activities), and low traffic volume, the quantity of anthropogenic emissions in the San Luis Valley is small, and thus ambient air quality is relatively good. The only air quality concern in the valley is particulates (primarily related to woodstoves, unpaved roads, and street sanding). Controlled and uncontrolled burns are a significant source of air pollution in the valley as well. Seasonal high winds and dry soil conditions in the valley result in blowing dust storms. High PM_{10} concentrations in Alamosa have been monitored during these unusual natural events since 1988; they peaked at 494 and 473 $\mu g/m^3$ in 2007, 424 $\mu g/m^3$ in 2006, and 412 $\mu g/m^3$ in 1991 (CDPHE 2008).

Except for data on PM_{10} and $PM_{2.5}$, there are no recent measurement data for air pollutants in the San Luis Valley. Background concentrations representative of the San Luis Valley presented in Table 10.4.13.1-2 are based on intermittent monitoring studies and routine monitoring data (Chick 2009; EPA 2009b). Except for Pb,[8] these values are conservative indicators of ambient concentrations that were developed for the CDPHE's internal use in initial screening models for permit applications.

The PSD regulations (40 CFR 52.21), which are designed to limit the growth of air pollution in clean areas, apply to a major new or modification of an existing major source within an attainment or unclassified area (see Section 4.11.2.3). As a matter of policy, the 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 Class I area. There are several Class I areas

[8] As a direct result of the phaseout of leaded gasoline in automobiles in the 1970s, average Pb concentrations throughout the country have decreased dramatically. Accordingly, Pb is not an air quality concern except at certain locations, such as lead smelters, waste incinerators, and lead-acid battery facilities, where the highest levels of lead in air are found.

TABLE 10.4.13.1-2 Applicable Ambient Air Quality Standards and Background Concentration Levels Representative of the Proposed Los Mogotes East SEZ in Conejos County, Colorado

			Background Concentration Level	
Pollutant[a]	Averaging Time	NAAQS/ SAAQS[b]	Concentration[c,d]	Measurement Location, Year
SO_2	1-hour	75 ppb[e]	NA[f]	NA
	3-hour	0.5 ppm[g,h]	0.009 ppm (1.8%)	Golden Energy at Portland, 2005–2006
	24-hour	0.14 ppm[g]	0.002 ppm (1.4%)	
	Annual	0.030 ppm[g]	0.001 ppm (3.3%)	
NO_2	1-hour	100 ppb[i]	NA	NA
	Annual	0.053 ppm	0.006 ppm (11%)	Southern Ute Site, 7571 Highway 550, 2003–2006
CO	1-hour	35 ppm	1 ppm (2.9%)	Southern Ute Site, 1 mi northeast of Ignacio on County Road 517, 2005–2006
	8-hour	9 ppm	1 ppm (11%)	
O_3	1-hour	0.12 ppm[j]	NA	NA
	8-hour	0.075 ppm	0.063 ppm (84%)	Southern Ute Site, 7571 Highway 550, 2004–2006
PM_{10}	24-hour	150 $\mu g/m^3$	27 $\mu g/m^3$ (18%)	Battle Mountain Gold Mine, San Luis, West Site, 1991
	Annual	50 $\mu g/m^3$ [k]	13 $\mu g/m^3$ (26%)	
$PM_{2.5}$	24-hour	35 $\mu g/m^3$	16 $\mu g/m^3$ (46%)	Great Sand Dunes, 1998–2002
	Annual	15.0 $\mu g/m^3$	4 $\mu g/m^3$ (27%)	
Pb[l]	Calendar quarter	1.5 $\mu g/m^3$	0.02 $\mu g/m^3$ (1.3%)	Pueblo, 2002
	Rolling 3-month	0.15 $\mu g/m^3$ [m]	NA	NA

[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] NAAQS/SAAQS for annual NO_2, CO, 1-hour O_3, and 24-hour PM_{10}; NAAQS for SO_2, 1-hour NO_2, 8-hour O_3, $PM_{2.5}$, and Pb; and SAAQS for annual PM_{10}.

[c] 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 arithmetic mean for annual SO_2, NO_2, PM_{10}, and $PM_{2.5}$. These values, except for Pb, are conservative indicators of ambient concentrations developed for internal use by CDPHE in initial screening models for permit application.

[d] Values in parentheses are background concentration levels as a percentage of NAAQS/SAAQS. 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 are available.

[e] Effective August 23, 2010.

[f] NA = not applicable or not available.

Footnotes continued on next page.

TABLE 10.4.13.1-2 (Cont.)

[g] Colorado has also established increments limiting the allowable increase ambient concentrations over an established baseline.

[h] Colorado state standard for 3-hour SO_2 is 700 μg/m^3 (0.267 ppm).

[i] Effective April 12, 2010.

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

[k] Effective December 18, 2006, the EPA revoked the annual PM_{10} standard of 50 μg/m^3.

[l] The Colorado Pb standard is 1-month average of 1.5 μg/m^3.

[m] Effective January 12, 2009.

Sources: CDPHE (2008); Chick (2009); EPA (2009b, 2010); 5 *Code of Colorado Regulations* 1001-14.

around the Los Mogotes East SEZ, four of which are situated within the 62-mi (100-km) range. The nearest Class I area is the Great Sand Dunes WA, about 35 mi (57 km) north-northeast of the Los Mogotes East SEZ (40 CFR 81.406). This Class I area is located downwind of prevailing winds at the Los Mogotes East SEZ (see Figure 10.4.13.1-1). The other two Class I areas in Colorado are the Weminuche and La Garita WA, which is about 44 mi (71 km) west–northwest and 55 mi (89 km) northwest of the Los Mogotes East SEZ. The Wheeler Peak WA in New Mexico is located about 50 mi (80 km) southeast of the SEZ (40 CFR 81.421). These three Class I areas are not located downwind of the prevailing winds at the Los Mogotes East SEZ.

10.4.13.2 Impacts

Potential impacts on ambient air quality associated with a solar project would be of most concern during the construction phase. Assuming application of extensive fugitive dust control measures and soil conservation mitigations, including adherence to vegetation management plans, impacts of fugitive dust emissions from soil disturbances on ambient air quality are anticipated, although they are expected to be of short duration. During the operation phase, only a few emission sources with generally low-level emissions would exist for the four types of solar technologies evaluated. A solar facility would either not burn any fossil fuels or burn only small amounts during operation. (For facilities using 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–powered 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 Los Mogotes 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 10.4.13.3, below, identifies SEZ-specific design features of particular relevance to the Los Mogotes East SEZ.

10.4.13.2.1 Construction

The terrain at Los Mogotes East SEZ is relatively flat, thus only a minimum amount 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 large areas would be disturbed in a region that has problems with windblown dust. 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 2009c). Details for emissions estimation, the description of AERMOD, input data processing procedures, and modeling assumption are described in Section M.13 of Appendix M. Estimated air concentrations were compared with the applicable NAAQS/SAAQS levels at the site boundaries and nearby communities and with PSD increment levels at nearby Class I areas.[9] For the Los Mogotes 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 eastern half of the SEZ, close to the nearest residence and the towns of Romeo and Manassa,

- Surface hourly meteorological data from the San Luis Valley Regional Airport in Alamosa and upper air sounding data from Denver for the 2004 to 2008 period,

- 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 and at the nearest Class I area—Geat Sand Dunes WA.

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

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 10.4.13.2-1. Maximum 24-hour PM_{10} concentration increments modeled at the site boundaries would be about 477 μg/m^3, which far exceeds the relevant standard level of 150 μg/m^3. Total 24-hour PM_{10} concentrations of 504 μg/m^3 would also exceed the standard level, by more than a factor of 3, at the SEZ boundary. 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 would be about 200 μg/m^3 at the nearest residence about 0.4 mi (0.6 km) east of the SEZ's southeastern corner; about 40 μg/m^3 at Antonito, Conejos, and Romeo; about 30 μg/m^3 at La Jara and Manassa; and about 20 μg/m^3 at Estrella, Sanford, and San Antonio. Annual modeled and total PM_{10} concentration increments at the SEZ boundary would be about 95.6 μg/m^3 and 109 μg/m^3, respectively, which are higher than the standard level of 50 μg/m^3. Annual PM_{10} increments would be much lower for the mentioned locations, about 15 μg/m^3 at the nearest residence, about 2.5 μg/m^3 at Romeo, about 1.5 μg/m^3 at Manassa, and about 1 μg/m^3 at Antonito, Conejos, La Jara, and Sanford. Total 24-hour $PM_{2.5}$ concentrations would be 49.4 μg/m^3 at the SEZ boundary, which is about 141% of its standard level of 35 μg/m^3; these modeled concentrations are about two times background concentrations. The total annual average $PM_{2.5}$ concentration at the SEZ boundary would be 13.6 μg/m^3, which is below the standard level of 15.0 μg/m^3. At the nearest residence, predicted maximum 24-hour and annual $PM_{2.5}$ concentration increments would be about 10 and 1.5 μg/m^3, respectively.

TABLE 10.4.13.2-1 Maximum Air Quality Impacts from Emissions Associated with Construction Activities for the Proposed Los Mogotes East SEZ

			Concentration (μg/m^3)				Percentage of NAAQS/SAAQS	
Pollutant[a]	Averaging Time	Rank[b]	Maximum Increment[b]	Background	Total	NAAQS/ SAAQS	Increment	Total
PM_{10}	24 hours	H6H	477	27	504	150	318	336
	Annual	–	95.6	13	109	50	191	217
$PM_{2.5}$	24 hours	H8H	33.4	16	49.4	35	96	141
	Annual	–	9.6	4	13.6	15	64	90

[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 5-year period are presented. Maximum concentrations are predicted to occur at the site boundaries.

Source: Chick (2009) for background concentration data.

Predicted 24-hour and annual PM_{10} concentration increments at the nearest Class I area, Great Sand Dunes WA, would be about 10 and 0.20 $\mu g/m^3$, or 131% and 5%, respectively, of the allowable PSD increment levels for Class I areas. Considering distance, prevailing winds, and topography, concentration increments at the other three Class I areas (La Garita WA and Weminuche WA in Colorado, and Wheeler Peak WA in New Mexico) would be much lower than those at the Great Sand Dunes WA.

In conclusion, predicted 24-hour and annual PM_{10} and 24-hour $PM_{2.5}$ concentration levels could exceed air quality standard levels at the SEZ boundaries and areas immediately surrounding them during the construction phase of a solar development. To reduce potential impacts on ambient air quality and in compliance with required programmatic design features, aggressive dust control measures would be used. Additionally, potential air quality impacts on neighboring communities would be much lower. Predicted total concentrations for annual $PM_{2.5}$ would be below their respective standard levels. Modeling indicates that construction activities could result in exceeding the maximum allowable Class I PSD PM_{10} increment levels at the nearest federal Class I area (Great Sand Dunes WA). However, construction activities are not subject to the PSD program; the comparison is made as an indicator of possible dust levels in the WA during the limited construction period and as a screen to gage the size of the potential impact. Therefore, it is anticipated that potential impacts of construction activities on ambient air quality would be moderate and temporary.

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

It is assumed that the existing regional 69-kV transmission line located within the SEZ would serve to transport solar energy generated on-site to the regional grid and thus construction of new transmission lines outside of the SEZ was not assessed. 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 to solar facility construction, and would be temporary in nature.

10.4.13.2.2 Operations

Emission sources associated with the operation of a solar facility 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 parabolic trough or power tower technology if wet cooling is implemented (drift constitutes 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 solar project development at the Los Mogotes East SEZ are presented in Table 10.4.13.2-2. Total power generation capacity ranging from 526 to 947 MW was estimated for the Los Mogotes East SEZ for various solar technologies (see Section 10.4.1.2). The estimated amount of emissions avoided for the solar technologies evaluated depends solely on the megawatts of conventional fossil fuel–generated power that would be displaced, because a composite emission factor per megawatt-hour of power by conventional technologies is assumed (EPA 2009d). If the Los Mogotes East SEZ is fully developed, it is expected that the amount of emissions avoided would be somewhat substantial. Development of 526 to 947 MW of solar power in the SEZ would result in avoided air emissions ranging from 1.9 to 3.5% of total emissions of SO_2, NO_x, Hg, and CO_2 from electric power

TABLE 10.4.13.2-2 Annual Emissions from Combustion-Related Power Generation Displaced by Full Solar Development of the Proposed Los Mogotes 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
5,918	526–947	922–1,659	1,219–2,194	1,405–2,529	0.008–0.014	910–1,639
Percentage of total emissions from electric power systems in the state of Colorado[d]			1.9–3.5%	1.9–3.5%	1.9–3.5%	1.9–3.5%
Percentage of total emissions from all source categories in the state of Colorado[e]			1.0–1.9%	0.34–0.62%	–[f]	0.88–1.6%
Percentage of total emissions from electric power systems in the six-state study area[d]			0.49–0.87%	0.38–0.68%	0.27–0.48%	0.35–0.63%
Percentage of total emissions from all source categories in the six-state study area[e]			0.26–0.47%	0.05–0.09%	–	0.11–0.20%

[a] Assumed that the SEZ would eventually have development on 80% of the lands and that a range of 5 acres (0.02 km^2) per MW (parabolic trough) to 9 acres (0.04 km^2) per MW (power tower, dish engine, and PV) 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 2.64, 3.05, 1.71×10^{-5}, and 1,976 lb/MWh, respectively, were used for the state of Colorado.

[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,d); WRAP (2009).

systems in the state of Colorado (EPA 2009d). Avoided emissions would be up to 0.9% of total emissions from electric power systems in the six-state study area. When compared with emissions from all source categories, power production from the same solar facilities would displace up to 1.9% of SO_2, 0.6% of NO_x, and 1.6% of CO_2 emissions in the state of Colorado (EPA 2009a; WRAP 2009). These emissions would be up to 0.5% of total emissions from all source categories in the six-state study area. Power generation from fossil fuel–fired power plants accounts for more than 96% of the total electric power generation in Colorado. The contribution of coal combustion is about 72%, followed by that of natural gas combustion, about 24%. Thus, solar facilities to be built in the Los Mogotes East SEZ could displace relatively more fossil fuel emissions than those built in other states that rely less on fossil fuel–generated power.

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 emissions would be small. In addition, transmission lines could produce minute amounts of O_3 and its precursor NO_x associated with corona discharge (i.e., the breakdown of air near high-voltage conductors), which is most noticeable for higher-voltage lines during rain or very humid conditions. Since the Los Mogotes East SEZ is located in an arid desert environment, these emissions would be small, and potential impacts on ambient air quality would be negligible, considering the infrequent occurrences and small emissions of corona discharges.

10.4.13.2.3 Decommissioning/Reclamation

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

10.4.13.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features are required. Limiting dust generation during construction and operations at the Los Mogotes East SEZ (e.g., by 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 (particularly at Great Sand Dunes WA) as low as possible during construction.

10.4.14 Visual Resources

10.4.14.1 Affected Environment

10.4.14.1.1 Regional Setting

The Los Mogotes East proposed SEZ is located approximately 11 mi (17.6 km) north of the Colorado–New Mexico border on the western side of the San Luis Valley in Conejos County in southern Colorado. Section 10.4.7.1.1 discusses the regional setting (San Luis Valley) for Los Mogotes East and the other Colorado proposed SEZs.

10.4.14.1.2 Los Mogotes East SEZ

The Los Mogotes East proposed SEZ encompasses 5,918 acres (24 km^2) over an area of approximately 5.1 mi (8.3 km) north to south (at greatest extent) and 1.8 mi (2.9 km) east to west, and is located approximately 5.2 mi (8.4 km) (at closest approach) north-northwest of the town of Antonito, Colorado, 4.3 mi (7.0 km) north–northwest of the unincorporated community of Conejos, and 3.0 mi (4.8 km) west of the community of Romeo. U.S. 285 roughly parallels the eastern boundary of the SEZ at a distance of 2.7 to 3.5 mi (4.3 to 5.7 km). The SEZ ranges in elevation from 7,715 ft (2,352 m) in the northeastern portion to 8,015 ft (2,443 m) in the southwestern portion of the SEZ.

The SEZ is in a gently sloping treeless plain, with the strong horizon line being the dominant visual feature. The western part of the SEZ slopes slightly upward to the west toward the San Juan Mountains; however, the view of the mountains is blocked in some parts of the proposed SEZ by a slightly steeper foreground slope immediately west of the SEZ. Vegetation is primarily low shrubs (generally less than 1 ft [0.3 m]) and grasses, with many areas of bare, generally tan soil. During a July 2009 site visit, the vegetation presented a range of light greens and grays, with banding and other variation sufficient to add slight visual interest. Some or all of the vegetation might be snow-covered in winter, and this might significantly affect the visual qualities of the area by changing the color contrasts associated with the vegetation and could in turn change the contrasts associated with the introduction of solar facilities into the landscape.

Very few roads cross the SEZ. A two-track road roughly bisects the SEZ east to west. The SEZ is dissected by dry washes, generally running sloping from the southwest or northwest to east, with several washes converging into a large wash that drains out of the eastern side of the SEZ just north of the east-west road. No permanent water features are present on the SEZ. This landscape type is common within the region.

Other than the few unpaved roads on the SEZ, some household debris apparently dumped off the east-west road, and wire fences, there is little evidence of cultural modifications that detract from the SEZ's scenic quality. In general, the SEZ is natural in appearance. Panoramic views of the SEZ are shown in Figures 10.4.14.1-1 and 10.4.14.1-2.

FIGURE 10.4.14.1-1 Approximately 90° Panoramic View of the Proposed Los Mogotes East SEZ, Facing East, Including Agricultural Lands, San Luis Hills, and Sangre de Cristo Range in Background

FIGURE 10.4.14.1-2 Approximately 180° Panoramic View of the Proposed Los Mogotes East SEZ Facing West, Including San Antonio Mountains on Far Left (South) and San Juan Mountains in Background

Off-site views include distant mountains (the San Juan Mountains to the west and north and the San Luis Hills and the Sangre de Cristo Range to the east). Views to the south are partially blocked by foreground slopes, but a solitary mountain (San Antonio Mountain) is visible.

East of the SEZ (less than 0.5 mi [0.8 km]) is an extensive agricultural area, utilizing primarily center-pivot irrigation; the area is plainly visible from the SEZ and presents a line (during the growing season) along the horizon of darker green shrubs and trees with some low buildings. An existing 69-kV transmission line runs to the SEZ from the east, ending just inside the SEZ boundary. Some of these cultural modifications are visible in Figure 10.4.14.1-1. In general, these off-site cultural modifications detract slightly from the area's scenic quality. Undeveloped land is visible directly north, west, and south of the SEZ.

The BLM conducted a 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 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. Class 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 values for the SEZ and immediate surroundings are VRI Class III, indicating moderate relative visual values. The inventory indicates low scenic quality for the SEZ and its immediate surroundings, based in part on the lack of topographic relief and water features, and the relative commonness of the landscape type within the region. Positive scenic quality attributes included some variety in vegetation types and color, and attractive off-site mountain views; however, these positive attributes were insufficient to raise the scenic quality to the "Moderate" level. The inventory indicates relatively low levels of use and public interest in the SEZ and its immediate vicinity. Uses noted include grazing, hunting, and some recreation. Despite the low use levels and public interest, the SEZ and surrounding area received a "High" sensitivity rating, primarily because the SEZ is within the viewshed of the Los Caminos Antiguos Scenic Byway. The SEZ is also within the viewshed of the West Fork of the North Branch of the Old Spanish Trail. This portion of the trail has yet to receive a congressional designation; however, its viewshed is sensitive. Finally, the SEZ is within the Sangre de Cristo NHA, also increasing its sensitivity.

Lands within the 25-mi (40-km), 650-ft (198-m) viewshed of the SEZ contain (88,696 acres [358.94 km^2]) of VRI Class II areas, primarily west and southwest of the SEZ; and (452,381 acres [1,830.72 km^2]) of Class III areas, surrounding the SEZ. There are no VRI Class IV lands in the La Jara FO within the 25-mi (40-km), 650-ft (198-m) viewshed of the SEZ.

The VRI map for the SEZ and surrounding lands is shown in Figure 10.4.14.1-3. More information about VRI methodology is available in Section 5.7 and in *Visual Resource Inventory*, BLM Manual Handbook 8410-1 (BLM 1986a).

The San Luis RMP (BLM 1991) indicates that the entire SEZ is managed as VRM Class III. VRM Class III objectives include partial retention of the existing character of the SEZ and allowing a moderate level of changes to the characteristic landscape. Management activities may attract attention, but should not dominate the views of casual observers. The VRM map for the proposed SEZ and surrounding lands is shown in Figure 10.4.14.1-4. More information about BLM's VRM program is available in Section 5.7 and in BLM's *Visual Resource Management*, BLM Manual Handbook 8400 (BLM 1984).

10.4.14.2 Impacts

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

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

Potential Glint and Glare Impacts. Similarly, the nature and magnitude of potential glint- and glare-related visual impacts for a given solar facility is highly dependent on viewer position, sun angle, the nature of the reflective surface and its orientation relative to the sun and the viewer, atmospheric conditions and other variables. The determination of potential impacts from glint and glare from solar facilities within a given proposed SEZ would require precise knowledge of these variables, and is not possible given the scope of this 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. For more information about potential glint and glare impacts associated with utility-scale solar energy facilities, see Section 5.12 of this PEIS.

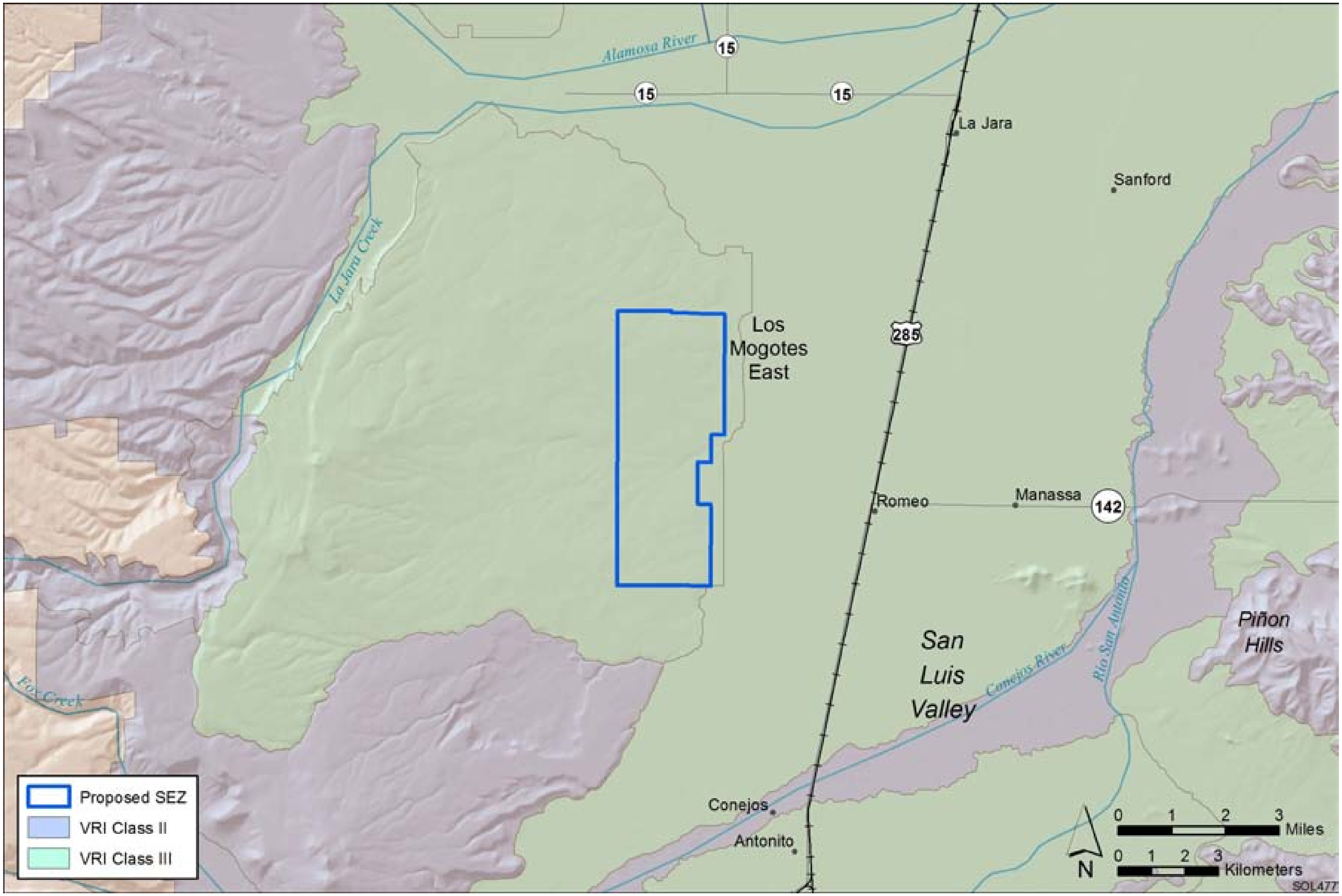

FIGURE 10.4.14.1-3 Visual Resource Inventory Values for the Proposed Los Mogotes East SEZ and Surrounding Lands

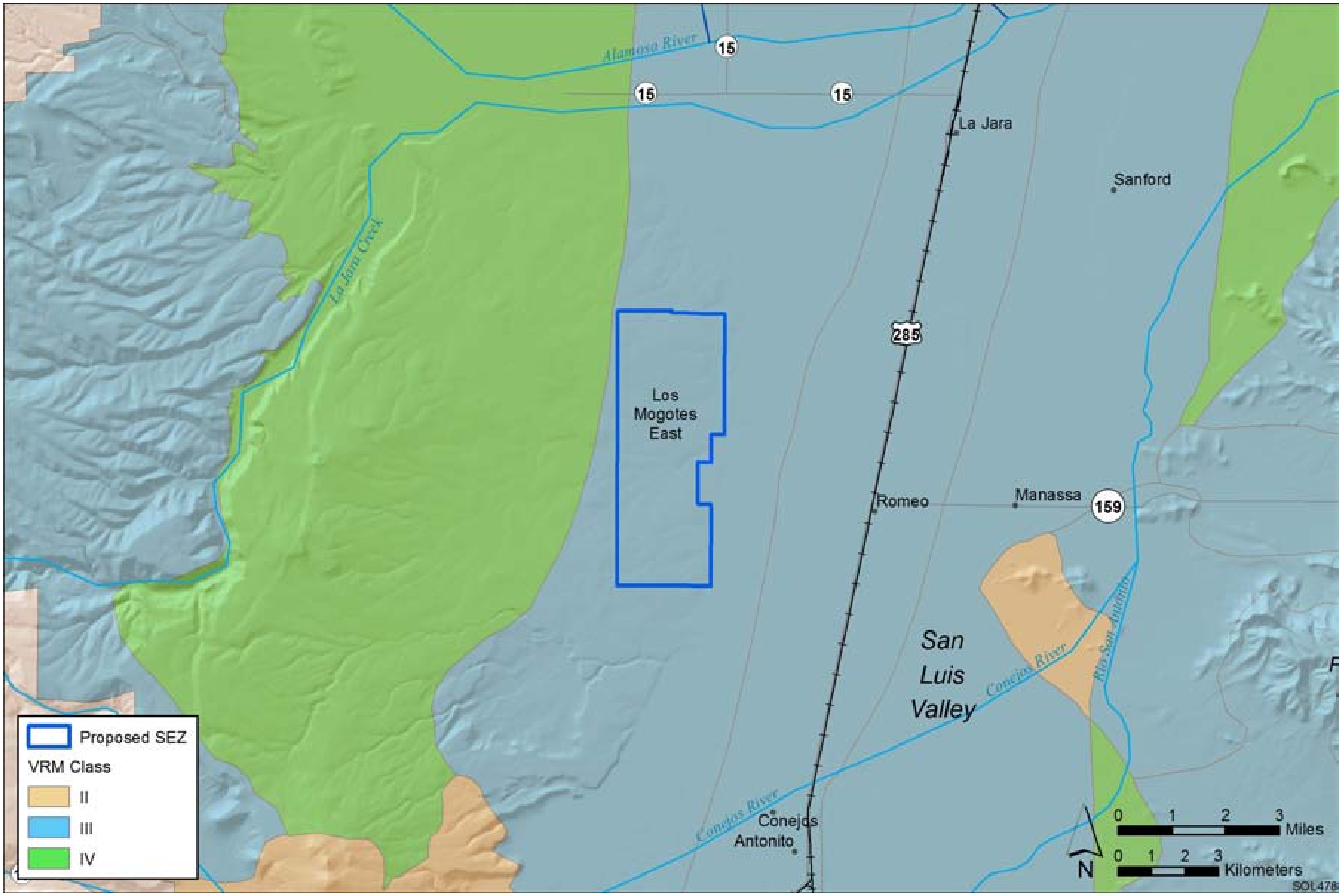

FIGURE 10.4.14.1-4 Visual Resource Management Classes for the Proposed Los Mogotes East SEZ and Surrounding Lands

10.4.14.2.1 Impacts on the Proposed Los Mogotes 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 utilizing highly reflective surfaces or major light-emitting facility components (solar dish, parabolic trough, and power tower technologies), with lesser impacts associated with reflective surfaces expected from PV facilities. These impacts would be expected to involve major modification of the existing character of the landscape and would likely dominate the views from nearby locations. Additional, and potentially large, impacts would occur as a result of the construction, operation, and decommissioning of related facilities, such as access roads and electric transmission lines. 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 and other projects 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 10.4.22.4.13of this PEIS.

The changes described above would be expected to be consistent with BLM visual resource management objectives for VRM Class IV, as seen from nearby KOPs. VRM Class IV management objectives include major modification of the existing character of the landscape. As shown in Figure 10.4.14.1-4, the SEZ is currently designated as VRM Class III. VRM Class III objectives allow only a moderate level of change to the characteristic landscape; therefore, impacts associated with utility-scale solar energy development at the Los Mogotes East SEZ could exceed those consistent with the current VRM Class III management objectives for the area. More information about impact determination using BLM's VRM program is available in Section 5.7 and in *Visual Resource Contrast Rating*, BLM Manual Handbook 8431-1 (BLM 1986b).

10.4.14.2.2 Impacts on Lands Surrounding the Proposed Los Mogotes East SEZ

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

Preliminary viewshed analyses were conducted to identify which lands surrounding the proposed SEZ could have views of solar facilities in at least some portion of the SEZ (see Appendix M for important information on assumptions and limitations of the methods used). Four viewshed analyses were conducted, assuming four different heights representative of project elements associated with potential solar energy technologies: PV and parabolic trough arrays (24.6 ft [7.5 m]), solar dishes and power blocks for CSP technologies (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 10.4.14.2-1 shows the combined results of the viewshed analyses for all four solar technologies. The colored portions indicate areas with clear lines of sight to one or more areas within the SEZ and from which solar facilities within these areas of the SEZ would be expected to be visible, assuming the absence of screening vegetation or structures and adequate lighting and other atmospheric conditions. The light brown areas are locations from which PV and parabolic trough arrays located in the SEZ could be visible. Solar dishes and power blocks for CSP technologies would be visible from the areas shaded light brown and the additional areas shaded 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 dark purple. Power tower facilities located in the SEZ could be visible from areas shaded light brown, light purple, dark purple, and at least the upper portions of power tower receivers could be visible from the additional areas shaded medium brown.

For the following visual impact discussion, the tall solar power tower (650 ft [198.1 m]) and PV and parabolic trough array (24.6 ft [7.5 m]) viewsheds are shown in the figures and discussed in the text. These heights represent the maximum and minimum landscape visibility, respectively, for solar energy technologies analyzed in this 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 for PV and parabolic trough arrays.

