11.2 DELAMAR VALLEY

11.2.1 Background and Summary of Impacts

11.2.1.1 General Information

The proposed Delamar Valley SEZ is located in Lincoln County in southeastern Nevada about 21 mi (34 km) south of the proposed Dry Lake Valley North SEZ (Figure 11.2.1.1-1). The SEZ has a total area of 16,552 acres (67 km^2). In 2008, the county population was 4,643, while adjacent Clark County to the south had a population of 1,879,093. The largest nearby town is Alamo, Nevada, about 11 mi (18 km) west in Lincoln County. The town of Panaca is located about 33 mi (53 km) northeast. Las Vegas lies about 90 mi (145 km) to the south.

The nearest major road access to the SEZ is via U.S. 93, which runs north–south, approximately 8 to 14 mi (13 to 23 km) to the west of the Delamar Valley SEZ and also east–west, approximately 8 mi (13 km) to the north of the SEZ. State Route 317 passes from the north to the south approximately 16 to 21 mi (26 to 34 km) east of the SEZ. The nearest railroad stop is in Caliente, 22 mi (35 km) away, while Lincoln County Airport is located 15 mi (24 km) north of Caliente in Panaca.

A 69-kV transmission line passes through the SEZ. It is assumed that this existing transmission line could potentially provide access from the SEZ to the transmission grid (see Section 11.2.1.1.2).

As of March 2010, there were two ROW applications for solar projects and one application for a wind project that would be located within 50 mi (80 km) of the SEZ. These applications are discussed in Section 11.2.22.2.1.

The proposed Delamar Valley SEZ is isolated and undeveloped. The SEZ is located in Delamar Valley, a north trending closed basin within the Basin and Range physiographic province immediately south of Dry Lake Valley and lying between the South Pahroc Range to the west and the Delamar Mountains to the east and southeast. Land within the SEZ is undeveloped scrubland characteristic of a high-elevation, semiarid basin.

The proposed Delamar Valley SEZ in Nevada and other relevant information are shown in Figure 11.2.1.1-1. The criteria used to identify the proposed Delamar Valley SEZ as an appropriate location for solar energy development included proximity to existing transmission 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 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

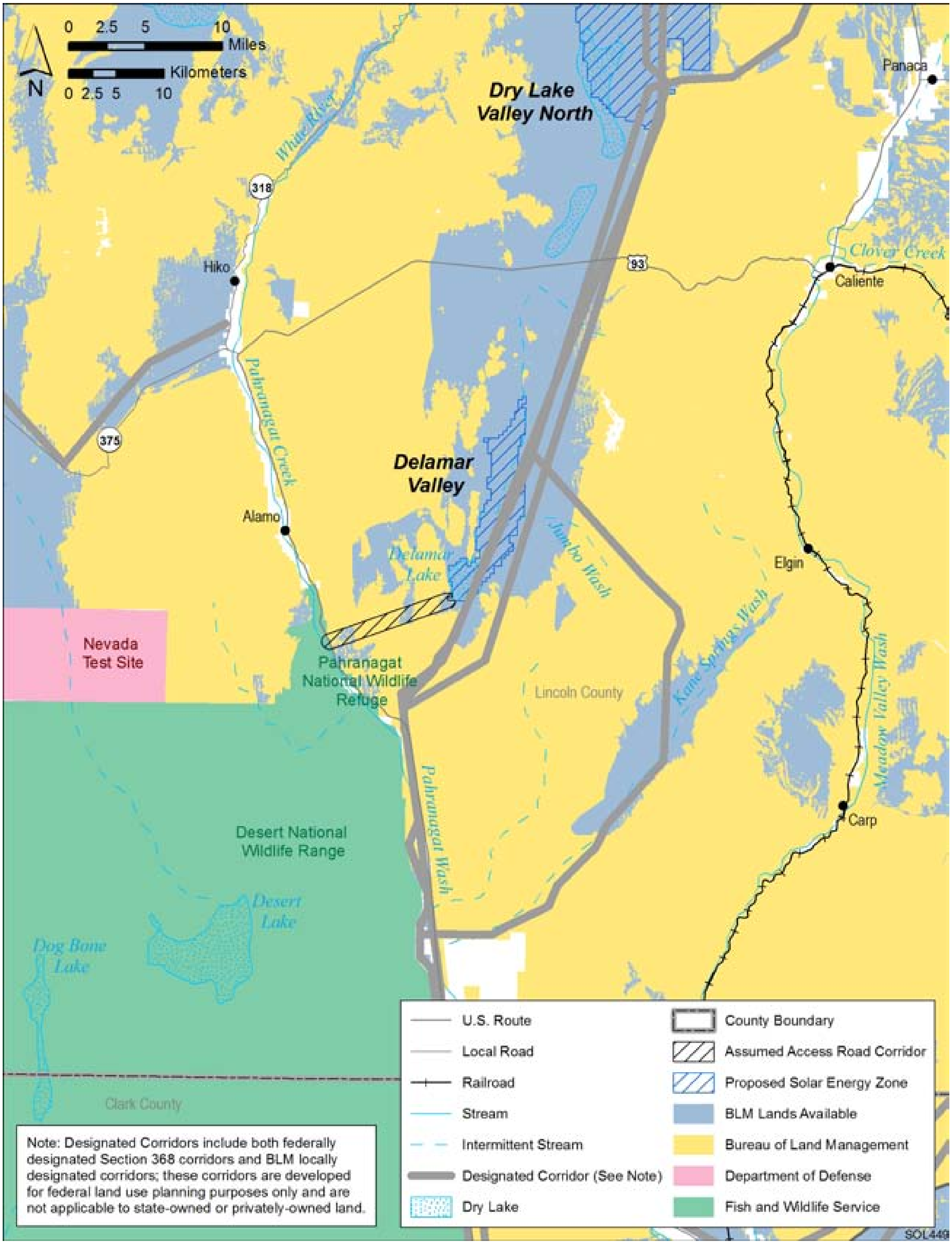

FIGURE 11.2.1.1-1 Proposed Delamar Valley SEZ

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 Delamar Valley SEZ encompassed 17,932 acres (73 km^2). Subsequent to the study area scoping period, the boundaries of the proposed Delamar Valley SEZ were altered somewhat to facilitate the BLM's administration of the SEZ area. The revised SEZ is approximately 1,380 acres (6 km^2) smaller than the original SEZ as published in June 2009.

11.2.1.2 Development Assumptions for the Impact Analysis

Maximum solar development of the proposed Delamar Valley SEZ is assumed to be 80% of the SEZ area over a period of 20 years, a maximum of 13,242 acres (54 km^2). These values are shown in Table 11.2.1.2-1, along with other development assumptions. Full development of the Delamar Valley SEZ would allow development of facilities with an estimated total of 1,471 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 2,648 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 that runs through 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 1,471 to 2,648 MW of new capacity (note: a 500 kV line can accommodate approximately the load of one 700 MW facility). At full build-out capacity, it is clear that substantial new transmission and/or upgrades of existing transmission lines would be required to bring electricity from the proposed Delamar Valley SEZ to load centers; however, at this time the location and size of such new transmission facilities are unknown. Generic impacts of transmission and associated infrastructure construction and of line upgrades for various resources are discussed in Chapter 5. Project-specific analyses would need to identify the specific impacts of new transmission construction and line upgrades for any projects proposed within the SEZ.

For the purposes of analysis in the PEIS, it was assumed that an existing 69-kV transmission line which intersects the SEZ could provide initial access to the transmission grid, and thus no additional acreage disturbance for transmission line access was assessed. Access to the existing 69-kV transmission line was assumed, without additional information on whether this line would be available for connection of future solar facilities. If a connecting transmission line were constructed in the future to connect facilities within the SEZ to a different, offsite, grid location from the one assumed here, site developers would need to determine the impacts from construction and operation of that line. In addition, developers would need to determine the impacts of line upgrades if they are needed.

An additional 58 acres (0.2 km^2) was assumed to be needed for new road access to support solar development in the Delamar Valley SEZ, as summarized in Table 11.2.1.2-1. This

TABLE 11.2.1.2-1 Proposed Delamar Valley SEZ—Assumed Development Acreages, Solar MW Output, Access Roads, and Transmission Line ROWs

Total Acreage and Assumed Developed Acreage (80% of Total)	Assumed Maximum SEZ Output for Various Solar Technologies	Distance to Nearest State, U.S., or Interstate Highway	Distance and Capacity of Nearest Existing Transmission Line	Area of Assumed Transmission Line and Road ROWs	Distance to Nearest Designated Corridor[e]
16,552 acres and 13,242 acres[a]	1,471 MW[b] and 2,648 MW[c]	State Route 93 9 mi[d]	0 mi and 69 kV	0 acres and 58 acres	Adjacent

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

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

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

[d] 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.

estimate was based on the assumption that a new 8-mi (13-km) access road to the nearest major road, U.S. 93, would support construction and operation of solar facilities. While there are existing dirt/ranch roads within the SEZ, additional internal road construction may be required to support solar facility construction.

11.2.1.3 Summary of Major Impacts and SEZ-Specific Design Features

In this section, the impacts and SEZ-specific design features assessed in Sections 11.2.2 through 11.2.21 for the proposed Delamar Valley SEZ are summarized in tabular form. Table 11.2.1.3-1 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 11.2.22 discusses potential cumulative impacts from solar energy development in the proposed SEZ.

Only those design features specific to the proposed Delamar Valley SEZ are included in Sections 11.2.2 through 11.2.21 and in the summary table. The programmatic design features for each resource area to be required under BLM’s Solar Energy Program are presented in Appendix A, Section A.2.2. These programmatic design features would also be required for development in this and other SEZs.

TABLE 11.2.1.3-1 Summary of Impacts of Solar Energy Development within the Proposed Delamar Valley SEZ and SEZ-Specific Design Features[a]

Resource Area	Environmental Impacts—Proposed Delamar SEZ	SEZ-Specific Design Features
Lands and Realty	Full development of the proposed Delamar Valley SEZ could disturb up to 13,242 acres (54 km^2). Development of the SEZ for utility-scale solar energy production would establish a large industrial area that would exclude many existing and potential uses of the land, perhaps in perpetuity. Since the SEZ is undeveloped and isolated, utility-scale solar energy development would be a new and discordant land use to the area.	None.
	The locally designated transmission corridor located within the SEZ occupies about 2,919 acres (12 km^2) (22%) of the proposed SEZ. The proposed SNWA pipeline ROW would also make additional land in the SEZ unavailable for solar energy development. Both of these ROWs would limit future solar development within the corridor, or alternatively, solar energy development in the SEZ could reduce corridor capacity..	Consideration should be given to relocating the existing transmission corridor and proposed SNWA ROW outside of the SEZ.
	Because of the 14-mi (23-km) length of the SEZ, east–west travel across the valley could be cut-off, requiring extensive detours for public land users.	None.
	A new 8-mi (13-km) access road would be constructed from the northern end of the SEZ to connect to U.S. 93, resulting in the surface disturbance of about 58 acres (0.2 km^2) of public land.	Priority consideration should be given to utilizing/improving existing roads to provide construction and operational access to the SEZ.

TABLE 11.2.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Delamar SEZ	SEZ-Specific Design Features
Specially Designated Areas and Lands with Wilderness Characteristics	Visual impacts of solar energy development would have the potential to affect wilderness characteristics of the Delamar Mountains and South Pahroc WAs.	The design features for visual resources should be adopted to minimize impacts on wilderness characteristics.
	Solar development of the SEZ could adversely affect the quality of the night sky environment in adjacent specially designated areas.	None.
Rangeland Resources: Livestock Grazing	Grazing would be precluded from areas developed for solar energy production. If full solar development would occur in the SEZ, the federal grazing permit for the Buckhorn allotment would be reduced in area by about 18%, and about 606 AUMs would be lost.	None.
Rangeland Resources: Wild Horses and Burros	About 33,140 acres (134.4 km^2) or 17.8% of the Delamar Mountains HA would be in the area of indirect impact for the Delamar Valley SEZ. However, with implementation of design features, indirect impacts on wild horses are expected to be negligible.	None.
Recreation	Recreation use would be eliminated from portions of the SEZ that would be developed for solar energy production.	None.
	Because the SEZ sits astride numerous roads and trails, construction of solar energy facilities could cause a major impact on existing recreation travel.	None.
Military and Civilian Aviation	The military has expressed serious concern over construction of solar energy facilities within the SEZ, and Nellis Air Force Base has indicated that any facilities more than 100 ft (30 m) may be incompatible with low-level aircraft use of the MTR. Further, the NTTR has indicated that solar technologies requiring structures higher than 50 ft (15 m) above ground level may present unacceptable electromagnetic compatibility concerns for their test mission.	None.

TABLE 11.2.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Delamar SEZ	SEZ-Specific Design Features
Geologic Setting and Soil Resources	Impacts on soil resources would occur mainly as a result of ground-disturbing activities (e.g., grading, excavating, and drilling), 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). Delamar Lake may not be a suitable location for construction.	None.
Minerals (fluids, solids, and geothermal resources)	None.	None.
Water Resources	Ground disturbance activities (affecting 36% of the total area in the peak construction year) could affect surface water quality due to surface runoff, sediment erosion, and contaminant spills. Construction activities may require up to 2,814 ac-ft (3.5 million m^3) of water during the peak construction year. Construction activities would generate as high as 148 ac-ft (182,600 m^3) of sanitary wastewater. Assuming full development of the SEZ, operations would use the following amounts of water: • For parabolic trough facilities (2,648-MW capacity), 1,891 to 4,009 ac-ft/yr (2.3 million to 4.9 million m3/yr) for dry-cooled systems; water requirements for wet-cooled systems exceed the perennial yield of the basin.	Water resource analysis indicates that wet-cooling options would not be feasible; other technologies should incorporate water conservation measures. Land disturbance activities should avoid impacts to the extent possible in the vicinity of the intermittent streams, ephemeral washes, and the dry lake present on the site. Siting of solar facilities and construction activities should avoid any areas identified as within a 100-year floodplain or jurisdictional waters. Groundwater rights must be obtained from the NDWR (dry-cooling and dish engine technologies may have to negotiate with the SNWA for water rights).

TABLE 11.2.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Delamar SEZ	SEZ-Specific Design Features
Water Resources *(Cont.)*	• For power tower facilities (1,471-MW capacity), 1,046 to 2,223 ac-ft/yr (1.3 million to 2.7 million m3/yr) for dry-cooled systems; water requirements for wet-cooled systems • For dish engine facilities (1,471-MW capacity), 752 ac-ft/yr (927,600 m3/yr). • For PV facilities (1,471-MW capacity), 76 ac-ft/yr (93,700 m3/yr). Assuming full development of the SEZ, operations would generate up to 37 ac-ft/yr (45,600 m^3/yr) of sanitary wastewater and up to 752 ac-ft/yr (927,600 m^3/yr) of blowdown water.	Stormwater management plans and BMPs should comply with standards developed by the Nevada Division of Environmental Protection. Groundwater monitoring and production wells should be constructed in accordance with state standards. Water for potable uses would have to meet or be treated to meet water quality standards according to *Nevada Administrative Code*.
Vegetation[b]	Up to 13,242 acres (54 km^2) of the SEZ would be cleared of vegetation. Because of the arid conditions, re-establishment of shrub, shrub steppe, or grassland communities in temporarily disturbed areas would likely be very difficult and might require extended periods of time. Noxious weeds could become established in disturbed areas and colonize adjacent undisturbed habitats, thus reducing restoration success and potentially resulting in widespread habitat degradation.	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 affected habitats and minimize the potential for the spread of invasive species, such as halogeton or tumbleweed. Invasive species control should focus on biological and mechanical methods where possible to reduce the use of herbicides. Dry washes, Delamar Lake playa, and the nearby marsh should be avoided to the extent practicable, and any impacts minimized and mitigated. Appropriate engineering controls should be used to

TABLE 11.2.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Delamar SEZ	SEZ-Specific Design Features
Vegetation[b] *(Cont.)*	The deposition of fugitive dust from large areas of disturbed soil onto habitats outside a solar project area could result in reduced productivity or changes in plant community composition. Vegetation communities associated with Delamar Lake and other playa habitats, Jumbo Wash and the unnamed intermittent stream, greasewood flats communities, riparian habitats, marshes, or other intermittently flooded areas within or downgradient from solar projects or the access road could be affected by ground-disturbing activities. Joshua tree communities within the northern portion of the SEZ and within the assumed access road corridor could be directly or indirectly affected. The use of groundwater within the proposed Delamar Valley SEZ for technologies with high water requirements, such as wet-cooling systems, could disrupt the groundwater flow pattern and adversely affect the springs and wetlands within the Pahranagat NWR, located southwest of the SEZ.	minimize impacts on wetlands within the assumed access road corridor, as well as dry washes, Delamar Lake and other playas, and riparian, marsh, and greasewood flat habitats within the SEZ and corridor, including downstream occurrences, resulting from surface water runoff, erosion, sedimentation, altered hydrology, accidental spills, or fugitive dust deposition. All wetland, dry wash, and riparian 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, playas, dry washes, and riparian areas to reduce the potential for impacts. Appropriate buffers and engineering controls would be determined through agency consultation. Joshua tree communities are protected by the State of Nevada and should be avoided in the northern areas of the SEZ and along the assumed access road corridor. Any Joshua trees in areas of direct impacts should be salvaged. Cactus species, including cholla, or ocotillo should be avoided. Any cacti that cannot be avoided should be salvaged. Groundwater withdrawals should be limited to reduce the potential for indirect impacts on springs and wetlands in the vicinity of the SEZ, at Pahranagat NWR. Potential impacts on springs should be determined through hydrological studies.