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

Figure 10.4.14.2-2 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 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

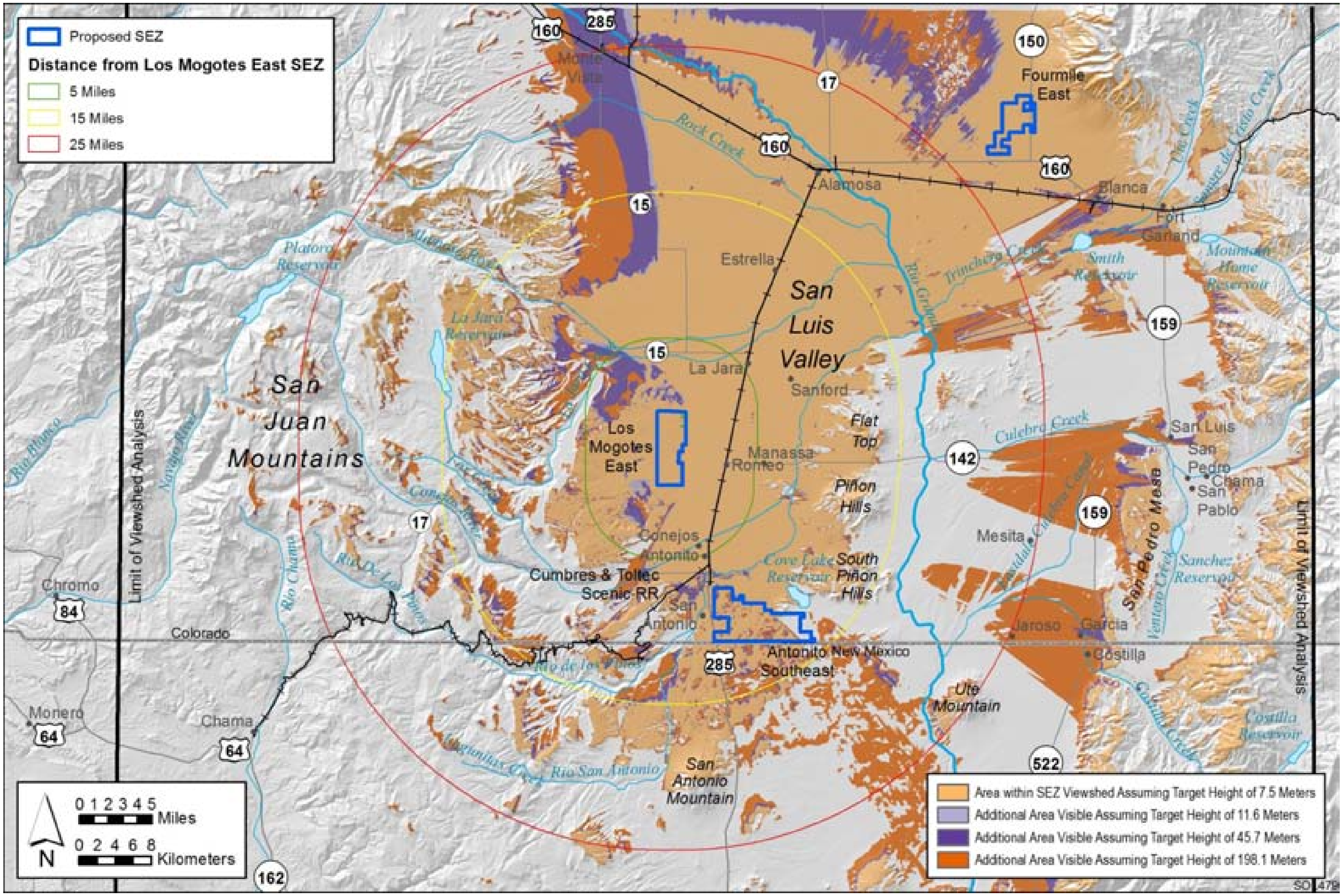

FIGURE 10.4.14.2-1 Viewshed Analyses for the Proposed Los Mogotes East SEZ and Surrounding Lands, Assuming Solar Technology Heights of 24.6 ft (7.5 m), 38 ft (11.6 m), 150 ft (45.7 m), and 650 ft (198.1 m) (shaded areas indicate lands from which solar development within the SEZ could be visible)

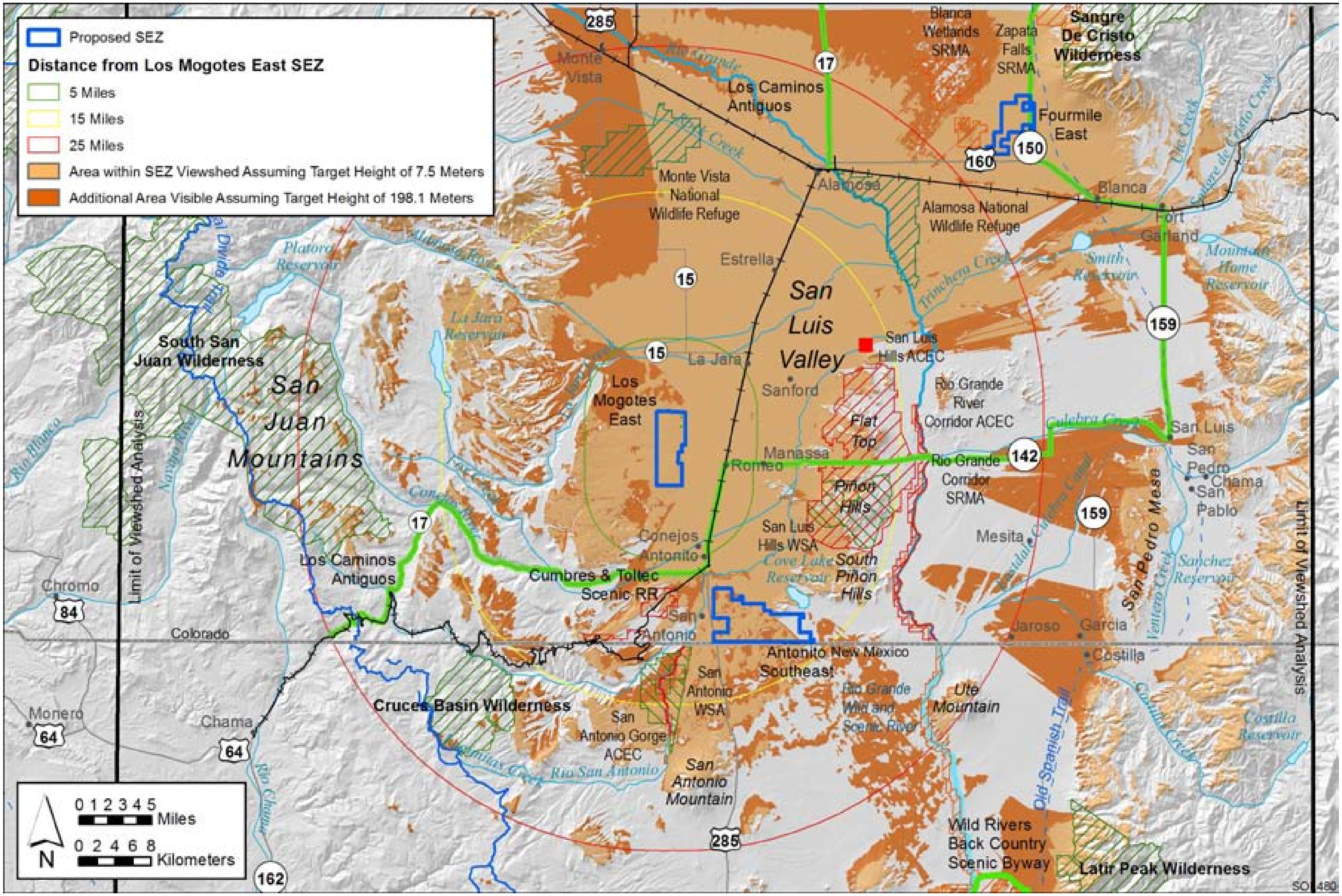

FIGURE 10.4.14.2-2 Overlay of Selected Sensitive Visual Resource Areas onto Combined 650-ft (198.1-m) and 24.6-ft (7.5-m) Viewsheds

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;

- 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 Los Mogotes East SEZ are discussed below. The results of this analysis are also summarized in Table 10.4.14.2-1. Further discussion of impacts on these areas is available in Sections 10.4.3 (Specially Designated Areas and Lands with Wilderness Characteristics) and 10.4.17 (Cultural Resources) of this PEIS.

The following visual impact analysis describes *visual contrast levels* rather than *visual impact levels*. *Visual contrasts* are changes in the seen landscape, including changes in the forms, lines, colors, and textures of objects seen in the landscape. A measure of *visual impact* includes potential human reactions to the visual contrasts arising from a development activity, based on viewer characteristics, including attitudes and values, expectations, and other characteristics that 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 where the project might be viewed from; and other variables that were not available or not feasible to incorporate in this 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 this PEIS.

TABLE 10.4.14.2-1 Selected Potentially Affected Sensitive Visual Resources within a 25-mi (40.2-km) Viewshed of the Proposed Los Mogotes 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
WAs	Cruces Basin (18,876 acres)	0 acres	0 acres	1,029 acres (5%)[b]
	South San Juan (160,832 acres)	0 acres	0 acres	3,809 acres (2%)
WSAs	San Antonio (7,321 acres)	0 acres	4,171 acres (57%)	1,898 acres (26%)
	San Luis Hills (10,896 acres)	0 acres	3,311 acres (30%)	0 acres
National Scenic Trail	Continental Divide	0 mi	0 mi	0.4 mi (0.6 km)
NHLs	Pike's Stockade (4 acres)	0 acres	4 acres (100%)	0 acres
NWRs	Alamosa (12,098 acres)	0 acres	0 acres	12,098 acres (100%)
	Monte Vista (14,761 acres)	0 acres	0 acres	14,761 acres (100%)
ACECs designated for outstanding scenic values	San Luis Hills (39,421 acres)	0 acres	15,604 acres (40%)	6 acres (0.02%)
	CTSR Corridor (3,868 acres)	0 acres	1,564 acres (40%)	6 acres (0.02%)
	San Antonio Gorge (377 acres)	0 acres	140 acres (37%)	28 acres (7%)
Scenic Highways/ Byways	Los Caminos Antiguos	8.4 mi (13.5 km)	15 mi (24 km)	3.7 mi (6.0 km)

[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 acreage or road length viewable.

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 this PEIS, but 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.

Wilderness Areas

- *Cruces Basin*—The Cruces Basin Wilderness is an 18,876-acre (76.389-km^2) congressionally designated WA located 17 mi (27 km) at the point of closest approach west–southwest of the SEZ in New Mexico. As shown in Figure 10.4.14.2-2, from the WA, solar energy facilities within the SEZ could be visible from higher elevations within the WA. Approximately 1,029 acres (4.164 km^2), or 5% of the total WA acreage, is within the 650-ft (198.1-m) viewshed of the proposed SEZ. Approximately 41 acres (0.17 km^2), or 0.2% of the total WA acreage, is within the 24.6-ft (7.5-m) viewshed. Portions of the WA in the visible area are forested, and views of the SEZ are screened by trees in some locations. However, some higher elevation meadows are not forested, and hikers in these meadow areas would have views of the SEZ, though in most areas views would be limited to the upper parts of power tower receivers, if sufficiently tall power towers are located at particular locations within the SEZ. Where there were views of the SEZ, because of the relatively long distance and partial screening of the SEZ by intervening topography, solar energy development within the SEZ would be expected to create minimal to weak visual contrasts as viewed from the WA.

- *South San Juan*—The South San Juan Wilderness is a 160,832-acre (650.864-km^2) congressionally designated WA located 18 mi (29 km) at the point of closest approach west of the SEZ. As shown in Figure 10.4.14.2-2, within the 25-mi (40-km) viewshed of the SEZ, solar energy facilities within the SEZ could be visible from a very small portion of the WA. Approximately 3,809 acres (15.42 km^2) of the WA is within the 650-ft (198.1-m) viewshed (3% of the total WA acreage), and 1,844 acres (7.462 km^2), or 1% of the total

WA acreage, is within the 24.6-ft (7.5-m) viewshed. However, the WA in the visible area is heavily forested, and views of the SEZ are screened by trees in most locations. Some higher elevation meadows are not forested, and hikers in these meadow areas would have

Views of the SEZ. Views in some of these meadow areaswould be limited to the upper parts of power tower receivers, if sufficiently tall power towers are located at particular locations within the SEZ. Where there were views of the SEZ, because of the relatively long distance, solar energy development within the SEZ would be expected to create minimal to weak visual contrasts as viewed from the WA.

Wilderness Study Areas

- *San Antonio*—The San Antonio WSA is located in New Mexico, approximately 11 mi (18 km) south of the SEZ at the point of closest approach. The WSA encompasses 7,321 acres (29.63 km^2). Most of the WSA (approximately 6,069 acres [24.56 km^2], or 83% of the total WSA acreage) is within the 650-ft (198.1-m) viewshed of the SEZ, and 2,999 acres (12.14 km^2), or 41% of the total WSA acreage, is within the 24.6-ft (7.5-m) viewshed. About 60% of the WSA is within the BLM-designated background distance of 15 mi (24.1 km) from the SEZ. Portions of the WSA within the viewshed extend approximately 11 mi (18 km) from the southwest corner of the SEZ to approximately 19 mi (31 km) from the SEZ. Viewpoints within the WSA are generally 0 to 700 ft (0 to 200 m) higher in elevation than the nearest portion of the SEZ, with viewpoint elevation increasing as the distance from the SEZ increases.

  Figure 10.4.14.2-3 is a three-dimensional perspective visualization created with Google Earth depicting the SEZ (highlighted in orange) as it would be seen from a point in the northeast portion of the WSA, approximately 11 mi (18 km) south of the SEZ's southern boundary. The viewpoint is about 260 ft (80 m) higher than the SEZ.

  The visualization includes simplified wireframe models of a hypothetical solar power tower facility. The models were placed within the SEZ as a visual aid for assessing the approximate size and viewing angle of utility-scale solar facilities. The receiver towers depicted in the visualizations 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, representing approximately 100 MW of electric generating capacity. Three power tower models were placed in the SEZ for this and other visualizations shown in this section of this PEIS. In the visualization, the SEZ area is depicted in orange, the heliostat fields in blue. The far northeast portion of the WSA has open but low-angle views of the SEZ, with little vegetative screening. At the relatively long distance involved,

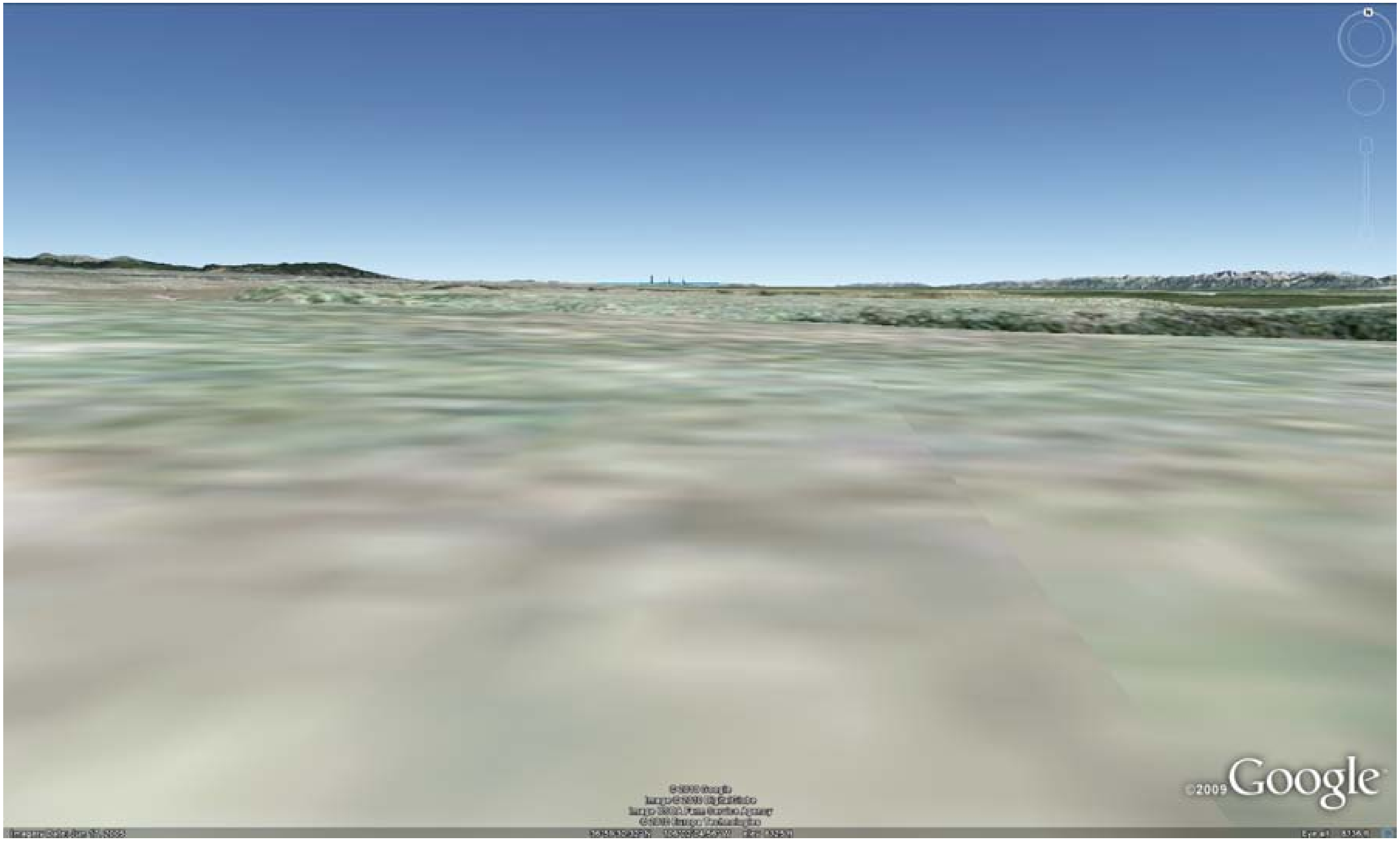

FIGURE 10.4.14.2-3 Google Earth Visualization of the Proposed Los Mogotes East SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Model, as Seen from the San Antonio WSA

and because the direction of view is along the SEZ's relatively narrow north–south axis, the SEZ occupies a very small portion of the field of view. Because of the very low angle of view, lower height facilities such as solar collector/reflector arrays, if visible at all, would appear as short and very thin lines on the horizon, which would tend to diminish apparent visual contrast. The receivers of operating power towers in the SEZ could be appear as points of light atop discernable tower structures just above the northern horizon.

At night, if sufficiently tall, power towers could have red or white flashing hazard navigation lights that could be visible for long distances, and would likely be visible from this viewpoint. Other lighting associated with solar facilities in the SEZ could be visible as well.

In addition to power tower structures, plumes from power plants and other taller structures might be visible projecting above the horizon. Farther south in the WSA, the viewpoints are higher in elevation, but the distance to the SEZ is longer. Solar collector arrays would still be viewed at a low enough angle that they would repeat the line of the plain in which the SEZ is located. The apparent visual contrast would be highly dependent on viewer location within the WSA and other visibility factors, but under the development scenario analyzed in this PEIS, solar energy development within the SEZ would be expected to create minimal to weak visual contrasts as viewed from the WSA.

- *San Luis Hills*—The San Luis Hills WSA is located approximately 8.8 mi (14.2 km) east–southeast of the SEZ at the point of closest approach and encompasses 10,896 acres (44.095 km^2). The WSA encompasses most of the Pinyon Hills. The San Luis Hills WSA is located entirely within the San Luis Hills ACEC, and both the ACEC and the WSA were designated in part for their scenic values and opportunities for solitude. The WSA provides panoramic views of the San Luis Valley and the surrounding mountain ranges. The SEZ viewshed includes the west-facing slopes of the Pinyon Hills and some lower elevation areas west of the Pinyon Hills. Portions of the WSA within the viewshed include approximately 3,273 acres (13.25 km^2) (or 30% of the total WSA acreage) within the 650-ft (198.1-m) viewshed, and 3,050 acres (12.34 km^2) (or 28% of the total WSA acreage) within the 24.6-ft (7.5-m) viewshed. Visible areas within the WSA extend from approximately 8.8 mi (14.2 km) from the eastern boundary of the SEZ to approximately 13 mi (21 km) from the SEZ.

  The upper slopes and peaks of the Pinyon Hills are sparsely vegetated and have relatively open views of both the Los Mogotes East and Antonito Southeast SEZs. Figure 10.4.14.2-4 is a Google Earth visualization of the SEZ as seen from a peak in the far western Pinyon Hills within the WSA, approximately 10 mi (16 km) east of the SEZ's eastern boundary. The

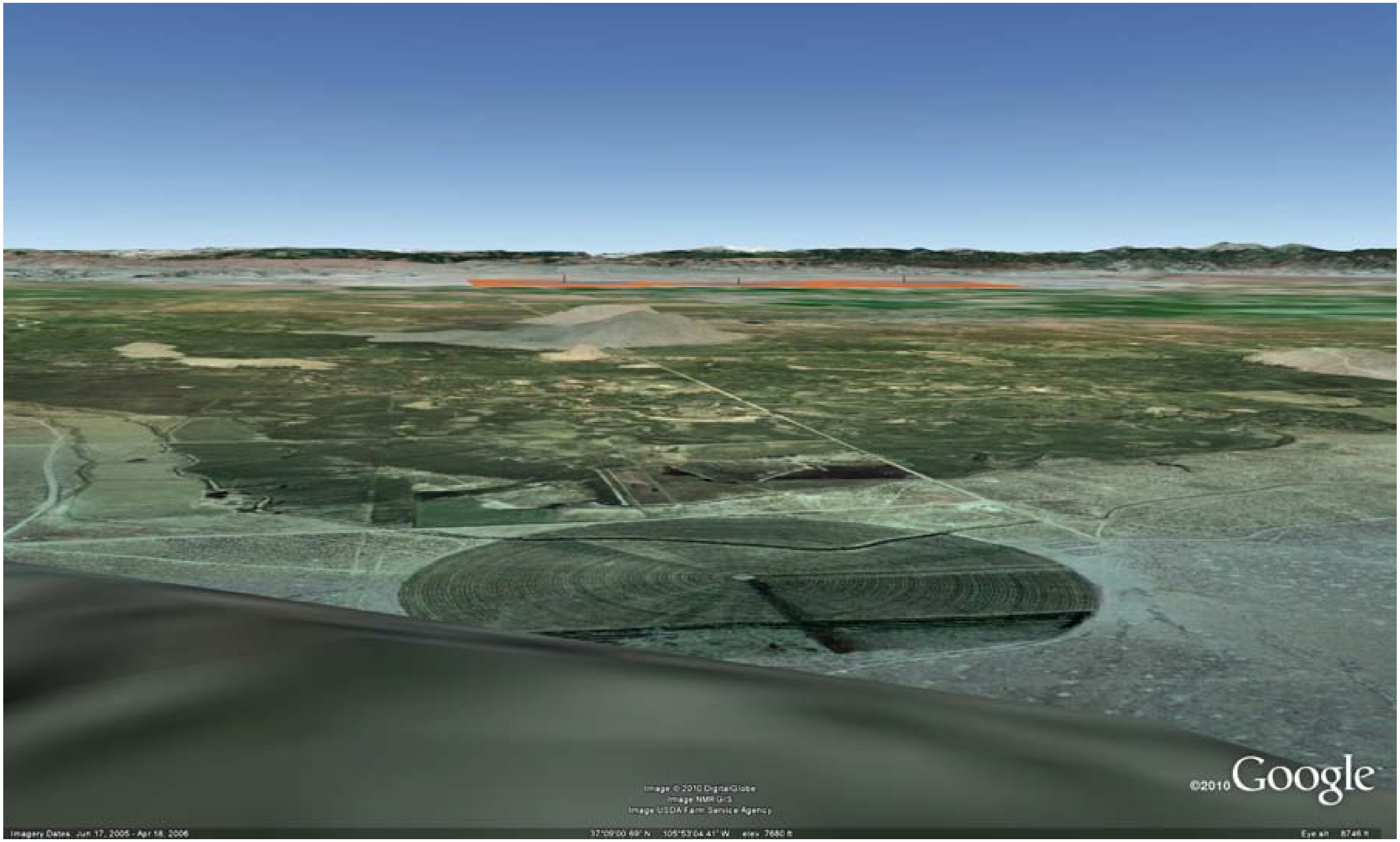

FIGURE 10.4.14.2-4 Google Earth Visualization of the Proposed Los Mogotes East SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Model, as Seen from the San Luis Hills WSA

viewpoint is about 870 ft (270 m) higher in elevation than the SEZ.The SEZ area is depicted in orange, the heliostat fields in blue.

The visualization suggests that the viewpoint is sufficiently close to the Los Mogotes SEZ that the SEZ would occupy a moderate portion of the horizontal field of view. Despite the elevated viewpoint, the distance to the SEZ is great enough that the vertical angle of view is low. The collector/reflector arrays for solar facilities within the SEZ would be seen nearly edge-on, making their large areal extent and regular geometry less apparent and causing them to appear in a thin band that would repeat the line of the horizon, tending to lessen visual contrast. Taller solar facility components, such as transmission towers or cooling towers, or plumes (if present) could potentially be visible from this viewpoint.

If operating power towers are located in the SEZ, the receivers would likely appear as points of light atop discernable tower structures, against a backdrop of the valley floor, and would be likely to attract visual attention. At night, if sufficiently tall, power towers could have red or white flashing hazard navigation lights that could be visible for long distances, and could be visually conspicuous from this viewpoint because the area west of the SEZ would have few comparable light sources visible. Other lighting associated with solar facilities in the SEZ could potentially be visible as well.

- At lower elevation viewpoints in the WSA, the angle of view is in some cases so low that the expected contrasts from solar facilities within the SEZ would drop to weak levels. In general, the range of visual contrasts observed from the WSA would be dependent on viewer location and project locations within the SEZ and the projects' characteristics. Under the 80% development scenario analyzed in the PEIS, solar energy development within the SEZ would be expected to create weak to moderate visual contrasts as viewed from the WSA. Contrast levels would be highest at high-elevation viewpoints in the western part of the WSA, and lower for low-elevation viewpoints such as in canyons or on bajadas.

  Note that portions of the WSA are also in the viewshed of the proposed Antonito Southeast SEZ, and could be subject to visual impacts from solar facilities in that SEZ as well.

National Scenic Trail

- *Continental Divide*—The Continental Divide National Scenic Trail is a congressionally designated multistate scenic trail that passes within about 20 mi (32 km) of the SEZ at the point of closest approach southwest of the SEZ; however, the portion of the trail within the viewshed of the SEZ is at nearly 25 mi

(40 km) distant from the SEZ. Approximately 0.4 mi (0.6 km) of the trail are within the 650-ft (198.1-m) viewshed of the SEZ.

A very short segment of the Continental Divide National Scenic Trail just north of the South San Juan WA has an open but distant view of the SEZ. The trail in this area is in an open meadow on a high mountain ridge elevated about 4, 500 ft (m) above the SEZ, but is so distant from the SEZ that the SEZ would occupy a very small portion of the field of view.

Solar facilities within the SEZ could potentially be visible just above the top of the closest ridge east of the trail. Despite the elevated viewpoint, the collector reflector arrays of solar facilities within the SEZ would be seen nearly edge on, and might not be noticed by casual viewers, unless they were reflecting sunlight back toward the viewpoint.

Operating power towers within the SEZ might be visible as distant star-like points of light just above the ridge top. At night, if sufficiently tall, the power towers could have red or white flashing hazard navigation lights that could be visible from this section of the trail.

In general, the range of visual contrasts observed from this short section of the Continental Divide National Scenic Trail would depend on project locations within the SEZ and the projects' characteristics. Under the 80% development scenario analyzed in the PEIS, solar energy development within the SEZ would be expected to create minimal to weak contrasts as viewed from this section of the trail.

National Historic Landmarks

- *Pike's Stockade*—Although the original 1807 stockade is no longer standing, this archeological site with a reconstructed stockade is located 13 mi (21 km) northeast of the northeast corner of the Los Mogotes East SEZ. It is contained within the SEZ viewshed.

  Pike Stockade is located within a heavily wooded riparian area along the Rio Grande. It is likely that vegetation would screen the site from views of the SEZ; however, visitors driving to or from Pike's Stockade would be outside the wooded area when going to or from the site and might have open views of the SEZ. Pike's Stockade is approximately 160 ft (48.8 m) lower in elevation than the lowest point in the SEZ, so if solar energy facilities were visible within the SEZ, , the associated collector/reflector arrays would repeat the line of the horizon, which would tend to reduce apparent contrast. Power tower receivers would not project above the distant line of the San Juan Mountains and, at the relatively long distance to the SEZ, would appear as distant points of light. Primarily because of vegetative screening, visual impacts from solar energy development within the SEZ would not be expected at the Pike Stockade site, but if screening were absent in the surrounding area, minimal to weak visual contrast would be expected.

National Wildlife Refuges

- *Alamosa*—The 12,098-acre (48.959-km^2) Alamosa NWR contains the headquarters and visitor center for the San Luis Valley National Wildlife Refuge Complex. It is located 18 mi (29 km) northeast of the SEZ at the closest point of approach and is entirely contained within the viewshed of the SEZ. The refuge is a haven for migratory birds and other wildlife. The Alamosa NWR consists of wet meadows, river oxbows, and riparian corridors primarily within the flood plain of the Rio Grande, and dry uplands vegetated with greasewood and saltbush.

  Because of the very long distance from the NWR to the SEZ, the orientation of views along the long north–south axis of the SEZ, and the lower elevation of the NWR relative to the SEZ (the NWR is about 350 ft [110 m] lower in elevation than the SEZ), solar facilities within the SEZ would be difficult to see from the NWR. From portions of the NWR, the upper portions of power towers within the SEZ might be visible as distant lights on the horizon. Visual impacts on the NWR from solar energy facilities within the SEZ would be minimal.

- *Monte Vista*—The 14,761-acre (59.736-km^2) Monte Vista NWR includes more than 11,000 acres (45 km^2) of wetlands located primarily within the Rio Grande flood plain. The refuge is located 16 mi (26 km) due north of the SEZ and is entirely contained within the viewshed of the SEZ. The NWR's wet meadows, river oxbows, and riparian corridors provide habitat for migratory birds and other wildlife. The NWR can be viewed from county roads and on a 4 mi (6 km) auto tour.

  Because of the very long distance from the NWR to the SEZ and the lower elevation of the NWR relative to the SEZ (the NWR is about 200 to 300 ft [60 to 90 m] lower in elevation than the SEZ), the SEZ and solar facilities within the SEZ would occupy a very small portion of the visual field for viewers in the NWR. From portions of the NWR, power towers within the SEZ might be visible as distant lights on the horizon. Visual impacts on the NWR from solar energy facilities within the SEZ would be minimal.

ACECs Designated for Outstanding Scenic Qualities

- *Cumbres & Toltec Scenic Railroad*—Impacts on the CTSR ACEC are described in Section 10.4.14.2.2.2 (Impacts on Selected Nonfederal Lands and Resources), under the discussion of impacts on the CTSR.

- *San Antonio Gorge*—The San Antonio Gorge ACEC is a very small (373-acre [1.5-km^2]) BLM-designated ACEC that follows San Antonio Creek in New Mexico and is located approximately 11 mi (18 km) due south of the SEZ at the point of closest approach. The ACEC was designated to protect significant wildlife, natural, and scenic values along this stretch of the creek. Because the creek and the ACEC are within a canyon, persons within the ACEC would not see solar development within the SEZ. Potential visual impacts on the ACEC would not be expected.

- *San Luis Hills*—The San Luis Hills ACEC is a 39,421-acre (159.53-km^2) BLM-designated ACEC located approximately 9.4 mi (15.1 km) east of the SEZ at the point of closest approach. The ACEC encompasses the Pinyon Hills and Flattop and nearby hills, and the lower slopes of some of these hills. The ACEC also encompasses the San Luis Hills WSA, and both the ACEC and the WSA were designated in part for their scenic values and opportunities for solitude. The ACEC provides panoramic views of the San Luis Valley and the surrounding mountain ranges. Views toward the SEZ include a large agricultural area east of the SEZ, with center-pivot irrigation circles, other agricultural fields, roads, and other cultural disturbances visible.

  The SEZ viewshed includes the west-facing slopes of the Pinyon Hills and Flattop. Portions of the ACEC within the 650-ft (198.1-m) viewshed include approximately 15,610 acres (63.171 km^2), or 40 % of the total ACEC acreage, and extend from just under 8.8 mi (14.2 km) from the eastern boundary of the SEZ to approximately 14 mi (23 km) from the SEZ. Portions of the ACEC within the 24.6-ft (7.5 m) viewshed include approximately 14,266 acres (57.733 km^2), or 36% of the total ACEC acreage.

  The upper slopes and peaks of the Pinyon Hills and Flattop are sparsely vegetated, have relatively open views of the SEZ, and are sufficiently close to the SEZ that they occupy a significant portion of the field of view, although intervening terrain might screen some views of portions of the SEZ, depending on viewer location. At the highest elevations within the ACEC, the angle of view is great enough that the tops of solar collector arrays might be visible. The angle of view is not so high, however, that the arrays would not repeat the line of the plain in which the SEZ is located, tending to reduce apparent visual contrast.

Figure 10.4.14.2-5 is a Earth visualization of the SEZ (highlighted in orange) as seen from the peak of Flattop, in the eastern portion of the ACEC, approximately 13 mi (21 km) east of the SEZ's eastern boundary. The viewpoint is about 1,400 ft (430 m) higher than the SEZ. . The SEZ area is depicted in orange; the heliostat fields in blue.