TABLE 11.2.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Delamar SEZ	SEZ-Specific Design Features
Wildlife: Amphibians and Reptiles[b]	Direct impacts on representative amphibian and reptile species from SEZ development would be small (i.e., loss of ≤1% of potentially suitable habitats). With implementation of proposed design features, indirect impacts would be expected to be negligible.	Delamar Lake, Jumbo Wash, and the unnamed wash should be avoided.
Wildlife: Birds[b]	Direct impacts on the killdeer would be moderate (i.e., loss of >1.0 to ≤10% of potentially suitable habitats). Impacts on all other representative bird species from SEZ development would be small (i.e., loss of ≤1% of potentially suitable habitats). Other impacts on birds could result from collision with vehicles and infrastructure (e.g., buildings and fences), surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, noise, lighting, spread of invasive species, accidental spills, and harassment. These indirect impacts are expected to be negligible with implementation of design features.	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 NDOW. A permit may be required under the Bald and Golden Eagle Protection Act. Delamar Lake, Jumbo Wash, and the unnamed wash should be avoided.
Wildlife: Mammals[b]	Based on land cover analyses direct impacts on mammal species would be small (i.e., loss of ≤1% of potentially suitable habitats). However, based on mapped ranges of big game species, direct impacts on pronghorn could be moderate (i.e., loss of >1.0 to ≤10% of its mapped range). In addition to habitat loss, other direct impacts on mammals could result from collision with vehicles and infrastructure (e.g., fences). Indirect impacts on mammals 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 the implementation of design features.	The fencing around the solar energy development should not block the free movement of mammals, particularly big game species. Delamar Lake and the unnamed wash should be avoided.

TABLE 11.2.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Delamar SEZ	SEZ-Specific Design Features
Aquatic Biota[b]	No permanent water bodies or streams are present within the area of direct or indirect effects associated with the Delamar Valley SEZ. The nearest perennial surface waters are located more than 8 mi (13 km) from the SEZ, and the intermittent streams in the SEZ do not drain into any permanent surface waters. Therefore, no direct impacts on perennial aquatic habitat are expected to result from solar development activities within the SEZ. Ground disturbance related to the presumed new access road terminates at U.S. 93, less than 1 mi (2 km) from Pahranagat Creek. Therefore, indirect impacts on the creek may result from the deposition of fugitive dust following ground disturbance.	Appropriate engineering controls should be implemented to minimize the amount of contaminants and sediment entering washes and Delamar Lake and Pahranagat Creek.
Special Status Species[b]	Potentially suitable habitat for 49 special status species occurs in the affected area of the Delamar Valley SEZ. For most of these special status species, less than 1% of the potentially suitable habitat in the region occurs in the area of direct effects. For one species, up to 4% of the potentially suitable habitat in the region occurs in the area of direct effects. There are 15 groundwater dependent species that occur outside of the areas of direct and indirect effects. Potential impacts on these species could range from small to large depending on the solar energy technology deployed, the scale of development within the SEZ, and the cumulative rate of groundwater withdrawals.	Pre-disturbance surveys should be conducted within the area of direct effects to determine the presence and abundance of special status species. Disturbance to occupied habitats for these species should be avoided or minimized to the extent practicable. If avoiding or minimizing impacts to occupied habitats is not possible for some species, translocation of individuals from areas of direct effects; 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. Consultation with the USFWS and NDOW should be conducted to address the potential for impacts on the following five species currently listed as threatened

TABLE 11.2.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Delamar SEZ	SEZ-Specific Design Features
Special Status Species[b] *(Cont.)*		or endangered under the ESA: Hiko White River springfish, Pahranagat roundtail chub, White River springfish, desert tortoise, and southwestern willow flycatcher. Consultation would identify an appropriate survey protocol, avoidance and minimization measures, and, if appropriate, reasonable and prudent alternatives, reasonable and prudent measures, and terms and conditions for incidental take statements. Coordination with the USFWS and NDOW should be conducted to address the potential for impacts on the following four species under review for listing under the ESA that may be affected by solar energy development on the SEZ: grated tryonia, Hubbs springsnail, Pahranagat pebblesnail, and northern leopard frog. Coordination would identify an appropriate survey protocol, and mitigation requirements, which may include avoidance, minimization, translocation, or compensation. Avoiding or minimizing disturbance to riparian, desert wash, playa, cliff, and rock outcrop habitats on the SEZ could reduce or eliminate impacts on 13 special status species. Avoidance or minimization of groundwater withdrawals to serve solar energy development on the SEZ could reduce or eliminate impacts on 15 special status species. In particular, impacts on aquatic and riparian habitat in the Pahranagat Valley should be avoided.

TABLE 11.2.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Delamar SEZ	SEZ-Specific Design Features
Special Status Species[b] *(Cont.)*		Harassment or disturbance of special status species and their habitats in the affected area should be avoided or minimized. This can be accomplished by identifying any additional sensitive areas and implementing necessary protection measures based upon consultation with the USFWS and NDOW.
Air Quality and Climate	*Construction*: Predicted 24-hour and annual PM_{10} and 24-hour $PM_{2.5}$ concentration levels could temporarily exceed the standard levels at the SEZ boundaries and in the immediate surrounding areas during the construction of solar facilities; higher concentrations would be limited to the immediate area surrounding the SEZ boundary and would decrease quickly with distance. Modeling indicates that Class I PSD PM_{10} increments at the nearest federal Class I area (Zion NP) would not be expected to be exceeded. Construction emissions from the engine exhaust from heavy equipment and vehicles could cause some short-term impacts on AQRVs (e.g., visibility and acid deposition) at the nearest federal Class I areas. *Operations*: Positive impact due to avoided emission of air pollutants from combustion-related power generation: 6.8 to 12% of total emissions of SO_2, NO_x, Hg, and CO_2 from electric power systems in the state of Nevada (up to 6,546 tons/yr SO_2, 5,615 tons/yr NO_x, 0.037 tons/yr Hg, and 3,604,000 tons/yr CO_2).	None.

TABLE 11.2.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Delamar SEZ	SEZ-Specific Design Features
Visual Resources	The SEZ is in an area of low scenic quality, with cultural disturbances already present. Residents, workers, and visitors to the area may experience visual impacts from solar energy facilities located within the SEZ (as well as any associated access roads and transmission lines) as they travel area roads. The residents nearest to the SEZ could be subjected to large visual impacts from solar energy development within the SEZ. Solar development could produce large visual impacts on the SEZ and surrounding lands within the SEZ viewshed due to major modification of the character of the existing landscape. The SEZ is located 1.8 mi (2.9 km) from the Delamar Mountains WA. Because of the open views of the SEZ and elevated viewpoints, strong visual contrasts could be observed by WA visitors. The SEZ is located 3.6 mi (5.8 km) from the South Pahroc Range WA. Because of the open views of the SEZ and elevated viewpoints, weak to strong visual contrasts could be observed by WA visitors. The SEZ is located 3.3 mi (5.3 km) from the North Delamar SRMA. Because of the open views of the SEZ and elevated viewpoints, strong visual contrasts could be observed by SRMA visitors. The SEZ is located 2.7 mi (4.4 km) from the Pahranagat SRMA. Because of the open views of the SEZ and elevated viewpoints, strong visual contrasts could be observed by SRMA visitors.	Within the SEZ, in areas visible from and within 3 mi (4.8 km) of the boundary of the Delamar Mountains WA, visual impacts associated with solar energy project operation should be consistent with VRM Class II management objectives, as experienced from KOPs (to be determined by the BLM) within the WA. In areas visible from between 3 and 5 mi (4.8 and 8 km), visual impacts should be consistent with VRM Class III management objectives. The VRM Class II consistency mitigation would affect approximately 2,080 acres (8.417 km^2) within the western portion of the SEZ. The VRM Class III consistency mitigation would affect approximately 5,485 additional acres (22.2 km^2). Within the SEZ, in areas visible from between 3 and 5 mi (4.8 and 8 km) of the boundary of the South Pahroc Range WA, visual impacts associated with solar energy project operation should be consistent with VRM Class III management objectives, as experienced from KOPs (to be determined by the BLM) within the WA. The VRM Class III consistency mitigation would affect approximately 4,921 acres (19.9 km^2).

TABLE 11.2.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Delamar SEZ	SEZ-Specific Design Features
Acoustic Environment	*Construction*. For construction activities occurring near the southern SEZ boundary, estimated noise levels at the nearest residences (about 9 mi [14 km] west of that boundary) would be about 17 dBA, which is well below a typical daytime mean rural background level of 40 dBA. In addition, an estimated 40-dBA L_{dn} at these residences (i.e., no contribution from construction activities) is well below the EPA guidance of 55 dBA L_{dn} for residential areas. *Operations* Noise levels at the nearest residences from a parabolic trough or power tower facility would be about 23 dBA, which is much lower than the typical daytime mean rural background level of 40 dBA. For 12-hour daytime operation, about 40 dBA L_{dn} (i.e., no contribution from facility operation) would be estimated for the nearest residences, which is well below the EPA guideline of 55 dBA L_{dn} for residential areas. In the case of 6-hour TES, the estimated nighttime noise level at the nearest residences would be would be 33 dBA, which is a little higher than the typical nighttime mean rural background level of 30 dBA. The day-night average noise level is estimated to be about 41 dBA L_{dn}, which is well below 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 residences, about 9 mi (14 km) from the SEZ boundary, would be about 34 dBA, which is below the typical daytime mean rural background level of 40 dBA. Assuming 12-hour daytime operation, the estimated 41 dBA L_{dn} at these residences would be well below the EPA guideline of 55 dBA L_{dn} for residential areas.	None.

TABLE 11.2.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Delamar SEZ	SEZ-Specific Design Features
Paleontological Resources	Few, if any, impacts on significant paleontological resources are likely to occur in 73% of the proposed Delamar Valley SEZ. However, a more detailed look at the geological deposits of the SEZ is needed to determine whether a paleontological survey is warranted. If the geological deposits are determined to be as described above, further assessment of paleontological resources in most of the SEZ is not likely to be necessary. The potential for impacts on significant paleontological resources in the remaining 27% of the SEZ is unknown. A more detailed investigation of the playa deposits is needed prior to project approval. A paleontological survey will likely be needed.	The need for and the nature of any SEZ-specific design features would depend on the results of future paleontological investigations.
Cultural Resources	The Delamar Valley SEZ has a high potential for containing prehistoric sites, especially in the dry lake area at the southern end of the SEZ. The potential for historic sites also exists in the area. Thus, direct impacts on significant cultural resources could occur in the proposed Delamar Valley SEZ; however, further investigation is needed at the project-specific level. A cultural resource survey of the entire area of potential effect, including consultation with affected Native American Tribes, would first need to be conducted to identify archaeological sites, historic structures and features, and traditional cultural properties, and an evaluation would need to follow to determine whether any are eligible for listing in the NRHP as historic properties. Indirect impacts on cultural resources outside of the SEZ boundary, such as through looting or vandalism, are possible in rock shelter and petroglyph sites immediately west of the SEZ. Visual impacts on areas of traditional cultural importance if identified either in the Pahroc Range or in the Delamar Mountains, would occur.	Avoidance of significant resources clustered in specific areas within the proposed SEZ, especially in the vicinity of the dry lake, is recommended. Other SEZ-specific design features would be determined through consultation with the Nevada SHPO and affected Tribes and would depend on the results of future investigations.

TABLE 11.2.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Delamar SEZ	SEZ-Specific Design Features
Native American Concerns	While no comments specific to the proposed Delamar Valley SEZ have been received from Native American Tribes to date, the Paiute Indian Tribe of Utah has asked to be kept informed of PEIS developments. When commenting on past projects in the Delamar Valley, the Southern Paiute have expressed concern over adverse effects of other energy projects on a wide range of resources. As consultation with the Tribes continues and project-specific analyses are undertaken, it is possible that there will be additional Native American concerns expressed over potential visual and other effects on specific resources and any culturally important landscapes within or adjacent to the proposed SEZ.	The need for and nature of SEZ-specific design features addressing issues of potential concern would be determined during government-to-government consultation with the affected Tribes
Socioeconomics	*Livestock grazing:* Construction and operation of solar facilities could decrease the amount of land available for livestock grazing in the SEZ, resulting in the loss of four jobs (total) and $0.1 million (total) in income in the ROI. *Construction:* 457 to 6,048 total jobs; $27.9 million to $369.5 million income in ROI. *Operations:* 39 to 890 annual total jobs; $1.4 million to $33.6 million annual income in the ROI. Construction of new access road: 169 jobs; $6.7 million income in ROI.	None.

TABLE 11.2.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Delamar SEZ	SEZ-Specific Design Features
Environmental Justice	Although impacts are likely to be small, both minority and low-income populations, as defined by CEQ guidelines, occur within 50 mi (80 km) of the boundary of the SEZ; this means that any adverse impacts of solar projects could disproportionately affect minority and low-income populations.	None.
Transportation	The primary transportation impacts are anticipated to be from commuting worker traffic. Single projects could involve up to 1,000 workers each day, with an additional 2,000 vehicle trips per day (maximum) or possibly 4,000 vehicle trips per day if two larger projects were developed at the same time. The additional traffic on U.S. 93 west of the SEZ would represent an increase in traffic volume of about 100 or 200% for one or two projects, respectively, should all traffic access the SEZ in that area. Such traffic levels would also represent an increase of about 250% or 500% of the traffic currently encountered on the east–west portion of U.S. 93 north of the SEZ for one or two projects, respectively.	None.

Abbreviations: AQRV = air quality-related value; AUM = animal unit month; BLM = Bureau of Land Management; CEQ = Council on Environmental Quality; CO_2 = carbon dioxide; dBA = A-weighted decibel; DoD = U.S. Department of Defense; EPA = U.S. Environmental Protection Agency; ESA = Endangered Species Act; HA = herd area; Hg = mercury; KOP = key observation point; L_{dn} = day-night average sound level; MTR = military training route; NDOW = Nevada Department of Wildlife; NDWR = Nevada Division of Water Resources; NO_x = nitrogen oxides; NP = National Park; NRHP = *National Register of Historic Places*; NTTR = Nevada Test and Training Range; NWR = National Wildlife Refuge; PEIS = programmatic environmental impact statement; $PM_{2.5}$ = particulate matter with an aerodynamic diameter of 2.5 µm or less; PM_{10} = particulate matter with an aerodynamic diameter of 10 µm or less; PSD = prevention of significant deterioration; PV= photovoltaic; ROI = region of influence; SEZ = solar energy zone; SNWA = Southern Nevada Water Authority; SO_2 = sulfur dioxide; SRMA = Special Recreation Management Area; USFWS = U.S. Fish and Wildlife Service; VRM = visual resource management; WA = Wilderness Area.

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

[b] The scientific names of all plants, wildlife, aquatic biota, and special status species are provided in Sections 11.2.10 through 11.2.12.

11.2.2 Lands and Realty

11.2.2.1 Affected Environment

The proposed Delamar Valley SEZ is a large and very well-blocked area of BLM-administered public land. The overall character of the land in and around the SEZ area is isolated and undeveloped. The southwestern portion of the SEZ includes part of a playa lake. U.S. 93 provides access to the southern end of the SEZ via a 12-mi (19-km) connecting dirt road that leaves the highway near Alamo, Nevada. Another dirt road connects to U.S. 93 and provides a 15-mi (24-km) access to the northern portion of the SEZ. Numerous dirt roads cross the SEZ or access livestock facilities in the area.

There are two locally designated transmission corridors in the area; one passes north–south through the eastern side of the SEZ, and the other is just outside the eastern boundary of the SEZ (see Figure 11.2.1.12-1). The former corridor is part of the route of a designated Section 368 (of the Energy Policy Act of 2005) energy corridor. Within this corridor, a permitted 500-kV SWIP transmission line has been approved for construction but has not yet been built. A 69-kV transmission line with a service road is located in the local corridor within the SEZ.

The SNWA has a ROW application for a pipeline that would pass through the middle of the proposed Delamar Valley SEZ. The pipeline has been proposed to convey water from northern Nevada to the Las Vegas area.

As of February 2010, there were no ROW applications for solar energy facility development within the proposed Delamar Valley SEZ.

11.2.2.2 Impacts

11.2.2.2.1 Construction and Operations

Full development of the proposed Delamar Valley SEZ could disturb up to 13,242 acres (54 km^2) (Table 11.2.1.2-1). Development of the SEZ for utility-scale solar energy production would establish a large industrial area that would exclude many existing and potential uses of the land, perhaps in perpetuity. Since the SEZ is undeveloped and isolated, utility-scale solar energy development would be a new and discordant land use to the area.

Existing ROW authorizations on the SEZ would not be affected by solar energy development since they are prior rights. Should the proposed SEZ be identified as an SEZ in the ROD for this PEIS, the BLM would still have discretion to authorize additional ROWs in the area until solar energy development was authorized, and then future ROWs would be subject to the rights granted for solar energy development. Because the area currently has so few ROWs present, and because of additional BLM administered lands around the SEZ, it is not anticipated that approval of solar energy development would have a significant impact on future ROW availability in the area.

The designated local transmission corridor located within the SEZ occupies about 2,919 acres (12 km^2) (22%) of the proposed SEZ and could limit future solar development within the corridor. The proposed SNWA corridor would also limit future solar development within the SEZ. To avoid technical or operational interference between transmission and pipeline facilities and other solar energy facilities, solar energy facilities cannot be constructed under transmission lines or over pipelines. The transmission corridor and the SNWA ROW could be relocated outside the SEZ to allow full solar development within the SEZ. Alternatively, capacity of the corridor could be restricted to allow maximum solar development within the SEZ. Transmission capacity is becoming a more critical factor, and reducing corridor capacity in this SEZ may have future, but currently unknown, consequences. This is an administrative conflict that the BLM can address through its planning process, but there would be implications for the amount of potential solar energy development that could be accommodated within the SEZ if the existing corridor and SNWA ROW alignments are retained.

The existing roads and trails in the SEZ would be closed wherever solar energy facilities are developed. Because of the 14-mi (23-km) length of the SEZ, if east–west travel across the SEZ were prevented by solar energy development, a long detour around the site could be required. Additionally, the major road through the Delamar Valley provides access to areas around the SEZ. Any obstruction of existing access routes would adversely affect a wide range of public land users.

11.2.2.2.2 Transmission Facilities and Other Off-Site Infrastructure

An existing 69-kV transmission line runs through the SEZ; this line might be available to transport the power produced in this SEZ. Establishing a connection to the existing line would not involve the construction of a new transmission line outside of the SEZ. If a connecting transmission line were constructed in a different location outside of the SEZ in the future, site developers would need to determine the impacts from construction and operation of that line. In addition, developers would need to determine the impacts of line upgrades if they were needed.

U.S. 93 is the closest highway to the SEZ, both north and southwest of the SEZ, and it is assumed for analysis purposes that a new 8-mi (13-km) road would be constructed from the highway to the southwest end of the SEZ. This would result in the surface disturbance of about 58 acres (0.2 km^2) of public land. Alternative or additional access to the SEZ could be provided to the northern end of the SEZ to connect from U.S. 93. Roads and transmission lines would be constructed within the SEZ as part of the development of the area.

11.2.2.3 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 mitigation for some identified impacts. The exceptions may be the development of the SEZ would establish a large industrial area that would exclude many existing and potential uses of the land, perhaps in perpetuity and, utility-scale solar energy development would be a new and discordant land use to the area.

Proposed design features specific to the Delamar Valley SEZ include:

- Priority consideration should be given to utilizing/improving existing roads to provide construction and operational access to the SEZ.

- Consideration should be given to relocating the existing transmission corridor and proposed SNWA ROW outside of the SEZ.

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11.2.3 Specially Designated Areas and Lands with Wilderness Characteristics

11.2.3.1 Affected Environment

Fifteen specially designated areas occur within 25 mi (40 km) of the proposed Delamar Valley SEZ that potentially could be affected by solar energy development within the SEZ. These include one ACEC, six designated WAs, three SRMAs, the congressionally designated Silver State Off-Highway Vehicle Trail and Backcountry Byway, the Highway 93 State-designated Scenic Byway, Highway 375—the Extraterrestrial Highway, and two NWRs (see Figure 11.2.3.1-1).

Areas Located between 0 and 5 mi (0 and 8 km) from the SEZ

Delamar Mountains WA
South Pahroc WA
Pahranagat SRMA
North Delamar SRMA

Areas Located between 5 and 15 mi (8 and 24 km) from the SEZ

Big Rocks WA
Kane Springs ACEC
Highway 93 Scenic Byway
Silver State Off-Highway Vehicle Trail and Backcountry Byway
State Highway 375—the Extraterrestrial Highway
Chief Mountain SRMA
Pahranagat NWR
Desert National Wildlife Range

Areas Located between 15 and 25 mi (24 and 40 km) from the SEZ

Clover Mountains WA
Meadow Valley Range WA
Mount Irish WA

Viewshed analysis shows that the Clover Mountains and Meadow Valley Range WAs, State Highway 375—the Extra-Terrestrial Highway, and the Kane Springs ACEC would have no visibility of solar development within the SEZ and therefore would not be affected by development in the SEZ; thus they are not considered further. In addition, because such small portions of the Mount Irish WA and the Pahranagat NWR have any potential visibility of the SEZ, they are also not considered further. No lands near the SEZ and outside of designated WSAs have been identified by BLM to be managed to protect wilderness characteristics.

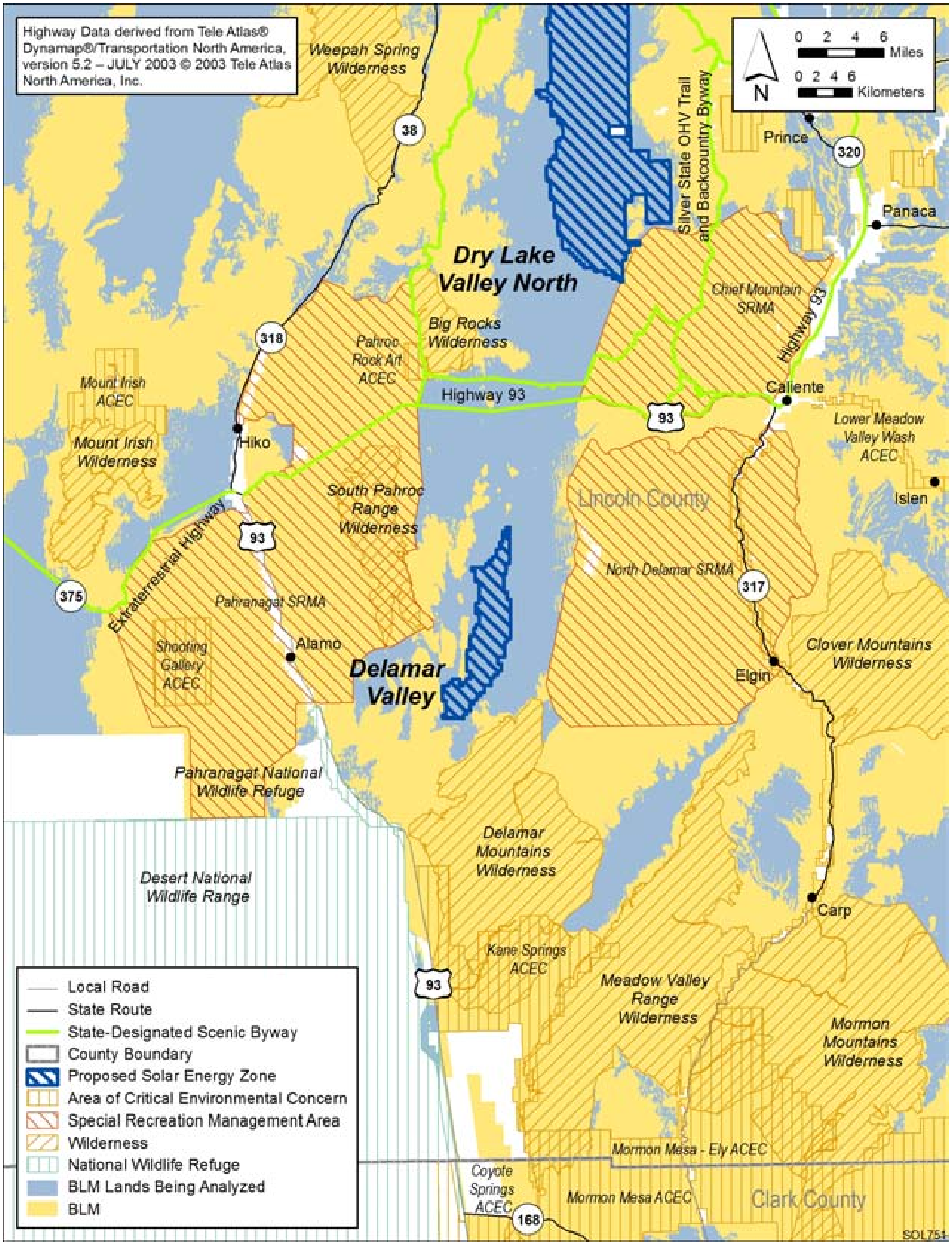

FIGURE 11.2.3.1-1 Specially Designated Areas in the Vicinity of the Proposed Delamar Valley SEZ

11.2.3.2 Impacts

11.2.3.2.1 Construction and Operations

The primary potential impacts of solar energy development of the SEZ on the nine remaining specially designated areas near the SEZ would be from visual impacts or from obstruction of access on existing roads that could affect access and scenic, recreational, or wilderness characteristics of the areas. The visual impact on specially designated areas is difficult to determine and would vary by solar technology employed, the specific area being affected, and the perception of individuals viewing the development. Development of the SEZ, especially full development, would be a factor in the viewshed from portions of these specially designated areas, as summarized in Table 11.2.3.2-1. The data provided in the table assume the use of the power tower solar energy technology, which because of the potential height of these facilities, could be visible from the largest amount of land of the technologies being considered in the PEIS. Viewshed analysis for this SEZ has shown that the visual impacts of shorter solar energy facilities would be slightly less than for power tower technology (See Section 11.2.14 for more detail on all viewshed analysis discussed in this section). 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 impact on an individual's perception. From a visual analysis perspective, the most sensitive viewing distances generally are from 0 to 5 mi (0 to 8 km). The viewing height above a solar energy development area, the size of the solar energy development area, and the purpose for which a person is visiting an area are also important. Individuals seeking a wilderness or scenic experience within these areas could be expected to be more adversely affected than those simply traveling along a highway with another destination in mind. In the case of the Delamar Valley SEZ, the low-lying location of the SEZ in relation to some of the surrounding specially designated areas, especially the South Pahroc Range and Delamar Valley WAs, would highlight the industrial-like development in the SEZ. In addition, because of the generally undeveloped nature of the whole area and the potential for a very large area of solar development, impacts on wilderness characteristics may be more significant than in other areas that are less pristine.

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.

Access to much of the land around the SEZ, including the North Delamar and Pahranagat SRMAs and the South Pahroc Range and Delamar Mountains WAs, is on existing roads through the SEZ. Solar development of the SEZ may result in the closure or rerouting of some access roads that could have impacts on visitors' ability to reach these areas.

TABLE 11.2.3.2-1 Potentially Affected Specially Designated Areas within a 25-mi (40-km) Viewshed of the Proposed Delamar Valley SEZ, Assuming Power Tower Solar Technology with a Height of 650 ft (198.1 m)

Feature Type	Feature Name (Total Acreage/ Highway Length)[a]	Feature Area or Highway Length[c]		
		Visible within 5 mi	Visible between 5 mi and 15 mi	Visible between 15 mi and 25 mi
WAs	Big Rocks (12,929 acres)	0 acres	2,531 acres (20%)	3 acres (0.2%)[b]
	Delamar Mountains (111,060 acres)	5,179 acres (5%)	663 acres (0.6%)	0 acres
	Mount Irish (28,283 acres)	0 acres	0 acres	198 acres (0.7%)
	South Pahroc Range (25,674 acres)	1,566 acres (6%)	4,846 acres (19%)	36 acres (0.1%)
National Wildlife Range	Desert (1,626,903 acres)	0 acres	4,948 acres (0.3%)	14,463 acres (0.9%)
NWR	Pahranagat (5,540 acres)	0 acres	10 acres (0.2%)	0 acres
SRMAs	Chief Mountain (111,151 acres)	0 acres	222 acres (0.2%)	1,549 acres (1.4%)
	North Delamar (202,839 acres)	9,947 acres (4.9%)	27,700 acres (13.7%)	0 acres
	Pahranagat (298,567 acres)	3,504 acres (1.2%)	35.341 acres (11.9%)	10,270 acres (3.4%)
Scenic Highways	Highway 93 (149 mi)	0 mi	8.8 mi (14.2 km)	0 mi
	Silver State Trail (240 mi)	0 mi	12 mi (5%)	0 mi
	Highway 375 — Extra-Terrestrial Highway (98 mi)	0 mi	0 mi	0 mi

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.

Because of the lack of development in the immediate region of the proposed Delamar Valley SEZ, the night sky is very dark, and night sky viewing is one of the attractions of camping in the area. Solar development of the SEZ could adversely affect the quality of the night sky environment. The amount of light that could emanate from solar facilities is not known, but it could adversely affect lands adjacent to the SEZ, including nearby WAs.

Delamar Mountains and South Pahroc Range Wilderness Areas

Solar development within the SEZ, especially full development, would be readily visible from portions of these two areas. The northern border of the Delamar Mountains WA boundary at its closest is within 2 mi (1.2 km) of the SEZ. Because of the steep rise of the mountains from the valley floor, it is the northern area of the WA that would be most heavily affected. Wilderness characteristics in the 5,178 acres (21 km^2) within 5 mi (8 km) of the SEZ would be adversely affected. On the basis of visual analysis, a relatively small amount of additional land, mainly scattered higher elevation areas located between 5 and 7 mi (8 and 11 km), would also have views of the SEZ if power tower technology were employed in the SEZ and wilderness characteristics there would also be adversely affected. Overall, visual analysis indicates that wilderness characteristics in 5% to 6% of the Delamar Mountains WA would be adversely affected depending upon the solar technology deployed in the SEZ.

It is largely the southern end and the eastern boundary of the South Pahroc Range WA that would be affected by solar development within the SEZ. Most of the affected acreage within the WA is from 3 to 8 mi (5 to 13 km) from the SEZ, and these areas would have a dominating view of development within the SEZ. Wilderness characteristics within this zone would be adversely affected. As distances from the SEZ increase in the northern portion of the WA, impacts on wilderness characteristics would decrease. Overall, visual analysis indicates that wilderness characteristics in 25% of the South Pahroc Range WA would be adversely affected depending upon the solar technology deployed in the SEZ.

Big Rocks Wilderness Area

The Big Rocks WA is located about 12 mi (19 km) north of the SEZ. Based on visual analysis, about 2,531 acres (10 km^2) of the WA would have limited visibility of the SEZ along its narrow axis from a distance of between 12 and 14 mi (19 and 22 km). About 20% of the WA would have long distance views of the SEZ. Because of the distance and limited width of the SEZ as seen from the WA, and the view of U.S. 93, there is expected to be no significant impact on wilderness characteristics in the Big Rocks Wilderness.

Pahranagat, North Delamar, and Chief Mountain SRMAs

These SRMAs are managed for a broad recreation opportunity spectrum to ensure a balance of recreation experiences. A wide range of activities occur within the SRMAs, including backcountry driving, hunting, OHV use, competitive racing, heritage tourism, and hiking as directed in the Ely Resource Management Plan (BLM 2008a). Small portions of both the Pahranagat and North Delamar SRMAs are within 5 mi (8 km) of the SEZ, and the SEZ would be visible from portions of all three SRMAs. While scenery is an important component of many recreational uses, the relatively limited near distance views of the SEZ from the SRMAs would limit the potential impact of solar development on the SRMAs. It is anticipated that there would not be a significant impact on these SRMAs from development of the proposed Delamar Valley SEZ.

Highway 93 State Scenic Byway

Viewshed analysis of the scenic byway shows that the views travelers on Highway 93 would have of the Delamar Valley SEZ would be from the north and at a distance of about 8 to 10 mi (13 to 16 km). The highway is slightly elevated above the level of the SEZ, and travelers would have periodic views of development within the SEZ along about 10 mi (16 km) of the highway. However, because of the distance to the SEZ, the relatively narrow view of the SEZ (only the narrow dimension of the SEZ would be exposed), and the nature of highway travel, it is not anticipated that there would be any adverse impact on the use of the scenic byway.

Silver State Off-Highway Vehicle Trail and Backcountry Byway

The trail/byway is about 10 mi (16 km) north of the SEZ and north of U.S. 93. The route of the trail is largely screened by topography, and views of development of the SEZ are expected to be minimal. It is not anticipated that there would be any impact on the use of the trail/byway.

Desert National Wildlife Range

The Desert National Wildlife Range's primary focus is the management of desert bighorn sheep, but numerous recreation opportunities exist in the area (USFWS 2010a). Although the nearest boundary of the Wildlife Range is about 9 mi (14 km) from the SEZ, intervening topography restricts views of solar energy facilities to power tower facilities, and in that instance, only the tower tops could be seen. Between 9- and 25-mi (14- and 40-km) views of tall solar facilities in the SEZ might be possible from about 20,000 acres (81 km^2) of the 1.5 million-acre (6,070-km^2) refuge. This amounts to about 1% of the refuge area. It is only at about 17 mi (27 km) that views of ground development within the SEZ would be possible. At this distance, there would be minimal visibility of SEZ facilities, and no adverse impacts on the NWR are anticipated.

11.2.3.2.2 Transmission Facilities and Other Off-Site Infrastructure

Because of the availability of an existing transmission line, no additional construction of transmission facilities was assessed. Should additional transmission lines be required outside of the SEZ, there may be additional impacts to specially designated areas. See Section 11.2.2.2 for a description of the analysis assumptions for transmission facilities.

Construction of an access road southwest from the SEZ to U.S. 93 would add about 58 acres (0.2 km^2) of surface disturbance to public land. This disturbance would not likely cause significant additional adverse impacts on specially designated areas.

11.2.3.3 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 some mitigation for some identified impacts. The exceptions may be the adverse impacts that would occur on wilderness characteristics in the South Pahroc and Delamar Mountains WAs and that would not be completely mitigated.

A proposed design feature specific to the Delamar Valley SEZ includes the following:

- The design features for visual resources included in Section 11.2.14.3 should be adopted to minimize impacts on wilderness characteristics.

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11.2.4 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 Delamar Valley SEZ are discussed in Sections 11.2.4.1 and 11.2.4.2.

11.2.4.1 Livestock Grazing

11.2.4.1.1 Affected Environment

The proposed Delamar Valley SEZ contains portions of two perennial grazing allotments; the Buckhorn and Oak Springs allotments. See Table 11.2.4.1-1 for a summary of key information regarding the allotments. There are numerous livestock water facilities located within the area of the proposed SEZ.