The visualization suggests that the SEZ would occupy a moderate portion of the horizontal field of view. Despite the elevated viewpoint, the distance to the SEZ is great enough that the vertical angle of view is low. The collector/reflector arrays for solar facilities within the SEZ would be seen nearly edge-on, making their large areal extent and regular geometry less apparent, and causing them to appear in a thin band that would repeat the line of the horizon, tending to lessen visual contrast. Taller solar facility components, such as transmission towers or cooling towers; or plumes (if present) could potentially be visible from this viewpoint.

If operating power towers were located in the SEZ, the receivers would likely appear as points of light atop discernable tower structures (though the structures might be missed by casual viewers), against a backdrop of the valley floor, and would be likely to attract visual attention. At night, if sufficiently tall, power towers could have red or white flashing hazard navigation lights that would likely be visible from this viewpoint, and could be conspicuous because the area west of the SEZ would have few comparable light sources visible. Other lighting associated with solar facilities in the SEZ could potentially be visible as well.

At lower elevation viewpoints in the ACEC, the angle of view is in some cases so low that the expected contrasts from solar facilities within the SEZ would drop to weak levels. In general, the range of visual contrasts observed from the ACEC would be dependent on viewer location and project locations within the SEZ and the projects' characteristics. Under the 80% development scenario analyzed in this PEIS, solar energy facilities within the SEZ would be expected to attract attention but would not be likely to dominate views from the ACEC, and would be expected to create weak to moderate visual contrasts, depending on viewer location and other visibility factors. Contrast levels would be highest at high-elevation viewpoints in the western part of the ACEC and lower for low-elevation viewpoints such as in canyons or on bajadas.

Note that portions of the ACEC are also in the viewshed of the proposed Antonito Southeast SEZ, and could be subject to visual impacts from solar facilities in that SEZ as well.

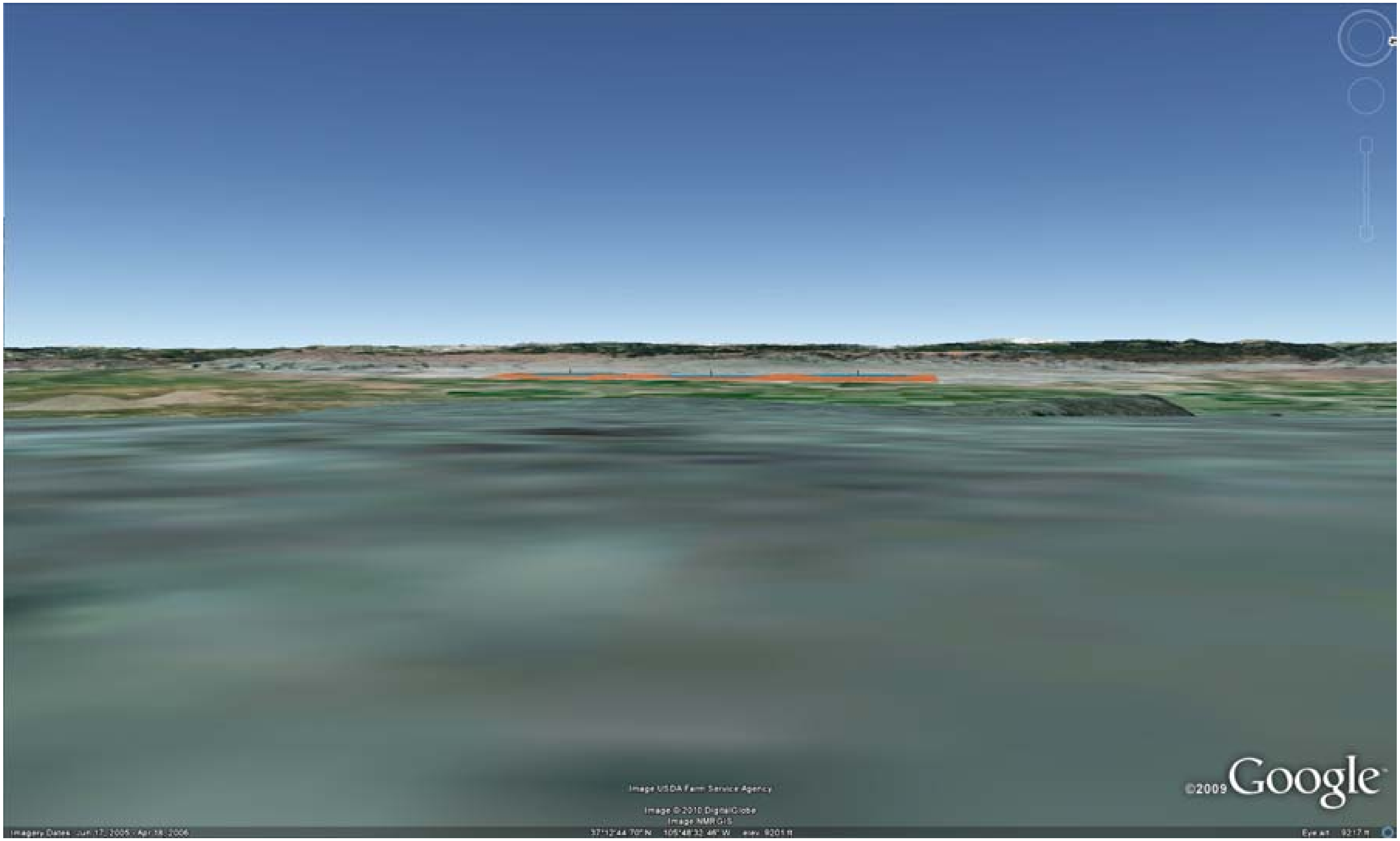

FIGURE 10.4.14.2-5 Google Earth Visualization of the Proposed Los Mogotes East SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Model, as Seen from Flattop, within the San Luis Hills ACEC

Scenic Highways/Byways

- *Los Caminos Antiguos*—The Los Caminos Antiguos Scenic Byway is a state- and BLM-designated scenic byway that runs through a large section of the San Luis Valley and is located in close proximity to several of the proposed SEZs, including Los Mogotes East. The byway is an important tourist attraction and, in addition to scenic views of the San Luis Valley and surrounding mountain ranges, provides access to numerous historic sites and cultural attractions.

  Approximately 27 mi (44 km) of the byway is within the calculated 650-ft (198.1-m) viewshed of the SEZ; however, undulations in topography; roadside and other vegetation; as well as buildings, such as those in the communities of La Jara, Romeo, and Conejos, screen views of much or all of the SEZ from many locations along the byway. At its point of closest approach to the SEZ, south of the community of Romeo, the byway is approximately 2.6 mi (4.3 km) east–southeast of the southeast corner of the SEZ.

  Elevations along the byway northeast, east, and southeast of the SEZ are slightly lower than in the SEZ itself. Because the SEZ slopes up toward the west, some of the western portions of the SEZ are visible above screening vegetation and structures between the byway and the SEZ.

  Due south of the SEZ, elevations along the byway are about as high as the highest points within the SEZ, but most views of the SEZ from the south would likely be at least partially screened by riparian vegetation along the Conejos River.

  For byway users approaching Conejos from the north, solar facilities visible within the SEZ would appear to the right (west) of the direction of travel. Travelers would likely see any power tower receivers within the SEZ projecting above the trees and landforms of areas close to the SEZ as they looked south down the byway. They would be less likely to see solar dish engines, solar trough arrays, or PV arrays because of screening unless those facilities were located in the western, more elevated portions of the SEZ. Plumes, cooling towers, and other tall structures such as transmission towers might be visible above screening, depending on viewer location and project location and characteristics. The facilities would tend to increase in apparent size as viewers moved toward them and might be subject to sudden disappearance and reappearance because of intermittent screening. Byway users traveling northward from Antonito and beyond would have a similar visual experience, but likely of shorter duration (because of the road configuration and screening of views of the SEZ), and solar facilities visible within the SEZ would appear to the left (west) of the direction of travel.

Because of the 5-mi (8-km) north–south orientation of the SEZ, it would take several minutes to pass the SEZ at highway speeds, and depending on facility height and other visibility factors, solar facilities within the SEZ might be visible to travelers several additional minutes as they approach the SEZ.

Figure 10.4.14.2-6 is a Google Earth visualization of the SEZ (highlighted in orange) as seen from Los Caminos Antiguos Scenic Byway in Romeoapproximately 3.0 mi (4.8 km) east of the SEZ's eastern boundary. The viewpoint is about 130 ft (40 m) lower in elevation than the SEZ. The center power tower in the visualization is about 4.1 mi (6.6 km) from the viewpoint.The SEZ is shown in orange; the heliostat fields in blue. Note that this visualization does not account for potential screening of views of the SEZ. Screening by vegetation and structures that exist in the area might obscure much or all of the view in this location.

The view axis from viewpoint east of the SEZ would be roughly perpendicular to the long north–south axis of the SEZ; because of this and because the SEZ would be so close to the viewpoint, the SEZ would be too large to be encompassed in one view, and viewers would need to turn their heads to scan across the whole SEZ..If screening were absent, the visualization suggests that solar energy facilities within the SEZ could potentially dominate the view from the byway and the community of Romero at this location.

The collector/reflector arrays for solar facilities within the SEZ would be seen nearly edge-on and would repeat the horizontal line of the sloping plain in which the SEZ is situated; this would tend to reduce visual line contrast. Taller ancillary facilities, such as buildings, transmission structures, and cooling towers, and plumes (if present) would likely be visible projecting above the collector/reflector arrays, and their structural details could be discernable, 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. Structural details of some facility components would likely be visible.

If operating power towers were located in the SEZ, the receivers would likely appear as very bright non-point light sources (i.e. they could appear as cylindrical or rectangular light-emitting surfaces) atop clearly discernable tower structures, against the backdrop of the San Juan Mountains to the west, or if sufficiently tall, they might project beyond the tops of the mountain range and be visible against a sky backdrop. 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). The operating power towers would strongly attract visual attention. At night, if sufficiently tall, power towers could have red or white flashing hazard navigation lights that

FIGURE 10.4.14.2-6 Google Earth Visualization of the Proposed Los Mogotes East SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Model, as Seen from Los Caminos Antiguos Scenic Byway, in Romeo, Colorado

would likely be very conspicuous from this viewpoint because the area to the west of the SEZ would have few comparable light sources visible. Other lighting associated with solar facilities in the SEZ could potentially be visible as well.

The range of impacts experienced by byway travelers would be highly dependent on viewer location, project location and design, and the presence of screening. Under the 80% development scenario analyzed in this PEIS, solar facilities within the SEZ could attract the attention of byway users, butthey would not be likely to dominate views except from some locations close to the eastern boundary of the SEZ, assuming screening was absent. At and near the point of closest approach between the byway and the SEZ.

Screening vegetation and buildings might conceal much of any solar facilities within the SEZ. Under the development scenario analyzed in this PEIS, solar energy development within the SEZ would be expected to create weak to strong visual contrasts as viewed from the byway, depending on viewer location along the byway and other visibility factors.

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

In addition to impacts associated with the solar energy facilities themselves, the SEZ, surrounding lands, and sensitive visual resources could be affected by facilities that would be built and operated in conjunction with the solar facilities. For 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. There is currently a short transmission line that reaches the eastern boundary of the SEZ, but if it can be utilized, an upgrade may be required. In addition, construction (or upgrading) and operation of a transmission line outside the SEZ may be required. If an existing transmission line can be utilized for the project, visual impacts associated with the transmission line would likely be smaller than if construction of a new, longer line was required. Depending on project- and site- Note that depending on project- and site-specific conditions, visual impacts associated with access roads and, to an even greater extent, transmission lines could be large. For this analysis, the impacts of construction and operation of transmission lines outside of the SEZ were not assessed, assuming that the existing 69-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. Detailed information on visual impacts associated with transmission lines is presented in Section 5.12.1 of this PEIS. A detailed site-specific impact 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

Communities of Romeo, La Jara, Antonito, Conejos, Sanford, and Manassa. The viewshed analyses indicate visibility of the proposed SEZ from the communities of La Jara (approximately 5.3 mi [8.6 km] northeast of the proposed SEZ), Antonito (approximately 5.2 mi [8.4 km] south–southeast of the proposed SEZ), Romeo (approximately 3.0 mi [4.8 km] east of the proposed SEZ), and the unincorporated community of Conejos (approximately 4.3 mi [7.0 km] south–southeast of the proposed SEZ). However, a site visit in July 2009 indicated at least partial screening of ground-level views of the proposed SEZ from these communities because of slight variations in topography, vegetation, or both. A detailed future site-specific NEPA analysis is required to determine visibility precisely; however, note that even with the existing screening, solar power towers, cooling towers, plumes, transmission lines and towers, or other tall structures associated with the facilities could potentially be tall enough to exceed the height of the screening and could in some cases cause visual impacts on these communities.

Where screening is absent, strong visual contrast could be observed, particularly in or near Romeo, because of the proximity of the SEZ and the orientation of view perpendicular to the long north–south axis of the SEZ (see Figure 10.4.14.2-6 for a view of the SEZ from Romeo). At night, hazard warning lights on power towers of sufficient height (200 ft [61 m] or greater) would likely be very conspicuous light sources as seen from Romeo.

La Jara is farther from the SEZ than Romeo, and the orientation of the views is more oblique to the long axis of the SEZ; thus the SEZ and solar energy facilities would occupy a much smaller portion of the field of view than at Romeo, and moderate levels of visual contrast would be expected. Antonito and Conejos are also farther from the SEZ than Romeo and have a more oblique viewing angle. In addition, many views from these locations would likely be screened by riparian vegetation along the Conejos River. Weak visual contrast levels would be expected where there were unobstructed views of the SEZ. At night, hazard warning lights on power towers of sufficient height (200 ft [61 m] or greater) would be conspicuous light sources as seen from these communities, where there were unobstructed views to the SEZ.

Manassa is approximately 5.5 mi (8.5 km) east of the SEZ, and like Romeo, the orientation of view is perpendicular to the long north–south axis of the SEZ. While trees and structures would screen views of the SEZ for much of Manassa, where screening was absent, the SEZ and associated solar facilities could potentially stretch across much of the field of view. The viewing angle would be low, but under the 80% development scenario analyzed in the PEIS, solar facilities in the SEZ would stretch across much of the western horizon, and expected contrast levels would be strong where there were unobstructed views to the SEZ.

Sanford is approximately 7.7 mi (12.4 km) east northeast of the SEZ. Potential visual impacts from solar energy facilities within the SEZ as experienced in Sanford would be generally similar to those experienced in Manassa, but somewhat lower in magnitude, because of the greater distance and slightly more oblique viewing angle. Moderate to strong visual contrasts would be expected where there were unobstructed views to the SEZ.

Regardless of visibility from these communities, residents, workers, and visitors to the area may experience visual impacts from solar energy facilities located within the SEZ (as well as any associated access roads and transmission lines) as they travel area roads, including U.S. 285, portions of which are included in the Los Caminos Antiguos Scenic Byway (see above).

Cumbres & Toltec Scenic Railroad. The CTSR is a narrow-gauge railroad running between Chama, New Mexico, and Antonito, Colorado, with an historic depot in Antonito. The railroad is an historic and cultural property owned by the states of Colorado and New Mexico and is operated for the states by the CTSR Commission, an interstate agency authorized by an act of Congress in 1974. The railroad is an important local tourist attraction, offering day-long rides through high-quality scenery, primarily in the San Juan Mountains. The railroad depot is on the southern edge of Antonito, and the rail line extends southwest of Antonio, climbing into the foothills of the San Juan Mountains and running southwest along the valley's western edge before turning west into the mountains after entering New Mexico.

The BLM has designated 3,868 acres (15.65 km^2) of land along the railroad route as the CTSR Corridor ACEC (see Figure 10.4.14.2-2), and the San Luis RMP (BLM 1991) states that the area will be subject to special management for "strict conformance to existing VRM class objectives" in order to protect historical and scenic values. The ACEC designation covers "the minimum necessary foreground viewshed" to "provide protection for the unique scenic resources viewed from the train." At the point of closest approach, the ACEC is approximately 7.1 mi (11.4 km) south of the SEZ.

The viewshed analyses indicate visibility of the SEZ from the railroad depot in Antonito (approximately 5.9 mi [9.5 km] south–southeast of the SEZ), though the view may be at least partially screened by landform and vegetation. The viewshed analyses indicate visibility of the SEZ from the rail line southwest of Antonito up to approximately 2.9 mi (4.7 km) from the railroad depot in Antonito, with potential visibility reduced slightly for the lower height solar technologies, as shown in Figure 10.4.14.2-1. The SEZ is also visible from some locations in the San Juan Mountains, including small portions of the CTSR Corridor ACEC, as shown in Figure 10.4.14.2-2. Portions of the ACEC within the 650-ft (198.1-m) viewshed include approximately 1,570 acres (6.354 km^2), or 41% of the total ACEC acreage. Portions of the ACEC within the 24.6-ft (7.5-m) viewshed include approximately 1,002 acres (4.055 km^2), or 26% of the total ACEC acreage. Approximately 13 mi (21 km) of the railroad line is within the SEZ viewshed.

The nature of the visual impacts experienced by train passengers and other visitors to the ACEC and surrounding lands would depend largely on viewer location, the size of the solar facility, the solar technology employed, the precise location of the facility within the SEZ, and other visibility factors discussed in Section 5.12. A detailed future site-specific NEPA analysis would be required to determine visibility and potential impacts precisely.

A site visit in July 2009 indicated at least partial screening of ground-level views of the SEZ from the CTSR depot in Antonito and the first 2.3 mi (3.7 km) of the railroad southwest of Antonito, because of slight variations in topography, vegetation, or both. However, some components of solar facilities sufficiently close to the southern boundary of the proposed SEZ (particularly power tower receivers) might be visible over the tops of screening vegetation or buildings and, if so, might create weak contrasts, primarily in line (due to vertical towers in a strongly horizontal landscape), especially if viewed against a sky backdrop. Depending on location, tower height, and project design, the intense light emitted by a power tower receiver could potentially be visible from the depot and rail line above the screening objects and could be noticeable, tending to draw viewers' attention. Where screening did not exist, more components of the solar facility could be visible, adding additional contrasts in form, line, color, and texture.

Trees and other vegetation along the rail line may screen some views of the SEZ from the rail line and from the scenic ACEC, but the viewpoint becomes increasingly elevated as the rail line approaches the San Juan Mountains, affording more open views of the proposed SEZ. Views within the mountains and some parts of the ACEC are also subject to screening from vegetation. However, some open views exist, and the viewpoints are further elevated, again affording unobstructed views of the SEZ. Even with any existing screening, solar power towers, cooling towers, plumes, transmission lines and towers, or other tall structures associated with the solar energy facilities could potentially be tall enough to exceed the height of the screening and could in some cases cause visual impacts on the rail line and the CTSR Corridor ACEC. Because of the north-to-south orientation of the SEZ, views from the rail line, which is south of the SEZ, would be along the north–south axis of the SEZ and would therefore be perpendicular to the relatively narrow (1.7 mi [2.8 km]) southern boundary of the SEZ. Thus the SEZ would occupy a very small portion of the field of view, tending to reduce visual contrasts. Under the development scenario analyzed in this PEIS, visual contrast from solar energy development in the SEZ would be expected to range from minimal to weak.

Figures 10.4.14.2-7 and 10.4.14.2-8 are Google Earth visualizations depicting views of the SEZ (highlighted in orange) as seen from points on the CTSR. The SEZ area is depicted in orange; the heliostat fields in blue. Note that these visualizations do not account for potential screening of views of the SEZ. Screening by vegetation and structures that exist in the area might obscure much or all of the view in these locations.

Figure 10.4.14.2-7 depicts a view of the SEZ as it would be seen from the CTSR line approximately 2.0 mi (3.2 km) southwest of the depot at Antonito, and 6.8 mi (11.0 km) from the closest point in the SEZ. The nearest power tower is located approximately 7.7 mi (12.5 km) from the viewpoint, and the farthest power tower is located approximately 11 mi (18 km) from the viewpoint. The viewpoint elevation is approximately 30 ft (9 m) higher than the base of the closest (left-most) power tower shown in the visualization. The visualization suggests that lower height solar facilities within the SEZ would not be visible from this location on the railroad, but, depending on tower location and height, power tower receivers and other sufficiently tall project

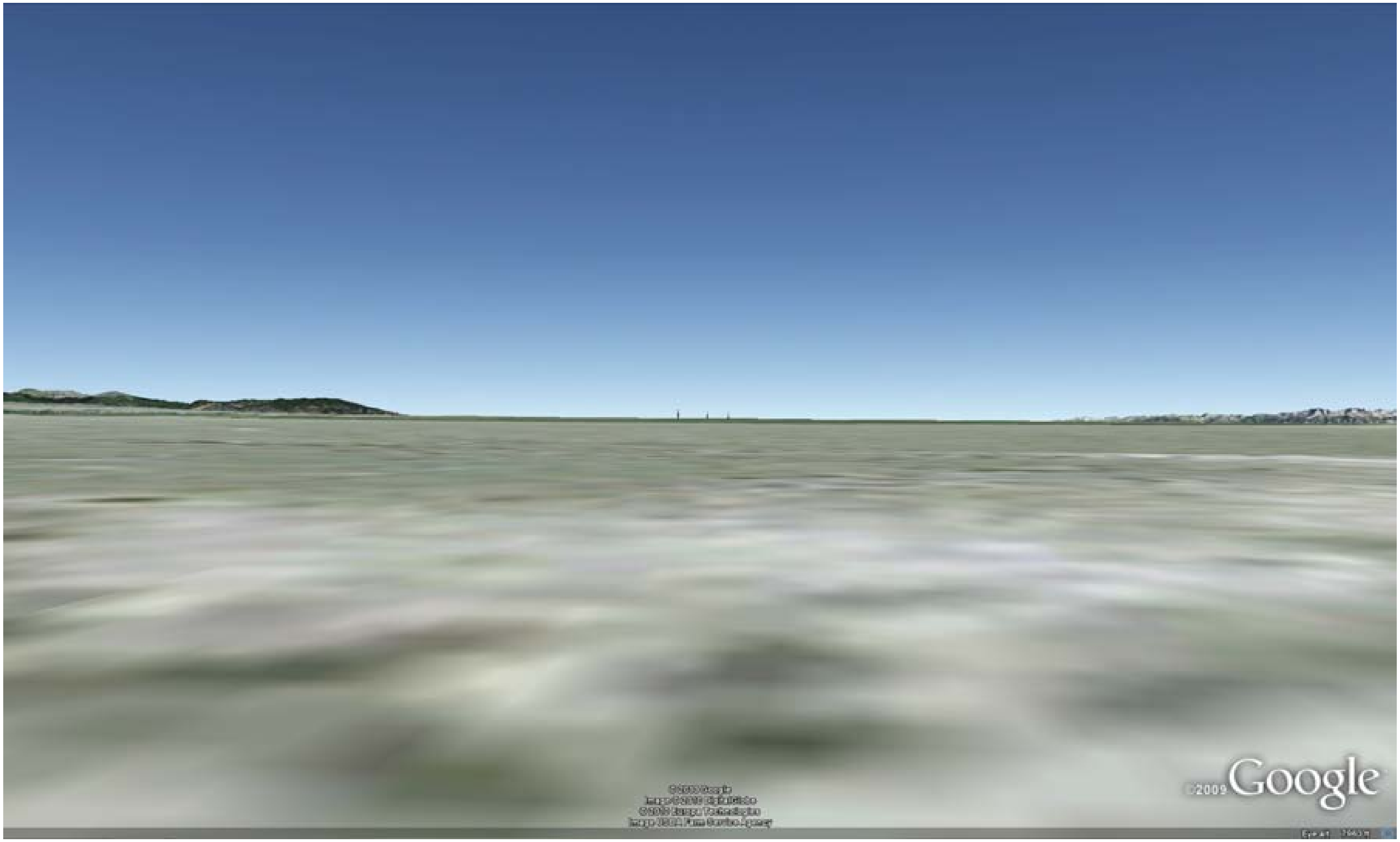

FIGURE 10.4.14.2-7 Google Earth Visualization of the Proposed Los Mogotes East SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from Viewpoint on the Cumbres & Toltec Scenic Railroad Approximately 2.0 mi (3.2 km) Southwest of the Depot at Antonito

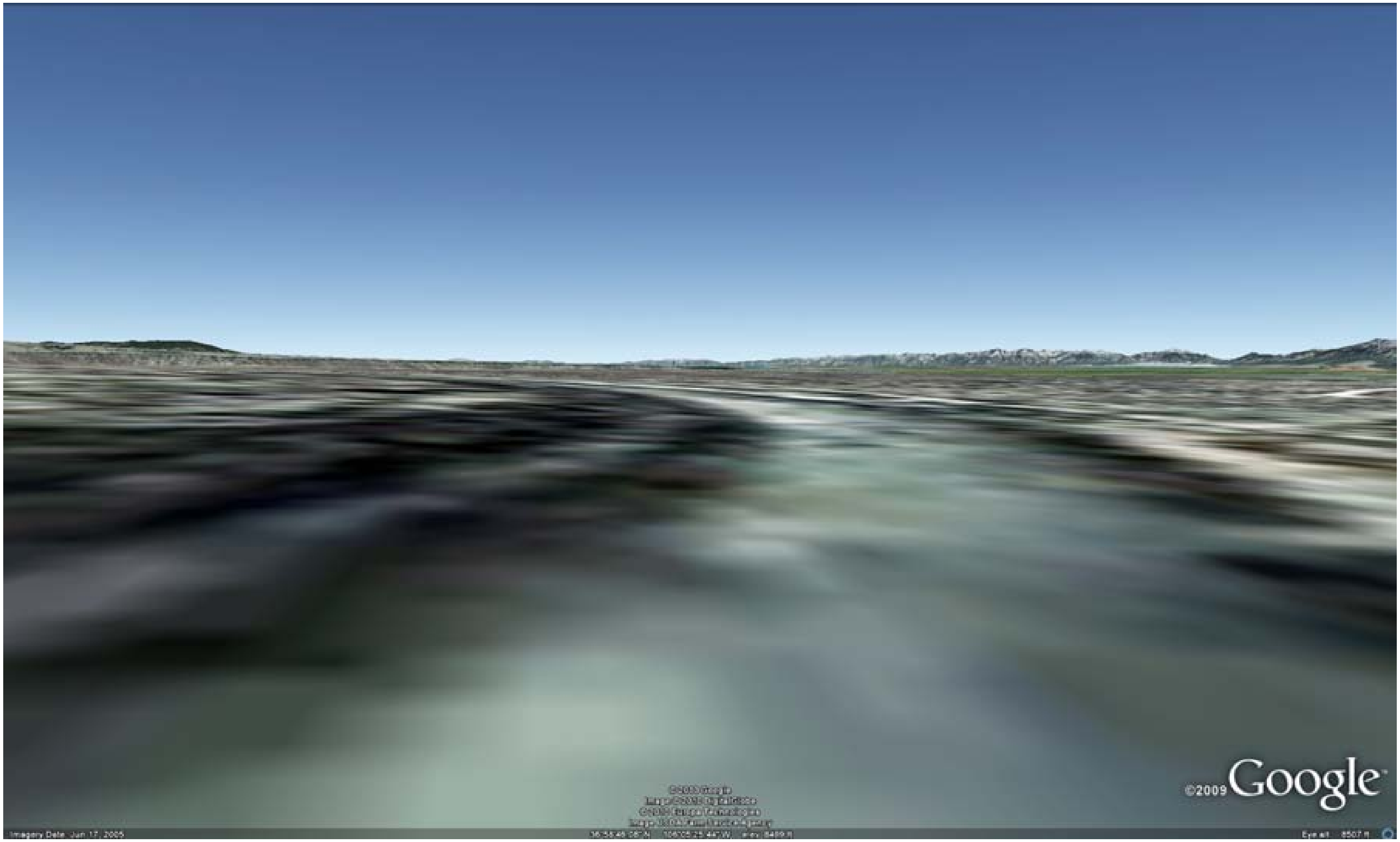

FIGURE 10.4.14.2-8 Google Earth Visualization of the Proposed Los Mogotes East SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from Viewpoint on the Cumbres & Toltec Scenic Railroad Approximately 7.4 mi (11.9 km) Southwest of the Depot at Antonito

components (e.g., condensers, transmission towers, plumes) could potentially be visible above intervening terrain (possibly with additional screening from vegetation) located between the viewpoint and the SEZ.

Figure 10.4.14.2-8 depicts a view of the SEZ as it would be seen from the CTSR line approximately 7.4 mi (11.9 km) southwest of the depot at Antonito. The nearest power tower is located approximately 13 mi (21 km) from the viewpoint, and the farthest power tower is located approximately 16 mi (26 km) from the viewpoint. The viewpoint elevation is approximately 570 ft (170 m) higher than the base of the closest (left-most) power tower shown in the visualization. The visualization suggests that low-height solar project components within the SEZ might not be visible from this location, but the upper portions of power tower receivers might be viewed against the backdrop of the mountains north of the SEZ. Because of the distance and elevated viewpoint, even tall power tower receivers would be unlikely to be visible above the peaks of the mountain range from this location. The elevated viewpoint could allow for slightly greater visibility of lower height facility components.

In general, because views from the CTSR line are along the SEZ's narrow north–south axis, the SEZ would occupy a very small portion of the horizontal field of view. In addition, the angle of view from the rail line to the SEZ is low, and many views toward the SEZ from the rail line are partially screened by topography, vegetation, or both. Consequently, solar facilities within the SEZ would be expected to cause weak levels of visual contrast for travelers on the railroad.

West Fork of the North Branch of the Old Spanish Trail. The West Fork of the North Branch of the Old Spanish Trail roughly parallels the eastern boundary of the proposed SEZ, passing to within approximately 1.0 mi (1.6 km) of the proposed SEZ at closest approach. The West Fork is visible as a blue dashed line near the eastern boundary of the SEZ in Figure 10.4.14.2-9. The viewshed analyses depicted in these figures indicate that the SEZ would be visible from many points along the trail, starting approximately 21 mi (24 km) south of the SEZ to farther than 25 mi (40 km) north of the SEZ. Approximately 54 mi (87 km) of the trail is within the 650-ft (198.1-m) SEZ viewshed within 25 mi (40 km) of the SEZ.

The community of Romeo is 1.6 mi (2.6 km) east of the West Fork trail and the SEZ, and a variety of other cultural modifications typical of a rural setting are also visible in the area.