11.2.4.1.2 Impacts

Construction and Operations

Should utility-scale solar development occur in the proposed Delamar Valley SEZ, grazing would be excluded from the areas developed as provided for in the BLM grazing

TABLE 11.2.4.1-1 Grazing Allotments within the Proposed Delamar Valley SEZ

Allotment	Total Acres[a]	% of Acres in SEZ[b]	Active BLM AUMs	No. of Permittees[c]
Oak Springs	195,049	<1	9,268	1
Buckhorn	82,968	18	3,370	1

[a] Includes public, private, and state lands included in the allotment based on the Allotment Master Reports included in the BLM's Rangeland Administration System (BLM 2009a).

[b] This is the percentage of the total allotment acreage of public lands located in the SEZ.

[c] The same permittee uses both allotments.

regulations (43 CFR Part 4100). This would include reimbursement of the permittee 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 public lands in this SEZ include a minimal amount of the Oak Springs allotment, and loss of this portion of the allotment is anticipated to have no impact on the overall operation. No loss of AUMs is anticipated in this allotment. See Table 11.2.4.1-1 for a summary of the key information for the allotments.

If full solar development would occur in the SEZ, the federal grazing permit for the Buckhorn allotment would be reduced in area by about 18%. Using a simplified assumption that the grazing capacity of the allotment would be reduced by the same percentage as the reduction in acreage, 606 AUMs would be lost. This is considered to be a small impact for the permittee. A quantification of the impact on the grazing allotments and permittees would require a specific analysis involving, at a minimum, the three factors identified at the beginning of this section. The level of impact on the Buckhorn allotment permittee would also be affected by any mitigation of the loss (e.g., through installation of new range improvements) that could be accomplished on the remaining public lands in the allotment.

For the purposes of this PEIS and assuming a loss of the 606 AUMs as described above, there would be a minimal impact on livestock use within the Caliente Field Office from the designation and development of the proposed Delamar Valley SEZ. This conclusion was derived from comparing the loss of the 606 AUMs with the total BLM-authorized AUMs in the Caliente Field Office for grazing year 2009, which totaled 43,255 AUMs. This represents a loss of about 1.4%.

Transmission Facilities and Other Off-Site Infrastructure

Because of the availability of a major transmission line in the SEZ, and assuming that additional project-specific analysis would be done for construction of such infrastructure, no assessment of the impacts of such activities outside of the SEZ was conducted See Section 11.2.2.2 for a description of the analysis assumptions for transmission facilities.

It is assumed that a new 8-mi (13-km) access road connecting to U.S. 93 to the southwest would be required to provide adequate access to the SEZ. Construction of this road would disturb about 58 acres (0.2 km^2) located in the Buckhorn and Lower Lake East allotments. This would not create a significant additional impact on grazing in either of these allotments.

11.2.4.1.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ specific design features were identified. Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program, would provide some mitigation for identified impacts. The exceptions would be there would be a loss of grazing capacity within the Buckhorn allotment that would not be mitigated and there would be an adverse economic impact on the grazing permittee.

11.2.4.2 Wild Horses and Burros

11.2.4.2.1 Affected Environment

Section 4.4.2 discusses wild horses (*Equus caballus*) and burros (*E. asinus*) that occur within the six-state study area. Nearly 100 wild horse and burro herd management areas (HMAs) occur within Nevada (BLM 2009b). Portions of the Silver King and Eagle HMAs occur within the 50-mi (80-km) SEZ region for the proposed Delamar Valley SEZ (Figure 11.2.4.2-1). Neither HMA occurs within the SEZ or indirect impact area of the SEZ.

In addition to the HMAs managed by the BLM, the USFS has wild horse and burro territories in Arizona, California, Nevada, New Mexico, and Utah, and is the lead management agency that administers 37 of the territories (Giffen 2009; USFS 2007). The closest territory to the proposed Delamar Valley SEZ is the Quinn Territory located within a portion of the Humboldt National Forest. This territory is located more than 50 mi (80 km) northwest of the SEZ (Figure 11.2.4.2-1).

11.2.4.2.2 Impacts

Because the Delamar Valley SEZ is about 16 mi (26 km) or more from any wild horse and burro HMA managed by the BLM and more than 50 mi (80 km) from any wild horse and burro territory administered by the USFS, solar energy development within the SEZ would not directly affect wild horses and burros that are managed by these agencies.

11.2.4.2.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features for solar development within the proposed Delamar Valley SEZ would be necessary to protect or minimize impacts on wild horses and burros.

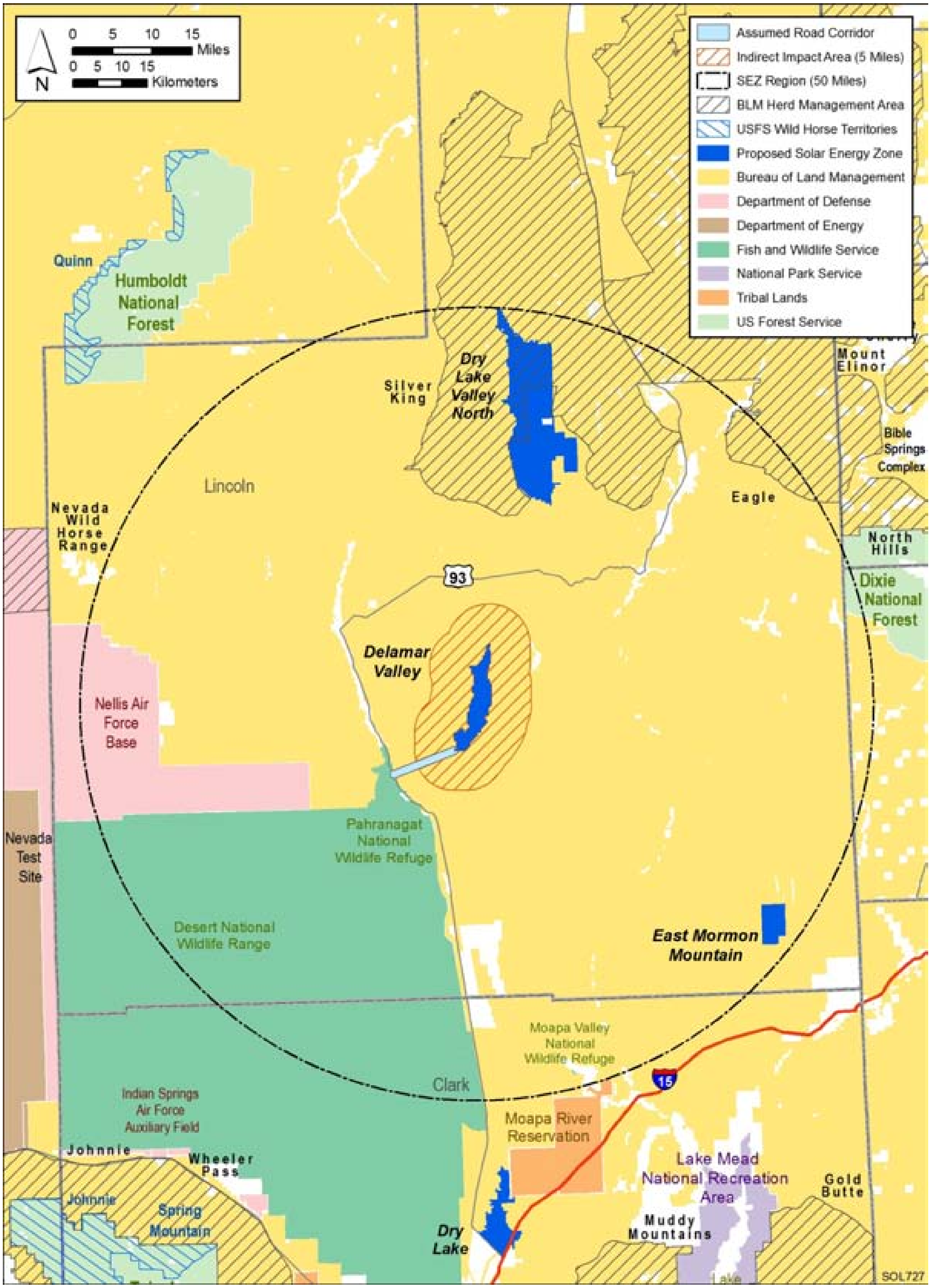

FIGURE 11.2.4.2-1 Wild Horse and Burro Herd Management Areas and Territories within the Analysis Area for the Proposed Delamar Valley SEZ (Sources: BLM 2010a; USFS 2007)

11.2.5 Recreation

11.2.5.1 Affected Environment

The site of the proposed Delamar Valley SEZ is a remote area that is flat with numerous roads and trails that provide access into and through the area. The main road in the valley passes through the SEZ. Backcountry driving, OHV use, and competitive truck, buggy, and motorcycle races that take place on the roads and trails in the areas surrounding the SEZ are important recreational activities. Camping and hunting opportunities are also available in and around the area. The general area attracts visitors from Las Vegas, about 80 mi (129 km) away. Native American petroglyphs as well as the deserted mining town of Delamar attract visitors to the area. The south end of the SEZ on the dry lakebed is popular for racing, and model rocket launching and for setting off pyrotechnics and is where much of the recreation in the area occurs. Two SRMAs are within 5 mi (8 km) of the SEZ, and a third SRMA is about 10 mi (16 km) north of the SEZ (see the brief description of the SRMAs in Section 11.2.3.2). OHV use in the SEZ and surrounding area has been designated as “Limited to travel on designated roads and trails” (BLM 2010c).

11.2.5.2 Impacts

Construction and Operations

Recreational use would be eliminated from portions of the SEZ developed for solar energy production. Although there are no recreational use figures for the general area, it is a common destination for a wide range of recreation visitors, and it is not clear what impact development of the valley bottom for solar energy use would have on the recreational use. Development of the southern end of the SEZ on the playa would curtail most of the use that occurs within the SEZ itself. The area contains numerous roads and trails that access areas around the SEZ, and the potential exists for some of these roads to be closed. In addition, the SEZ is about 15 mi (24 km) long and if east–west travel across the SEZ were prevented by solar energy development, a long detour around the site could be required. This would adversely affect recreation and other public land users. Whether recreational visitors would continue to use any remaining undeveloped portions of the SEZ, or how recreational use of areas surrounding the SEZ would change, is unknown.

Solar development within the SEZ would affect public access along OHV routes designated open and available for public use. If open OHV routes within the SEZ were identified during project-specific analyses, they would be re-designated as closed (see Section 5.5.1 for more details on how routes coinciding with proposed solar facilities would be treated).

Transmission Facilities and Other Off-Site Infrastructure

Because of the availability of an existing transmission line, no additional construction of transmission or road facilities was assessed. See Section 11.2.2.2 for a description of the analysis assumptions for transmission facilities.

It is assumed that a new 8-mi (13-km) access road connecting to U.S. 93 to the southwest would be required to provide adequate access to the SEZ. Construction of this road would disturb about 58 acres (0.2 km^2) but would not have a significant additional impact on recreation use.

11.2.5.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ specific design features were identified. Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program, would provide mitigation for some identified impacts. The exceptions would be the loss of recreational use of the area developed for solar energy production that would not be mitigable.

11.2.6 Military and Civilian Aviation

11.2.6.1 Affected Environment

The Delamar Valley SEZ is crossed by one MTR with a 100 ft (30 m) AGL operating limit. Supersonic speeds are authorized at and above 5,000 ft AGL (1,524 m) in the NTTR in this area. The area is completely included within the boundary of the NTTR airspace. The closest military installations to the proposed SEZ are the NTTR, which is located about 50 mi (80 km) west of the SEZ, and Nellis Air Force Base, which is located about 70 mi (113 km) south of the area.

The nearest public airport is the Alamo Landing Field Airport located near the town of Alamo, about 13 mi (21 km) northwest of the closest boundary of the SEZ. The second closest public airport is the Lincoln County Airport, a small local airport about 32 mi (51 km) northeast of the SEZ. The Alamo Landing Field Airport and Lincoln County Airport do not have any scheduled commercial passenger or freight service.

11.2.6.2 Impacts

The military has expressed serious concern over solar energy facilities being constructed within the proposed Delamar Valley SEZ. Nellis Air Force Base has indicated that any facilities higher than 100 ft (30 m) may be incompatible with low-level aircraft use of the MTR. Additionally, the NTTR has indicated that solar technologies requiring structures higher than 50 ft (15 m) may present unacceptable electromagnetic compatibility concerns for its test mission. The NTTR maintains that a pristine testing environment is required for the unique national security missions conducted on the NTTR and that solar energy facilities could cause potential electromagnetic interference with those testing activities. Potential for electromagnetic interference, coupled with potential training route obstructions created by taller structures, make it possible that solar facilities could significantly affect military operations.

The Alamo Landing Field and Lincoln County Airports are located far enough from the SEZ that there would be no effect on their operations.

11.2.6.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ specific design features were identified. 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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11.2.7 Geologic Setting and Soil Resources

11.2.7.1 Affected Environment

11.2.7.1.1 Geologic Setting

Regional Setting

The proposed Delamar Valley SEZ is located in Delamar Valley, a north-trending closed basin within the Basin and Range physiographic province in southern Nevada. The valley lies immediately south of Dry Lake Valley (north). It is bounded on the west by the South Pahroc Range and on the east and southeast by the Delamar Mountains (Figure 11.2.7.1-1). Delamar Valley is one of many structural basins (grabens) typical of the Basin and Range province.

Exposed sediments in Delamar Valley consist mainly of modern alluvial and eolian deposits (Figure 11.2.7.1-2). Fan deposits consist of poorly sorted gravel, gravelly sand, and sand. Playa lake sediments at Delamar Lake (Qp) occur in the southern part of the valley and cover about 14% of the SEZ. The surrounding mountains are composed mainly of Late Proterozoic and Cambrian metamorphic rocks overlain by Paleozoic carbonate and shale and capped by late-Tertiary ash-flow tuffs from the Caliente caldera complex, one of a series of Tertiary caldera complexes in the Delamar Mountains to the east (Mankinen et al. 2008; Scott et al. 1992). The oldest rocks exposed in the region are the Late Proterozoic to Cambrian metamorphic rocks (CZq) that occur in the central part of the Delamar Mountains, near the Delamar mining district (Mankinen et al. 2008).

Semiconsolidated to unconsolidated basin-fill deposits are estimated to be about 0.6 to 1.2 mi (1 to 2 km) thick across most of Delamar Valley; estimates of the basin's maximum depth range from 2.5 to 4 mi (4 to 6.5 km) in the area just west of the southern part of the valley (depending on basin fill density assumptions; Scheirer 2005). Shallow basin-fill aquifers occur in the sand and gravel deposits. Most of these aquifers are hydraulically isolated from similar aquifers in adjacent valleys, but some are connected by flow through the underlying carbonate-rock aquifer (Mankinen et al. 2008).

Topography

The Delamar Valley is an elongated basin, about 25 mi (40 km) long and 8 to 12 mi (13 to 19 km) wide. It is south of Dry Lake Valley (south of U.S. 93). Elevations along the valley axis range from about 4,920 ft (1,500 m) at the northern end and along the valley sides to about 4,540 ft (1,380 m) at the Delamar Flat Reservoir at the southern end. Coalescing alluvial fans form continuous fan aprons along the mountain fronts on both sides of Delamar Valley; aprons on the east side of the valley are more deeply dissected and younger fans are more deeply inset into older fans (Swadley et al. 1992). The valley is drained by several unnamed ephemeral