Trail users would have extended views of the Los Mogotes East SEZ as they approached and passed it. However, some views of the SEZ (particularly the eastern portion) would likely be partially screened by vegetation and structures located between the trail and the SEZ. Where views are open, trail users distant from the SEZ would generally see solar facilities located near the western boundary of the SEZ, close to the center of their field of view as they looked down the trail, causing weak visual contrasts with the surrounding landscape. As viewers approached the SEZ, the facilities would appear farther away from the center of the field of view looking down the trail. The facilities would appear larger and more detailed and would have greater

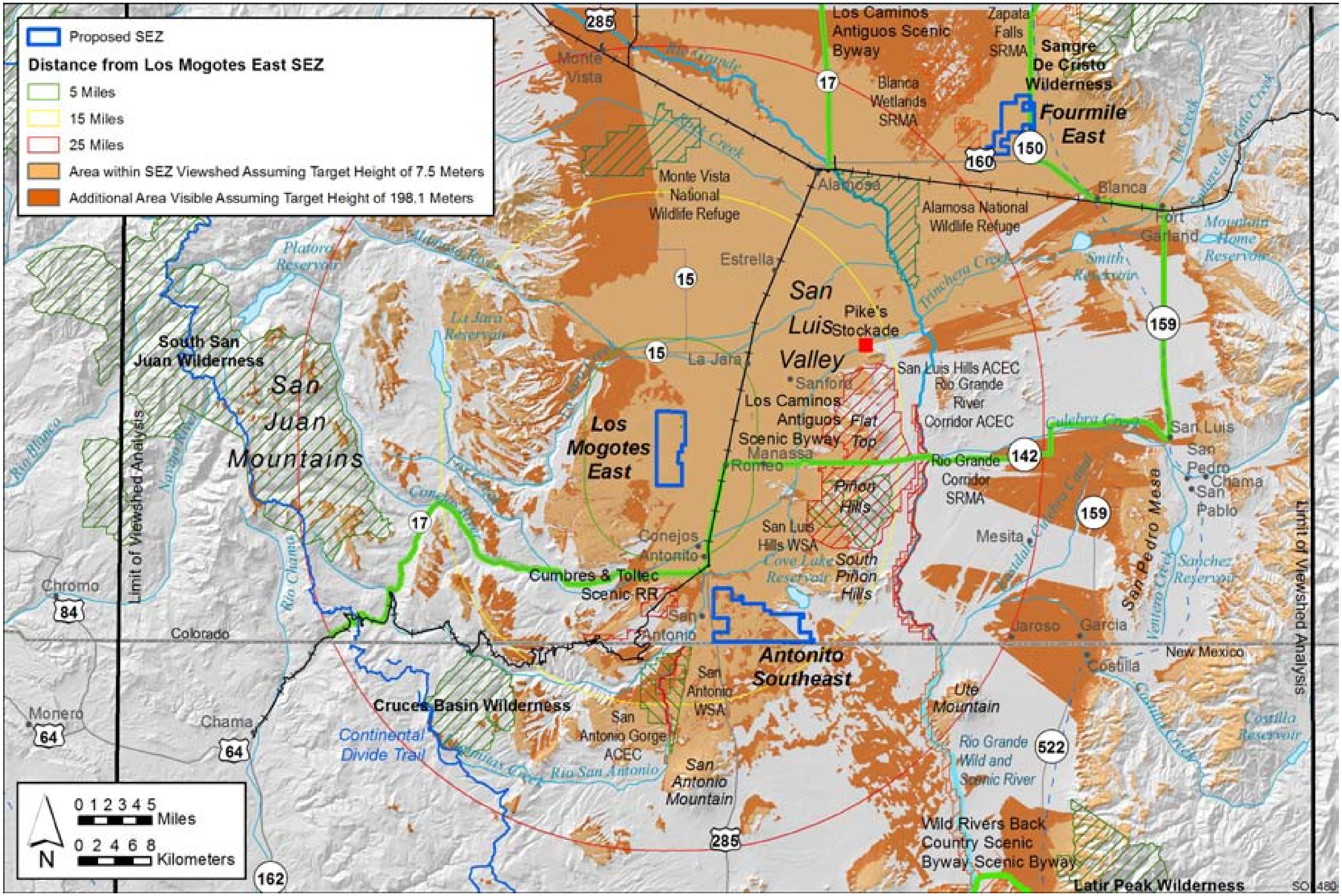

FIGURE 10.4.14.2-9 West Fork of the North Branch of the Old Spanish Trail in the Vicinity of the Proposed Los Mogotes East SEZ

contrast with their surroundings. Where screening was absent or insufficiently tall to block views of solar facilities within the SEZ, because of the close approach of the West Fork trail to the SEZ (approximately 1.0 mi [1.6 km]), energy facilities located within the SEZ might be viewed in the foreground for trail users and could potentially create strong visual contrasts with the surrounding landscape.

The Antonito Southeast SEZ is relatively close to the Los Mogotes East SEZ (approximately 7 mi [11.3 km]). The West Fork of the North Branch of the Old Spanish Trail is located between the two SEZs, paralleling the western boundary of the Antonito Southeast SEZ and the eastern boundary of the Los Mogotes East SEZ. As a result, from some locations on the West Fork, both SEZs are within the field of view, or could be seen in succession as a viewer turned his or her head to scan the field of view. It is therefore possible that solar energy facilities in both SEZs could be visible simultaneously or in succession. However, the topography and viewing geometry are such that solar facilities in one of the two SEZs would be expected to cause much lower levels of visual impact than facilities in the other SEZ, as viewed from most locations, due to its relative distance. Screening in some locations might also limit simultaneous viewing of both SEZs.

Figures 10.4.14.2-10 and 10.4.14.2-11 are Google Earth visualizations depicting views of the SEZ as seen from points on the West Fork of the North Branch of the Old Spanish Trail. The SEZ area is depicted in orange; the heliostat fields in blue. Note that these visualization do not account for potential screening of views of the SEZ and solar energy facilities that might be built within the SEZ. Screening by vegetation and structures that exist in the area might obscure much or all of the view in these locations.

Figure 10.4.14.2-10 depicts a view of the SEZ as it would be seen from the West Fork trail approximately 3.6 mi (5.8 km) southeast of the southeast corner of the SEZ. The nearest power tower is located approximately 4.9 mi (7.8 km) from the viewpoint, and the farthest power tower is located approximately 7.9 mi (12.7 km) from the viewpoint. The viewpoint is elevated approximately 46 ft (14.0 m) above the southeastern corner of the SEZ. The visualization suggests that from this location, solar projects within the SEZ would generally be viewed against the backdrop of the San Juan Mountains west of the SEZ or against the sky, depending on viewer and project location.

Operating power towers within the nearest portions of the SEZ would likely appear as very bright non-point (i.e., with a visible cylindrical or rectangular shape) light sources atop discernable tower structures. 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). When operating, the power towers would likely strongly attract visual attention, as seen from this viewpoint.

At night, if sufficiently tall, power towers in the SEZ could have red or white flashing hazard navigation lighting that would likely be conspicuous from this viewpoint. Other light associated with solar facilities in the SEZ would likely be visible as well.

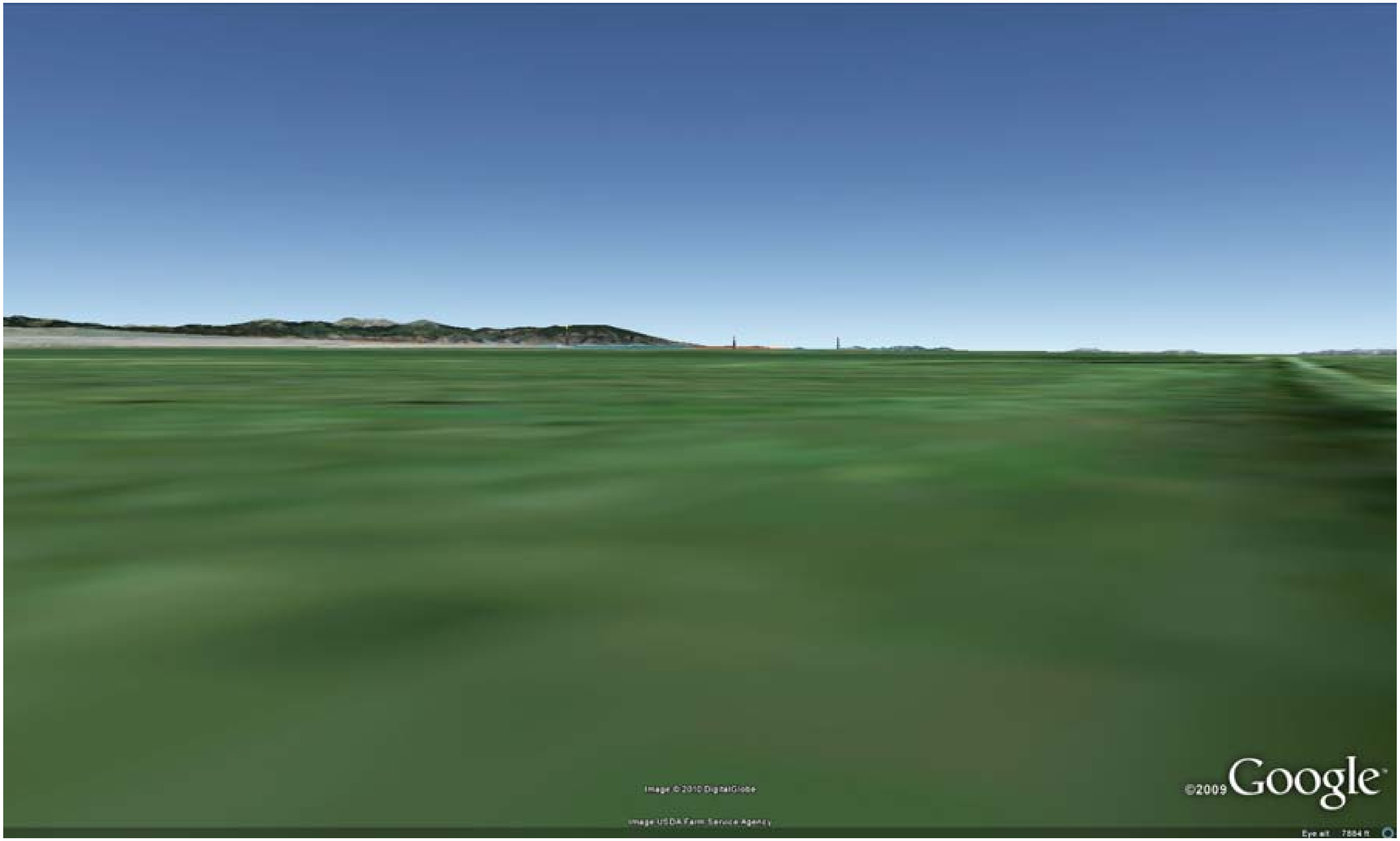

FIGURE 10.4.14.2-10 Google Earth Visualization of the Proposed Los Mogotes East SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from Viewpoint on the West Fork of the North Branch of the Old Spanish Trail Approximately 3.6 mi (5.8 km) Southeast of the Southeast Corner of the SEZ

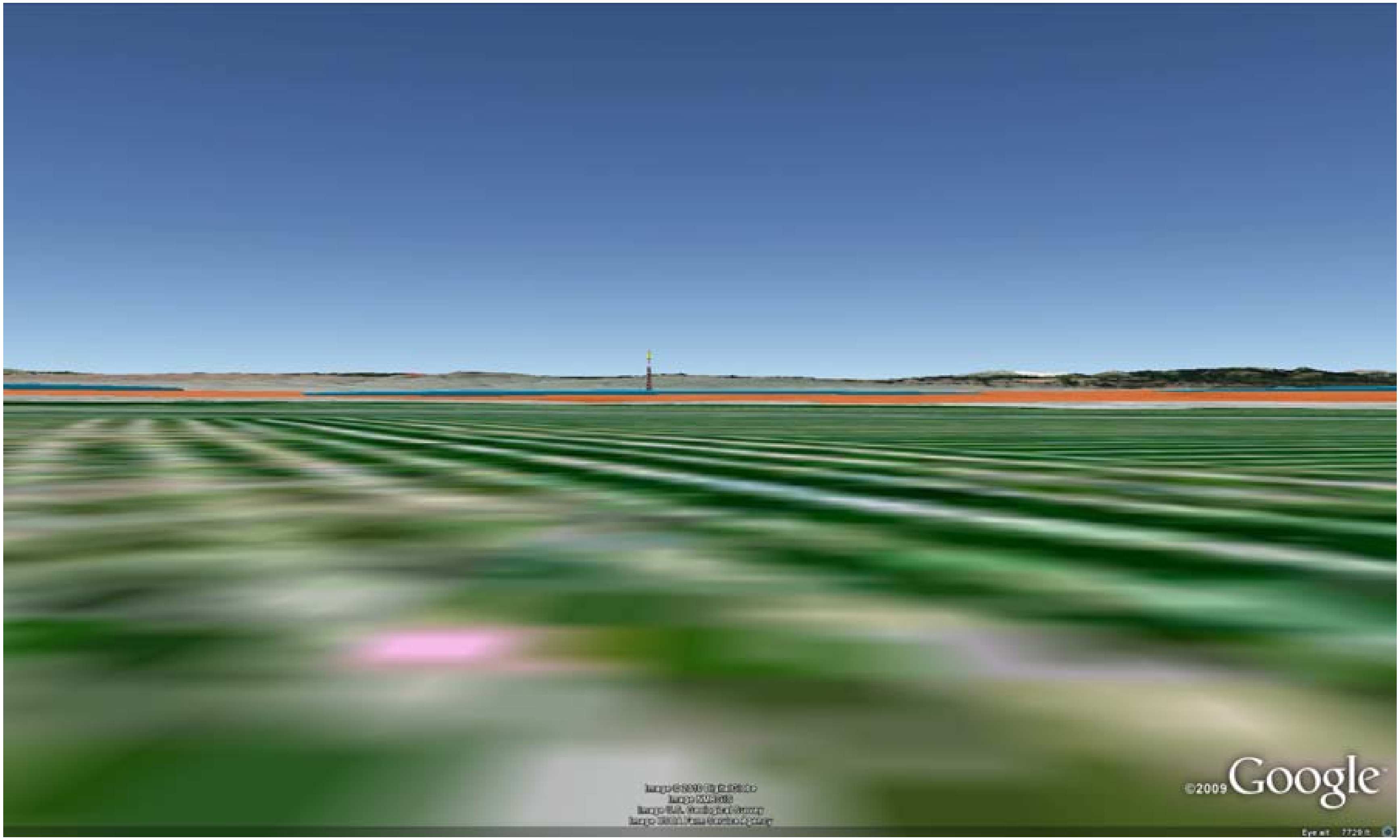

FIGURE 10.4.14.2-11 Google Earth Visualization of the Proposed Los Mogotes East SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from Viewpoint on the West Fork of the North Branch of the Old Spanish Trail Approximately 1.2 mi (1.9 km) from the Closest Point in the SEZ

Figure 10.4.14.2-11 depicts a view of the SEZ as it would be seen from the West Fork trail from a location directly east of the SEZ and approximately 1.2 mi (1.9 km) from the closest point in the SEZ, looking west. The single power tower in this view is located approximately 2.4 mi (3.9 km) from the viewpoint. The viewpoint is elevated approximately 14 ft (4.3 m) above the western edge of the SEZ.

The visualization suggests that because the SEZ is so close to the viewpoint, the SEZ is too large to be encompassed in one view, and viewers would need to turn their heads to scan across the whole SEZ. Under the 80% development scenario analyzed in this PEIS, solar facilities within the SEZ would likely dominate the view toward the San Juan Mountains from this location.

Because the viewpoint is only slightly higher in elevation than the SEZ, the vertical angle of view would be very low, so that collector/reflector arrays of solar facilities within the SEZ would be seen edge-on. This would make the large areal extent and regular geometry of the arrays less apparent, and they would appear as thin lines on the horizon, though if very close to the viewpoint, their forms and structural details could be evident, thereby increasing contrasts. Taller ancillary facilities, such as transmission components, cooling towers, and the like would likely be visible projecting above the arrays, and could contrast noticeably in form, line, and possibly color with the very regular and strongly horizontal collector/reflector arrays.

Operating power towers within the nearest portions of the SEZ would likely appear as brilliant white non-point (i.e., with a visible cylindrical or rectangular shape) light sources atop clearly discernable tower structures. 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). Depending on tower location and height, power tower receivers could potentially be visible above the peaks of the San Juan Mountains. When operating, the power towers would likely strongly attract visual attention, as seen from this viewpoint.

At night, if sufficiently tall, power towers in the SEZ could have red or white flashing hazard navigation lighting that would likely be very conspicuous from this viewpoint. Other light associated with solar facilities in the SEZ would likely be visible as well.

The range of visual impacts on the West Fork would be highly dependent on viewer location along the trail, project location within the SEZ, project characteristics, and the presence or absence of topographic and vegetation screening. These issues would be addressed in a site- and project-specific impact assessment. Depending primarily on viewer location on the trail, where screening did not conceal the facilities from view, solar facilities within the SEZ could dominate the view from nearby portions of the trail. Under the development scenario analyzed in this PEIS, visual contrast from solar energy facilities in the SEZ would be expected to range from minimal to strong.

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.

10.4.14.2.3 Summary of Visual Resource Impacts for the Proposed Los Mogotes East SEZ

Under the 80% development scenario analyzed in this PEIS, there could be multiple solar facilities within the Los Mogotes 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. Visitors to the area, workers, and residents of nearby areas 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.

Utility-scale solar energy development within the proposed Los Mogotes East is likely to result in weak to moderate visual contrasts for some viewpoints in the San Luis Hills WSA, which is approximately 8.8 mi (14.2 km) east–southeast of the SEZ.

Weak to moderate visual contrast levels would be expected for high-elevation viewpoints in the San Luis Hills ACEC, which is approximately 9.4 mi (15.1 km) east of the SEZ.

Almost 33 mi (53 km) of Los Caminos Antiguos Scenic Byway is within the Los Mogotes East SEZ viewshed. Travelers on the byway would be likely to observe weak to strong visual contrasts from solar energy development within the SEZ at some locations on the byway.

Portions of the CTSR Corridor and the CTSR Corridor ACEC are within the SEZ viewshed. Railroad passengers would be likely to observe moderate visual contrasts from solar energy development within the SEZ at some points on the railroad.

The West Fork of the North Branch of the Old Spanish Trail roughly parallels the eastern boundary of the proposed SEZ, passing to within approximately 1.0 mi (1.6 km) of the proposed SEZ. Trail users would be expected to observe strong visual contrasts from solar energy development within the SEZ at some points on the trail.

Where clear views to the SEZ existed, residents and visitors to the communities of Romeo (approximately 3.0 mi [4.8 km] east of the proposed SEZ) and Manassa (approximately 5.5 mi (8.5 km) east of the SEZ) could observe strong visual contrasts from solar facilities within the SEZ. Where clear views to the SEZ existed, residents and visitors to the community of Sanford (approximately 7.7 mi (12.4 km) east–northeast of the SEZ) could observe moderate to strong visual contrasts from solar facilities within the SEZ. Residents of and visitors to La Jara (approximately 5.3 mi [8.6 km] northeast of the proposed SEZ) could observe moderate levels of contrasts.

Minimal to weak visual contrasts would be expected for some viewpoints within other sensitive visual resource areas within the SEZ 25-mi (40 km) viewshed.

10.4.14.3 SEZ-Specific Design Features and Design Feature Effectiveness

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. However, the implementation of required programmatic design features presented in Appendix A, Section A.2.2, would reduce the magnitude of visual impacts experienced. While the applicability and appropriateness of some design features would depend on site- and project-specific information that would be available only after a specific solar energy project had been proposed, the following SEZ-specific design feature can be identified for the Los Mogotes East SEZ at this time:

- The development of power tower facilities should be prohibited within the SEZ.

The height of solar power tower receiver structures, combined with the intense light generated by the receiver atop the tower, would be expected to create strong visual contrasts that could not be effectively screened from view for most areas surrounding the SEZ, given the broad, flat, and generally treeless expanse of the San Luis Valley. In addition, for power towers exceeding 200 ft (61 m) in height, hazard navigation lighting that could be visible for very long distances would likely be required. Prohibiting the development of power tower facilities would remove this source of impacts, thus substantially reducing potential visual impacts on the West Fork of the North Branch of the Old Spanish Trail; the Los Caminos Antiguos Scenic Byway; the other sensitive visual resource areas identified above; the communities of Antonito, Conejos, Romeo, Sanford, Manassa, and La Jara; and other residents and visitors to the San Luis Valley, a regionally important tourist destination.

Implementation of design features intended to reduce visual impacts (described in Appendix A, Section A.2.2, of this 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-specificlevel. Given the large scale, reflective surfaces, 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 is the primary means of mitigating visual impacts. The effectiveness of other visual impact mitigation measures would generally be limited.

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10.4.15 Acoustic Environment

10.4.15.1 Affected Environment

The proposed Los Mogotes East SEZ is located near the central portion of the Conejos County in south-central Colorado, which has no quantitative noise level regulations, but Colorado has established the maximum permissible noise levels for the state by land use zone and by time of day, as shown in Table 4.13.1-1.

U.S. 285 is located as close as about 2.6 mi (4 km) east of the Los Mogotes East SEZ. Several county roads criss-cross the agricultural lands to the east, three of which provide access roads from U.S. 285 to the SEZ. The nearest railroad runs to the east along U.S. 285. The nearest airport is San Luis Valley Regional Airport, about 17 mi (27 km) north–northeast of the SEZ. Other nearby airports include Monte Vista Municipal Airport and Blanca Airport, which are located about 21 mi (34 km) north and 29 mi (47 km) east–northeast of the SEZ, respectively. Immediately to the east and the north are developed, large-scale irrigated agricultural activities for alfalfa and grains, while cattle grazing occurs on-site. No sensitive receptors (e.g., hospitals, schools, or nursing homes) exist around the Los Mogotes East SEZ. The nearby residences from the SEZ boundary are farms to the east and the north, located as close as about 0.4 mi (0.6 km) from the southeast corner. Several population centers with schools or town infrastructure are within a 5-mi (8-km) distaqnce. Antonito to the east–southeast, Manassa to the east, and La Jara to the northeast. Accordingly, noise sources around the SEZ include road traffic, railroad traffic, aircraft flyover, agricultural activities, animal noise, and community activities and events. The proposed Los Mogotes East SEZ is mostly undeveloped, the overall character of which is considered rural. To date, no environmental noise survey has been conducted in the vicinity of the Los Mogotes East SEZ. On the basis of population density, the day-night sound level (L_{dn} or DNL) is estimated to be 30 dBA for Conejos County, lower than the 33 to 47 dBA L_{dn} typical of a rural area[10] (Eldred 1982; Miller 2002).

10.4.15.2 Impacts

Potential noise impacts associated with solar projects built in the Los Mogotes East SEZ would occur during all phases of the projects. During the construction phase, potential noise impacts on the nearest residence (within 0.4 mi [0.6 km] of the SEZ boundary) associated with operation of heavy equipment and vehicular traffic would be anticipated, albeit of short duration. During the operation 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 Los Mogotes East SEZ are presented in this section. Any such impacts would be minimized through the implementation of required programmatic design

[10] Rural and undeveloped areas have sound levels in the range of 33 to 47 dBA as L_{dn} (Eldred 1982). Typically, the nighttime level is 10 dBA lower than the daytime level, and it can be interpreted as 33 to 47 dBA (mean 40 dBA) during daytime hours and 23 to 37 dBA (mean 30 dBA) during nighttime hours.

features described in Appendix A, Section A.2.2, and through the application of any additional SEZ-specific design features (see Section 10.4.15.3, below). This section primarily addresses potential noise impacts on humans, although potential impacts on wildlife at nearby sensitive areas are discussed, Additional discussion on potential noise impacts on wildlife is presented in Section 5.10.2.

10.4.15.2.1 Construction

The proposed Los Mogotes 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; installing equipment, piping, and electrical). Solar array construction would also generate noise, but 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, where key components (e.g., steam turbine/generator) needed to generate electricity are located; 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 used. Typically, the power block area is located in the center of a solar facility, at a distance of more than 0.5 mi (0.8 km) to the facility boundary. Noise levels from construction of the solar array would be lower than 95 dBA. With geometric spreading and ground effects, as explained in Section 4.13.1, noise levels would attenuate to about 40 dBA at a distance of 1.2 mi (1.9 km) from the power block area. This noise level is typical of daytime mean rural background level. In addition, mid- and high-frequency noise from construction activities is significantly attenuated by atmospheric absorption under the low humidity conditions typical of an arid desert environment, and by temperature lapse conditions typical of daytime hours; thus noise attenuation to a 40-dBA level would occur at somewhat shorter distances than the aforementioned distances. 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 residence closest to the southeastern SEZ boundary, estimated noise levels at the nearest residence would be about 52 dBA, which is higher than a typical daytime mean rural background level of 40 dBA. In addition, an estimated 49 dBA L_{dn} at this residence[11] falls below the EPA guideline of 55 dBA for residential areas.

In addition, noise levels were estimated at the specially designated areas within a 5-mi (8-km) distance from the Los Mogotes East SEZ, which is the farthest distance that noise (except extremely loud noise) would be discernable. The Los Mogotes ACEC and North Branch of the Old Spanish Trail, which lie as close as 1.0 mi (1.6) west and east of the SEZ boundary, respectively, are within this distance. For construction activities occurring near the western or eastern SEZ boundary, estimated noise levels at the Los Mogotes ACEC or North Branch of Old Spanish Trail would be about 42 dBA, slightly higher than the typical daytime mean rural background level of 40 dBA. Construction noise from the SEZ is not likely to adversely affect

[11] For this analysis, background levels of 40 and 30 dBA for daytime and nighttime hours, respectively, are assumed, which result in day-night average noise level (L_{dn}) of 40 dBA.

wildlife at the Los Mogotes ACEC (Manci et al. 1988), as discussed in Section 5.10.2. However, construction occurrning near the eastern SEZ boundary could result in minor noise impacts on the North Branch of Old Spanish Trail. These impacts would be temporary.

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, in contrast to impulsive impact pile drivers frequently seen at large-scale construction sites. Potential impacts on neighboring residences would be anticipated to be minor, considering the distance to the nearest residence (more than 0.4 mi [0.6 km] from the SEZ boundary).

It is assumed that most construction activities would occur during the day, when noise is tolerated better than at night because of the masking effects of background noise. In addition, construction activities for a utility-scale facility are temporary (typically a few years). Construction would cause some unavoidable but localized short-term impacts on neighboring communities, particularly for activities occurring near the eastern 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 is the case 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 close. Therefore, no adverse vibration impacts from construction activities are anticipated, 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 regional 69-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 would be a minor component of construction impacts in comparison to solar facility construction and would be temporary.

10.4.15.2.2 Operations

Noise sources common to all or most types of solar technologies are equipment motion from solar tracking; maintenance and repair activities (e.g., washing of mirrors or replacement of broken mirrors) at the solar array area; and commuter/visitor/support/delivery traffic within and around the solar facility and around 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 arrays area would be minimal, related mainly to solar tracking, if used. On the other hand, dish engine technology, which employs collector and converter devices in a single unit, would be the strongest noise source.

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 51 dBA at the facility boundary, about 0.5 mi (0.8 km) from the power block area. For a facility located near the southeastern corner of the SEZ, the predicted noise level from the power block would be about 45 dBA at the nearest residence, located about 0.4 mi (0.6 km) from the site boundary, which is higher than the typical daytime mean rural background level of 40 dBA. If TES was not used (i.e., if the operation was limited to daytime, 12 hours only[12]), the EPA guideline level of 55 dBA as L_{dn} for residential areas would occur at about 1,370 ft (420 m) from the power block area and thus would not be exceeded outside of the proposed SEZ boundary. At the nearest residence, about 44 dBA L_{dn} would be estimated, which is well below the EPA guideline level of 55 dBA L_{dn} for residential areas. However, day-night average noise levels higher than those estimated above by using the simple noise modeling would be anticipated if TES was used during nighttime hours, as explained below and in Section 4.13.1.

On a calm, clear night typical of the proposed Los Mogotes East SEZ setting, 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. There would be little, if any, shadow zone[13] within 1 or 2 mi (1.6 to 3 km) of the noise source in the presence of a strong temperature inversion (Beranek 1988). In particular, such conditions add to the effect of noise being more discernable during nighttime hours when the background levels are the lowest. To estimate the day-night average noise level (L_{dn}), 6-hour nighttime generation after 12-hour daytime generation with TES is assumed. For nighttime hours under temperature inversion, 10 dB is added to noise levels estimated from the uniform atmosphere (see Section 4.13.1). Based on these assumptions, the estimated nighttime noise level at the nearest residence (about 0.9 mi [1.4 km] from the power block area for a solar facility located near the southeastern SEZ boundary) would be about 55 dBA, which is quite higher than the typical nighttime mean rural background level of 30 dBA. The day-night average noise level is estimated to be about 57 dBA L_{dn}, which is a little higher than the EPA guideline of 55 dBA L_{dn} for residential areas. The assumptions are conservative in terms of operating hours, and no credit was given to other attenuation mechanisms, so it is likely that sound levels would be lower than

[12] Maximally possible operating hours around summer solstice but limited to 7 to 8 hours around winter solstice.

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

57 dBA L_{dn} at the nearest residence, even if TES is used at a solar facility. Consequently, operating parabolic trough or power tower facilities with TES and located near the southeastern SEZ boundary could result in potential noise impacts on the nearest residence, depending on background noise levels and meteorological conditions.

For a parabolic trough or power tower solar facility located near the western or eastern boundary of the SEZ, estimated daytime and nighttime noise levels at the Los Mogotes ACEC or North Branch of Old Spanish Trail would be about 41 and 51 dBA, respectively, which are comparable to and higher than typical daytime and nighttime mean rural background levels of 40 and 30 dBA. Operation noise from the SEZ is not likely to adversely affect wildlife at the Los Mogotes ACEC (Manci et al. 1988). However, a solar facility located near the eastern SEZ boundary could result in noise impacts on the North Branch of Old Spanish Trail.

In the permitting process, refined noise propagation modeling would be warranted along with measurement of background noise levels.

The solar dish engine is unique among CSP technologies because it generates electricity directly, and this technology does not need a power block. A single, large solar dish engine has relatively low noise levels, but a solar facility might employ 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 Los Mogotes East SEZ, assuming a dish engine facility of up to 526-MW capacitly (covering 80% of the total area, or 4,734 acres [19.2 km^2]), up to 21,040 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 a substation; however, the noise from these sources would be masked by dish engine noise.

The composite noise level of a single dish engine would be about 88 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 rural daytime environment) within 320 ft (100 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, e.g., about 48 dBA at 1 mi (1.6 km) and 44 dBA at 2 mi (3 km) from the boundary of the square-shaped dish engine solar field; both values are higher than the typical daytime mean rual background level of 40 dBA. However, 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 residence, it was assumed that dish engines were placed all over the Los Mogotes East SEZ at intervals of 98 ft (30 m). Under these assumptions, the estimated noise level at the nearest residence, about 0.4 mi (0.6 km) from the SEZ boundary would be about 49 dBA, which is higher than the typical daytime mean rural background level of 40 dBA. On the basis of 12-hour daytime operation, the estimated 47 dBA L_{dn} at this residence is below the EPA guideline of 55 dBA L_{dn} for residential areas. On the basis of other attenuation mechanisms, 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 residence, depending on background noise levels and meteorological conditions.

For dish engines placed all over the SEZ, estimated noise levels would be about 47 to 48 dBA at the Los Mogotes ACEC and North Branch of Old Spanish Trail, which are higher than the typical daytime mean rural background level of 40 dBA. Dish engine noise from the SEZ is not likely to adversely affect wildlife at the Los Mogotes ACEC (Manci et al. 1988) but could result in noise impacts on the North Branch of Old Spanish Trail.

Consideration of minimizing noise impacts is very important during the siting of dish engine facilities. Direct mitigation of dish engine noise through noise control engineering could also be considered.

During operations, no major ground-vibrating equipment would be used. In addition, no sensitive structures are located close enough to the Los Mogotes 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 placed near the power block area, which is typically near the center of a solar facility. Noise from these sources would generally be limited to within the facility boundary and rarely be heard at nearby residences, assuming a 0.9-mi (1.4-km) distance (at least 0.5 mi [0.8 km] to the facility boundary and another 0.4 mi [0.6 km] to the nearby residences). Accordingly, potential impacts of these noise sources on nearby residences would be minimal.

For noise impacts from transmission line corona discharge (Section 5.13.1.5), during rainfall events, the noise levels 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, which may be judged to be more annoying than other environmental noises. However, corona noise would not likely cause impacts unless a residence is located close to it (e.g., within 500 ft [152 m] of a 230-kV transmission line). The Los Mogotes East SEZ is located in an arid desert environment, and incidents of corona discharge are infrequent. Therefore, potential impacts associated with transmission lines on nearby residents along the transmission lines ROW would be negligible.

10.4.15.2.3 Decommissioning/Reclamation

Decommissioning/reclamation requires many of the same procedures and equipment used in traditional construction. Decommissioning/reclamation would include dismantling of solar facilities, 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 less than those for construction activities. Decommissioning activities would be of short duration, and their potential impacts would be minor and temporary. The same design features adopted during the construction phase could also be implemented during the decommissioning phase.

Similarly, potential vibration impacts on surrounding communities and vibration-sensitive structures during decommissioning of any solar facility would be less than those during construction and thus minimal.

10.4.15.3 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 project details are being considered, some measures can be identified at this time, as follows:

- Noise levels from cooling systems equipped with TES should be managed so that levels at nearby residences to the north and east 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 Los Mogotes East SEZ should be located more than 1 to 2 mi (1.6 to 3 km) from nearby residences around the SEZ (i.e., the facilities should be located in the western area 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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10.4.16 Paleontological Resources

The paleontological conditions of the San Luis Valley, which encompasses the proposed Los Mogotes East SEZ, are described in Section 10.1.16.

10.4.16.1 Affected Environment

The proposed Los Mogotes East SEZ is covered predominantly by Tertiary basalt flows and associated tuff, breccia, and conglomerate (classified as Tbb on geological maps). Of the entire 5,909-acre (24-km^2) area of SEZ land, 5,192 acres (21 km^2), or 88%, is composed of this volcanic deposit. The PFYC for Tbb is Class 1, which indicates that the occurrence of significant fossil materials is non-existent or extremely rare. (Section 4.8 discusses the PFYC system.) No paleontological resources from this surface geology type are known in the San Luis Valley Resource Area. About 12% of the SEZ (718 acres or 2.9 km^2) is composed of unclassified Quaternary surface deposits (classified on geologic maps as QTsa) overlying the Alamosa Formation. This area is on the eastern edge of the SEZ. The PFYC for QTsa is Class 4/5 (on the basis of the PFYC map from the Colorado State Office; see Murphey and Daitch 2007), although no known paleontological resources from these deposits in the San Luis Valley have been recorded (Lindsey 1983). The nearest identified exposures of the Alamosa Formation are located in the San Luis Hills to the east of the Los Mogotes East SEZ and at Hansen's Bluff southeast of Alamosa, Colorado (northeast of the SEZ). Most areas immediately adjacent to the proposed Los Mogotes East SEZ are also Tbb deposits and are unlikely to contain significant fossils. However areas immediately east of the SEZ are composed of QTsa deposits and are PFYC Class 4/5.