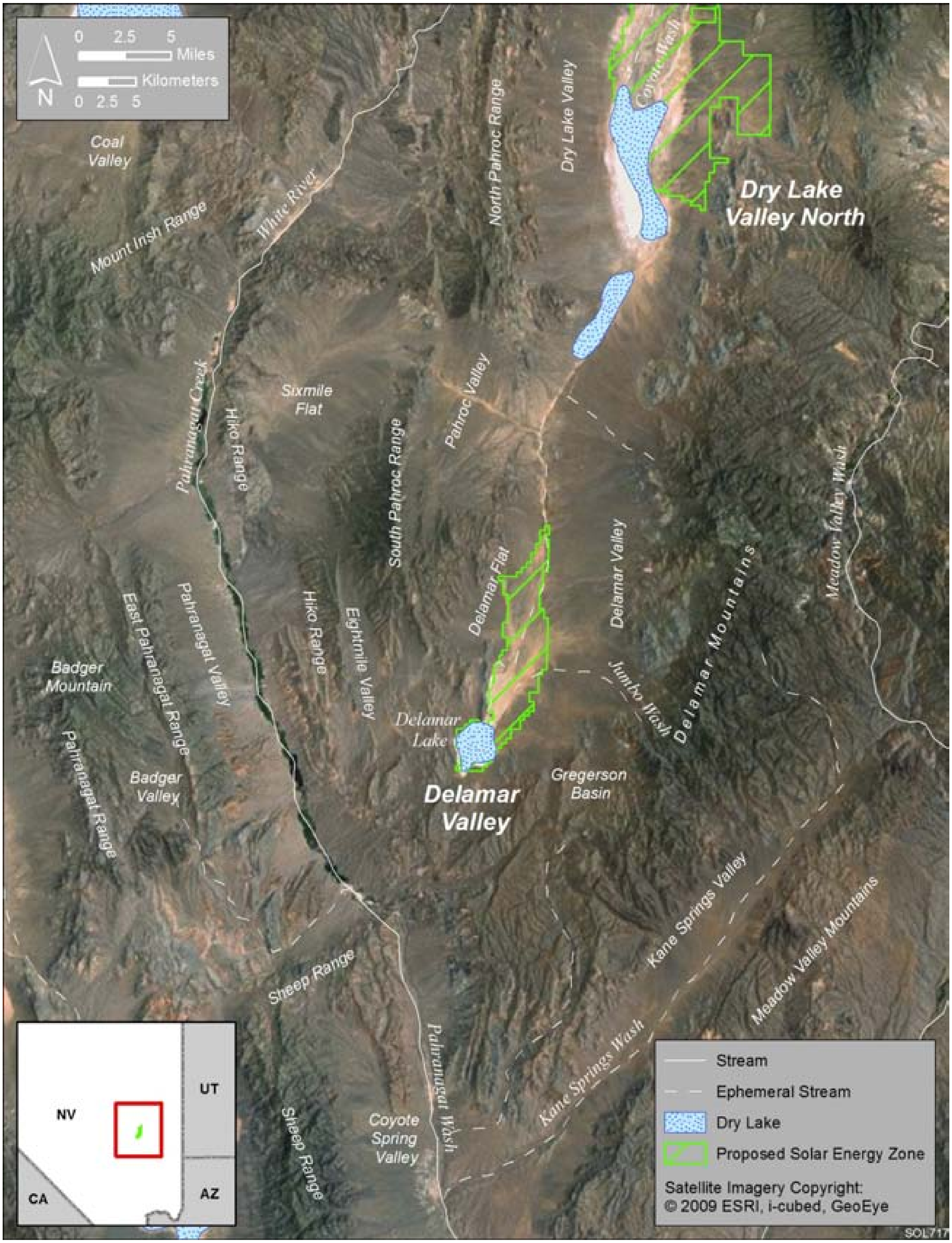

FIGURE 11.2.7.1-1 Physiographic Features of the Delamar Valley Region

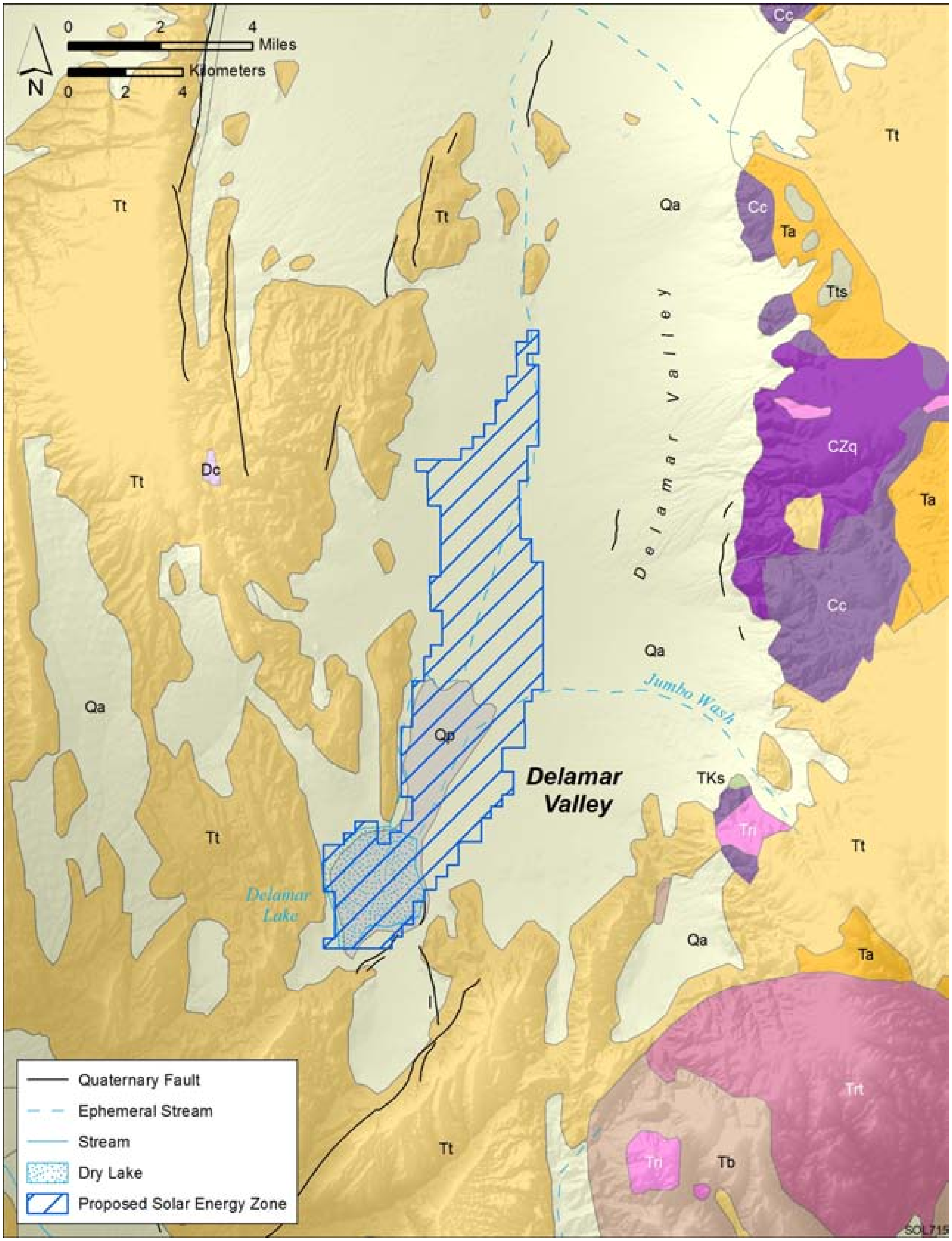

FIGURE 11.2.7.1-2 Geologic Map of the Delamar Valley Region (Ludington et al. 2007; Stewart and Carlson 1978)

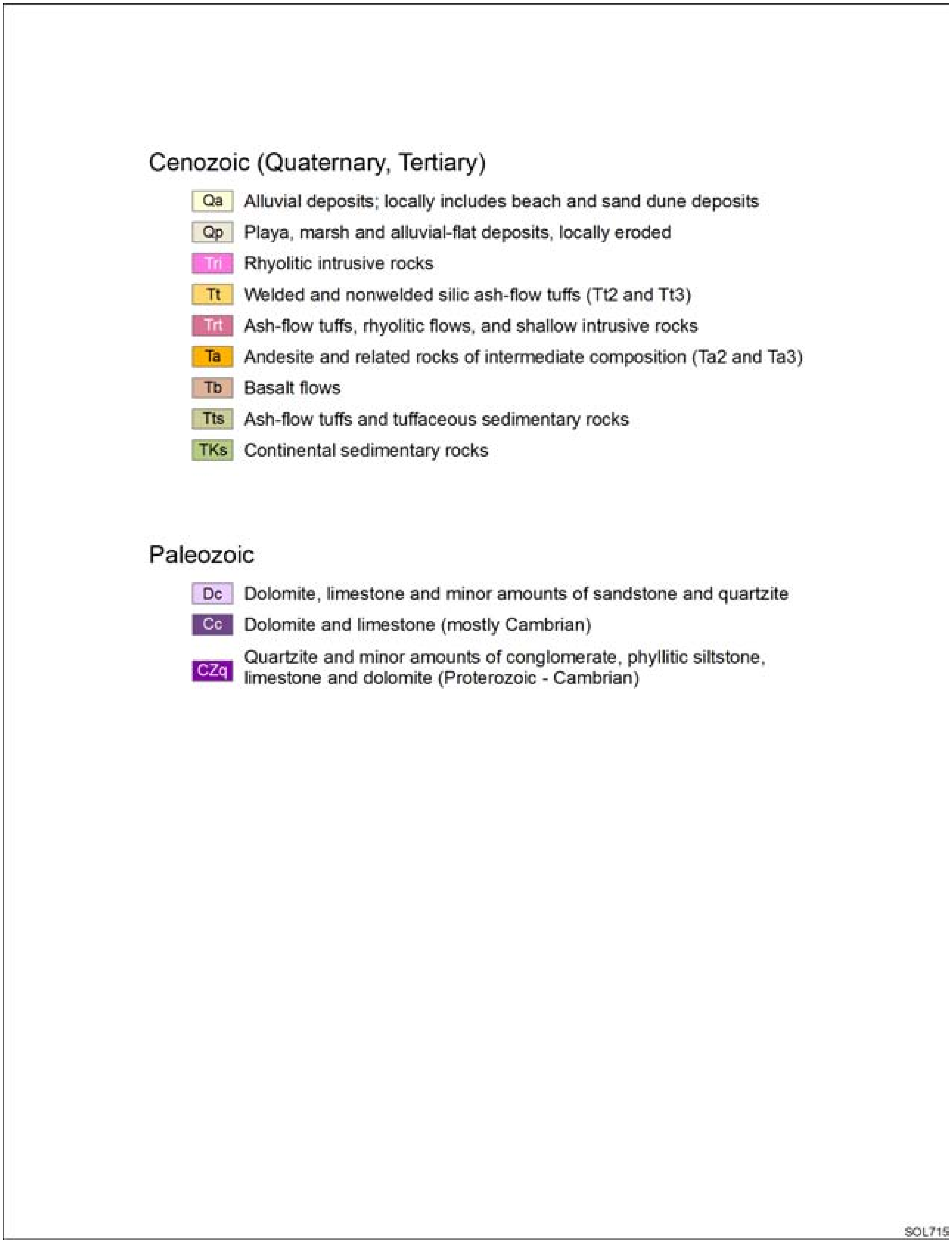

FIGURE 11.2.7.1-2 (Cont.)

streams that terminate at Delamar Lake, a playa in the southern part of the valley. The main topographic features in the valley are low volcanic hills in the northern part of the valley and the range front alluvial fans.

The proposed Delamar Valley SEZ is located in the southern part of Delamar Valley, between the South Pahroc Range to the west and the Delamar Mountains to the east. Its terrain slopes gently to the south. Elevations range from about 4,760 ft (1,450 m) in the northwest corner to 4,530 ft (1,380 m) near the SEZ's southwest end at Delamar Lake (Figure 11.2.7.1-3).

Geologic Hazards

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

Seismicity. Delamar Valley is located within the Southern Nevada Seismic Belt (also called the Pahranagat Shear Zone), a south–southwest trending zone of seismic activity characterized mainly by background earthquakes (i.e., earthquakes not associated with surface expression) (DePolo and DePolo 1999). The seismic zone is not well understood because it does not follow the dominant strike (north–south) of faulting in southern Nevada, but is thought to accommodate strain between an area of extension to the south (Mojave Desert) and the much more rigid area of the central Great Basin to the north (Kreemer et al. 2010). Faults within the Pahranagat Shear Zone are estimated to exhibit as much as 10 to 12 mi (16 to 19 km) of left-lateral movement (Tschanz and Pampeyan 1970). The proposed Delamar Valley SEZ lies to the north of the Maynard Lake fault. The Pahroc and Delamar Valley faults are to the northwest of the SEZ; the Delamar Mountains fault is to the east (Figure 11.2.7.1-4).

The northeast-trending Maynard Lake fault is located about 3 mi (5 km) south of the Delamar Valley SEZ. The fault extends to the southwest from the Delamar Lake area along bedrock ridges that cross the valley between the Delamar Mountains to the east and the Sheep Range to the southwest. Although the Maynard fault is part of a zone of left-lateral strike-slip faults, Quaternary displacement along it is vertical (normal). With the age of offset sediments (Late Pleistocene), the most recent movement along the fault is estimated at less than 130,000 years ago. The slip rate along this fault is estimated to be less than 0.2 mm/yr. Recurrence intervals have not been estimated (Anderson 1999a).

The Pahroc and Delamar Valley faults together compose a group of discontinuous north-trending normal faults northwest of the Delamar Valley SEZ along the South Pahroc Range (Pahroc faults) and the low volcanic hills in the north part of the valley (Delamar Valley faults). Movement along the Pahroc fault is down to the east; east-facing scarps separate the main part of the South Pahroc Range from the alluvial flats and volcanic hills to the east. The Delamar Valley

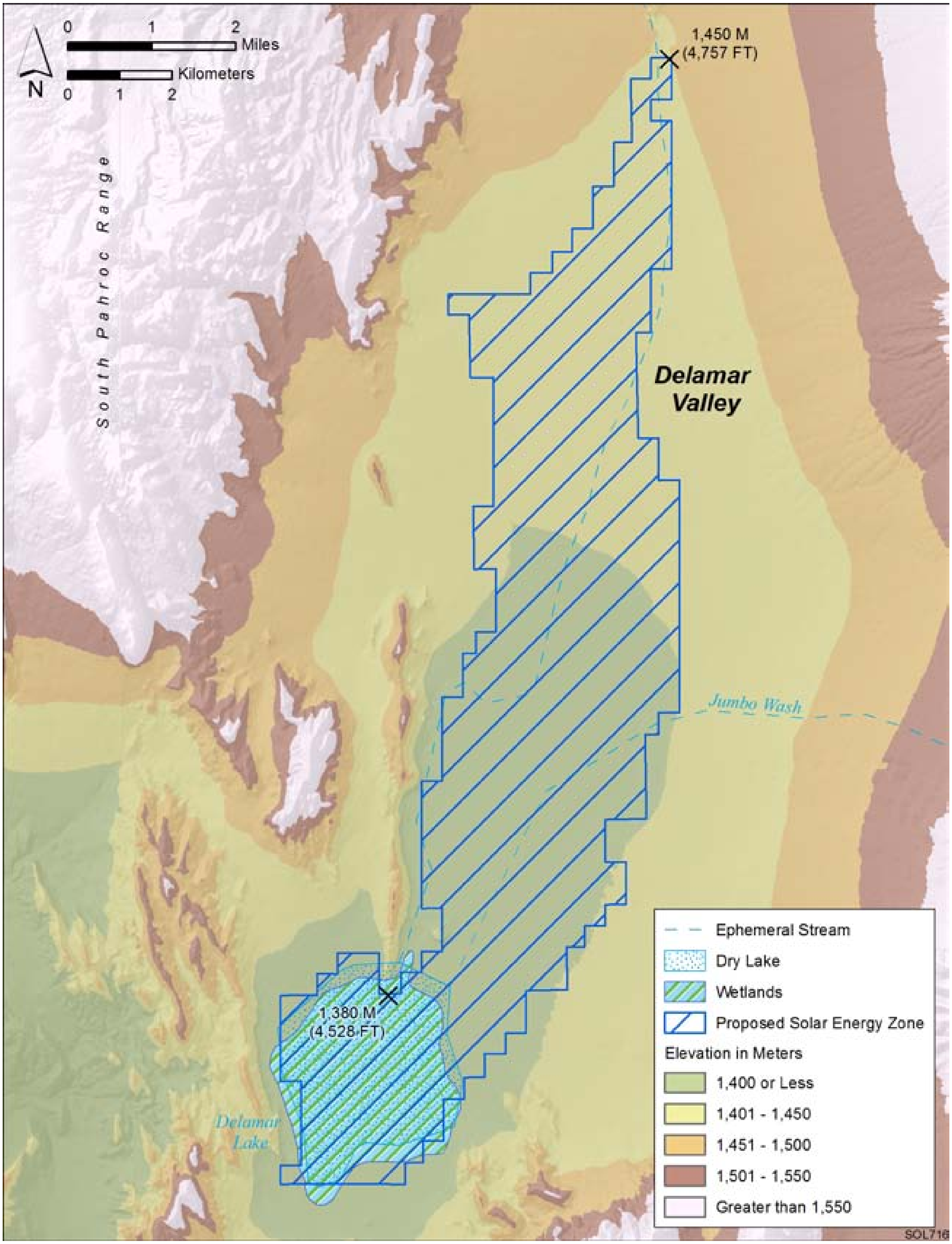

FIGURE 11.2.7.1-3 General Terrain of the Proposed Delamar Valley SEZ

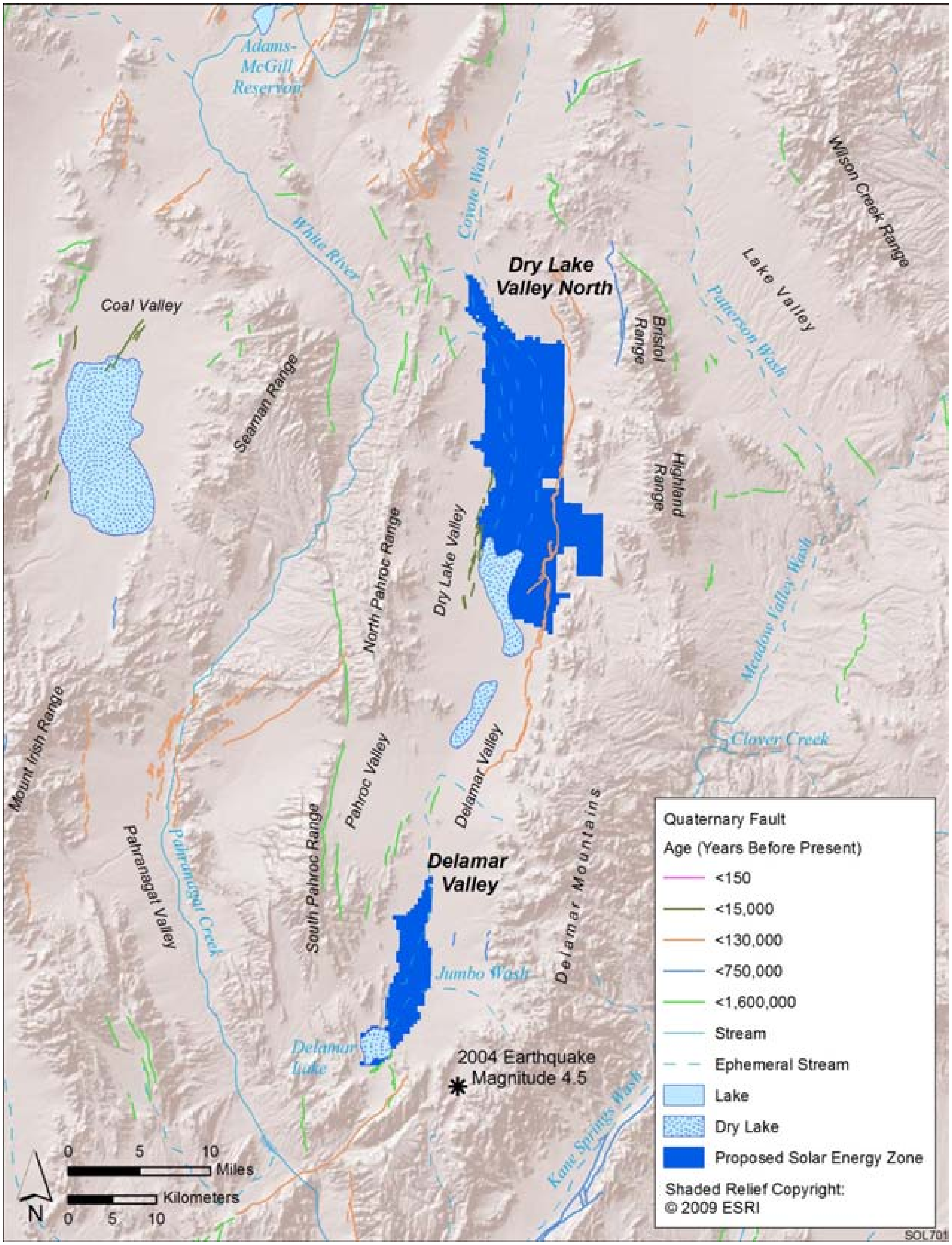

FIGURE 11.2.7.1-4 Quaternary Faults in the Delamar Valley Region (USGS and NBMG 2010; USGS 2010c)

fault is marked by west-facing scarps, indicating down-to-the-west movement. With offsets of middle to early Pleistocene sediments, the most recent activity on both these fault systems is estimated at less than 1.6 million years ago. Recurrence and slip rates have not been estimated, but the slip rates are thought to be low since these faults are "post-tectonic" (Anderson 1999b,c; Ertec Western, Inc. 1981).

The discontinuous group of north-trending normal faults making up the Delamar Mountains fault lies to the east of the Delamar Valley SEZ. These faults are part of a larger fault system of west-facing scarps, marking the boundary between the valley and the western base of the Delamar Mountains. With offsets of Pleistocene to Pliocene sediments, the most recent movement along the fault is estimated at less than 750,000 years ago. The slip rate along this fault is estimated to be less than 0.2 mm/yr. Recurrence intervals have not been estimated (Anderson 1999d).

From June 1, 2000 to May 31, 2010, 57 earthquakes were recorded within a 61-mi (100-km) radius of the proposed Delamar Valley SEZ. The largest earthquake during that period occurred on May 16, 2004. It was located about 5 mi (8 km) southeast of the SEZ in the Gregerson Basin (near the Delamar Mountains) and registered a Richter scale magnitude (ML[1]) of 4.5 (Figure 11.2.7.1-4). During this period, 32 (56%) of the recorded earthquakes within a 61-mi (100-km) radius of the SEZ had magnitudes greater than 3.0; none were greater than 4.5 (USGS 2010c).

Liquefaction. The proposed Delamar Valley SEZ lies within an area where the peak horizontal acceleration with a 10% probability of exceedance in 50 years is between 0.10 and 0.15 g. Shaking associated with this level of acceleration is generally perceived as strong; however, potential damage to structures is light (USGS 2008). Given the deep water table (from 300 ft [90 m] in the north to 1,000 ft [305 m] below Delamar Lake [Ertec Western, Inc. 1981]) and the low intensity of ground shaking estimated for Delamar Valley, the potential for liquefaction in Delamar Valley sediments is likely to be low.

Volcanic Hazards. Several calderas in southern Nevada are the sources of voluminous and widespread Tertiary volcanic deposits throughout the region. These include the Indian Peak caldera complex to the northeast of Delamar Valley, between the Highland Range and the Nevada-Utah border; the Caliente caldera complex, also to the east, in the northern Delamar and Clover Mountains and extending into western Utah; the smaller Kane Springs Wash caldera in the southern Delamar Mountains; and the Central Nevada caldera complex to the northwest of Delamar Valley (Scott et al. 1992). Tertiary volcanism overlaps periods of extension in southern

[1] Richter scale magnitude (ML) was the original magnitude defined by Richter and Gutenberg for local earthquakes in 1935. It was based on the maximum amplitude recorded on a Wood-Anderson torsion seismograph but is currently calculated for earthquakes with magnitudes ranging from 2 to 6, using modern instruments with adjustments (USGS 2010d).

Nevada and occurred as recently as 2.6 million years ago (late Pliocene) (Noble 1972); however, there is no evidence of more recent volcanic activity associated with these complexes.

Delamar Valley is located about 80 mi (130 km) east–northeast of the southwestern Nevada volcanic field, which consists of volcanic rocks (tuffs and lavas) of the Timber Mountain-Oasis Valley caldera complex and Silent Canyon and Black Mountain calderas (Figure 11.2.7.1-4). The area has been studied extensively because of its proximity to the NTS and Yucca Mountain repository. Two types of fields are present in the region: (1) large-volume, long-lived fields with a range of basalt types associated with more silicic volcanic rocks produced by melting of the lower crust, and (2) small-volume fields formed by scattered basaltic scoria cones during brief cycles of activity, called rift basalts because of their association with extensional structural features. The basalts of the region typically belong to the second group; examples include the basalts of Silent Canyon and Sleeping Butte (Byers et al. 1989; Crowe et al. 1983).

The oldest basalts in the region were erupted during the waning stages of silicic volcanism in the southern Great Basin in the Late Miocene and are associated with silicic volcanic centers like Dome Mountain (the first group). Rates of basaltic volcanic activity in the region have been relatively constant but generally low. Basaltic eruptions occurred from 1.7 million to 700,000 years ago, creating the cinder cones within Crater Flat (Stuckless and O'Leary 2007). The most recent episode of basaltic eruptions occurred at the Lathrop Wells Cone complex about 80,000 years ago (Stuckless and O'Leary 2007). There has been no silicic volcanism in the region in the past 5 million years. Current silicic volcanic activity occurs entirely along the margins of the Great Basin (Crowe et al. 1983).

Crowe et al. (1983) determined that the annual probability of a volcanic event for the region is very low (3.3×10^{-10} to 4.7×10^{-8}), similar to the probability of 1.7×10^{-8} calculated for the proposed Yucca Mountain repository (Cline et al. 2005). The volcanic risk in the region is associated only with basaltic eruptions; the risk of silicic volcanism is negligible. Perry (2002) cites geologic data that could increase the recurrence rate (and thus the probability of disruption). These include hypothesized episodes of an anomalously high strain rate, the hypothesized presence of a regional mantle hot spot, and new aeromagnetic data that suggest that previously unrecognized volcanoes may be buried in the alluvial basins in the region.

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 like the Delamar 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.

Other Hazards. Other potential hazards at the proposed Delamar Valley 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 may increase the likelihood of soil erosion by wind.

Alluvial fan surfaces, such as those found in the Delamar Valley, can be the sites of damaging high-velocity flash floods and debris flows during periods of intense and prolonged rainfall. The nature of the flooding and sedimentation processes (e.g., stream flow versus debris flow) depends on the specific morphology of the fan) (National Research Council 1996). Section 11.2.9.1.1 provides further discussion of flood risks within the Delamar Valley SEZ.

11.2.7.1.2 Soil Resources

Soils within the proposed Delamar Valley SEZ are sandy loams and silt loams of the Geer, Penoyer, Koyen, Keefa, and Slaw Series, which together make up about 81% of the soil coverage at the site (Figure 11.2.7.1-5). Soil map units within the Delamar Valley SEZ are described in Table 11.2.7.1-1. These level to nearly level soils are derived from alluvium from mixed sources, typical of soils on alluvial fans and fan remnants. They are characterized as very deep and well drained. Most soils on the site have moderate surface runoff potential and moderate to moderately rapid permeability (except for the Slaw silt loam and playa soils which have slow permeability). The natural soil surface is suitable for roads with a slight to moderate erosion hazard when used as roads or trails. The Slaw silt loam along Jumbo wash, north of Delamar Lake, and playa soils within Delamar Lake are not suitable for roads because of high flooding or erosion potential and a severe rutting hazard. Ponding is frequent in playa soils, covering 2,394 ac (10 km^2), with a 50% chance of occurrence in any given year. The water erosion potential is low to moderate for most soils. The susceptibility to wind erosion is moderate, with as much as 86 tons (78 metric tons) of soil eroded by wind per acre (4,000 m^2) each year (NRCS 2010). Biological soil crusts and desert pavement have not been documented within the SEZ, but may be present.

Only the playa soils within the proposed Delamar Valley SEZ are rated as hydric.[2] Flooding is rare for most soils at the site except for the Slaw silt loam, north of Delamar Lake, which covers about 2,706 ac (11 km^2) and has an occasional flood rating, with a 5 to 50% chance in any year. Soils of the Geer-Penoyer association and the Koyen gravelly sandy loam, covering 7,990 ac (32 km^2) in the north part of the site, are classified as prime farmland, if irrigated, depending of soil quality and erodibility (NRCS 2010).

11.2.7.2 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.

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2 A hydric soil is a soil that formed under conditions of saturation, flooding, or ponding (NRCS 2010).

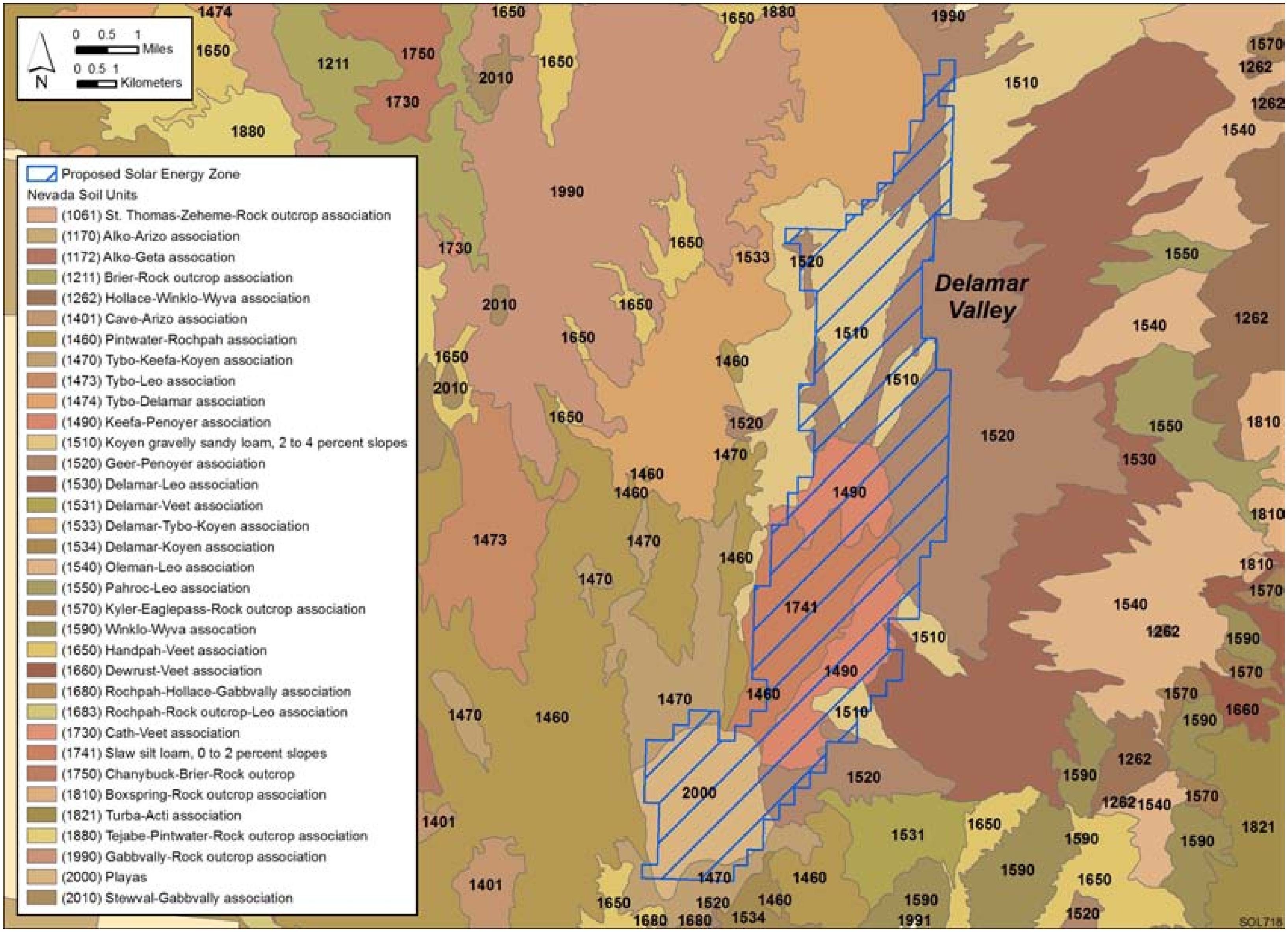

FIGURE 11.2.7.1-5 Soil Map for the Proposed Delamar Valley SEZ (NRCS 2008)

TABLE 11.2.7.1-1 Summary of Soil Map Units within the Proposed Delamar Valley SEZ

Map Unit Symbol	Map Unit Name	Water Erosion Potential[a]	Wind Erosion Potential[b]	Description	Area, in Acres[c] (% of SEZ)
1520	Geer-Penoyer association	Moderate	Moderate (WEG 3)[d]	Consists of about 65% Geer fine sandy loam and 30% Penoyers silt loam. Level to nearly level soils on alluvial fan skirts and alluvial flats. Parent material is alluvium from welded tuff and limestone with a minor component of volcanic ash. Very deep and well drained, with moderate surface runoff potential and moderate permeability. Available water capacity is high. Severe rutting hazard. Used mainly for livestock grazing and cultivated crops (alfalfa, small grains, potatoes, and sugar beets). Prime farmland[e] if irrigated and reclaimed of excess salts and sodium.	4,314 (26)
1510	Koyen gravelly sandy loam (2 to 4% slopes)	Low	Moderate (WEG 4)	Nearly level soils on alluvial fan skirts. Parent material is alluvium from volcanic rock. Very deep and well drained, with moderate surface runoff potential and moderately rapid permeability. Available water capacity is low. Moderate rutting hazard. Used mainly for wildlife grazing and wildlife habitat. Prime farmland if irrigated (depending on climate and erodibility).	3,676 (22)
1490	Keefa-Penoyer association	Low	Moderate (WEG 3)	Consists of 70% Keefa sandy loam and 15% Penoyer silt loam. Level to nearly level soils on alluvial fan skirts. Parent material consists of alluvium from mixed sources. Very deep and well drained, with moderate surface runoff potential and moderate permeability. Available water capacity is low to high. Moderate rutting hazard. Used mainly for livestock grazing.	2,866 (17)
1741	Slaw silt loam (0 to 2% slopes)	High	Moderate (WEG 4)	Level to nearly level soils on alluvial flats and lacustrine deposits. Parent material consists of alluvium from mixed sources. Very deep and well drained, with high surface runoff potential (slow infiltration rate) and slow permeability. Available water capacity is high. Severe rutting hazard. Used mainly for livestock grazing, wildlife habitat, and limited irrigated cropland.	2,706 (16)

TABLE 11.2.7.1-1 (Cont.)

Map Unit Symbol	Map Unit Name	Water Erosion Potential[a]	Wind Erosion Potential[b]	Description	Area, in Acres[c] (% of SEZ)
2000	Playas	Moderate	Moderate (WEG 5)	Level soils formed on playas. Parent material consists of alluvium derived from mixed sources, including limestone and dolomite. Deep and somewhat poorly drained, with moderate surface runoff potential and slow permeability. Moderately to strongly saline. Available water capacity is very low. Severe rutting hazard.	2,394 (14)
1470	Tybo-Keefa-Koyen association	Low	Moderate (WEG 4)	Consists of 30% Tybo gravelly fine sandy loam, 30% Keefa gravelly very fine sandy loam, and 25% Koyen gravelly fine sandy loam. Level to nearly level soils on inset fans, sand sheets, and dunes. Parent material consists of alluvium from mixed sources, including volcanic rock. Deep (Tybo soils shallow to duripan) and well drained, with low surface runoff potential (high infiltration rate) and moderately rapid permeability. Available water capacity is very low to low. Moderate rutting hazard. Used mainly as livestock grazing and wildlife habitat.	334 (2)
1530	Delamar-Leo association	Low	Moderate (WEG 4)	Consists of 60% Delamar gravelly sandy loam and 30% Leo gravelly sandy loam. Nearly level soils on inset fans and alluvial fan remnants. Parent material consists of alluvium from mixed sources. Very deep (Delamar soils moderately deep to an indurated duripan) and well to excessively drained, with moderate surface runoff potential and moderately slow to rapid permeability. Available water capacity is low. Moderate rutting hazard. Used mainly for livestock grazing, wildlife habitat, and irrigated cropland (alfalfa and small grains).	155 (<1)

TABLE 11.2.7.1-1 (Cont.)