10.4.16.2 Impacts

Few, if any, impacts on significant paleontological resources are likely to occur in the portion of the proposed Los Mogotes East SEZ that have been identified as PFYC Class 1. However, a more detailed look at the local geological deposits of the SEZ is needed to verify that a PFYC of Class 1 is accurate and appropriate and that no exposures of the Alamosa Formation are present. On the basis of the PFYC classification of Class 4/5 for the eastern 12% of the SEZ, there could be impacts on significant paleontological resources in this area, although the presence of such resources is currently unknown. A more detailed look at the geological deposits in the eastern portion of the SEZ and the depth to the Alamosa Formation is needed, as well as a paleontological survey prior to development, as per BLM IM2008-009 and IM2009-011 (BLM 2007, 2008a). If significant paleontological resources are found to be present within the eastern 12% of the proposed Los Mogotes East SEZ during a paleontological survey, Section 5.14 discusses the types of impacts that could occur. Because it is also possible that no significant paleontological resources may be present within the SEZ, there may not be any impacts on this resource as a result of construction and operation of a solar facility. Programmatic design features (as described in Section A.2.2) assume that the necessary surveys will occur.

Indirect impacts, such as through looting or vandalism, on paleontological resources outside of the SEZ, in areas to the east that are also classified as PFYC 4/5, are unknown but unlikely; any such resources would be below the surface and not readily accessed, although the presence of exposures of the Alamosa Formation is currently unknown. Programmatic design features for controlling water runoff and sedimentation would prevent erosion-related impacts on buried deposits outside of the SEZ.

Approximately 3 mi (5 km) of access road is anticipated to connect the SEZ to U.S. 285 to the east. Areas of PFYC Class 4/5 could be affected. The depth to the Alamosa Formation should be determined to identify whether the application of mitigation measures might be necessary in that area to avoid the potential for adverse effects (both direct and indirect) related to construction of the ROW.

10.4.16.3 SEZ-Specific Design Features and Design Feature Effectiveness

Impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2. An SEZ-specific design feature is as follows:

- Avoidance of PFYC Class 4/5 areas is recommended for development within the proposed Los Mogotes East SEZ and for access road placement. Where avoidance of Class 4/5 deposits is not possible, a paleontological survey may be required.

10.4.17 Cultural Resources

The general culture history of the San Luis Valley, which encompasses the proposed Los Mogotes East SEZ, is described in Section 10.1.17.

10.4.17.1 Affected Environment

No archaeological sites have been recorded in the proposed Los Mogotes East SEZ. Two segments of the Little Mogotes Allotment Water Development Project that minimally extend into the Los Mogotes East SEZ were surveyed for cultural resources (0.02% of the SEZ). No sites were encountered in these small survey areas. A total of 144 sites and isolated finds have been recorded within 5 mi (8 km) of the SEZ. In 1980, a 5-mi^2 (13-km^2) area directly south of the SEZ, called the Mogote Survey Area, was surface surveyed as part of the first phase of the San Luis Valley Archaeological Project. Thirty-nine sites were recorded, including several stone circles, stone enclosures, and rock piles, as well as prehistoric activity and occupation areas and historic sites and trash scatters; at least one of the sites appeared to have buried deposits in association with a hearth (Haas 1980). Just west of the SEZ, a large number of archaeological sites (50 sites within 5 mi [8 km] of the SEZ) were recorded in 1982 as part of a project called "San Luis Valley: A Model for Management." Many of these sites are rock alignments, cairns, and wind breaks (Colorado SHPO 2009). During the site visit, a cairn overlooking the SEZ was visited; it contained an historic rock art depiction of a cross etched into the desert varnish. It was likely one of the sites initially recorded in 1982. Approximately 135 additional sites located slightly more than 5 mi (8 km) west of the north end of the SEZ were recorded and evaluated during a survey of the La Jara Reservoir area for the Baca Land Exchange; 51 of those sites are eligible for listing in the NRHP and 29 sites, although not individually eligible, contribute to the La Jara Archaeological Area (Wells 2008). Consistent with findings in the local area, many of the prehistoric sites found during the survey include lithic scatters, open camps, open architectural sites, and rock art sites, and historic sites include culturally peeled trees, trash scatters, structures, and an ethnobotanical gathering site.

No properties currently listed in the NRHP for Conejos County are located within the SEZ; however, five properties are located nearby in Antonito, just over 5 mi (8 km) to the south of the SEZ. The Denver & Rio Grande Railroad San Juan Extension (also known as the CTSR) is one of the properties listed in the NRHP that is located relatively close to the SEZ; it is currently nominated for National Landmark status.

No traditional cultural properties within the SEZ have been identified during government-to-government consultations, nor have concerns been raised to date for traditional cultural properties located in the vicinity of the SEZ (see also Section 10.4.18). Traditional cultural properties of interest to the Hispanic community are possible in this area.

This SEZ has the potential to contain significant cultural resources. The large number of sites encountered to the west indicates people were present in this location in both prehistoric and historic times. The potential for finding significant Paleoindian sites exists throughout the entire valley. Sites related to the historic period settlement of the valley are also possible. A large trash scatter of seemingly recent origin is located on the eastern side of the SEZ, outside the boundary, although older deposits of historic debris are possible in the vicinity. An acequia is also located just east of the proposed SEZ, connecting to the Conejos River.

The West Fork of the North Branch of the Old Spanish Trail proceeds close to the eastern boundary of the SEZ.[14] A survey of the West Fork is needed to verify the location of the trail and identify associated sites and features. Identification of evidence for use of the West Fork during the period of 1829 to 1848 would support local recommendations by the Old Spanish Trail Association to include the West Fork as part of the congressionally designated Old Spanish National Historic Trail. Until additional research has been completed, the West Fork is being managed as a significant cultural resource in order to maintain the historic and visual integrity of the corridor (Haas 2010).

10.4.17.2 Impacts

Direct impacts on significant cultural resources during site preparation and construction activities could occur in the proposed Los Mogotes East SEZ; however, further investigation is needed. A cultural resource survey of the entire area of potential effect would first need to be conducted required to identify archaeological sites, historic structures or features, and traditional cultural properties, and an evaluation would need to follow to determine whether any recorded sites meet the criteria for eligibility for listing in the NRHP. Section 5.15 discusses the types of impacts that could occur on any significant cultural resources found to be present within the proposed SEZ. Impacts would be minimized to the extent possible 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 would occur.

Indirect impacts on cultural resources resulting from erosion outside of the SEZ boundary (including along ROWs) are unlikely assuming programmatic design features to reduce water runoff and sedimentation are implemented (as described in Section A.2.2). Approximately 3 mi (5 km) of access road is anticipated to connect to U.S. 285 to the east. Indirect impacts on cultural resources, such as vandalism or theft, could occur if significant sites are close to the ROW east of the SEZ. No new transmission lines have been assessed for the proposed SEZ, assuming existing corridors would be used and no new areas of potential cultural significance would be opened to increased access; impacts on cultural resources related to the creation of new corridors would be evaluated at the project-specific level if new road construction or line upgrades are to occur.

Although the West Fork of the North Branch of the Old Spanish Trail has not received National Historic Trail status, the potential effect of solar energy development on the visual setting of the nearby trail should be further evaluated. On the basis of the preliminary visual analysis presented in Section 10.4.14.2, the CTSR Corridor ACEC located south of the zone would not be adversely affected by solar energy development in the Los Mogotes East SEZ, with

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[14] The West Fork is located within 1.0 mi (1.6 km) of the SEZ at its closest point on the basis of preliminary maps; the mapped location of the trail is considered approximate.

the possible exception of visual impacts resulting from the installation of a power tower or other similarly tall structures (see Figure 10.4.14.2-1). However, the ACEC is located farther away than other portions of the railroad system, and the impact of solar energy development on the visual setting of the entire historic property should be further evaluated.

10.4.17.3 SEZ-Specific Design Features and Design Feature Effectiveness

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.

Ongoing consultation with the Colorado SHPO and the appropriate Native American governments would be conducted during the development of the proposed Los Mogotes East SEZ. It is likely that adverse effects on significant resources in the valley could be mitigated to some degree through such efforts, although not enough to eliminate the effects unless a significant resource is avoided entirely. SEZ-specific design features could include:

- Development of a PA may be needed among the BLM, DOE, Colorado SHPO, and ACHP to consistently address impacts on significant cultural resources from solar energy development. Should a PA be developed to incorporate mitigation measures for resolving adverse effects on the Old Spanish National Historic Trail or the West Fork of the North Branch of the Old Spanish Trail, the Trail Administration for the Old Spanish Trail (BLM-NMSO and NPS Intermountain Trails Office, Santa Fe) also should be included in the development of that PA.

- Additional coordination with the CTSR Commission is recommended to address possible mitigation measures for reducing visual impacts on the Cumbres and Toltec Scenic Railroad.[15]

[15] Additional parties, such as the NPS and the ACHP, may need to be consulted if the railroad achieves National Historic Landmark status.

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10.4.18 Native American Concerns

10.4.18.1 Affected Environment

For a discussion of issues of possible Native American concern, several sections in this PEIS should be consulted. General topics of concern are addressed in Section 4.16. Specifically for the proposed Los Mogotes East SEZ, Section 10.4.17 discusses archaeological sites, structures, landscapes, trails, and traditional cultural properties, and Section 10.1.17 describes the general cultural history of the San Luis Valley; Section 10.4.9.1.3 discusses water rights and water use; Section 10.4.10 discusses plant species; 10.4.11 discusses wildlife species, including wildlife migration patterns; Sections 10.4.19 and 10.4.20 discuss socioeconomics and environmental justice, respectively; and issues of human health and safety are discussed in Section 5.21.

The valley was predominantly used by Tribes historically for hunting and trading rather than long-term settlement. The nearest Tribal land claim (judicially established as traditional tribal territory) to the proposed Los Mogotes East SEZ is for the Jicarilla Apache. Their land claim is located east and southeast of the SEZ, mostly in New Mexico but also up into southeastern Colorado. The Taos Pueblo has a judicially established land claim to the south of the SEZ in New Mexico.

Consultation for the Colorado SEZs has been initiated by the BLM with the Tribes[16] shown in Table 10.4.18.1-1. Details on government-to-government consultation efforts are presented in Chapter 14 and Appendix K. Plants and other resources within the San Luis Valley of potential importance are discussed in Sections 10.1.18.1.1 and 10.1.18.1.2.

10.4.18.2 Impacts

To date, no comments have been received from the Tribes referencing the proposed Los Mogotes East SEZ specifically. The Navajo Nation has responded that “the proposed undertaking/project area will not impact any Navajo traditional cultural properties,” with the caveat that the Nation be notified of any inadvertent discoveries that might take place related to the undertaking (Joe 2008; Joe 2009). No direct impacts from disturbance during project development would occur to judicially established Tribal land claims or to areas in the San Luis Valley previously indicated as culturally significant (San Luis Lakes, the Great Sand Dunes, Blanca Peak). It is possible that there will be Native American concerns about potential visual effects and the effects of noise from solar energy development in the SEZ on these areas or on the valley as a whole as consultation continues and additional analyses are undertaken. If 80% of the proposed SEZ is developed, it is likely that some plants traditionally important to Native Americans will be destroyed and that habitat of traditionally important animals will be lost.

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16 Plains Tribes that may have used the valley ranged widely and may have been settled a great distance from the valley in Oklahoma and South Dakota.

TABLE 10.4.18.1-1 Federally Recognized Tribes with Traditional Ties to the Proposed SEZs in San Luis Valley

Tribe	Location	State
Cheyenne and Arapaho Tribes of Oklahoma	Concho	Oklahoma
Comanche Nation	Lawton	Oklahoma
Eastern Shoshone	Fort Washakie	Wyoming
Fort Sill Apache Tribe of Oklahoma	Apache	Oklahoma
Hopi	Kykotsmovi	Arizona
Jicarilla Apache Nation	Dulce	New Mexico
Kiowa Tribe of Oklahoma	Carnegie	Oklahoma
Navajo Nation	Window Rock	Arizona
Northern Arapaho	Fort Washakie	Wyoming
Northern Cheyenne	Lame Deer	Montana
Ohkay Owingeh	San Juan Pueblo	New Mexico
Pueblo of Nambe	Santa Fe	New Mexico
Pueblo of Santa Ana	Santa Ana Pueblo	New Mexico
Pueblo of Santo Domingo	Santo Domingo Pueblo	New Mexico
San Ildefonso Pueblo	Santa Fe	New Mexico
Santa Clara Pueblo	Espanola	New Mexico
Southern Ute	Ignacio	Colorado
Taos Pueblo	Taos	New Mexico
Tesuque Pueblo	Santa Fe	New Mexico
Ute Mountain Ute	Towaoc	Colorado
Ute Tribe of the Uinta and Ouray Reservation	Fort Duchesne	Utah
White Mesa Ute	Blanding	Utah

Given that similar plants and habitat would remain in the valley, project-level consultation with Tribes will be necessary to determine the importance of the traditional resources.

Groundwater withdrawals in the valley are tightly regulated and the use of programmatic design features described in Appendix A, Section A.2.2, would ensure that minimal impacts to surface waters and springs would occur.

10.4.18.3 SEZ-Specific Design Features and Design Feature Effectiveness

Programmatic design features to mitigate impacts of potential concern to Native Americans, such as avoidance of sacred sites, water sources, and tribally important plant and animal species, are provided in Appendix A, Section A.2.2. Programmatic design features assume that the necessary surveys, evaluations, and consultations will occur.

The need for and nature of SEZ-specific design features regarding potential issues of concern would be determined during government-to-government consultation with affected Tribes listed in Table 10.4.18.1-1.

10.4.19 Socioeconomics

10.4.19.1 Affected Environment

This section describes current socioeconomic conditions and local community services within the ROI surrounding the proposed Los Mogotes East SEZ. The ROI is a six-county area comprising Alamosa, Conejos, Costilla, and Rio Grande Counties in Colorado and Rio Arriba and Taos Counties in New Mexico. 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.

10.4.19.1.1 ROI Employment

In 2008, employment in the ROI stood at 55,187 (Table 10.4.19.1-1). Over the period 1999 to 2008, annual average employment growth rates were higher in Taos County (3.7%) and Rio Grande County (2.4%) than elsewhere in the ROI. Employment declined over this period in Conejos County. At 1.5%, the growth rate in the ROI as a whole was similar to the average state rates for Colorado (1.5%) and New Mexico (1.5%).

TABLE 10.4.19.1-1 ROI Employment for the Proposed Los Mogotes East SEZ

Location	1999	2008	Average Annual Growth Rate, 1999–2008 (%)
Alamosa County, Colorado	7,885	7,935	0.1
Conejos County, Colorado	3,498	3,402	–0.3
Costilla County, Colorado	1,234	1,268	0.3
Rio Grande County, Colorado	4,784	6,040	2.4
Rio Arriba County, New Mexico	18,426	19,886	0.8
Taos County, New Mexico	11,612	16,656	3.7
ROI	47,439	55,187	1.5
Colorado	2,269,668	2,596,309	1.5
New Mexico	793,052	919,466	1.5

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

In 2006, the service sector provided the highest percentage of employment in the ROI at 47.7%, followed by agriculture (18.6%) and wholesale and retail trade (18.0%) (Table 10.4.19.1-2). Smaller employment shares were held by construction (7.0%) and finance, insurance, and real estate (4.7%). Within the ROI, the distribution of employment across sectors is similar to that of the ROI as a whole, with a lower percentage of employment in agriculture in Rio Arriba County (14.1%) and in Taos County (3.6%) than in the ROI as a whole. In the four Colorado counties, employment in agriculture is more significant than in the ROI as a whole, with more than 75% of total employment in this sector in Costilla County, and more than 40% in Rio Grande and Conejos Counties. Employment in services is much less significant than in the ROI as a whole.

10.4.19.1.2 ROI Unemployment

Unemployment rates have varied across the six counties in the ROI. Over the period 1999 to 2008, the average rate in Costilla County was 9.2%, with a relatively high rate of 6.9% in Taos and Conejos Counties, with rates exceeding 5% in all counties except Alamosa over this period (Table 10.4.19.1-3). Rates have fallen over the period; in 1999, Taos and Conejos Counties experienced rates higher than 11%. The average rate in the ROI over this period was 6.1%, higher than the average rate for Colorado (4.5%) and New Mexico (5.0%). Unemployment rates for the first 5 months of 2009 contrast with rates for 2008 as a whole; in Costilla County, the unemployment rate increased to 11.1%, while rates reached 9.9% and 8.4% in Conejos County and Rio Grande County, respectively. The average rates for the ROI (7.0%), for Colorado (7.5%), and for New Mexico (5.6%) were also higher during this period than the corresponding average rates for 2008.

10.4.19.1.3 ROI Urban Population

The population of the ROI in 2008 was 29% urban; the largest city, Alamosa, had an estimated population of 8,746; other cities in the ROI include Espanola (7,076), Taos (5,546) and Monte Vista (4,015) (Table 10.4.19.1-4). In addition, there are ten smaller cities in the ROI with a 2008 population of less than 1,500.

Population growth rates in the ROI have varied over the period 2000 to 2008 (Table 10.4.19.1-4). Taos grew at an annual rate of 2.1% during this period, with higher-than average-growth also experienced in Chama (1.4%) and Alamosa (1.2%). The remaining cities experienced lower growth rates from 2000 to 2008, with the majority of these cities experiencing negative growth rates during this period.

10.4.19.1.4 ROI Urban Income

Median household incomes vary across cities in the ROI. No data are available for cities in the ROI for 2006 to 2008. In 2000, only Taos Ski Village ($87,175) had a median income that

TABLE 10.4.19.1-2 ROI Employment for the Proposed Los Mogotes East SEZ by Sector, 2006[a]

Industry	Alamosa County, Colorado: Employment	Alamosa County, Colorado: % of Total	Conejos County, Colorado: Employment	Conejos County, Colorado: % of Total	Costilla County, Colorado: Employment	Costilla County, Colorado: % of Total	Rio Grande County, Colorado: Employment	Rio Grande County, Colorado: % of Total
Agriculture[a]	1,470	22.4	488	42.8	484	77.0	1,763	41.9
Mining	10	0.2	10	0.9	0	0.0	0	0.0
Construction	324	4.9	39	3.4	14	2.2	179	4.3
Manufacturing	93	1.4	60	5.3	10	1.6	79	1.9
Transportation and public utilities	201	3.1	100	8.8	10	1.6	70	1.7
Wholesale and retail trade	1,300	19.8	159	14.0	90	14.3	769	18.3
Finance, insurance, and real estate	434	6.6	41	3.6	10	1.6	197	4.7
Services	2,752	41.9	299	26.3	114	18.4	1,172	27.9
Other	9	0.1	0	0.0	10	1.6	10	0.2
Total	6,575		1,139		631		4,207	

Industry	Rio Arriba County, New Mexico: Employment	Rio Arriba County, New Mexico: % of Total	Taos County, New Mexico: Employment	Taos County, New Mexico: % of Total	ROI: Employment	ROI: % of Total
Agriculture[a]	1,281	14.1	353	3.6	5,841	18.6
Mining	107	1.2	758	0.8	205	0.7
Construction	621	6.8	1,038	10.6	2,215	7.0
Manufacturing	176	1.9	133	1.4	551	1.8
Transportation and public utilities	225	2.5	199	2.0	805	2.6
Wholesale and retail trade	1,724	18.9	1,637	16.7	5,679	18.0
Finance, insurance, and real estate	290	3.2	495	5.0	1,467	4.7
Services	4,803	52.8	5,874	59.8	15,014	47.7
Other	10	0.1	10	0.1	49	0.2
Total	9,100		9,825		31,477	

[a] Agricultural employment includes 2007 data for hired farm workers.

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

TABLE 10.4.19.1-3 ROI Unemployment Rates (%) for the Proposed Los Mogotes East SEZ

Location	1999–2008	2008	2009[a]
Alamosa County, Colorado	5.0	5.3	7.6
Conejos County, Colorado	6.9	7.5	9.9
Costilla County, Colorado	9.2	7.6	11.1
Rio Grande County, Colorado	5.6	5.8	8.4
Rio Arriba County, New Mexico	5.9	5.1	6.1
Taos County, New Mexico	6.9	5.2	6.5
ROI	6.1	5.5	7.0
Colorado	4.5	4.2	7.5
New Mexico	5.0	4.9	5.6

[a] Rates for 2009 are the average for January through May.

Sources: U.S. Department of Labor (2009a–c).

TABLE 10.4.19.1-4 ROI Urban Population and Income for the Proposed Los Mogotes East SEZ

	Population			Median Household Income ($ 2008)		
City	2000	2008	Average Annual Growth Rate, 2000–2008 (%)	1999	2006–2008	Average Annual Growth Rate, 1999 and 2006–2008 (%)[a]
Alamosa, Colorado	7,960	8,746	1.2	32,771	NA	NA
Espanola, New Mexico	7,105	7,076	–0.1	34,948	NA	NA
Taos, New Mexico	4,700	5,546	2.1	32,208	NA	NA
Monte Vista, Colorado	4,529	4,015	–1.5	36,556	NA	NA
Chama, New Mexico	1,199	1,344	1.4	39,286	NA	NA
Manassa, Colorado	1,042	936	–1.3	29,731	NA	NA
La Jara, Colorado	877	784	–1.4	31,115	NA	NA
Antonito, Colorado	873	776	–1.5	24,727	NA	NA
Sanford, Colorado	817	733	–1.3	32,993	NA	NA
San Luis, Colorado	739	641	–1.8	18,299	NA	NA
Blanca, Colorado	391	343	–1.6	29,452	NA	NA
Romeo, Colorado	375	340	–1.2	24,857	NA	NA
Hooper, Colorado	123	125	0.2	41,154	NA	NA
Taos Ski Village, New Mexico	56	58	0.4	87,175	NA	NA

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

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

was higher than the average for Colorado ($56,574) and New Mexico ($43,202) (Table 10.4.19.1-4).

10.4.19.1.5 ROI Population

Table 10.4.19.1-5 presents recent and projected populations in the ROI and states as a whole. Population in the ROI stood at 116,511 in 2008, having grown at an average annual rate of 0.7% since 2000. Growth rates for the ROI were lower than those for New Mexico (1.7%) and Colorado (1.9%) over the same period.

Three of the six counties in the ROI have experienced minor growth in population since 2000; the remainder have experienced loss of population. Population in Taos County grew at an annual rate of 1.2% from 2000 to 2008, while Alamosa County and Rio Arriba County populations grew by 0.7% over the same period. The remaining counties saw declines in population of less than 1.0%. The ROI population is expected to increase to 132,554 by 2021 and to 134,655 by 2023 (State Demography Office 2009; University of New Mexico 2009).

10.4.19.1.6 ROI Income

Personal income in the ROI stood at $3.0 billion in 2007 and grew at an annual average rate of 2.2% over the period 1998 to 2007 (Table 10.4.19.1-6). ROI personal income per

TABLE 10.4.19.1-5 ROI Population for the Proposed Los Mogotes East SEZ

Location	2000	2008	Average Annual Growth Rate, 2000–2008 (%)	2021	2023
Alamosa County, Colorado	14,966	15,783	0.7	20,210	20,943
Conejos County, Colorado	8,400	8,232	–0.3	9,322	9,453
Costilla County, Colorado	3,663	3,465	–0.7	3,898	3,945
Rio Grande County, Colorado	12,413	12,279	–0.1	14,465	14,776
Rio Arriba County, New Mexico	41,190	43,653	0.7	46,300	46,487
Taos County, New Mexico	29,979	33,100	1.2	38,359	39,051
ROI	110,611	116,511	0.7	132,554	134,655
Colorado	4,301,261	5,010,395	1.9	6,398,532	6,613,747
New Mexico	1,819,046	2,085,115	1.7	2,573,667	2,640,712

Sources: U.S. Bureau of the Census (2009e,f); State Demography Office (2009); University of New Mexico (2009).

TABLE 10.4.19.1-6 ROI Personal Income for the Proposed Los Mogotes East SEZ

Location	1998	2007	Average Annual Growth Rate, 1998–2007 (%)
Alamosa County, Colorado			
Total income[a]	0.4	0.4	1.1
Per capita income	26,089	27,238	0.4
Conejos County, Colorado			
Total income[a]	0.2	0.2	0.9
Per capita income	18,795	20,161	0.7
Costilla County, Colorado			
Total income[a]	0.1	0.1	0.9
Per capita income	20,755	23,273	1.2
Rio Grande County, Colorado			
Total income[a]	0.3	0.4	0.5
Per capita income	27,435	27,814	0.1
Rio Arriba County, New Mexico			
Total income[a]	0.8	1.0	2.4
Per capita income	19,865	23,321	1.6
Taos County, New Mexico			
Total income[a]	0.7	0.9	3.6
Per capita income	23,005	28,763	2.3
ROI			
Total income[a]	2.4	3.0	2.2
Per capita income	22,360	25,637	1.4
Colorado			
Total income[a]	118.5	199.5	2.8
Per capita income	37,878	41,955	1.0
New Mexico			
Total income[a]	48.8	62.4	2.5
Per capita income	27,182	30,497	1.2

[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).

capita also rose over the same period at a rate of 1.4%, increasing from $22,360 to $25,637. Per-capita incomes in Taos ($28,763), Rio Grande ($27,814), and Alamosa ($27,238) Counties in 2007 were higher than elsewhere in the ROI. Personal income and per-capita income growth rates were higher in Rio Arriba and Taos Counties than in New Mexico as a whole; personal income per capita, however, was higher in New Mexico ($30,497) in 2007 than in both New Mexico counties. In the Colorado counties, the per-capita income growth rate in Costilla County was higher than the state rate, but per-capita incomes were significantly lower in these counties than for Colorado as a whole ($41,955).

Median household income over the period 2006 to 2008 varied between $25,146 in Costilla County and $41,387 in Rio Arriba County (U.S. Bureau of the Census 2009d).

10.4.19.1.7 ROI Housing

In 2007, more than 57,300 housing units were located in the six ROI counties, with more than 6% of these in Rio Arriba and Taos Counties (Table 10.4.19.1-7). Owner-occupied units compose approximately 75% of the occupied units in the six counties, with rental housing making up 25% of the total. Vacancy rates in 2007 were significantly higher in Taos County (32.4%) and Costilla County (31.7%) than elsewhere in the ROI, although a significant portion of vacant housing in Taos County were units used for seasonal or recreational purposes. With an overall vacancy rate of 25.6% in the ROI, there were 14,691 vacant housing units in the ROI in 2007, of which 2,844 are estimated to be rental units that would be available to construction workers. There were 5,837 seasonal, recreational, or occasional-use units vacant at the time of the 2000 Census.

Housing stock in the ROI as a whole grew at an annual rate of 1.0% over the period 2000 to 2007, with 3,729 new units added to the existing housing stock in the ROI (Table 10.4.19.1-6).

The median value of owner-occupied housing in 2006 to 2008 varied between $58,980 in Costilla County and $233,000 in Taos County (U.S. Bureau of the Census 2009g).

10.4.19.1.8 ROI Local Government Organizations

The various local and county government organizations in the ROI are listed in Table 10.4.19.1-8. There are five Tribal governments located in the ROI, and there are members of other Tribal groups located in the ROI but whose Tribal governments are located in adjacent counties or states.

TABLE 10.4.19.1-7 ROI Housing Characteristics for the Proposed Los Mogotes East SEZ

Parameter	2000	2007[a]
Alamosa County, Colorado		
Owner-occupied	3,498	3,713
Rental	1,969	2,090
Vacant units	621	659
Seasonal and recreational use	75	NA[b]
Total units	6,088	6,463
Conejos Count, Colorado		
Owner-occupied	2,347	2,590
Rental	633	699
Vacant units	906	1,000
Seasonal and recreational use	544	NA
Total units	3,886	4,289
Costilla County, Colorado		
Owner-occupied	1,175	1,230
Rental	328	343
Vacant units	699	732
Seasonal and recreational use	447	NA
Total units	2,202	2,305
Rio Grande County, Colorado		
Owner-occupied	3,323	3,676
Rental	1,378	1,524
Vacant units	1,302	1,440
Seasonal and recreational use	761	NA
Total units	6,003	1,641
Rio Arriba County, New Mexico		
Owner-occupied	12,281	11,164
Rental	2,763	2,831
Vacant units	2,972	4,731
Seasonal and recreational use	1,042	NA
Total units	18,016	18,726
Taos County, New Mexico		
Owner occupied	9,570	9,166
Rental	3,105	3,609
Vacant units	4,729	6,129
Seasonal and recreational use	2,968	NA
Total units	17,404	18,904

TABLE 10.4.19.1-7 (Cont.)

Parameter	2000	2007[a]
ROI total		
Owner-occupied	32,194	31,540
Rental	10,176	11,097
Vacant units	11,229	14,691
Seasonal and recreational use	5,837	NA
Total units	53,599	57,328

[a] 2007 data for number of owner-occupied, rental, and vacant units for Colorado counties are not available; data are based on 2007 total housing units and 2000 data on housing tenure.

[b] NA = data not available.

Sources: U.S. Bureau of the Census (2009h–j).

TABLE 10.4.19.1-8 ROI Local Government Organizations and Social Institutions for the Proposed Los Mogotes East SEZ

Governments	
City	
Alamosa, Colorado	Manassa, Colorado
Antonito, Colorado	Monte Vista, Colorado
Blanca, Colorado	Romeo, Colorado
Chama, New Mexico	San Luis, Colorado
Espanola, New Mexico	Sanford, Colorado
Hooper, Colorado	Taos, New Mexico
La Jara, Colorado	Taos Ski Village. New Mexico
County	
Alamosa County, Colorado	Rio Grande County, Colorado
Conejos County, Colorado	Rio Arriba County, New Mexico
Costilla County, Colorado	Taos County, New Mexico
Tribal	
Jicarilla Apache Nation, New Mexico	Pueblo of Santa Clara, New Mexico
Pueblo of Picuris, New Mexico	Pueblo of Taos, New Mexico
Pueblo of San Juan, New Mexico	

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

10.4.19.1.9 ROI Community and Social Services

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

Schools

In 2007, the six-county ROI had a total of 92 public and private elementary, middle, and high schools (NCES 2009). Table 10.4.19.1-9 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 Costilla County schools (11.1) is slightly lower than for schools in the remaining five counties, while the level of service is slightly higher in Conejos County (15.4); in Taos County, there are fewer teachers per 1,000 population (8.8).

Health Care

While Taos County has a much larger number of physicians (98), the number of doctors per 1,000 population is also higher than in the majority of the remaining counties in the ROI, and significantly higher than in Costilla County (0.8) (Table 10.4.19.1-10). The smaller number of health care professionals in Conejos and Costilla Counties may mean that residents of these counties have poorer access to health care; a substantial number of county residents might also travel to other counties in the ROI for their medical care.

TABLE 10.4.19.1-9 ROI School District Data for the Proposed Los Mogotes East SEZ, 2007

Location	Number of Students	Number of Teachers	Student-Teacher Ratio	Level of Service[a]
Alamosa County, Colorado	2,483	166	14.9	10.5
Conejos County, Colorado	1,830	129	14.2	15.4
Costilla County, Colorado	535	48	11.1	13.6
Rio Grande County, Colorado	2,272	170	13.4	13.5
Rio Arriba County, New Mexico	6,550	447	14.7	10.3
Taos County, New Mexico	4,315	287	15.1	8.8
ROI	17,985	1,246	14.4	10.7

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

Source: NCES (2009).

TABLE 10.4.19.1-10 Physicians in the Proposed Los Mogotes East SEZ ROI, 2007

Location	Number of Primary Care Physicians	Level of Service[a]
Alamosa County, Colorado	41	2.6
Conejos County, Colorado	8	1.0
Costilla County, Colorado	3	0.8
Rio Grande County, Colorado	13	1.0
Rio Arriba County, New Mexico	47	1.1
Taos County, New Mexico	98	3.0
ROI	210	1.8

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

Source: AMA (2009).

Public Safety

Several state, county, and local police departments provide law enforcement in the ROI (Table 10.4.19.1-11). Conejos County has 7 officers and would provide law enforcement services to the SEZ; there are 69 officers in the remainder of the ROI counties. Currently, there is only 1 professional firefighter in the ROI, with the majority of firefighting services provided by volunteers (Table 10.4.19.1-11). Levels of service of police protection in Costilla County (1.4) and Alamosa County (1.3) are higher than those for the counties in the remainder of the ROI, and lower than those in Rio Arriba County (0.4).

10.4.19.1.10 ROI Social Structures 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.

Various energy development studies have suggested that once the annual growth in population is between 5 and 15% in smaller rural communities, there would be increases in alcoholism, depression, suicide, social conflict, divorce, and delinquency and deterioration in levels of community satisfaction (BLM 1980, 1983, 1996). Tables 10.4.19.1-12 and 10.4.19.1-13 present data for a number of indicators of social change, including violent and property crime

TABLE 10.4.19.1-11 Public Safety Employment in the Proposed Los Mogotes East SEZ ROI

Location	Number of Police Officers[a]	Level of Service[b]	Number of Firefighters[c]	Level of Service
Alamosa County	21	1.3	0	0.0
Conejos County	7	0.8	0	0.0
Costilla County	5	1.4	0	0.0
Rio Grande County	8	0.6	0	0.0
Rio Arriba County	18	0.4	1	0.0
Taos County	17	0.5	0	0.0
ROI	76	0.7	1	0.0

[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).

TABLE 10.4.19.1-12 County and ROI Crime Rates for the Proposed Los Mogotes East SEZ[a]

	Violent Crime[b]		Property Crime[c]		All Crime	
Location	Offenses	Rate	Offenses	Rate	Offenses	Rate
Alamosa County, Colorado	65	4.1	477	30.2	542	34.3
Conejos County, Colorado	NA[d]	NA	NA	NA	NA	NA
Costilla County, Colorado	NA	NA	NA	NA	NA	NA
Rio Grande County, Colorado	26	2.1	139	11.3	165	13.4
Rio Arriba County, New Mexico	224	5.1	669	15.3	893	20.5
Taos County, New Mexico	58	1.8	448	13.5	506	15.3
ROI	368	3.2	1,696	14.6	2,064	17.7

[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.

[d] NA = not available.

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

TABLE 10.4.19.1-13 Alcoholism, Drug Use, Mental Health, and Divorce in the Proposed Los Mogotes East SEZ ROI

Geographic Area	Alcoholism[a]	Illicit Drug Use[a]	Mental Health[b]	Divorce[c]
Colorado Region 4 (includes Alamosa, Conejos, Costilla, and Rio Grande Counties)	9.7	3.1	10.2	–[d]
New Mexico Region 2 (includes Rio Arriba and Taos Counties	9.3	2.6	9.8	–
Colorado				4.4
New Mexico				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 or 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 2004.

[d] A dash indicates not applicable.

Sources: SAMHSA (2009); CDC (2009).

rates, alcoholism and illicit drug use, metal 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 Rio Arriba County (5.1 per 1000 population) and Alamosa County (4.1) and lower rates elsewhere in the ROI (Table 10.4.19.1-12). Property-related crime rates were much higher in Alamosa County (30.2) than in the remainder of the ROI, meaning that overall crime rates in Alamosa County were almost double the rate for the ROI as a whole. No crime rates for Conejos County and Costilla County were reported.

Other measures of social change–alcoholism, illicit drug use, and mental health—are not available at the county level and so are presented for the region in which the ROI is located. There is some variation across the ROI, with slightly higher rates in the Colorado portion of the ROI than in the New Mexico counties (Table 10.4.19.1-13). Divorce rates are also slightly higher in Colorado as a whole than in New Mexico.

10.4.19.1.11 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 activities are discussed in Section 10.4.5.

Because the number of visitors using state and federal lands for recreational activities is not available from the various administering agencies, the value of recreational resources in these areas based solely on the number of recorded visitors is likely to be an underestimation. In addition to visitation rates, the economic valuation of certain natural resources can also be assessed in terms of the potential recreational destination for current and future users, that is, their nonmarket value (see Section 5.17.1.1.1).

Another method is to estimate the economic impact of the various recreational activities supported by natural resources on public land in the vicinity of the proposed solar facilities 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; some activity occurrs 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, 5,577 people were employed in the ROI in the various sectors identified as recreation, constituting 10.0% of total ROI employment (Table 10.4.19.1-14). Recreation spending also produced almost $104.3 million in income in the ROI in 2007. The primary sources of recreation-related employment were eating and drinking places.

10.4.19.2 Impacts

The following analysis begins with a description of the common impacts of solar development, including those on recreation, social change, and livestock grazing. These impacts would occur regardless of the solar technology developed in the SEZ. The impacts of projects employing various solar energy technologies are analyzed in detail in subsequent sections.

TABLE 10.4.19.1-14 Recreation Sector Activity in the Proposed Los Mogotes East SEZ ROI, 2007

ROI	Employment	Income ($ million)
Amusement and recreation services	336	8.1
Automotive rental	18	0.6
Eating and drinking places	3,479	55.7
Hotels and lodging places	882	19.4
Museums and historic sites	55	4.9
Recreational vehicle parks and campsites	187	3.7
Scenic tours	154	5.7
Sporting goods retailers	486	6.2
Total ROI	5,577	104.3

Source: MIG, Inc. (2010).

10.4.19.2.1 Common Impacts

Construction and operation of solar energy facilities at the proposed 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 circulated 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 projects 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). 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 accommodations 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 development in small rural communities are still unclear (see Section 5.17). 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, and an annual rate of 5 to 10% growth in population is 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 1.4 % in ROI population during construction of the trough technology and smaller increases for the power tower, dish engine and photovoltaic 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 in smaller rural communities in the ROI to accommodate all in-migrating workers and families, and an 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, 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 region of influence 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.

Livestock Grazing Impacts

Cattle ranching and farming supported 847 jobs and $5.0 million in income in the ROI in 2007 (MIG, Inc. 2010). The construction and operation of solar facilities in the proposed SEZ could result in a decline in the amount of land available for livestock grazing, resulting in the loss of a total (direct plus indirect) of 1 job and less than $0.1 million in income in the ROI. There would also be a decline in grazing fees payable to the BLM and to the USFS by individual permittees based on the number of AUMs required to support livestock on public land. Assuming the 2008 fee of $1.35 per AUM, grazing fee losses would amount to $74 annually on land dedicated to solar development in the SEZ.

Access Road Impacts

The impacts of construction of an access road connecting the Los Mogotes SEZ could include the addition of 60 jobs in the ROI (including direct and indirect impacts) in the peak year of construction (Table 10.4.19.2-1). Construction activities in the peak year would constitute less than 1% of total ROI employment. Access road construction would also produce $1.8 million in ROI income. Direct sales taxes and direct income taxes would each be less than $0.1 million.

Total operations (maintenance) impacts in the ROI (including direct and indirect impacts) of an access road would be less than 1 job during the first year of operation (Table 10.4.19.2-1) and less than $0.1 million in income. Direct sales taxes would be less than $0.1 million in the first year, and direct income taxes, less than $0.1 million.

Construction and operation of an access road would not require the in-migration of workers and their families from outside the ROI; consequently, no impacts on housing markets

TABLE 10.4.19.2-1 ROI Socioeconomic Impacts of an Access Road Connecting the Proposed Los Mogotes East SEZ[a]

Parameter	Construction	Operations
Employment (no.)		
Direct	35	<1
Total	60	<1
Income[b]		
Total	1.8	<0.1
Direct state taxes[b]		
Sales	<0.1	<0.1
Income	<0.1	<0.1
In-migrants (no.)	0	0
Vacant housing[c] (no.)	0	0
Local community service employment		
Teachers (no.)	0	0
Physicians (no.)	0	0
Public safety (no.)	0	0

[a] Construction impacts assume 3 mi (5 km) of access road are required for the SEZ. Construction impacts are assessed for the peak year of construction.

[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.

in the ROI would be expected, and no new community service employment would be required in order to meet existing levels of service in the ROI.

10.4.19.2.2 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), BLM acreage rental and capacity payments, population in-migration, housing, and community service employment (education, health, and public safety). More information on the data and methods used in the analysis is presented in Appendix M.

The assessment of the impact of the construction and operation of each technology was based on SEZ acreage, assuming 80% of the area could be developed. To capture a range of possible impacts, solar facility size was estimated on the basis of the land requirements of various solar technologies, assuming that 9 acres/MW (0.04 km^2/MW) would be required for power tower, dish engine, and PV technologies and 5 acres/MW (0.02 km^2/MW) for solar trough technologies. Impacts of multiple facilities employing a given technology at each SEZ were assumed to be the same as impacts for a single facility with the same total capacity. Construction impacts were assessed for a representative peak year of construction, assumed to be 2021 for each technology. Construction impacts assumed that a maximum of 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 each technology. The years of construction and operations were selected as representative of the entire 20-year study period because they are the approximate midpoint; construction and operations could begin earlier.

Solar Trough

Construction. Total construction employment impacts in the ROI (including direct and indirect impacts) in 2021 from the use of solar trough technologies would be 2,885 jobs (Table 10.4.19.2-2), assuming that one 600-MW facility was constructed. Construction activities would constitute 4.4% of total ROI employment. A solar development would also produce $153.7 million in income. Direct sales taxes would be $0.1 million, with direct income taxes of $5.9 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 1,827 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) would mean that the impact of solar facility construction on the number of vacant rental housing units is not expected to be large, with 914 rental units expected to be occupied in the ROI. This occupancy rate would represent 28.3% of the vacant rental units expected to be available in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service (education, health, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, 21 new teachers, 3 physicians, and 1 public safety employee (career firefighters and uniformed police officers) would be required in the ROI. These increases would represent 1.4% of total ROI employment expected in these occupations.

Operations. Total operations employment impacts in the ROI (including direct and indirect impacts) of a build-out using solar trough technologies would be 323 jobs

TABLE 10.4.19.2-2 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed Los Mogotes East SEZ with Trough Facilities[a]

Parameter	Construction	Operations
Employment (no.)		
Direct	1,641	206
Total	2,885	323
Income[b]		
Total	153.7	10.2
Direct state taxes[b]		
Sales	0.1	0.1
Income	5.9	0.3
BLM payments[b]		
Rental	NA	0.4
Capacity[d]	NA	6.2
In-migrants (no.)	1,827	131
Vacant housing[c] (no.)	914	118
Local community service employment		
Teachers (no.)	21	1
Physicians (no.)	3	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 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 947 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] 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.

(Table 10.4.19.2-2). Such a solar development would also produce $10.2 million in income. Direct sales taxes would be $0.1 million, and 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 $0.4 million, and solar generating capacity payments would total at least $6.2 million.

Given the likelihood of local worker availability in the required occupational categories, operation of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 131 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) would mean that the impact of solar facility operation on the number of vacant owner-occupied housing units is not expected to be large, with 118 owner-occupied units expected to be occupied in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service (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.

Power Tower

Construction. Total construction employment impacts in the ROI (including direct and indirect impacts) in 2021 from the use of power tower technologies would be 1,149 jobs (Table 10.4.19.2-3), assuming that one 333-MW facility was constructed. Construction activities would constitute 1.7% of total ROI employment. Such a solar development would also produce $61.2 million in income. Direct sales taxes would be less than $0.1 million, and 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 between 728 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) would mean that the impact of solar facility construction on the number of vacant rental housing units is not expected to be large, with 364 rental units expected to be occupied in the ROI. This occupancy rate would represent 11.3% of the vacant rental units expected to be available in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service (education, health, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, eight new teachers, one physician, and one public safety employee (career firefighters and uniformed

TABLE 10.4.19.2-3 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed Los Mogotes East SEZ with Power Tower Facilities[a]

Parameter	Construction	Operations
Employment (no.)		
Direct	654	107
Total	1,149	151
Income[b]		
Total	61.2	4.7
Direct state taxes[b]		
Sales	<0.1	<0.1
Income	2.4	0.2
BLM payments[b]		
Rental	NA	0.4
Capacity[d]	NA	3.5
In-migrants (no.)	728	68
Vacant housing[c] (no.)	364	61
Local community service employment		
Teachers (no.)	8	1
Physicians (no.)	1	0
Public safety (no.)	1	0

[a] Construction impacts are based on the development at the site in a single year; it was assumed that several facilities with a combined capacity of up to 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 526 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] 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.

police officers) would be required in the ROI. These increases would represent 0.5% of total ROI employment expected in these occupations.

Operations. Total operations employment impacts in the ROI (including direct and indirect impacts) of a build-out using power tower technologies would be 151 jobs (Table 10.4.19.2-3). Such a solar development would also produce $4.7 million in income. Direct sales taxes would be less than $0.1 million, and 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 $0.4 million, and solar generating capacity payments would total at least $3.5 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 68 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) would mean that the impact of solar facility operation on the number of vacant owner-occupied housing units is not expected to be large, with 61 owner-occupied units expected to be required in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service (education, health, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, one new teacher would be required in the ROI.

Dish Engine

Construction. Total construction employment impacts in the ROI (including direct and indirect impacts) in 2021 using dish engine technologies would be 467 jobs (Table 10.4.19.2-4), assuming that one 333-MW facility was constructed. Construction activities would constitute 0.7% of total ROI employment. Such a solar development would also produce $24.9 million in income. Direct sales taxes would be less than $0.1 million, and 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 solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 296 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) would mean that the impact of solar facility construction on the number of vacant rental housing units is not expected to be large, with 148 rental units expected to be occupied in the ROI. This occupancy rate would represent 4.6% of the vacant rental units expected to be available in the ROI.

TABLE 10.4.19.2-4 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed Los Mogotes East SEZ with Dish Engine Facilities[a]

Parameter	Construction	Operations
Employment (no.)		
Direct	266	104
Total	467	146
Income[b]		
Total	24.9	4.5
Direct state taxes[b]		
Sales	<0.1	<0.1
Income	1.0	0.2
BLM payments[b]		
Rental	NA	0.4
Capacity[d]	NA	3.5
In-migrants (no.)	296	66
Vacant housing[c] (no.)	148	59
Local community service employment		
Teachers (no.)	3	1
Physicians (no.)	1	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 526 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] 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 also 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, three new teachers and one physician would be required in the ROI. These increases would represent 0.2% of total ROI employment expected in these occupations.

Operations. Total operations employment impacts in the ROI (including direct and indirect impacts) of a build-out using dish engine technologies would be 146 jobs (Table 10.4.19.2-4). Such a solar development would also produce $4.5 million in income. Direct sales taxes would be less than $0.1 million, and 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 $0.4 million, and solar generating capacity payments would total at least $3.5 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 66 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) would mean that the impact of solar facility operation on the number of vacant owner-occupied housing units is not expected to be large, with 59 owner-occupied units expected to be required in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service (education, health, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, one new teacher would be required in the ROI.

Photovoltaic

Construction. Total construction employment impacts in the ROI (including direct and indirect impacts) from the use of PV technologies would be 218 jobs (Table 10.4.19.2-5), assuming that one 333-MW facility was constructed. Construction activities would constitute 0.3% of total ROI employment. Such a solar development would also produce $11.6 million in income. Direct sales taxes would be less than $0.1 million, and direct income taxes, $0.4 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 138 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) would mean that the impact of solar facility construction on the number of vacant rental housing units is not expected to be large,

TABLE 10.4.19.2-5 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed Los Mogotes East SEZ with PV Facilities[a]

Parameter	Construction	Operations
Employment (no.)		
Direct	124	10
Total	218	15
Income[b]		
Total	11.6	0.5
Direct state taxes[b]		
Sales	<0.1	<0.1
Income	0.4	<0.1
BLM Payments[b]		
Rental	NA	0.4
Capacity[d]	NA	2.8
In-migrants (no.)	138	7
Vacant housing[c] (no.)	69	6
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 526 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] 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.

with 69 rental units expected to be occupied in the ROI. This occupancy rate would represent 2.1% 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 0.1% of total ROI employment expected in this occupation.

Operations. Total operations employment impacts in the ROI (including direct and indirect impacts) of a build-out using PV technologies would be 15 jobs (Table 10.4.19.2-5). Such a solar development would also produce $0.5 million in income. Direct sales taxes would be less than $0.1 million, and 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 $0.4 million, and solar generating capacity payments would total at least $2.8 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 seven 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) would mean that the impact of solar facility operation on the number of vacant owner-occupied housing units is not expected to be large, with six 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.

10.4.19.3 SEZ-Specific Design Features and Design Feature Effectiveness

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

10.4.20 Environmental Justice

10.4.20.1 Affected Environment

On February 11, 1994, the President signed E. O. 12898,"Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," which formally requires federal agencies to incorporate environmental justice as part of their missions (*Federal Register*, Vol. 59, page 7629, Feb. 11, 1994). Specifically, it directs them to address, as appropriate, any disproportionately high and adverse human health or environmental effects of their actions, programs, or policies on minority and low-income populations.

The analysis of the impacts of solar energy projects on environmental justice issues follows guidelines described in the CEQ's *Environmental Justice Guidance under the National Environmental Policy Act* (CEQ 1997). The analysis method has three parts: (1) a description of the geographic distribution of low-income and minority populations in the affected area is undertaken; (2) an assessment of whether the impacts of construction and operation would produce impacts that are high and adverse; and (3) if impacts are high and adverse, a determination is made as to whether these impacts disproportionately affect minority and low-income populations.

Construction and operation of solar energy projects in the proposed SEZ could affect environmental justice if any adverse health and environmental impacts resulting from either phase of development are significantly high, and if these impacts would disproportionately affect minority and low-income populations. If the analysis determines that health and environmental impacts are not significant, there can be no disproportionate impacts on minority and low-income populations. In the event impacts are significant, disproportionality would be determined by comparing the proximity of any high and adverse impacts with the location of low-income and minority populations.

The analysis of environmental justice issues associated with the development of solar facilities considered impacts within the SEZ and an associated 50-mi (80-km) radius around the boundary of the SEZ. A description of the geographic distribution of minority and low-income groups in the affected area was based on demographic data from the 2000 Census (U.S. Bureau of the Census 2009k,l). The following definitions were used to define minority and low-income population groups:

- **Minority.** Persons are included in the minority category if they identify themselves as belonging to any of the following racial groups: (1) Hispanic, (2) Black (not of Hispanic origin) or African American, (3) American Indian or Alaska Native, (4) Asian, or (5) Native Hawaiian or Other Pacific Islander.

  Beginning with the 2000 Census, where appropriate, the census form allows individuals to designate multiple population group categories to reflect their ethnic or racial origin. In addition, persons who classify themselves as being of multiple racial origins may choose up to six racial groups as the basis of their racial origins. The term minority includes all persons, including those classifying themselves in multiple racial categories, except those who classify themselves as not of Hispanic origin and as White or “Other Race” (U.S. Bureau of the Census 2009k).

The CEQ guidance proposed that minority populations should be identified where either (1) the minority population of the affected area exceeds 50%, or (2) the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis.

The PEIS applies both criteria in using the Census Bureau data for census block groups, wherein consideration is given to the minority population that is both over 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 10.4.20.1-1 show the minority and low-income composition of total population located in the 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 also 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 Colorado, 47.0% of the population is classified as minority, while 19.0% is classified as low-income. Although the number of minority individuals does not exceed 50% of the total population in the area, the number of minority individuals exceeds the state average by 20 percentage points or more, meaning that there is a minority population in the Colorado portion of the 50-mi (80-km) area based on 2000 Census data and CEQ guidelines. The number of low-income individuals does not exceed the state average by 20 percentage points or more and does not exceed 50% of the total population in the area, meaning that there are no low-income populations in the Colorado portion of the SEZ.

Within the 50-mi (80-km) radius in New Mexico, 59.3% of the population is classified as minority, while 17.8% is classified as low-income. Although the number of minority individuals does not exceed the state average by 20 percentage points or more, the minority population exceeds 50% of the total population in the area, meaning that there are minority populations in the New Mexico portion of the 50-mi (80-km) area based on 2000 Census data and CEQ guidelines. The number of low-income individuals does not exceed the state average by

TABLE 10.4.20.1-1 Minority and Low-Income Populations within the 50-mi (80-km) Radius Surrounding the Proposed Los Mogotes East SEZ

Parameter	Colorado	New Mexico
Total population	50,862	21,683
White, non-Hispanic	26,949	8,828
Hispanic or Latino	22,318	12,021
Non-Hispanic or Latino minorities	1,595	834
One race	988	513
Black or African American	163	47
American Indian or Alaskan Native	499	337
Asian	222	69
Native Hawaiian or other Pacific Islander	18	5
Some other race	86	55
Two or more races	607	321
Total minority	23,913	12,855
Low-income	9,651	3,867
Percent minority	47.0	59.3
State percent minority	25.5	55.3
Percent low-income	19.0	17.8
State percent low-income	9.3	18.4

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

20 percentage points or more and does not exceed 50% of the total population in the area, meaning that there are no low-income populations in the New Mexico portion of the 50-mi (80-km) area.

Figures 10.4.20.1-1 and 10.4.20.1-2 show the locations of minority and low-income population groups in the 50-mi (80-km) radius around the boundary of the SEZ.

In the Colorado portion of the 50-mi (80-km) radius, more than 50% of the population in all but one of the block groups in Conejos County is made up of minority population groups, together with all the block groups in the adjacent Costilla County. Block groups in the cities of Alamosa (Alamosa County), Monte Vista and Del Norte (both in Rio Grande County), and Center (Saguache County) are also more than 50% minority. In the New Mexico portion of the area, Rio Arriba County has three block groups in which the minority population is more than 20 percentage points higher than the state average, and one block group that is more than 50%

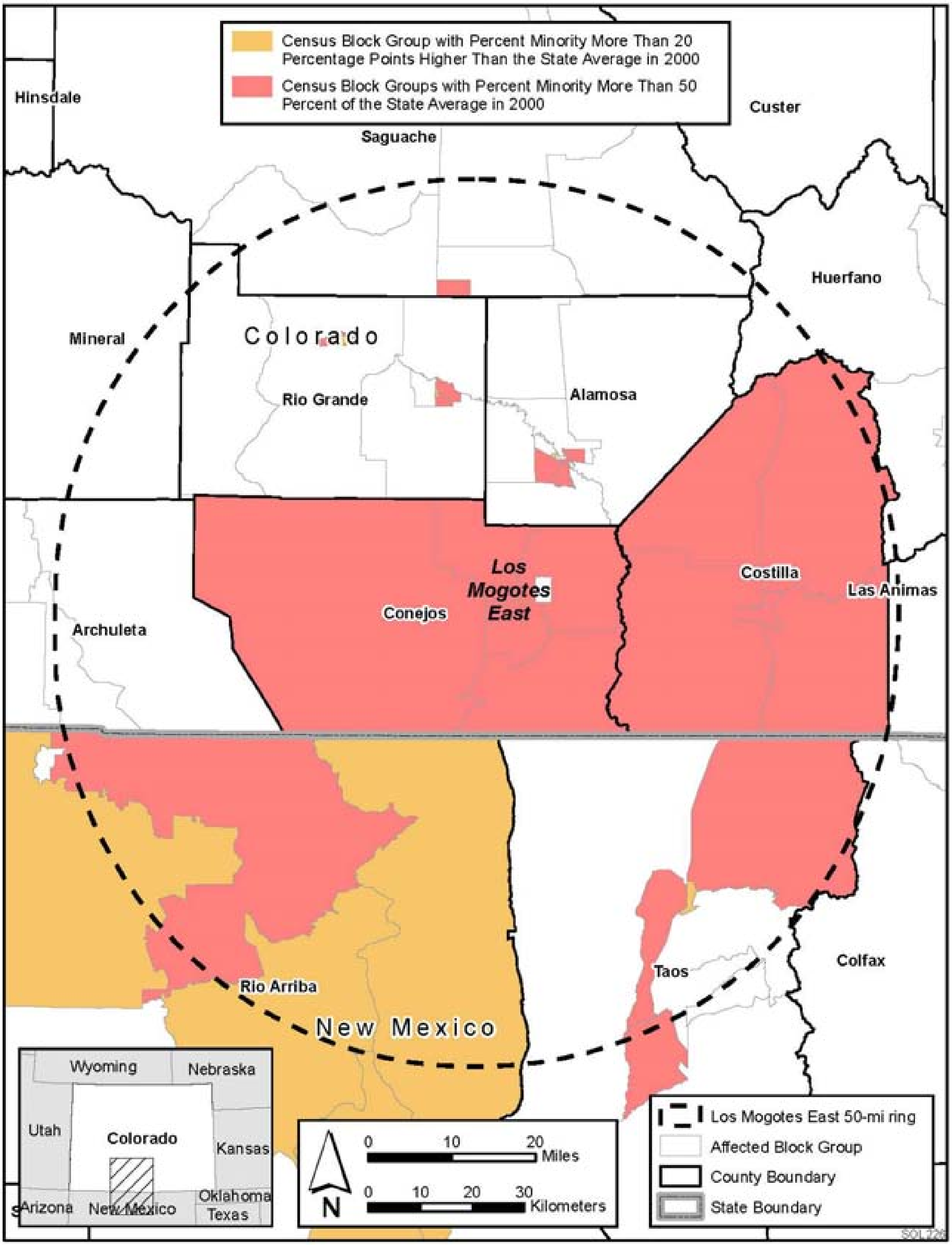

FIGURE 10.4.20.1-1 Minority Population Groups within the 50-mi (80-km) Radius Surrounding the Proposed Los Mogotes East SEZ

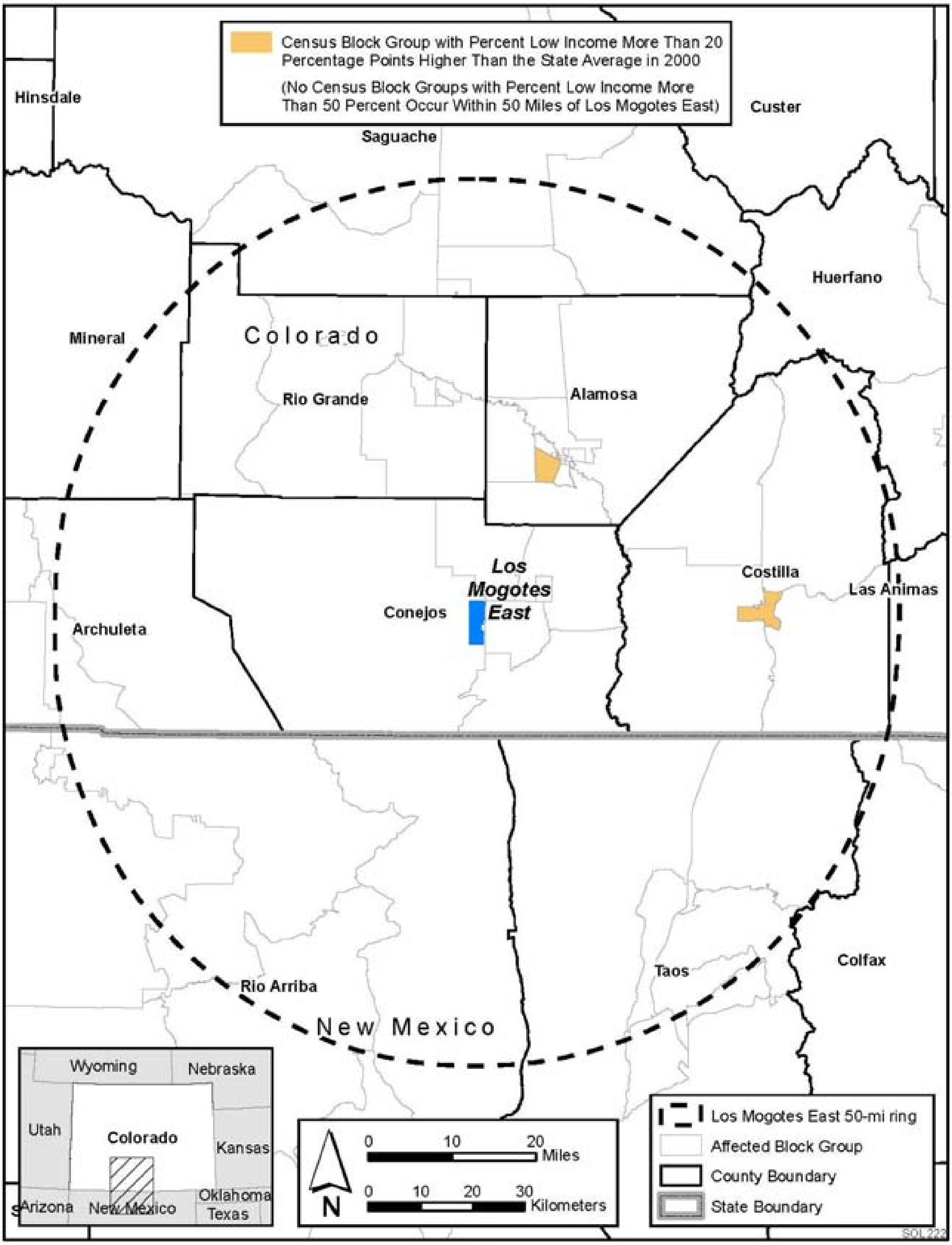

FIGURE 10.4.20.1-2 Low-Income Population Groups within the 50-mi (80-km) Radius Surrounding the Proposed Los Mogotes East SEZ

minority, while Taos County has three block groups with more than 50% minority, and one block group where the minority population is 20 percentage points higher than the state average.

Low-income populations in the 50-mi (80-km) radius are limited to two block groups in the Colorado portion, in the cities of San Luis (Costilla County) and Alamosa, both of which have low-income population shares that are more than 20 percentage points higher than the state average.

10.4.20.2 Impacts

Environmental justice concerns common to all utility-scale solar energy projects 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 SEZ include noise and dust during the construction of solar facilities; noise and EMF effects associated with solar project operations; the visual impacts of solar generation and auxiliary facilities, including transmission lines; access to land used for economic, cultural, or religious purposes; and effects on property values as areas of concern that might potentially affect minority and low-income populations.

Potential impacts on low-income and minority populations could be incurred as a result of the construction and operation of solar facilities involving each of the four technologies. Although impacts are likely to be small, there are minority populations defined by CEQ guidelines (see Section 10.4.20.1) within both the Colorado and New Mexico portions of the 50-mi (80-km) radius around the boundary of the SEZ; thus any adverse impacts of solar projects would disproportionately affect minority populations. Because there are also low-income populations within the 50-mi (80-km) radius, according to CEQ guidelines, there would also be impacts on low-income populations.

10.4.20.3 SEZ-Specific Design Features and Design Feature Effectiveness

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

10.4.21 Transportation

The proposed Los Mogotes East SEZ is accessible by road and rail networks. One U.S. highway and one regional railroad serve the area. A small regional airport is located 22 mi (35 km) north of the SEZ. General transportation considerations and impacts are discussed in Sections 3.4 and 5.19, respectively.

10.4.21.1 Affected Environment

U.S. 285, a two-lane highway, passes to the east of the proposed Los Mogotes East SEZ at a distance of about 3 mi (5 km), as shown in Figure 10.4.21.1-1. The small town of Romeo is located to the east of the SEZ along U.S. 285 on its way to Alamosa, 22 mi (35 km) to the north. Santa Fe, New Mexico, can be reached traveling south on U.S. 285 to U.S. 84 for a total distance of 120 mi (193 km). A number of local roads cross the SEZ. Three road/trail segments within the SEZ have been identified as Open Motorized Road, are available for OHV or vehicular travel, and also provide access to areas west of the SEZ. Annual average traffic volumes for the major roads for 2008 are provided in Table 10.4.21.1-1.

The SLRG Railroad serves the area (SLRG 2009). This regional railroad has rail stops in the towns of Romeo directly to the east of the SEZ, and Conejos and La Jara several miles to the south and north of the SEZ, respectively. A freight dock and warehouse are also available in Antonito to the south and Alamosa to the north. The SLRG Railroad runs to the northeast from Romeo for a distance of approximately 95 mi (153 km), where it connects to the UP Railroad in Walsenburg.

The nearest public airport is San Luis Valley Regional Airport located 22 mi (35 km) north of the SEZ in Alamosa along U.S. 285. The airport has two runways, one of which is restricted to light aircraft. One regional airline provides daily scheduled service to Denver. No commercial cargo shipped to or from the airport has been reported by the BTS, and about 7,800 passengers departed from or arrived at the airport in 2008 (BTS 2008).