Map Unit Symbol	Map Unit Name	Water Erosion Potential[a]	Wind Erosion Potential[b]	Description	Area, in Acres[c] (% of SEZ)
1533	Delamar-Tybo-Koyen association	Moderate	Moderate (WEG 3)	Consists of 45% Delamar sandy loam, 25% Tybo gravelly fine sandy loam, and 15% Koyen gravelly sandy loam. Nearly level soils on inset fans and fan remnants. Parent material consists of alluvium from mixed sources, including volcanic rocks. Deep (Delamar soils moderately deep to an indurated duripan) and well drained, with moderate surface runoff potential and rapid to very rapid permeability. Available water capacity is very low to low. Moderate rutting hazard. Used mainly for livestock grazing and wildlife habitat.	97 (<1)

[a] Water erosion potential rates based on soil erosion factor K, which indicates the susceptibility of soil to sheet and rill erosion by water. Values range from 0.02 to 0.69 and are provided in parentheses under the general rating; a higher value indicates a higher susceptibility to erosion. Estimates based on the percentage of silt, sand, and organic matter and on soil structure and saturated hydraulic conductivity.

[b] Wind erosion potential here is based on the wind erodibility group (WEG) designation: groups 1 and 2, high; groups 3 through 6, moderate; and groups 7 and 8 low (see footnote d for further explanation).

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

[d] 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: WEGs 3 and 4, 86 tons (78 metric tons) per acre (4,000 m^2) per year; and WEG 5, 56 tons (51 metric tons) per acre (4,000 m^2) per year.

[e] 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 (2010).

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

Delamar Lake may not be a suitable location for construction, because lakebed sediments are often saturated with shallow groundwater and likely collapsible. The lake sits within the lowest elevation area of Delamar Valley and serves as a sump for drainage in the valley.

11.2.7.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features were identified for soil resources at the proposed Delamar Valley 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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11.2.8 Minerals (Fluids, Solids, and Geothermal Resources)

11.2.8.1 Affected Environment

There were no locatable mining claims within the proposed Delamar Valley SEZ as of July 13, 2010 (BLM and USFS 2010a), and the public land within the SEZ was closed to locatable mineral entry in June 2009, pending the outcome of this solar energy PEIS. There are no active oil and gas leases in the area, but all but a small portion of the area has been leased in the past (BLM and USFS 2010b). The area remains open for discretionary mineral leasing for oil and gas and other leasable minerals, and for disposal of salable minerals. There is no active geothermal leasing or development in or near the SEZ, although a portion of the southwestern corner of the SEZ was previously leased (BLM and USFS 2010b).

11.2.8.2 Impacts

If the area were identified as a solar energy zone, it would continue to be closed to all incompatible forms of mineral development. For the purpose of this analysis, it was assumed that future development of oil and gas resources would continue to be possible, since such development could occur with directional drilling from outside the SEZ. Since the SEZ does not contain existing mining claims, it was also assumed that there would be no future loss of locatable mineral production. The production of common minerals, such as sand and gravel and mineral materials used for road construction or other purposes, might take place in areas not directly developed for solar energy production.

The SEZ has had no history of development of geothermal resources. For that reason, it is not anticipated that solar development would adversely affect the development of geothermal resources.

11.2.8.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ specific design features have been identified. Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program, would provide adequate mitigation for mineral resources.

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11.2.9 Water Resources

11.2.9.1 Affected Environment

The proposed Delamar Valley SEZ is located within the Central Nevada Desert Basins subunit of the Great Basin hydrologic region (USGS 2010a) and the Basin and Range physiographic province characterized by intermittent mountain ranges and desert valleys (Planert and Williams 1995). Delamar Valley is a narrow valley oriented north to south between the Delamar Mountains to the east and the South Pahroc Range to the west (Figure 11.2.9.1-1) with an average relief of 18 ft/mi (3.4 m/km) (Eakin 1963). The proposed Delamar Valley SEZ has surface elevations ranging between 4,530 and 4,760 ft (1,380 and 1,450 m); elevations in the surrounding mountains reach higher than 6,500 ft (1981 m). The climate in this region of Nevada is characterized as having low humidity and precipitation, with mild winters and hot summers (Planert and Williams 1995; WRCC 2010a). The average annual precipitation is 6.9 in. (17.5 cm), and the average annual snowfall is 2.7 in. (6.9 cm) in the adjacent Pahranagat Valley near the town of Hiko (WRCC 2010b). Precipitation and snowfall amounts are greater at higher elevations; the average annual precipitation ranges from 13.5 to 15.7 in. (34 to 40 cm) and snowfalls from 34.7 to 61.6 in. (88 to 156 cm) (WRCC 2010c,d). Pan evaporation rates are estimated to be 80 in./yr (203 cm/yr) (Cowherd et al. 1988; WRCC 2010e). Reference crop evapotranspiration has been estimated at 59 in./yr (150 cm/yr) in nearby Caliente (Huntington and Allen 2010).

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

There are no perennial surface water features in the proposed Delamar Valley SEZ. Delamar Lake is a dry lake that covers 2,600 acres (10.5 km^2) in the southern portion of the proposed SEZ. Two intermittent streams that originate out of the Delamar Mountains flow through the proposed SEZ. Both of these intermittent streams, Jumbo Wash and an unnamed wash, flow west out of the mountains and then turn southward towards Delamar Lake (Figure 11.2.9.1-1). Several ephemeral washes are located in the northern and central portions of the proposed SEZ that are oriented from north to south flowing towards Delamar Lake.

Several ephemeral washes that flow out of the surrounding mountains end prior to reaching the proposed SEZ (not labeled in Figure 11.2.9.1-1 but can be seen as drainage patterns on aerial photo). The most significant of these come out of the Delamar Mountains and include Monkey Wrench Wash, Helene Wash, Delamar Wash, Cedar Wash, and Big Lime Wash (listed by location from north to south); they are all north of Jumbo Wash. A shallow drainage divide separates the Delamar Valley and Dry Lake Valley just to the north. In Dry Lake Valley, peak discharges in the Dry Lake Valley Tributary coming out of the Delamar Mountains are as high as 150 ft^3/s (4.2 m^3/s) (USGS 2010b; gauge 10245270).

The White River system (also referred to as Pahranagat Creek in the Pahranagat Valley) follows the axis of the adjacent Pahranagat Valley, approximately 9 mi (14 km) west and south of Delamar Valley (Figure 11.2.9.1-1). The river bed is typically dry, but Upper Pahranagat Lake

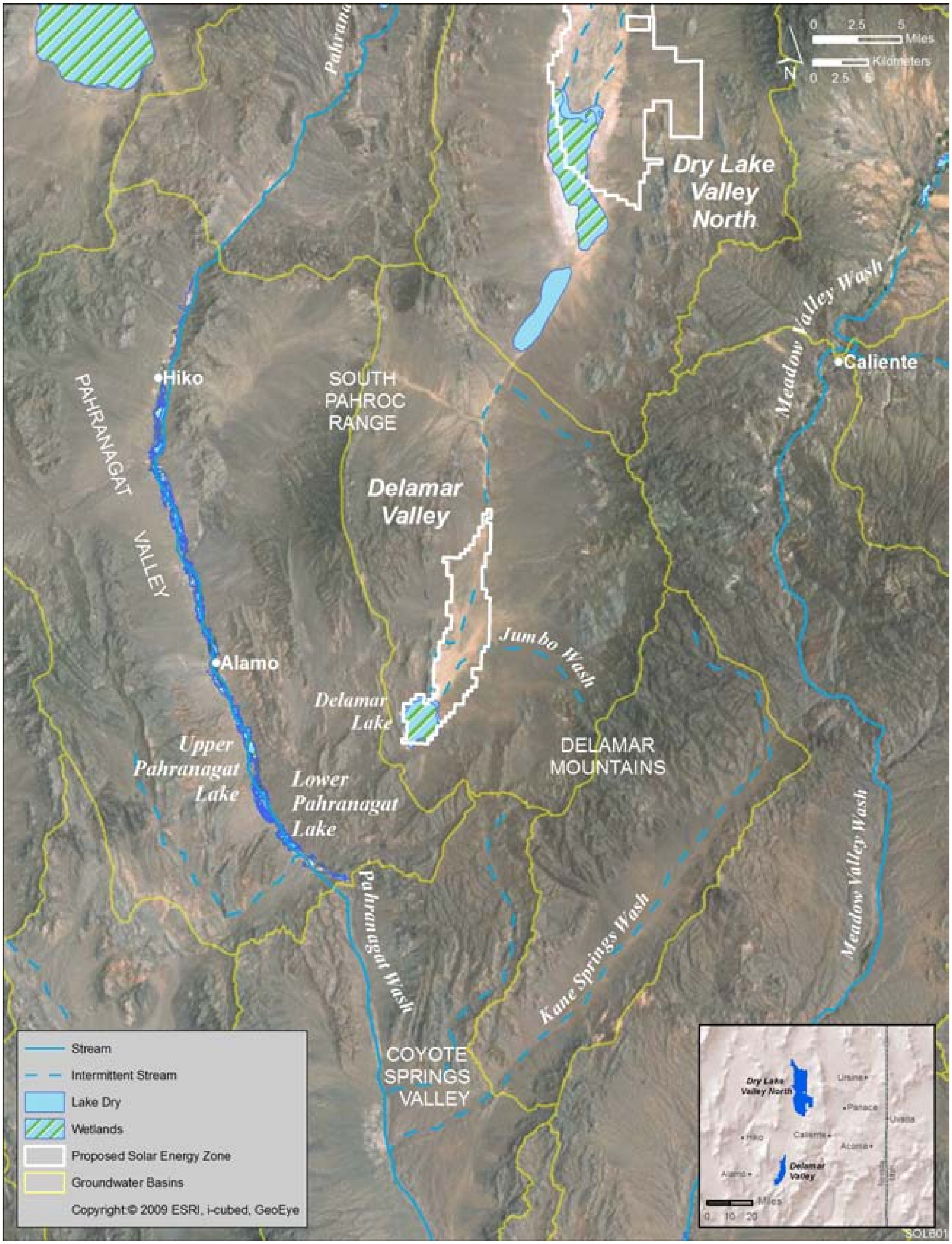

FIGURE 11.2.9.1-1 Surface Water Features near the Proposed Delamar Valley SEZ

contains water fed by thermal springs, which gets released to the Lower Pahranagat Lake and riparian areas downstream to maintain conditions in the Pahranagat National Wildlife Refuge (USFWS 2010d).

Delamar Lake is classified as a lacustrine wetland with an unconsolidated shore substrate, and the riparian regions of the White River system, Upper Pahranagat Lake, and Lower Pahranagat Lake contain a mixture of riverine, palustrine, and lacustrine wetlands according to the National Wetlands Inventory (USFWS 2009a). The hydrologic conditions of the marshes and wetlands in the Pahranagat National Wildlife Refuge are controlled to encourage habitat conditions, as well as to promote plant decomposition and plant growth at certain times (USFWS 2010b). Further information on wetlands in the region of the proposed Delamar Valley SEZ is presented in Section 11.2.10.1.

Flood hazards have not been identified (Zone D) for the region surrounding the proposed Delamar Valley SEZ (FEMA 2009). Intermittent flooding may occur, with temporary ponding and erosion along the ephemeral washes, from the hills on the sides of the basin and within the Delamar Lake region.

11.2.9.1.2 Groundwater

The proposed Delamar Valley SEZ is located within the Delamar Valley groundwater basin, which covers an area of 245,120 acres (992 km^2) (NDWR 2010a). The Delamar Valley groundwater basin is hydraulically connected to the Dry Lake Valley groundwater basin to the north (see Section 11.4.9.1.2) separated by a shallow surface divide. Groundwater in the Delamar Valley is contained in Quaternary and Tertiary age basin-fill deposits, Tertiary age volcanic rocks, and Paleozoic carbonate-rock aquifers (Burbey 1997). The basin fill deposits consist of interbedded sand, gravel, and clay with a thickness ranging from 1,000 to 4,000 ft (305 to 1,219 m) (Burbey 1997; SNWA and BLM 2008). The volcanic rock aquifer is up to 6,000 ft (1,829 m) in thickness (Burbey 1997), and the basin fill and volcanic rock aquifers together average a thickness of 9,800 ft (2,987 m) (Mankinen et al. 2008). The carbonate-rock aquifer can be as much as 10,000 ft (3,048 m) below the surface, except in the southwestern portion of Delamar Valley, where it is located at shallower depths (Burbey 1997).

The carbonate-rock aquifer beneath Delamar Valley and Dry Lake Valley basins is a part of the White River Groundwater Flow System, a regional-scale carbonate-rock aquifer that flows generally toward the south and terminates at Muddy River Springs and the Virgin River (Eakin 1966). The White River Groundwater Flow System is a part of a large carbonate-rock province that occurs within approximately one-third of Nevada, a large portion of Utah, and parts of Arizona and California (Harrill and Prudic 1998). Connectivity of the carbonate rocks that underlay Dry Lake Valley to the White River Groundwater Flow System is not well understood, and has yet to be studied in detail in this area (Harrill and Prudic 1998; NDWR 2008).

The water balance on groundwater in the Delamar Valley consists of precipitation recharge, subsurface inflow, and subsurface outflow processes. Evapotranspiration of groundwater is negligible given the considerable depth to groundwater in the Delamar Valley

(NDWR 2008). Groundwater recharge from precipitation occurs within the valley and via runoff from higher elevations in the surrounding mountains. Estimates of groundwater recharge vary depending upon the methodology used and range from 1,000 ac-ft/yr (1.2 million m^3/yr) (Eakin 1963, 1966) to between 6,400 and 7,760 ac-ft/yr (7.9 million and 9.6 million m^3/yr) (Flint et al. 2004; NDWR 2008). Subsurface inflow from the Dry Lake Valley groundwater basin ranges from 5,000 to 7,000 ac-ft/yr (6.2 million to 8.6 million m^3/yr), and subsurface discharge to Pahranagat Valley and Coyote Springs Valley from 6,000 to 9,500 ac-ft/yr (7.4 million to 11.7 million m^3/yr) (Burbey 1997).

Several springs are located at higher elevations in the Delamar Mountains according to USGS topographic maps. Only one spring is considered to have a significant water source, Grassy Spring, in the northeastern portion of Delamar Valley and at an elevation of 5,783 ft (1,760 m), which has a discharge ranging from 1.6 to 16.0 ac-ft/yr (1,970 to 19,700 m^3/yr) (SNWA and BLM 2008). However, the springs in this region are predominantly recharged by local runoff in the mountains and disconnected from the main groundwater aquifers in Delamar Valley (NDWR 2008).

In the Delamar Valley, groundwater enters from the Dry Lake Valley to the north and along the basin margins, where infiltration occurs along mountain front areas. The general groundwater flow direction is from north to south. Groundwater surface elevations range from 3,840 ft (1,170 m) near the center of the valley to 4,530 ft (1,381 m) at the base of the Delamar Mountains (USGS 2010b; wells 372639114520901 and 33192311451330, respectively). The depth to groundwater is typically on the order of 900 ft (274 m) below the ground surface, and a substantial portion of the groundwater flow is in the basin fill and volcanic rock aquifers (Burbey 1997). Delamar Valley is at higher elevations than Pahranagat Valley and Coyote Springs Valley located to the west and south, and the relative amount of groundwater discharge to these receiving basins is not fully realized (NDWR 2008). However, it is likely that the groundwater in the basin fill and volcanic rock aquifers of Delamar Valley discharges to the carbonate-rock aquifers of the Pahranagat Valley and Coyote Springs Valley basins that are a part of the White River Groundwater Flow System, given that the basin fill deposits are not as thick in these receiving basins (Burbey 1997).

The chemical quality of water in the Delamar Valley basin is varied, as indicated by groundwater sampling conducted by the SNWA. This effort indicated that some groundwater samples exceeded primary drinking water MCL standards for arsenic and fluoride, as well as secondary MCL standards for aluminum and iron. TDS concentrations ranged between 210 and 481 mg/L (SNWA and BLM 2008).

11.2.9.1.3 Water Use and Water Rights Management

In 2005, water withdrawals from surface waters and groundwater in Lincoln County were 57,100 ac-ft/yr (70 million m^3/yr), of which 11% came from surface waters and 89% came from groundwater. The largest water use category was irrigation, at 55,100 ac-ft/yr (68 million m^3/yr). Public supply/domestic water uses accounted for 1,300 ac-ft/yr (1.6 million m^3/yr), and livestock and mining water uses on the order of 230 ac-ft/yr (280,000 m^3/yr) and

450 ac-ft/yr (560,000 m^3/yr), respectively (Kenny et al. 2009). However, within Delamar Valley there has been very little groundwater development, with less than 100 ac-ft/yr (123,000 m^3/yr) withdrawn for stock ponds (Eakin 1963).

All waters in Nevada are the property of the public in the state of Nevada and subject to the laws described in Nevada Revised Statutes, Chapters 532 through 538 (available at http://leg.state.nv.us/nrs). The NDWR, led by the Office of the State Engineer, is the agency responsible for managing both surface water and groundwater resources, and this responsibility includes overseeing water right applications, appropriations, and interbasin transfers (NDWR 2010b). The two principal ideas behind water rights in Nevada are the prior appropriations doctrine and the concept of beneficial use. A water right establishes an appropriation amount and date such that more senior water rights have priority over newer water rights. Additionally, water rights are treated as both real and personal property, such that water rights can be transferred without affecting the land ownership (NDWR 2010b). Water rights applications (new or transfer of existing) are approved if the water is available to be appropriated, if existing water rights will not be affected, and if the proposed use is not deemed to be harmful to the public interest. If these conditions are satisfied according to the Office of the State Engineer, a proof of beneficial use of the approved water must be provided within a certain time period, and following that a certificate of appropriation is issued (BLM 2001).