10.4.21.2 Impacts

As discussed in Section 5.19, the primary transportation impacts are anticipated to be from commuting worker traffic. U.S. 285 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), an increase that is about half of the current daily traffic levels summarized in Table 10.4.21.1-1 for U.S. 285. In addition, local road improvements might be necessary on the county roads between U.S. 285 and the SEZ. Improvements would be necessary in any portion of the SEZ 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 designated as open and available for public use. Such open routes crossing areas granted ROWs

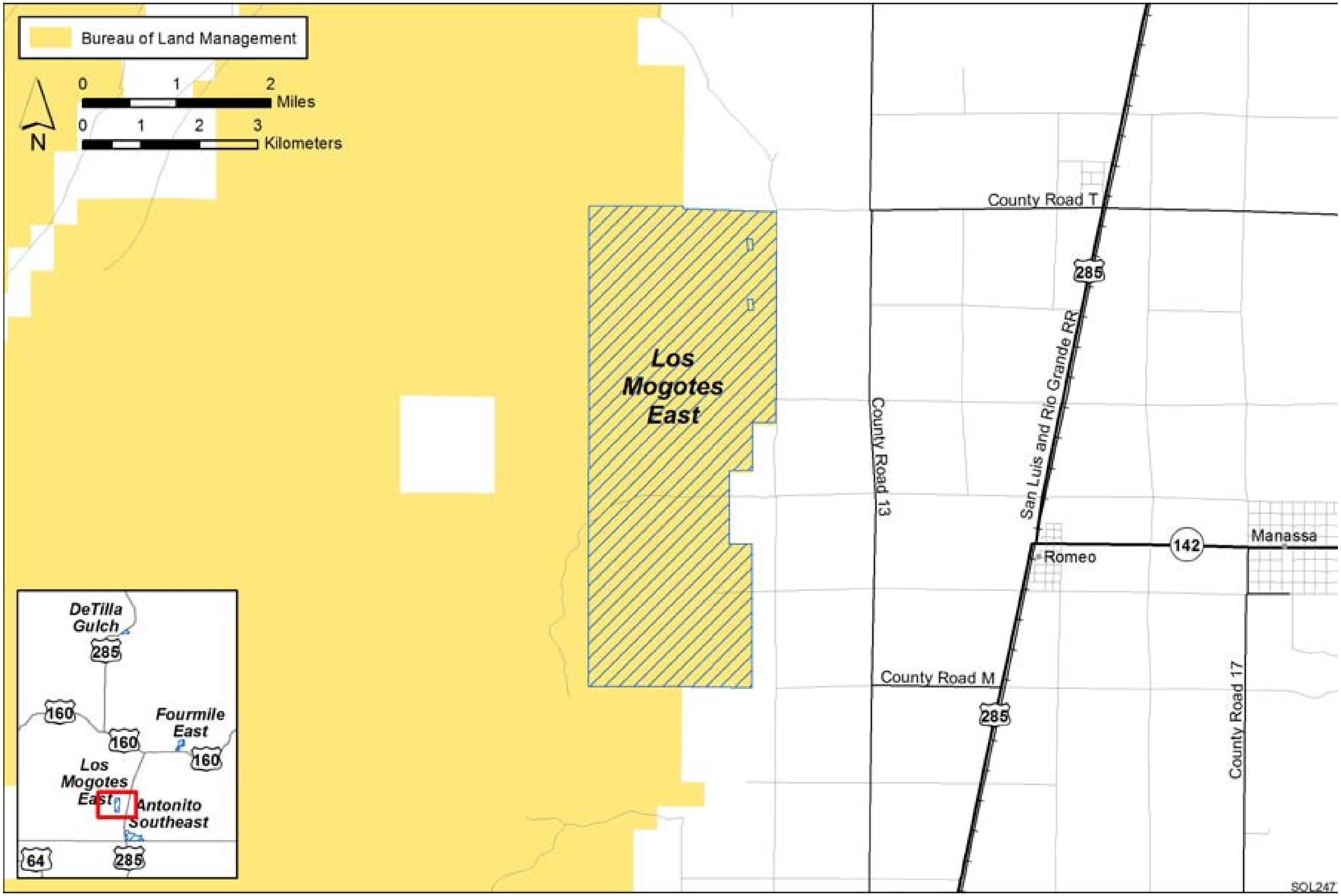

FIGURE 10.4.21.1-1 Local Transportation Network Serving the Proposed Los Mogotes East SEZ

TABLE 10.4.21.1-1 Annual Average Daily Traffic (AADT) on Major Roads near the Proposed Los Mogotes East SEZ, 2008

Road	General Direction	Location	AADT (Vehicles)
U.S. Highway 285	North-south	Junction with County Road T	4,900
		Junction with State Highway 142 in Romeo	4,700
		Junction with County Road J	3,900
CO 142	East-west	Junction with U.S. 285 in Romeo	2,100
		Junction with County Road 18 (1st St.)	970

Source: CDOT (undated).

for solar facilities would be redesignated as closed (see Section 5.5.1 for more details on how routes coinciding with proposed solar facilities would be treated).

10.4.21.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features have been identified related to impacts on transportation systems around the proposed Los Mogotes 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 site. Depending on the location of the proposed solar facility within the SEZ, more specific access locations and local road improvements would be implemented.

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10.4.22 Cumulative Impacts

The analysis presented in this section addresses the potential cumulative impacts in the vicinity of the proposed Los Mogotes East SEZ in the southern part of the San Luis Valley, Colorado. 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 what agency (federal or nonfederal), organization, or person undertakes them. The time frame of this cumulative impact 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 proposed Los Mogotes East SEZ is located 7 mi (11 km) northwest of the Antonito Southeast SEZ in Conejos County, Colorado, and about 20 mi (32 km) southeast of the town of Alamosa. The SEZ is located on the eastern edge of a block of BLM-administered land that is bounded on the north and east by private lands. The private lands are primarily developed for irrigated agriculture with numerous center-pivot irrigation systems in place. There are also three sections of state-owned land in near proximity to the SEZ. The blocks of BLM-administered lands are bordered roughly on the north and south by the Alamosa and Conejos Rivers, respectively. The SEZ is located within the boundaries of the Sangre de Cristo NHA. The designated Los Caminos Antiguos Scenic Byway passes within 3 mi (5 km) of the southern and eastern boundaries of the SEZ. The SEZ is part of a grazing allotment and is being actively grazed. No closed or active oil and gas leases occur in or near the SEZ, nor are there any active mining claims in or near the area (BLM and USFS 2010a,b). The SEZ is not within a DoD airspace consultation area (BLM and USFS 2010a,b).

The geographic extent of the cumulative impacts analyses for potentially affected resources near the Los Mogotes East SEZ is identified in Section 10.4.22.1. An overview of ongoing and reasonably foreseeable future actions is presented in Section 10.4.22.2. General trends in population growth, energy demand, water availability, and climate change are discussed in Section 10.4.22.3. Cumulative impacts for each resource area are discussed in Section 10.4.22.4.

10.4.22.1 Geographic Extent of the Cumulative Impacts Analysis

Table 10.4.22.1-1 presents the geographic extent of the cumulative impacts analysis for potentially affected resources evaluated near the Los Mogotes East SEZ. These geographic areas define the geographic boundaries of areas encompassing potentially affected resources. Their extent may vary on the basis of the nature of the resource being evaluated and the distance at which an impact may occur (thus, for example, the evaluation of air quality may have a greater regional extent of impact than cultural resources). Lands around the SEZ are privately owned, or administered by the USFS, NPS, or the BLM. The BLM administers approximately 11% of the lands within a 50-mi (80-km) radius of the Los Mogotes East SEZ.

TABLE 10.4.22.1-1 Geographic Extent of the Cumulative Impacts Analysis by Resource Area: Proposed Los Mogotes East SEZ

Resource Area	Geographic Extent
Lands and Realty	Southern San Luis Valley
Specially Designated Areas and Lands with Wilderness Characteristics	Southern San Luis Valley
Rangeland Resources	Southern San Luis Valley
Recreation	Southern San Luis Valley
Military and Civilian Aviation	Southern San Luis Valley
Soil Resources	Areas within and adjacent to the Los Mogotes East SEZ
Minerals	Southern San Luis Valley
Water Resources	
Surface Water	Conejos River, La Jara Creek, La Jara Reservoir, and Rio Grande
Groundwater	Rio Grande Basin within the San Luis Valley (unconfined and confined aquifers)
Vegetation, Wildlife and Aquatic Biota, Special Status Species	Known or potential occurrences within a 50-mi (80-km) radius of the Los Mogotes East SEZ, including Conejos, Alamosa, Costilla, Rio Grande, Archuleta, and Saguache Counties, Colorado; Rio Arriba and Taos Counties, New Mexico.
Air Quality and Climate	San Luis Valley and beyond
Visual Resources	Viewshed within a 25-mi (40-km) radius of the Los Mogotes East SEZ
Acoustic Environment (noise)	Areas adjacent to the Los Mogotes East SEZ
Paleontological Resources	Areas within and adjacent to the Los Mogotes East SEZ
Cultural Resources	Areas within and adjacent to the Los Mogotes East SEZ for archaeological sites; viewshed within a 25-mi (40-km) radius of the Los Mogotes East SEZ for other properties, such as historic trails and traditional cultural properties.
Native American Concerns	San Luis Valley; viewshed within a 25-mi (40-km) radius of the Los Mogotes East SEZ
Socioeconomics	Alamosa, Conejos, Costilla, Rio Grande Counties, Colorado; Rio Arriba and Taos Counties, New Mexico.
Environmental Justice	Conejos, Alamosa, Costilla, Rio Grande, Archuleta, and Saguache Counties, Colorado; Rio Arriba and Taos Counties, New Mexico.
Transportation	U.S. 285

10.4.22.2 Overview of Ongoing and Reasonably Foreseeable Future Actions

The future actions described below are those that are “reasonably foreseeable;” that is, they have already occurred, are ongoing, are funded for future implementation, or are included in firm near-term plans. Types of proposals with firm near-term plans include:

- Proposals for which NEPA documents are in preparation or finalized;
- Proposals in a detailed design phase;
- Proposals listed in formal NOIs published in the *Federal Register* or state publications;
- Proposals for which enabling legislation 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 (e.g., the Iowa Pacific Holding Railway Hub) were not included in the cumulative impacts analysis.

The reasonably foreseeable future actions described below are grouped into two categories: (1) actions related to energy production and distribution, including potential solar energy projects under the proposed action (Section 10.4.22.2.1), and (2) other ongiong and foreseeable actions, including those related to mining and mineral processing, grazing management, transportation, recreation, water management, and conservation (Section 10.4.22.2.2). Together, these actions have the potential to affect human and environmental receptors within the San Luis Valley over the next 20 years.

10.4.22.2.1 Energy Production and Distribution

Reasonably foreseeable future actions related to energy development and distribution within the San Luis Valley are identified in Table 10.4.22.2-1 and are described in the following sections. Figure 10.4.22.2-1 shows the approximate locations of the key projects.

Renewable Energy Development

In 2007, the State of Colorado increased its Renewable Portfolio Standard by requiring that large investor-owned utilities produce 20% of their energy from renewable resources by 2020; of this total, 4% must come from solar-electric technologies. Municipal utilities and rural electric providers must provide 10% of their electricity from renewable sources by 2020 (Pew Center on Global Climate Change 2009).

TABLE 10.4.22.2-1 Reasonably Foreseeable Future Actions Related to Energy Development and Distribution near the Proposed Los Mogotes East SEZ and in the San Luis Valley

Description	Status	Resources Affected	Primary Impact Location
Renewable Energy Development			
Renewable Portfolio Standards	Ongoing	Land use	State of Colorado
San Luis Valley GDA (Solar) Designation	Ongoing	Land use	San Luis Valley
Xcel Energy/SunEdison Project; 8.2 MW, PV	Ongoing	Land use, ecological resources, visual	San Luis Valley GDA
Alamosa Solar Energy Project; 30 MW, PV	Under way	Land use, ecological resources, visual	San Luis Valley GDA
Greater Sandhill Solar Project; 17 MW, PV	Under way	Land use, ecological resources, visual	San Luis Valley GDA
San Luis Valley Solar Project; Tessera Solar, 200 MW, dish engine	Proposed	Land use, ecological resources, visual, cultural	San Luis Valley GDA
Solar Reserve; 200 MW, solar tower	Preliminary application	Land use, ecological resources, visual	San Luis Valley GDA (Saguache)
Cogentrix Solar Services; 30 MW, CPV	Approved/ under way	Land use, ecological resources, visual	San Luis Valley GDA
Lincoln Renewables; 37 MW PV	County permit approved	Land use, ecological resources, visual	San Luis Valley GDA
NextEra; 30 MW, PV	County permit approved	Land use, ecological resources, visual	San Luis Valley GDA
Transmission and Distribution Systems			
San Luis Valley–Calumet-Comanche Transmission Project	Proposed	Land use, ecological resources, visual, cultural	San Luis Valley (select counties)

Also in 2007, the General Assembly of Colorado passed Colorado Senate Bill (SB) 07-100 that established a task force to develop a map of existing generation and transmission lines and to identify potential development areas for renewable energy resources within Colorado. These areas, called GDAs, are regions within Colorado with a concentration of renewable resources that provide a minimum of 1,000 MW of developable electric generating capacity. The task force identified eight wind GDAs (mainly on the Eastern Plain) and two solar GDAs. NREL conducted detailed analyses of these areas and concluded that the San Luis Valley GDA is one of two regions in southern Colorado capable of generating large blocks of power—as much as 5.5 GW—via utility-scale solar power technologies. Although geothermal power is a potentially vast resource in Colorado (and in the San Luis Valley), no single site was found to

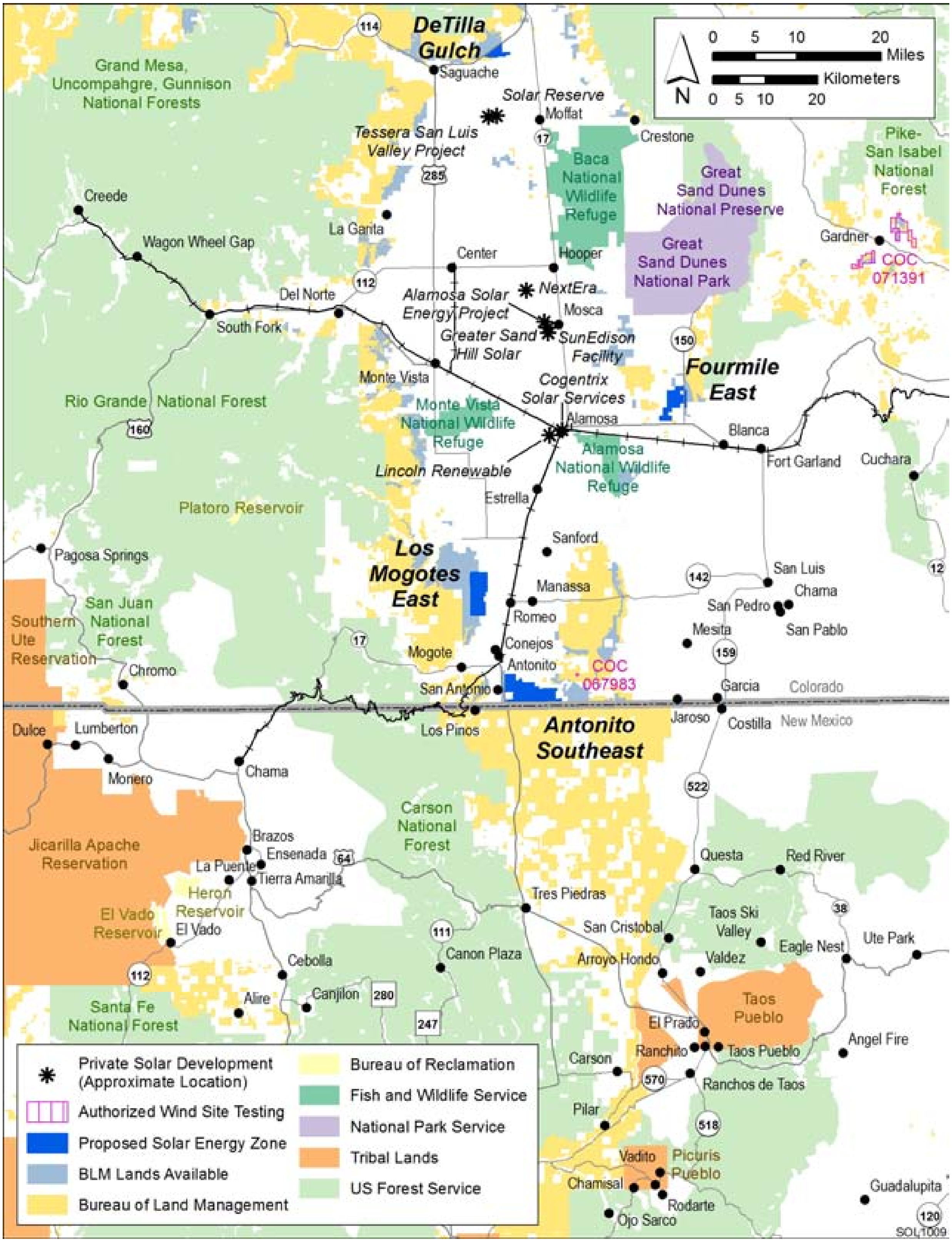

FIGURE 10.4.22.2-1 Existing and Proposed Energy Development Projects within the San Luis Valley

generate 1,000 MW. As a result, the task force did not identify geothermal GDAs (Colorado Governor's Energy Office 2007).

In addition to the Los Mogotes East SEZ, the BLM has proposed three other SEZs in the San Luis Valley: the De Tilla Gulch SEZ (1,522 acres [6.2 km^2]), the Fourmile East SEZ (3,882 acres [15.7 km^2]), and the Antonito Southeast SEZ (9,729 acres [39.4 km^2]) (Figure 10.4.22.2-1). The four proposed SEZs together constitute 21,050 acres (85 km^2) of land and could provide as much as 3,368 MW of solar energy capacity. The Antonito Southeast SEZ is close to the Los Mogotes East SEZ, only 7 mi (11 km) to the southeast; the other two SEZs are much farther away (De Tilla Gulch is about 70 mi [113 km] to the north, and Fourmile East is about 30 mi [48 km] to the northeast).

Solar Energy Development. Several solar power projects are planned or under way in the San Luis Valley GDA. These include:

- *Xcel Energy/Sun Edison Project.* The 8.2-MW project began operations in August 2007. Located on 82 acres (0.3 km^2) of private land just west of CO 17 near Mosca in Alamosa County, the facility consists of three different solar technologies, including an array of PV panels, a PV system of single-axis trackers, and a system of CSP units. It generates power for distribution both within the San Luis Valley and outside the region.

- *Alamosa Solar Energy Project.* The 30-MW PV project will be located near Mosca, just west of CO 17 and 8 Mile Lane North, on private land currently being used for agriculture. The facility is being built by Iberdrola Renewables in two 15-MW phases and will connect to the San Luis Valley Substation, about 5 mi (7 km) to the west of the project site. A Special Use and Site Plan application was submitted to Alamosa County in July 2009; the first half of the facility is scheduled to begin operations in early 2011.

- *Greater Sandhill Solar Project.* Located on 200 acres (0.8 km^2) to the east of CO 17 near Mosca (across from the Xcel Energy/Sun Edison Project), the 17-MW PV facility to be built by Xcel Energy and SunPower has been approved by the Colorado Public Utilities Commission and will begin operations in 2011.

- *San Luis Valley Solar Project.* Tessera Solar North America submitted a Final 1041 Permit Application to Saguache County in June 2010 for a 200-MW dish engine solar facility to be built on a 1,525-acre (6.2-km^2) site near Saguache. The facility would employ 8,000 SunCatcher dish engines and cost $300 to $500 to build. It would use only 10 ac-ft/yr (12,000 m^3/yr) (of water for operation and maintenance and would employ 45 full-time workers. The permit application identified expected significant effects of the proposed facility on visual resources and on socioeconomics, while effects on biological, cultural, and water resources and from noise were not expected to be significant. Construction would start in late 2010 (TSNA 2010). Tessera has offered to sell power to Xcel Energy. A 500-ft (150-m) transmission line would be built to connect to an existing 230-kV line owned by Xcel.

- *Solar Reserve.* Solar Reserve submitted a Preliminary 1041 Permit Application to Saguache County in July 2010 for a 200-MW solar tower facility. The project would be built in two 100-MW phases, each covering 1,400 acres and employing 17,500 heliostats serving a 650-ft (200-m) power tower in southern Saguache County. A power block will house a steam turbine generator and molten salt thermal energy storage tanks. The facility would use wet cooling. Total water required for operation would be up to 1,200 ac-ft/yr (1.5 million m^3/yr). An on-site switchyard would connect to an existing 230-kV line crossing the site. Construction would start in 2011 and operation in June 2013, employing 250 and 50 workers on average, respectively (Solar Reserve 2010).

- *Cogentrix Solar Services.* Cogentix Energy plans to build a 30-MW PV facility near Alamosa. The facility would use dual-axis mounted concentrating solar cells from Amonix and would be the largest facility using this technology. The facility would cost $140 to $150 million and would be located on 225 acres (0.9 km^2) adjacent to an existing Xcel Energy transmission line. It would employ up to 140 workers during construction and 5 to 10 during operation and would begin operating in mid-2012. Cogentrix would sell power to Xcel Energy.

- *Lincoln Renewables.* Alamosa County issued a permit to Lincoln Renewables in April 2010 to build a 37-MW PV facility on 255 acres (1.0 km^2) south of Alamosa. As of that date, the project was still in need of interconnection and power purchase agreements. Construction would be completed by 2012, employing 125 workers. Operation would require only a couple of full-time workers.

- *NextEra.* Alamosa County issued a permit to NextEra in August 2010 to build a 30-MW PV facility on 279 acres (1.1 km^2) in northern Alamosa County. As of that date, the project was still in need of a power purchase agreement. Construction would start in 2011, employing 125 workers. Operation would require one to three full time workers. The plant would require a 3.5-mi (5.6-km) transmission line to connect to the power grid.

Transmission and Distribution Systems

Colorado SB 07-100 also directed rate-regulated utilities, such as Xcel Energy's Public Service Company of Colorado (Public Service), to develop plans to construct or expand transmission facilities to provide for the delivery of electric power consistent with the timing of the development of beneficial energy (including renewable) resources in Colorado. In response, Public Service has identified transmission-constrained areas in south-central Colorado, including the San Luis Valley and Walsenburg areas. Tri-State Generation and Transmission Association (Tri-State) and Public Service are proposing to construct a transmission project called the San Luis Valley–Calumet-Comanche Transmission project to meet the requirements of SB 07-100 and to improve the load service and system reliability throughout the San Luis Valley (Tri-State Generation and Transmission Association, Inc. 2008, 2009; Tri-State and Public Service Company of Colorado 2009) and are pursuing financial support from the USDA's Rural Utilities Service electric program. The proposed project would consist of four parts:

1. A new 345- to 230-kV substation called Calumet, located about 6 mi (10 km) north of Tri-State's existing Walsenburg Substation in Huerfano County;

2. A double-circuit 230-kV line between the San Luis Valley Substation just north of Alamosa and the Calumet Substation;

3. A new (second) single-circuit 230-kV line between the Calumet Substation and Tri-State's existing Walsenburg Substation; and

4. A new double-circuit 345-kV transmission line connecting the Calumet Substation to the existing Comanche Substation in Pueblo County.

Parts 2 and 3, the 230-kV projects between the San Luis Valley and Walsenburg to Calumet, would take the place of Tri-State's proposed San Luis Valley Electric System Improvement project.

The segment crossing the San Luis Valley would consist of a new double-circuit 230-kV transmission line extending 95 mi (153 km) from the San Luis Valley Substation near Alamosa eastward to the Walsenburg Substation. The San Luis Valley Substation would also be expanded to a five-breaker ring to allow for the two new 230-kV line bays and future generator interconnections (Tri-State Generation and Transmission Association, Inc. 2009).

A detailed EA of the San Luis Valley–Calumet-Comanche Transmission project is planned; public meetings were held in August 2009. Route refinement workshops are scheduled to occur by the end of 2010. The partnership plans to have the transmission lines in service by May 2013 (Tri-State and Public Service Company of Colorado 2009).

10.4.22.2.2 Other Actions

Other ongoing and reasonably foreseeable future actions within the San Luis Valley are identified in Table 10.4.22.2-2 and are described in the following sections.

TABLE 10.4.22.2-2 Reasonably Foreseeable Future Actions near the Proposed Los Mogotes East SEZ and in the San Luis Valley

Description	Status	Resources Affected	Primary Impact Location
Transportation			
Travel Management Plan (BLM)	Proposed	Transportation, ecological resources, recreation	San Luis Valley
Recreation			
Rio Grande Scenic Railroad	Ongoing	Visual, ecological resources, socioeconomics	San Luis Valley, including routes adjacent to the Los Mogotes East SEZ (Conejos County)
CTSR	Ongoing	Visual, ecological resources, socioeconomics	San Luis Valley, including routes south of the Los Mogotes East SEZ (Conejos County)
Water Management			
Rio Grande Compact	Ongoing	Water, ecological resources	San Luis Valley
San Luis Valley Project – Conejos Division (CWCD)	Ongoing	Water, ecological resources	San Luis Valley
Conservation			
Rio Grande Riparian Enhancement Project	Proposed	Ecological resources	San Luis Valley (areas along the Rio Grande)
Old Spanish National Historic Trail Comprehensive Management Plan (BLM and NPS)	Proposed	Cultural, visual resources	San Luis Valley (and immediately east of the Los Mogotes East SEZ)
Sangre de Cristo National Heritage Area	Ongoing	Cultural, visual resources	San Luis Valley (areas along the east side)
San Luis Valley Regional Habitat Conservation Plan	Ongoing	Ecological resources	Areas along the Rio San Antonio (near Antonito)

Mining and Mineral Processing

The nearest mining activity is an active sand and gravel pit on the east side of the southeast corner of the proposed Los Mogotes East SEZ, between the SEZ and U.S. 285. No other mining or mineral processing activities occur in the immediate vicinity of the SEZ.

Grazing Management

Within the San Luis Valley, the BLM's La Jara and Saguache Field Offices authorize grazing use on public lands. The current average active grazing use authorized by these offices is 13,719 and 17,506 AUMs, respectively. While many factors could influence the level of authorized use, including livestock market conditions, natural drought cycles, increasing nonagricultural land development, and long-term climate change, it is anticipated that this average level of use will continue in the near term. Grazing use on private lands in the San Luis Valley is frequently (but not always) related to grazing use of public and other federal lands since it is common for federal grazing permittees to utilize USFS- and BLM-administered lands as part of their annual operating cycle. For these operations, a long-term reduction or increase in Federally authorized grazing use would affect the value of the private grazing lands.

Transportation

The travel planning area addressed in the BLM's Travel Management Plan encompasses BLM-administered lands within the San Luis Valley and includes portions of Saguache, Rio Grande, Alamosa, Conejos, and Costilla Counties. The plan for the San Luis Resource Area amends the San Luis Resource Area RMP by changing all area OHV designations of "OHV Open" to "OHV Limited" on various designated roads and trails. The two exceptions to the amendment are the Manassa area of 179 acres (0.7 km^2) and the Antonito area of 82 acres (0.3 km^2), which will be retained as OHV Open areas. Prior to this amendment, 389,279 acres (1,575 km^2) of the 520,945 acres (2,108 km^2) with OHV area designations (i.e., OHV Open, OHV Limited, OHV Closed) were designated as "OHV Open." The proposed ROD was signed on June 4, 2009 (BLM 2009b).

Recreation

Two scenic railroads operate in the San Luis Valley:

- *Rio Grande Scenic Railroad.* Operated by the SLR&G Railroad, the scenic railroad has about 17,600 visitors each year. Scenic routes run between Alamosa and La Veta, Alamosa and Monte Vista, and Alamosa and Chama (New Mexico) via Antonito. The route between Alamosa and La Veta is especially famous for traversing over the historic La Veta Pass, the highest point (at 9,242 ft [2,817 m]) that standard gauge track crosses the Rocky Mountains (RGSR 2009).

- *Cumbres & Toltec Scenic Railroad.* The CTSR is a narrow gauge railroad that runs along the Colorado–New Mexico border. It has depots in Antonito and Chama (New Mexico) (CTSR 2010).

Water Management

Water management is of great importance in the San Luis Valley because it supports agriculture and the raising of livestock, the primary economic activities in the valley. It is estimated that an average of more than 2.8 million ac-ft (3.5 billion m^3) of water enter and leave the valley each year. Surface water inputs are estimated to be about 1.2 million ac-ft (1.5 billion m^3), providing recharge to the valley's aquifers and nearly all the water for irrigation. Several actions by the State of Colorado, the RGWCD, and the BOR affect the distribution priorities of water in the San Luis Valley. These include the Rio Grande Compact, the San Luis Valley Project (Conejos and Closed Basin Divisions), and the recent Subdistrict 1 Water Management Plan.

Rio Grande Compact. The Rio Grande Compact is an agreement among the states of Colorado, New Mexico, and Texas signed in 1938 and ratified in 1939 to apportion the waters of the Upper Rio Grande Basin (north of Fort Quitman, Texas) among the three states. The compact established a sliding scale for the annual volume of water that must be delivered to the Colorado-New Mexico border (as measured at the Lobatos streamflow gauge) that depends on the volume of water measured each year at the Del Norte, Colorado, streamflow gauge. Under the compact, Colorado is obligated to provide an annual delivery of 10,000 ac-ft (12 million m^3) of water into the Rio Grande River at the Colorado–New Mexico state line (as measured at the Lobatos gauging station) less quantities available for depletion from the Rio Grande River at Del Norte and the Conejos River. If the delivery is not met, it creates a debit that has to be repaid in later years. Delivery requirements are administered by the State Engineer and the Colorado Division of Water Resources, Water Division III, in Alamosa (Hinderlider et al. 1939; SLV Development Resources Group 2007).

San Luis Valley Project—Conejos Division. The Conejos Division encompasses the Platoro Dam and Reservoir, located on the Conejos River within the Rio Grande National Forest. Managed by the Conejos Water Conservancy District, the Platoro Project provides flood control and storage of supplemental water for the irrigation of about 81,000 acres (328 km^2) within the district. The reservoir also provides recreational opportunities such as fishing, boating, hiking, and camping (Simonds 2009).

Conservation

Rio Grande Riparian Enhancement Project. This riparian enhancement project along the Rio Grande River is to be completed by the BLM with ARRA funds. The project falls under a Categorical Exclusion under NEPA.

Old Spanish Historic Trail Comprehensive Management Plan. In preparation by the BLM and the NPS. The purpose of the plan is to provide a long-term strategy for managing and interpreting the Old Spanish Historic Trail.

Sangre de Cristo National Heritage Area. The Sangre de Cristo NHA was designated in March 2009. NHAs are designated by Congress and are intended to encourage the conservation of historic, cultural, and natural resources within the area of their designation. NHAs are managed by the NPS (Heide 2009; NPS 2009).

The Sangre de Cristo NHA covers more than 3,000 mi^2 (7,770 km^2) of land in Alamosa, Conejos, and Costilla Counties and encompasses the Monte Vista National Wildlife Refuge, the Baca National Wildlife Refuge, and the Great Sand Dunes National Park and Preserve. In addition, it has more than 20 cultural properties listed on the NRHP (including the CTSR). The NHA has been home to native Tribes, Spanish explorers, and European settlers over more than 11,000 years of settlement (NPS 2009; SLV Development Resources Group 2009). Three of the four proposed Colorado SEZs (Fourmile East, Los Mogotes East, and Antonito Southeast) are within the Sangre de Cristo NHA; the De Tilla Gulch SEZ is about 15 mi (24 km) to the north.

San Luis Valley Habitat Conservation Plan. The USFWS, with the RGWCD and the State of Colorado, is developing a regional Habitat Conservation Plan to address more than 150 mi (241 km) of riparian habitat and land use activities on more than 2 million acres (8,090 km^2) of land that affect the southwestern willow flycatcher, the bald eagle, and the yellow-billed cuckoo throughout the San Luis Valley. Funds were granted in 2004 and 2005 to prepare the plan and NEPA documentation (USFWS 2009a). The NOI to prepare an environmental analysis and to hold public scoping meetings was published by the USFWS in the *Federal Register* on January 7, 2005 (70 FR 5). The agency's intent is to apply for an ITP for the flycatcher, bald eagle, and yellow-billed cuckoo and possible other rare and/or sensitive species that may be affected by various activities within the San Luis Valley. The NOA for the draft EIS and receipt of application for an ITP was published on June 23, 2006 (71 FR 121). It is not clear at the time of preparation of this report if a final EIS was issued.

Miscellaneous Other Actions

The BLM has several small-scale and administrative projects that require NEPA documentation that are not addressed individually in this cumulative impacts analysis. These include many that pertain to grazing permits, such as permit renewals, transfer of permits, changes in grazing dates (seasons), changes in pasture rotations; and changes in AUMs. Other small-scale projects on the NEPA register include the construction of a wildlife boundary fence, an illegal dump remediation project, rock removal, weed control, and a creek restoration project. Some of these projects could occur within 50 mi (80 km) of the Los Mogotes East SEZ.

10.4.22.3 General Trends

Table 10.4.22.3-1 lists general trends within the San Luis Valley with the potential to contribute to cumulative impacts; the trends are discussed in the following sections.

10.4.22.3.1 Population Growth

The 2006 official population estimate for the San Luis Valley (48,291) represents a 4.5% increase over that reported by the 2000 Census, with an annual increase of about 0.75% over the 6-year period (Table 10.4.22.3-2). The growth rate in Conejos County over the same 6-year period was 2.2%. Most of this growth was in unincorporated areas. Population growth within the valley is expected to increase at a rate of about 0.6% each year from 2006 to 2011; then 1.1% each year after that to 2016. This represents about 60 to 70% of the projected Colorado statewide growth rate of 1.0% (2006 to 2011) and 1.5% (2012 to 2016). In the 10-year period between 2006 and 2016, population growth within Conejos County is projected to be 9.2% (SLV Development Resources Group 2007).

TABLE 10.4.22.3-1 General Trends in the San Luis Valley

General Trend	Impacting Factors
Population growth	Urbanization Increased use of roads and traffic Land use modification Employment Education and training Increased resource use (e.g., water and energy) Tax revenue
Energy demand	Increased resource use Energy development (including alternative energy sources) Energy transmission and distribution
Water availability	Drought conditions and water loss Conservation practices Changes in water distribution
Climate change	Water cycle changes Increased wildland fires Habitat changes Changes in farming production and costs

TABLE 10.4.22.3-2 Population Change in the San Luis Valley Counties and Colorado from 2000 to 2006, with Population Forecast to 2016

	Population			Population Forecast		
	2000	2006	Percent Increase 2000 to 2006	2011	2016	Percent Increase 2006 to 2016
San Luis Valley	46,190	48,291	4.5	51,293	54,765	18.6
Colorado	4,301,261	4,812,289	11.9	5,308,500	5,308,300	23.4
Counties						
Alamosa County	14,966	15,765	5.3	16,948	18,326	22.5
Conejos County	8,400	8,587	2.2	8,966	9,373	11.6
Saguache County	5,917	6,568	11.0	7,078	7,582	28.1

Source: SLV Development Resources Group (2007).

10.4.22.3.2 Energy Demand

The growth in energy demand is related to population growth through increases in housing, commercial floorspace, transportation, manufacturing, and services. Given that population growth is expected in the San Luis Valley (by as much as 19% between 2006 and 2016), an increase in energy demand is also expected. However, the EIA projects a decline in per capita energy use through 2030, mainly because of improvements in energy efficiency and the high cost of oil throughout the projection period. Primary energy consumption in the United States between 2007 and 2030 is expected to grow by about 0.5% each year, with the fastest growth projected for the commercial sector (at 1.1% each year). Transportation, residential, and industrial energy consumption are expected to grow by about 0.5%, 0.4%, and 0.1% each year, respectively (EIA 2009).

10.4.22.3.3 Water Availability

Significant water loss has occurred in the San Luis Valley over the past century. Since 1890, the average annual surface water flows of the Rio Grande River (near Del Norte) have averaged about 700,000 ac-ft (863 million m^3). Annual flows peaked in 1920 with a flow of 1 million ac-ft (1.2 billion m^3; about 143% of the average). The lowest annual flows were recorded in 2002 at 154,000 ac-ft (190 million m^3; about 24% of the average). Three of the five years between 2003 and 2007 have been below the average; although flows in 2007 have measured slightly above it (710,000 ac-ft, or 876 million m^3). A comparison of streamflows across the valley shows a similar trend; with both surface water and groundwater data in 2002 indicating extreme to exceptional drought severity. Data from 2007, however, suggest a possible easing of the drought (Thompson 2002; SLV Development Resources Group 2007).

Water in the San Luis Valley is used predominantly for crop irrigation; including both center pivot and flood irrigation techniques. For a typical potato farm, a sprinkler system on a 125-acre (0.5-km^2) circle applies about 210 ac-ft (259,000 m^3) during a 100-day growing season, 70% of which (146 ac-ft or 180,000 m^3) is consumed in the growing crop. In comparison, flood irrigation (not common for potato farming) draws 290 ac-ft (358,000 m^3) during a 100-day growing season and consumes about 50% (144 ac-ft, or 178,000 m^3). An alfalfa farm requires about one and a half times the water required by a typical potato or barley farm.
Table 10.4.22.3-3 compares daily water use by sector. Total daily water withdrawals and consumptive use are highest in Conejos County, a county that has a large share of its crops in alfalfa (accounting for greater than one-third of its water consumption) (SLV Development Resources Group 2007).

Over the past 20 years, groundwater consumption in the San Luis Valley has increased. This increase is attributed mainly to changes in crop patterns from less water-consumptive crops to more water-consumptive crops; changes in the type and frequency of irrigation; the increasing number of acres under irrigation; and more heavy reliance on wells that were formally only used sporadically for irrigation. These changes, combined with a declining water supply due to prolonged drought conditions over the past decade, have reduced the groundwater supply available for crop irrigation. Since 1976, it is estimated that the unconfined aquifer has lost more than 1 million ac-ft (1.2 billion m^3) (RGWCD 2009; SLV Development Resources Group 2007).

The severe drought recorded in 2002 marked an unparalleled situation in the San Luis Valley in terms of the lack of surface water supplies, a lack of precipitation, a lack of residual soil moisture, and poor vegetation health. Well production decreased significantly with declining groundwater levels in the unconfined aquifer and decreasing artesian pressure in the confined

TABLE 10.4.22.3-3 Daily Water Use by Sector in Colorado, 1995

	Withdrawals					
			Sector (Mgal)			
Region	Total (Mgal)	Percentage Groundwater	Irrigation	Public Supply	Industrial	Consumptive Use (Mgal)
Alamosa	414	29	411 (109)[a]	2	2	171
Conejos	732	3.9	727 (111)	3	–[b]	264
Saguache	426	34	423 (210)	2	–	66
San Luis Valley	2,176	19	2,159	15	4	843
Colorado	13,840	16	12,735 (3,404)	705	123	5,235

[a] Numbers in parentheses represent the number of irrigated acres (in thousands) in the region (USGS 2000).

[b] A dash indicates no water use for the sector.

Source: SLV Development Resources Group (2007).

aquifer. In response, water conservation and irrigation strategies (including crop abandonment) were considered by area farmers to minimize water usage (and evapotranspiration rates) and reduce the risk of over-irrigating crops (Thompson 2002).

Most of the cities in the San Luis Valley draw their water from deep wells in the confined aquifer. Water used for the public supply is only a small fraction of that used for agriculture (Table 10.4.22.3-3). Because of drought conditions over the past decade, some residential wells in the San Luis Valley are drying up. Since 1972, the State Engineer has not allowed any new high-capacity wells (i.e., wells with yields greater than 300 gpm or 1,136 L/min) to be constructed in the confined aquifer (SLV Development Resources Group 2007).

The San Luis Valley has about 230,000 acres (931 km^2) of wetlands that provide important wildlife habitat. Only about 10% of the wetlands in the valley occur on public land; conservation efforts with landowner cooperation are becoming popular through the use of land trusts and similar alternatives. Streams, reservoirs, and lakes within the San Luis Valley provide high-quality water and, when sufficient water levels are present, support trout fisheries. Boating in the valley's streams, reservoirs, and lakes has declined in recent years. Drought impacts over the past decade have reduced the depths of surface water bodies in the valley; many are completely dry (SLV Development Resources Group 2007).

10.4.22.3.4 Climate Change

According to a recent report prepared for the CWCB (Ray et al. 2008), temperatures in Colorado have increased by about 2°F (1.1°C) between 1977 and 2006. Climate models project continued increasing temperatures in Colorado—as much as 2.5°F (1.4°C) by 2025 and 4°F (2.2°C) by 2050 (relative to the 1950 to 1999 baseline temperature). In 2050, seasonal increases in temperature could rise as much as 5°F (2.8°C) in summer and 3°F (1.7°C) in winter. These changes in temperature would have the effect of shifting the climate typical of the Eastern Plains of Colorado westward and upslope, bringing temperature regimes that currently occur near the Colorado–Kansas border into the Front Range.

Because of the high variability in precipitation across the state, current climate models have not been able to identify consistent long-term trends in annual precipitation. However, projections do indicate a seasonal shift in precipitation, with a significant increase in the proportion of precipitation falling as rain rather than snow. A precipitous decline in snowpack at lower elevations (below 8,200 ft [2,499 m]) is expected by 2050.

In the past 30 years, the onset of streamflows from melting snow (called the "spring pulse") has shifted earlier in the season by 2 weeks. This trend is expected to continue as spring temperatures warm. Projections also suggest a decline in runoff for most of the river basins in Colorado by 2050. Hydrologic studies of the Upper Colorado River Basin estimate average decreases in runoff of 6 to 20% by 2050 (as compared to the twentieth century average).[17] These

[17] The effects of climate change are not as well studied in the Rio Grande Basin as in the Upper Colorado River Basin.

changes in the water cycle, combined with increasing temperatures and related changes in groundwater recharge rates and soil moisture and evaporation rates, will increase the potential for severe drought and reduce the total water supply, while creating greater demand pressures on water resources.

In general, the physical effects of climate change in the western United States include warmer springs (with earlier snowmelt), melting glaciers, longer summer drought, and increased wildland fire activity (Westerling et al. 2006). All these factors contribute to detrimental changes to ecosystems (e.g., increases in insect and disease infestations, shifts in species distribution, and changing in the timing of natural events). Adverse impacts on human health, agriculture (crops and livestock), infrastructure, water supplies, energy demand (due to increased intensity of extreme weather and reduced water for hydropower), and fishing, ranching, and other resource-use activities are also predicted (GAO 2007; NSTC 2008; Backlund et al. 2008).

The State of Colorado has plans to reduce its GHG emissions by 80% over the next 40 years (Ritter 2007). Initiatives to accomplish this goal will focus on modifying farm practices (e.g., less frequent tilling, improving storage and management of livestock manure, and capturing livestock-produced methane), improving standards in the transportation sector, providing reliable and sustainable energy supplies (e.g., small-scale hydropower, solar, wind, and geothermal energy), and joining the Climate Registry of North American GHG emissions, among others.

10.4.22.4 Cumulative Impacts on Resources

This section addresses potential cumulative impacts in the proposed Los Mogotes 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 4,734 acres (19 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 69-kV transmission line is connected to the SEZ. It is likely that this line will need to be upgraded for utility-scale solar facilities on the SEZ. No designated transmission corridor is close to the SEZ. Regarding site access, U.S. 285 passes 3 mi (5 km) to the east of the proposed SEZ. A new road would need to be constructed to connect the SEZ to U.S. 285. The cumulative impacts discussions in this section include the impacts that would be associated with this potential road construction.

Cumulative impacts would result from the construction, operation, and decommissioning of solar energy development projects within the proposed SEZ and any associated transmission lines and access roads outside the SEZ when added to impacts from other past, present, and reasonably foreseeable future actions described in the previous section in each resource area. 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 semi-quantitatively, with ranges given as appropriate. More detailed analyses of cumulative impacts would be performed in the environmental reviews for the specific projects in relation to all other existing and proposed projects in the geographic areas.

10.4.22.4.1 Lands and Realty

The area covered by the proposed Los Mogotes East SEZ is largely undeveloped. Just to the east of the SEZ are some private agricultural lands. In general, the areas surrounding the SEZ are rural in nature. Three county roads provide access to the SEZ from U.S. 285. Construction of utility-scale solar energy facilities within the SEZ would preclude use of those areas occupied by the solar energy facilities for other purposes. The areas that would be occupied by the solar facilities would be fenced, and access to those areas by both the general public and wildlife would be eliminated. Traditional uses of public lands (there is no agriculture on these sites) would no longer be allowed. Access to BLM, state, and private lands to the west of the SEZ could be affected by solar energy development if provision is not made to retain legal access through solar development areas.

If the area is developed as an SEZ, it is likely that improvements to the infrastructure and increased availability of energy from the solar facilities could attract other users to the area. As a result, the area could acquire more industry. Development of the SEZs could introduce a highly contrasting industrialized land use into areas that are largely rural. As a result, the contribution to cumulative impacts of utility-scale solar projects on public lands on and around the Los Mogotes East SEZ could be significant, particularly if the SEZ is fully developed with solar projects.

10.4.22.4.2 Specially Designated Areas and Lands with Wilderness Characteristics

There are no specially designated areas within the SEZ but there are such areas in the general vicinity. These areas include four ACECs (three in Colorado and one in New Mexico), two WSAs, portions of two WA, portions of two scenic byways, a NHA, and a historic trail. Construction of utility-scale solar energy facilities within the SEZ would have the potential for cumulatively contributing to the visual impacts on these specially designated areas. The exact nature of impacts would depend on the specific technologies employed and the locations selected within the SEZ. These impacts would be in addition to impacts from any other ongoing or future activities. However, development of the SEZ, especially full development, would be a dominant factor in the viewshed from large portions of these specially designated areas.

10.4.22.4.3 Rangeland Resources

The main current land use of the BLM-administered public lands in the SEZ is grazing. If utility-scale solar facilities are constructed on the SEZ, those areas occupied by the solar projects would be excluded from grazing. If water rights supporting agricultural use are purchased to support solar development, some areas that are currently farmed by using that water would be converted to dryland uses.

Because the closest wild horse HMA is more than 70 mi (113 km) from the proposed SEZ, solar energy development would not contribute to cumulative impacts on wild horses and burros managed by the BLM.

10.4.22.4.4 Recreation

It is likely that limited outdoor recreation (e.g., backcountry driving, OHV use, and hunting) occurs on or in the immediate vicinity of the SEZ. Construction of utility-scale solar projects on the SEZ would preclude recreational use of the affected lands for the duration of the projects. However, improvements to or additional access roads could increase the amount of recreational use in unaffected areas of the SEZ or in the immediate vicinity. There would be a potential for visual impacts on recreational users of the surrounding specially designated areas (Section 10.4.22.3.2). The overall cumulative impacts on recreation could be large for the users of the areas affected by the solar projects, but would be relatively small for users of areas outside of the affected areas.

10.4.22.4.5 Military and Civilian Aviation

The SEZ is not affected by any MTRs. The nearest civilian airport is at Alamosa about 20 mi (32 km) from the SEZ. Recent information from DoD indicates that there are no concerns about solar development in the SEZ. Considering other ongoing and reasonably foreseeable future actions discussed in Section 10.4.22.2, the cumulative impacts from the solar energy development in the proposed SEZ would be small.

10.4.22.4.6 Soil Resources

Ground-disturbing activities (e.g., grading, excavating, and drilling) during the construction phase of a solar project would contribute to the soil loss due to wind erosion. Construction of new roads within the SEZ or improvements to existing roads would also contribute to soil erosion. During construction, operations, and decommissioning of the solar facilities, travel back and forth by the workers at the facilities, visitors and delivery personnel to the facilities, or waste haulers from the facilities 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 of other renewable energy facilities, recreational users, and agricultural users. Erosion of exposed soils could also lead to the generation of fugitive dust, which could affect local air quality (see Section 10.4.22.3.12). As discussed in Section 10.4.7.3, design features would be employed to minimize erosion and loss of soil during the construction, operation, and decommissioning phases of the solar facilities. Overall SEZ contributions to cumulative impacts on soil resources would be small and temporary during the construction and decommissioning of the facilities.

Landscaping of solar energy facility areas could alter drainage patterns and lead to increased siltation of surface water streambeds, in addition to that from other development activities and agriculture. However, with the required design features in place, cumulative impacts would be small.

10.4.22.4.7 Minerals (Fluids, Solids, and Geothermal Resources)

There are no mining claims or oil and gas leases in the SEZ. Lands in the SEZ were recently closed to “locatable mineral” entry, pending the outcome of this PEIS. These lands would continue to be closed to all incompatible forms of mineral development if the area is designated as an SEZ. However, some mineral uses might be allowed. For example, oil and gas development utilizing directional drilling techniques would still be possible. Also, 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.

10.4.22.4.8 Water Resources

The water requirements for various technologies if they were to be employed on the proposed Los Mogotes East SEZ to develop utility-scale solar energy facilities are described in Sections 10.4.9.2. If the SEZ was 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 686 to 964 ac-ft (846,200 to 1.2 million m^3). During operations, the amount of water needed would be a strong function of the cooling technology employed, ranging from 27 ac-ft/yr (33,300 m^3/yr) for PV systems to as high as 14,216 ac-ft/yr (17.5 million m^3/yr) for wet-cooled technologies. The amount of water needed during decommissioning would be similar to or less than the amount used during construction. These numbers would compare with 1,100 ac-ft/day (402,680 ac-ft/yr) in Conejos County that was withdrawn from surface water and groundwater resources in 2005. Therefore, cumulatively the additional water resource needed for solar facilities in the SEZ would constitute a relatively small increment (0.1 to 4%, the ratio of the annual operations water requirement to the annual amount withdrawn in Conejos County). However, as discussed in Sections 10.4.9.1.3, the water resources in the area are fully appropriated, and any new users would have to purchase a more senior water right (e.g., an old irrigation right), retire that historic consumptive use, and transfer that amount of historic consumptive use to the new project. Additionally, the proposed water management rules being developed for the Rio Grande Basin will impose limits on groundwater withdrawals and set requirements for augmentation water plans that can affect the process of securing water supplies (see Sections 10.4.9.1.3 and 10.4.9.2.4). The strict management of water resources in the Rio Grande Basin acts to ensure that any impacts from a new water use would continue to be equivalent or less than those from current uses, and no net increase would occur in the total amount of water used.

Small quantities of sanitary wastewater would be generated during the construction and operation of the potential utility-scale solar energy facilities. The amount generated from solar facilities would be in the range of 9 to 74 ac-ft (11,100 to 91,300 m^3) during the peak construction year and would range from less than 1 to 13 ac-ft/yr (up to 16,000 m^3/yr) during operations. Because of the small quantity, the sanitary wastewater generated by the solar energy facilities would not be expected to put undue strain on available sanitary wastewater treatment facilities in the general area of the SEZ. For technologies that rely on conventional wet- or dry-cooling systems, there would also be 149 to 269 ac-ft/yr (183,800 to 331,800 m^3/yr) of blowdown water from cooling towers. This water would be treated on-site (e.g., in settling ponds) and injected into the ground, released to surface water bodies, or reused.

10.4.22.4.9 Vegetation

The proposed Los Mogotes East SEZ is located primarily within the San Luis Alluvial Flats and Wetlands ecoregion, which supports shrublands, grasslands, and, on upper elevations of the San Luis Hills, pinyon-juniper woodlands. These plant community types generally have a wide distribution within the San Luis Valley area, and thus other ongoing and reasonably foreseeable future actions would have a cumulative effect on them. Because of the long history of livestock grazing, the plant communities present within the SEZ have likely been affected by grazing. If utility-scale solar energy projects were to be constructed within the SEZ, all vegetation within the footprints of the facilities would likely be removed during land-clearing and -grading operations. In addition, any wetlands within the footprint of the facility would need to be avoided or impacts mitigated. Wetland or riparian habitats outside of the SEZ that are supported by groundwater discharge could be affected by hydrologic changes resulting from project activities. The fugitive dust generated during the construction of the solar facilities could increase the dust loading in habitats outside a solar project area, which could result in reduced productivity or changes in plant community composition. Similarly, surface runoff from project areas after heavy rains could increase sedimentation and siltation in areas downstream. Other activities that would contribute to the overall dust generation in the area would include construction of new solar facilities or other facilities, agriculture, recreation, and transportation. Design features would be used to reduce the impacts from solar energy projects and thus reduce the overall cumulative impacts on plant communities and habitats.

10.4.22.4.10 Wildlife and Aquatic Biota

As discussed in Section 10.4.11, a number of amphibian, reptile, bird, and mammal species occur in and around the proposed Los Mogotes East SEZ. 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, and wildlife injury or mortality. Unless mitigated, these impacts, when added to impacts that would result from other activities in the general area, could be moderate to large. 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. Implementation of required design features would reduce the severity of impacts on wildlife. The design features may include pre-disturbance biological surveys to identify key habitat areas used by wildlife followed by avoidance or minimization of disturbance to those habitats.

The proposed De Tilla Gulch and Fourmile East SEZs, and the operating and planned solar facilities near the Fourmile East SEZ are smaller areas and likely too far away from the Los Mogotes East SEZ to have cumulative impacts on wildlife and aquatic biota. However, the proposed Antonito Southeast SEZ is only about 7 mi (11 km) from the Los Mogotes East SEZ. Additionally, there are other ongoing and reasonably foreseeable future actions (Section 10.4.22.2) occurring in the vicinity of the Los Mogotes East SEZ. If development of solar facilities occurred at both proposed SEZs in the future, or if other actions occurred in the vicinity, there could be cumulative impacts on wildlife and aquatic biota habitat. However, many of the wildlife species have extensive available habitat within the affected counties (e.g., elk and pronghorn). Nonetheless, several new solar facilities and the other actions would have a cumulative impact on wildlife. Where projects are closely spaced, the cumulative impact on a particular species could be moderate to large.

For example, solar energy development in the proposed Los Mogotes East SEZ would encompass an area of severe winter range for elk. Design features would be used to reduce the impacts from solar energy projects and thus reduce the overall cumulative impacts on wildlife.

There are no permanent water bodies or perennial streams within the boundaries of the proposed SEZ or within the potential area for new road construction. There are some perennial streams and small wetlands outside but in close proximity to the SEZ. Among them are the Alamosa River, Conejos River, and La Jara Creek (Section 10.4.11.4). Cumulative impacts on aquatic biota and habitats resulting from solar facilities within the SEZ and other reasonably foreseeable activities would most likely occur as a result of groundwater drawdown or sedimentation of wetlands and downgradient streams. Although there may be a small net increase in impacts on aquatic biota in certain areas around the SEZ, since net groundwater use should not change because of regulations governing use in the San Luis Valley, cumulative impacts on aquatic biota and habitats from groundwater drawdown should not occur. Design features to prevent erosion and sedimentation would reduce cumulative impacts on stream habitat and aquatic biota.

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

One species listed under the ESA (southwestern willow flycatcher) has the potential to occur within the affected area of the SEZ. The Gunnison's prairie dog is the only species that is a candidate for listing as threatened or endangered under the ESA that may occur near the proposed Los Mogotes East SEZ. Numerous additional species occurring on or in the vicinity of the SEZ are listed as threatened or endangered by the states of Colorado or New Mexico, or listed as a sensitive species by the BLM. Design features that could be used to reduce or eliminate the potential for effects on these species from the construction and operation of utility-scale solar energy projects include avoidance of habitat and minimization of erosion, sedimentation, and dust deposition. The impacts of full-scale solar energy development on threatened, endangered, and sensitive species would be minimized if design features, including avoidance of occupied or suitable habitats, avoidance of occupied areas, and translocation of individuals, were implemented successfully. This approach would also minimize the contribution of potential solar energy projects to cumulative impacts on protected species. Depending on other projects occurring in the area at the time, there may still be some cumulative impacts on protected species. However, other projects would likely also employ mitigation measures to reduce or eliminate the impacts on protected species as required by the ESA and other applicable federal and state laws and regulations.

The proposed De Tilla Gulch and Fourmile East SEZs, and the operating and planned solar facilities near the Fourmile East SEZ are smaller areas and likely too far away from the Los Mogotes East SEZ to have cumulative impacts on special status species. However, the proposed Antonito Southeast SEZ is only about 7 mi (11 km) from the Los Mogotes East SEZ. Special status species with potential habitat impacts from solar development that are common to both the Los Mogotes East SEZ and the Antonito Southeast SEZ are the Bodin milkvetch, grassy slope sedge, least moonwort, northern moonwort, Rocky Mountain blazing-star, western moonwort, short-eared owl, Rio Grande chub, Rio Grande sucker, and southwestern willow flycatcher.

There are also other ongoing and reasonably foreseeable future actions (Section 10.4.22.2) occurring in the vicinity of the proposed Los Mogotes East SEZ. Together, several new solar facilities and the other actions would have a cumulative impact on species status species. Where projects are closely spaced, the cumulative impact on a particular species could be moderate to large.

10.4.22.4.12 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 be responsible for some amount of air pollutants. Most of the emissions would be 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, the maximum 24-hour PM_{10} concentration at or near the SEZ boundaries could at times exceed the applicable standard of 150 $\mu g/m^3$. 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.

Other planned energy production and distribution activities in the San Luis Valley include construction and operation of two smaller (less than 300 acres [1.2 km^2]) PV facilities near the Fourmile East SEZ, and construction of a power line running east from Alamosa to Walsenburg. In addition a 30-MW PV facility is being constructed in Colfax County in northeastern New Mexico. Construction of these projects would result in a temporary increase in particulate emissions. In addition, since the Los Mogotes East and Antonito Southeast SEZs are within about 12 mi (19 km) of each other, construction of solar facilities at the two SEZs could have cumulative impacts. However, because of the limited duration of construction activities and the likelihood that those activities would occur at different times, adverse cumulative air quality impacts are not expected. If two solar facilities were being constructed at approximately the same time at the two SEZs, specific schedules could be managed to reduce air quality impacts.

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 by offsetting the need for energy production that results in higher levels of emissions, such as coal, oil, and natural gas. As discussed in Section 10.4.13, during operations of solar energy facilities, only a few sources of air emissions exist, and their emissions would typically be relatively small. However, the amount of criteria air pollutant, VOCs, TAP, and GHG emissions that would be avoided if the solar facilities were to displace the energy that otherwise would have been generated from fossil fuels could be relative large. For example, if the Los Mogotes East SEZ was fully developed with solar facilities up to 80% of its size, the quantity of pollutants avoided could be as large as 3.5% of all emissions from the current electric power systems in Colorado.

10.4.22.4.13 Visual Resources

The San Luis Valley floor is very flat and is characterized by wide open views. Generally good air quality and a lack of obstructions allow visibility for 50 mi (80 km) or more under favorable atmospheric conditions. The proposed SEZ is a generally flat to gently rolling, largely treeless plain, with the strong horizon line being the dominant visual feature. The VRI values for the SEZ and immediate surroundings are VRI Class III, indicating moderate relative visual values. The inventory indicates relatively low levels of use and public interest; however, the inventory indicated high visual sensitivity for the SEZ and surrounding lands, primarily because the SEZ is within the viewshed of the Los Caminos Antiguos Scenic Byway and the viewshed of the West Fork of the North Branch of the Old Spanish Trail.

Development of utility-scalesolar energy projects within the SEZ would contribute to the cumulative visual impacts in the general vicinity of the SEZ and in the San Luis Valley. However, the exact nature of the visual impact and the mitigation measures 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 mitigation measures 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 facilities 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 facilities. Some of the affected lands outside the SEZ would include potentially sensitive scenic resource areas, including the San Luis Hills, Los Mogotes, Cumbres &Toltec, and San Antonio Gorge ACECs; the San Luis Hills and San Antonio WSAs; portions of South San Juan and

Cruces Basin WAs; portions of three scenic byways; the Sangre de Cristo NHA; and portions of the Old Spanish National Historic Trail. 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, like wind mills. 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.

In addition to cumulative visual impacts associated with views of particular future projects, 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 facilities would likely vary in appearance, and depending on the number and type of facilities, the resulting visual disharmony could exceed the visual absorption capability of the landscape and add significantly to the cumulative visual impact.

10.4.22.4.14 Acoustic Environment

The areas around the proposed Los Mogotes East SEZ and in the San Luis Valley area, in general, are relatively quiet. The existing noise sources include road traffic, railroad traffic, aircraft flyover, agricultural activities, animal noise, and community activities and events. 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. If one or more of these types of facilities were to be constructed close to the boundaries of an SEZ or on different SEZs relatively close to each other (i.e., Antonito Southeast and Los Mogotes East), residents living nearby could be affected by the noise generated by these machines, particularly at night when the noise is more discernable due to relatively low background levels.

10.4.22.4.15 Paleontological Resources

Little surveying for paleontological resources has been conducted in the San Luis Valley. For reasons described in Section 10.4.16, few, if any, impacts on significant paleontological resources are likely to occur in the proposed SEZ. However, the specific sites selected for future projects would be surveyed if determined necessary by the BLM, and any paleontological resources discovered through surveys or during the construction of the projects would be avoided or mitigated to the extent possible. No significant cumulative impacts on paleontological resources are expected.

10.4.22.4.16 Cultural Resources

The San Luis Valley is rich in cultural history with settlements dating as far back as 11,000 years. Several geographic features in the valley may have cultural significance. However, only a very small portion (about 0.02%) of the area occupied by the proposed Los Mogotes East SEZ has been surveyed for cultural resources, no archeological sites have been recorded within the SEZ to date. There are, however, several historic properties, including a scenic railroad (Cumbres & Toltec) and an historic trail (the Old Spanish Trail), close to the SEZ, and there is a potential for properties of significance to the Hispanic community to exist in the area. 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, the specific sites selected for future projects would be surveyed, and any cultural resources discovered through surveys or during the construction of the projects would be avoided or mitigated to the extent possible. Similarly, through ongoing consultation with the Colorado SHPO and appropriate Native American governments, it is likely that most adverse effects on significant resources in the San Luis Valley could be mitigated to some degree, but not necessarily eliminated.

10.4.22.4.17 Native American Concerns

Government-to-government consultation is under way with Native American governments with possible traditional ties to the San Luis Valley. To date no specific concerns regarding the proposed Los Mogotes East SEZ have been raised to the BLM. The Jicarilla Apache have judicially established a tribal land claim in proximity to the SEZ, but on the basis of available maps, the claim does not appear to include any portions of the SEZ and should not contribute to any impacts on that claim. In addition, the Taos Pueblo has a judicially established land claim to the south of the SEZ in New Mexico. 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 the impacts in the valley that may be of concern to Native American Tribes. Continued discussions with the area Tribes through government-to-government consultation is necessary to effectively consider and mitigate the Tribes' concern tied to solar energy development in the San Luis Valley.

10.4.22.4.18 Socioeconomics

Solar energy development projects in the proposed Los Mogotes 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 development. The number of workers involved in the construction of solar projects in the peak construction year could range from about 120 to 1,600 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 220 (solar PV) to as high as 2,900 (solar trough). Cumulative socioeconomic effects in the ROI from construction of solar facilities would occur to the extent that multiple construction projects of any type were ongoing 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-or-more year solar development period.

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 would be in the range of 10 to 200, with approximately 15 to 320 total jobs created in the region. Population increases would contribute to general upward 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.

10.4.22.4.19 Environmental Justice

Both minority and low-income populations have been identified within 50 mi (80 km) of the proposed SEZ. Any impacts from solar development could have cumulative impacts on minority and low-income populations in combination with other development in the area. Such impacts could be both positive, such as from increased economic activity, and negative, such as visual impacts, noise, fugitive dust, and loss of agricultural jobs from conversion of lands. However, these impacts are not expected to be disproportionately high on the minority and low-income populations. If needed, mitigation measures can be employed to reduce the impacts on the population in the vicinity of the SEZ, including the minority and low-income populations. As the overall scale and environmental impacts of potential projects within the ROI are expected to be generally low, it is not expected that the proposed Los Mogotes East SEZ would contribute to cumulative impacts on minority and low-income populations.

10.4.22.4.20 Transportation

A two-lane highway (U.S. 285) passes 3 mi (5 km) to the east of the proposed Los Mogotes East SEZ. The SLRG Railroad also serves the area. The nearest public airport is San Luis Valley Regional Airport, 22 mi (35 km) north of the SEZ in Alamosa. The AADT on U.S. 285 in the vicinity of the SEZ ranges from about 3,900 to 4,900. During construction activities, there could be up to 1,000 workers commuting to the construction site at the SEZ, which could increase the AADT on this highway by 2,000 vehicles. This increase in highway traffic from construction workers could have moderate cumulative impacts in combination with existing traffic levels and increases from additional future projects in the area. However, if construction is occurring concurrently in the proposed Los Mogotes East and Antinito Southeast

SEZs, which are relatively close to each other and are both served by U.S. 285, the increase in traffic during shift changes could be significant. Local road improvements may be necessary near site access points. Any impacts during construction activities would be temporary. The impacts could be mitigated to some degree by having different work hours within an SEZ or between two SEZs. Traffic increases during operation would be relatively small because of the low number of workers needed to operate solar facilities and would have little contribution to cumulative impacts.

10.4.23 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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