Delamar Valley is not a designated groundwater basin; thus, there are no specified beneficial uses set by the NDWR (NDWR 1974). The NDWR estimates the perennial yield for each groundwater basin as the amount of water that can be economically withdrawn for an indefinite period without depleting the source (NDWR 1999). The perennial yield of the Delamar Valley groundwater basin is set at 2,550 ac-ft/yr (3.1 million m^3/yr), representing one-half of the natural recharge estimate used by the Office of the State Engineer in Ruling 5875 (NDWR 2008). Of the available 2,550 ac-ft/yr (3.1 million m^3/yr) in water rights, 7 ac-ft/yr (8,600 m^3/yr) is allocated for stock water and 2,493 ac-ft/yr (3.1 million m^3/yr) for municipal use (NDWR 2010a). The municipal water right allocation was granted to the SNWA by the Office of the State Engineer through Ruling 5875, with the remaining 50 ac-ft/yr (61,700 m^3/yr) of unallocated water rights in Delamar Valley being set aside for future water development (NDWR 2008). The SNWA is developing a project that would convey water to Las Vegas with a small portion of this water set for use in Lincoln County (SNWA 2008). However, in October 2009, the Seventh Judicial District Court of Nevada (Lincoln County) ordered the NDWR Ruling 5875 be remanded, and in November 2009, the SNWA filed an appeal to the Nevada Supreme Court to fight this decision (BLM 2010b). In June 2010, the Nevada Supreme Court issued a ruling related to SNWA water rights applications in Dry Lake Valley; the NDWR has been ordered to reconsider the SNWA water rights applications and reopen the protest period related to the applications (*Great Basin Water Network v. State Engineer* 2010).

11.2.9.2 Impacts

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

11.2.9.2.1 Land Disturbance Impacts on Water Resources

Impacts related to land disturbance activities are common to all utility-scale solar energy development and are described in more detail for the four phases of development in Section 5.9.1; these impacts will be minimized through the implementation of programmatic design features described in Appendix A, Section A.2.2. Land disturbance activities should be avoided to the extent possible within the two intermittent streams, Jumbo Wash and unnamed wash, in the proposed Delamar Valley SEZ. Additionally, minimizing landscape alterations to the many ephemeral washes and Delamar Lake would reduce impacts associated with erosion, sedimentation, and habitat disturbances within the washes, as well as the clogging of groundwater recharge at Delamar Lake.

11.2.9.2.2 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 Delamar Valley SEZ include the following:

- On the basis of a total area of 16,552 acres (67 km2), it is assumed that two solar projects 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 km2);
- 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 36% 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 the workforce potable water supply and fugitive dust control. 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 providing the workforce potable water supply. Because there are no significant surface water bodies on the proposed Delamar Valley SEZ, the water requirements for construction activities could be met either by trucking water to the sites or by using on-site groundwater resources. The variable quality of groundwater in the Delamar Valley basin could potentially be an issue for the potable water supply. Elevated concentrations of arsenic and fluoride have been reported in the basin that exceed drinking water standards. If the groundwater supply used for a project does not meet drinking water standards, then treatment or off-site sources would need to be considered.

Water requirements for dust suppression and potable water supply during construction are shown in Table 11.2.9.2-1 and could be as high as 2,814 ac-ft (3.5 million m^3). The assumptions underlying these estimates for each solar energy technology are described in Appendix M. Groundwater wells would have to yield an estimated 1,220 to 1,740 gpm (4,620 to 6,590 L/min) to meet the estimated construction water requirements. These groundwater withdrawal rates are similar in magnitude to those of large municipal and irrigation production wells (Harter 2003), so multiple wells may be needed in order to obtain the water requirements. The total water requirements during the peak construction year are similar to quantities used on small to medium-size farms in Nevada (USDA 2009c). The availability of groundwater and the potential impacts of groundwater withdrawal would need to be assessed during the site characterization phase. In addition, up to 148 ac-ft (182,600 m^3) of sanitary wastewater would need to be treated either on-site or sent to an off-site facility.

Operations

During operations, water would be required for mirror/panel washing, the workforce potable water supply, and cooling (parabolic trough and power tower only) (Table 11.2.9.2-2). Water needs for cooling are a function of the type of cooling used (dry, hybrid, wet). Further refinements to water requirements for cooling would result from the percentage of time that the

TABLE 11.2.9.2-1 Estimated Water Requirements during the Peak Construction Year for the Proposed Delamar Valley SEZ

Activity	Parabolic Trough	Power Tower	Dish Engine	PV
Water use requirements[a]				
Fugitive dust control (ac-ft)[b,c]	1,816	2,724	2,724	2,724
Potable supply for workforce (ac-ft)	148	90	37	19
Total water use requirements (ac-ft)	1,964	2,814	2,761	2,743
Wastewater generated				
Sanitary wastewater (ac-ft)	148	90	37	19

[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 80 in./yr (203 cm/yr) (Cowherd et al. 1988; WRCC 2010e).

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

option was employed (30 to 60% range assumed) and the power of the system. The differences between the water requirements reported in Table 11.2.9.2-2 for the parabolic trough and power tower technologies are attributable to the assumptions of acreage per megawatt. As a result, the water usage for the more energy-dense parabolic trough technology is estimated to be almost twice as large as that for the power tower technology.

At full build-out capacity, water needs for mirror/panel washing are estimated to range from 74 to 1,324 ac-ft/yr (91,300 to 1.6 million m^3/yr) and the workforce potable water supply from 2 to 37 ac-ft/yr (2,500 to 45,600 m^3/yr). The maximum total water usage during normal operation at full build-out capacity would be greatest for technologies using the wet-cooling option and is estimated to be as high as 39,762 ac-ft/yr (49.0 million m^3/yr). Water usage for dry-cooling systems would be as high as 4,009 ac-ft/yr (4.9 million m^3/yr), approximately a factor of 10 times less than that for the wet-cooling option. Non-cooled technologies require substantially less water at full build-out capacity: 752 ac-ft/yr (927,600 m^3/yr) for dish engine and 76 ac-ft/yr (93,700 million m^3/yr) for PV systems (Table 11.2.9.2-2). Operations would produce up to 37 ac-ft/yr (45,600 m^3/yr) of sanitary wastewater. In addition, for wet-cooled technologies, 418 to 752 ac-ft/yr (515,600 to 927,600 m^3/yr) of cooling system blowdown water would need to be treated either on- or off-site. Any on-site treatment of wastewater would have to ensure that treatment ponds are effectively lined in order to prevent groundwater contamination.

Groundwater is the primary water resource available for solar energy development at the proposed Delamar Valley SEZ. The NDWR has set the perennial yield of the Delamar Valley groundwater basin at 2,550 ac-ft/yr (3.1 million m^3/yr), which is only 6% to 35% of the water needed for technologies using wet-cooling. The water requirement estimates for technologies using dry-cooling are on the order of the perennial yield of the basin depending upon operation

TABLE 11.2.9.2-2 Estimated Water Requirements during Operations at the Proposed Delamar Valley SEZ

Activity	Parabolic Trough	Power Tower	Dish Engine	PV
Full build-out capacity (MW)[a,b]	2,648	1,471	1,471	1,471
Water use requirements				
Mirror/panel washing (ac-ft/yr)[c,d]	1,324	736	736	74
Potable supply for workforce (ac-ft/yr)	37	16	16	2
Dry cooling (ac-ft/yr)[e]	530–2,648	294–1,471	NA[f]	NA
Wet cooling (ac-ft/yr)[e]	11,917–38,401	6,621–21,334	NA	NA
Total water use requirements				
Non-cooled technologies (ac-ft/yr)	NA	NA	752	76
Dry-cooled technologies (ac-ft/yr)	1,891–4,009	1,046–2,223	NA	NA
Wet-cooled technologies (ac-ft/yr)	13,278–39,762	7,373–22,086	NA	NA
Wastewater generated				
Blowdown (ac-ft/yr)[g]	752	418	NA	NA
Sanitary wastewater (ac-ft/yr)	37	16	16	2

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

[f] NA = not applicable.

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

conditions. Obtaining water rights within the Delamar Valley groundwater basin is potentially limited by the municipal water rights of the SNWA totaling 2,493 ac-ft/yr (3.1 million m^3/yr), which are currently under review by the Office of the State Engineer (see Section 11.2.9.1.3). Under current conditions of available water rights in the Delamar Valley, only 50 ac-ft/yr (61,700 m^3/yr) is unallocated, which is on the order of water requirements needed for PV systems. Given the available water resources within the Delamar Valley basin, PV systems would be the preferred technology for the full build-out scenario. Solar development projects using dry-cooling and dish engine technologies would likely have to negotiate water rights with the SNWA and the NDWR. Technologies using wet cooling are unfeasible for the proposed Delamar Valley SEZ, because their water use requirements are well above the available groundwater in the basin.

Decommissioning/Reclamation

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

11.2.9.2.3 Off-Site Impacts: Roads and Transmission Lines

The proposed Delamar Valley SEZ is located approximately 8 mi (13 km) east of U.S. 93, and an existing 69-kV transmission line runs through the proposed SEZ, as described in Section 11.2.1.2. 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 use impacts 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.

11.2.9.2.4 Summary of Impacts on Water Resources

The impacts on water resources from solar energy development at the proposed Delamar Valley SEZ are associated with land disturbance effects on 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, as well as alter groundwater recharge and discharge processes. Two intermittent streams, several ephemeral washes, and a dry lake are located within the proposed SEZ. Alterations to the natural drainage patterns of these surface features 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.

Impacts relating to water use requirements vary depending on the type of solar technology built and, for technologies using cooling systems, the type of cooling (wet, dry, or hybrid) used. Groundwater in the Delamar Valley is a part of White River Groundwater Flow System, which is a regional-scale system of carbonate-rock aquifers. Subsurface inflow from Dry Lake Valley to the north moves southward through Delamar Valley, primarily in the basin-fill aquifer, and discharges to Pahranagat Valley and Coyote Springs Valley. Delamar Valley and

Dry Lake Valley are at higher elevations than the receiving Pahranagat Valley and Coyote Springs Valley that have thin basin-fill deposits, so it is likely that subsurface discharge from Delamar Valley contributes to the carbonate-rock aquifers of the White River Groundwater Flow System. Excessive groundwater withdrawals at the proposed Delamar Valley SEZ could disrupt this groundwater flow pattern and adversely affect the White River Groundwater Flow System, as well as the springs and wetlands within the Pahranagat National Wildlife Refuge that support critical wildlife habitat.

Groundwater is the primary water resource available to solar energy facilities in the proposed Delamar Valley SEZ. The perennial yield of the Delamar Valley basin is set at 2,550 ac-ft/yr (3.1 million m^3/yr), and currently only 50 ac-ft/yr (61,700 m^3/yr) is unallocated. Wet-cooling technologies would not be feasible in Delamar Valley, because their water use requirements far exceed available groundwater resources in the basin. Dry-cooled parabolic trough facilities would have to modify operations and employ water conservation measures in order to reduce needed water quantities to that of the perennial yield of the basin. Additionally, dry-cooling and dish engine technologies would have to negotiate with the SNWA and the NDWR to obtain water rights to meet project demands. PV systems are the preferred technology for the full build-out scenario, because their water use requirements are of similar magnitude to the unallocated water rights within the Delamar Valley groundwater basin.

11.2.9.3 SEZ-Specific Design Features and Design Feature Effectiveness

The program for solar energy development on BLM-administered lands will require the programmatic design features presented in Appendix A, Section A.2.2, to be implemented, thus mitigating some impacts on water resources. Programmatic design features would focus on coordinating with federal, state, and local agencies that regulate the use of water resources to meet the requirements of permits and approvals needed to obtain water for development, and on 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.

Design features specific to the proposed Delamar Valley SEZ include the following:

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

- Land disturbance activities should avoid impacts to the extent possible in the vicinity of the intermittent streams, ephemeral washes, and the dry lake present on the site;

- Siting of solar facilities and construction activities should avoid any areas identified as within a 100-year floodplain or jurisdictional waters;

- Groundwater rights must be obtained from the NDWR (dry-cooling and dish engine technologies may have to negotiate with the SNWA for water rights);

- Stormwater management plans and BMPs should comply with standards developed by the Nevada Division of Environmental Protection (NDEP 2010);

- Groundwater monitoring and production wells should be constructed in accordance with state standards (NDWR 2006); and

- Water for potable uses would have to meet or be treated to meet water quality standards according to Nevada Administrative Code (445A.453-445A.455).

11.2.10 Vegetation

This section addresses vegetation that could occur or is known to occur within the potentially affected area of the proposed Delamar Valley 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. No new transmission projects are expected to be needed to serve development on the SEZ because of the proximity of existing infrastructure (refer to Section 11.2.1.2 for development assumptions). The area of indirect effects was defined as the area within 5 mi (8 km) of the SEZ boundary and 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 effects.

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

11.2.10.1 Affected Environment

The proposed Delamar Valley SEZ is located within the Tonopah Basin Level IV ecoregion, which primarily supports sparse shadscale (*Atriplex confertifolia*) communities on broad valleys, hills, bajadas, and alluvial fans (Bryce et al. 2003). Additional commonly occurring shrubs include bud sagebrush (*Picrothamnus desertorum*), spiny hopsage (*Grayia spinosa*), seepweed (*Suaeda* sp.), fourwing saltbush (*Atriplex canescens*), spiny menodora (*Menodora spinescens*), Nevada ephedra (*Ephedra nevadensis*), littleleaf horsebrush (*Tetradymia glabrata*), Douglas rabbitbrush (*Chrysothamnus viscidiflorus*), and winterfat (*Krascheninnikovia lanata*), which, along with shadscale, often codominate in highly diverse mosaics. Warm season grasses, such as Indian rice grass (*Achnatherum hymenoides*) and galleta grass (*Pleuraphis jamesii*), occur in the understory. Stands of inland saltgrass (*Distichlis spicata*) and alkali sacaton (*Sporobolus airoides*) also occur. Warm desert species, such as blackbrush (*Coleogyne ramosissima*), Joshua tree (*Yucca brevifolia*), banana yucca (*Yucca baccata*), and cholla (*Cylindropuntia* sp.), are found in this ecoregion. Black greasewood (*Sarcobatus vermiculatus*) occurs in saline bottoms. Springs and sporadic precipitation in foothills provide surface water sources. Annual precipitation in the vicinity of the SEZ is very low, averaging 6.2 in. (15.7 cm) at the Pahranagat NWR (see Section 11.2.13).

The Tonopah Basin lies within the Central Basin and Range Level III ecoregion, described in Appendix I, and is part of the Great Basin desertscrub biome; however, the

Delamar Valley SEZ is located in a transition zone between the Great Basin and Mojave Deserts, with Mojave desertscrub communities and endemic species in the SEZ and adjacent areas.

The area surrounding the SEZ is a mosaic of five Level IV ecoregions: (1) the Tonopah Basin; (2) the Tonopah Sagebrush Foothills ecoregion, which supports black sagebrush (*Artemisia nova*) and Mojave species such as blackbrush, Joshua tree, and cholla on rocky substrates; (3) Tonopah Uplands, which includes woodlands, such as pinyon (*Pinus monophylla*)-juniper (*Juniperus osteosperma*), and shrublands on hills and mountains; (4) the Woodland and Shrub Covered Low Mountains to the east, which includes open groves of juniper and pinyon with mountain brush communities at higher elevations; and (5) the Arid Footslopes ecoregion to the southeast, part of the Mojave Basin and Range, which supports a sparse mixture of Mojave desert species, such as creosotebush (*Larrea tridentata*), white bursage (*Ambrosia dumosa*), cacti, and *Yucca* species, including Joshua tree, on alluvial fans, basalt flows, hills, and low mountains, and blackbrush at higher elevations.

Land cover types described and mapped under the SWReGAP (USGS 2005a) 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 Delamar Valley SEZ are shown in Figure 11.2.10.1-1. Table 11.2.10.1-1 provides the surface area of each cover type within the potentially affected area.

Lands within the proposed Delamar Valley SEZ are classified primarily as Inter-Mountain Basins Mixed Salt Desert Scrub. Additional cover types within the SEZ are given in Table 11.2.10.1-1. The southern portion of the SEZ includes a large playa, bordered by a salt scrub community of fourwing saltbush (*Atriplex canescens*) and shadscale (*Atriplex confertifolia*). Dominant species in the low scrub communities observed in other portions of the SEZ in August 2009 included winterfat (*Krascheninnikovia lanata*), shadscale, buckwheat (*Eriogonum* sp.), halogeton (*Halogeton glomeratus*), broom snakeweed (*Gutierrezia sarothrae*), tumbleweed (*Sisymbrium loeselii*), and rabbitbrush (*Chrysothamnus* sp.). The northern portion of the SEZ supports a Joshua tree (*Yucca brevifolia*) forest community with ephedra (*Ephedra* sp.), spiny hopsage (*Grayia spinosa*), rabbitbrush, Cholla (*Cylindropuntia* sp.), and Indian rice grass (*Achnatherum hymenoides*). Because of its location in a narrow transition zone between the Great Basin and Mojave Deserts, the plant assemblage of the SEZ is not likely found anywhere else. Sensitive habitats on the SEZ include desert dry washes, playas, wetlands, and Joshua tree communities. The area has had a long history of livestock grazing, and the plant communities present within the SEZ have likely been affected by grazing.

The area of indirect effects, including the area surrounding the SEZ within 5 mi (8 km), includes 22 cover types, which are listed in Table 11.2.10.1-1. The predominant cover types are Inter-Mountain Basins Semi-Desert Shrub Steppe, Mojave Mid-Elevation Mixed Desert Scrub, Inter-Mountain Basins Big Sagebrush Shrubland, and Inter-Mountain Basins Mixed Salt Desert Scrub.

One wetland mapped by the NWI is located within the southern portion of the SEZ (USFWS 2009a) (Figure 11.2.10.1-2). This large sparsely vegetated lacustrine wetland, Delamar Lake, is mapped primarily as Inter-Mountain Basins Playa, with small areas of Inter-Mountain

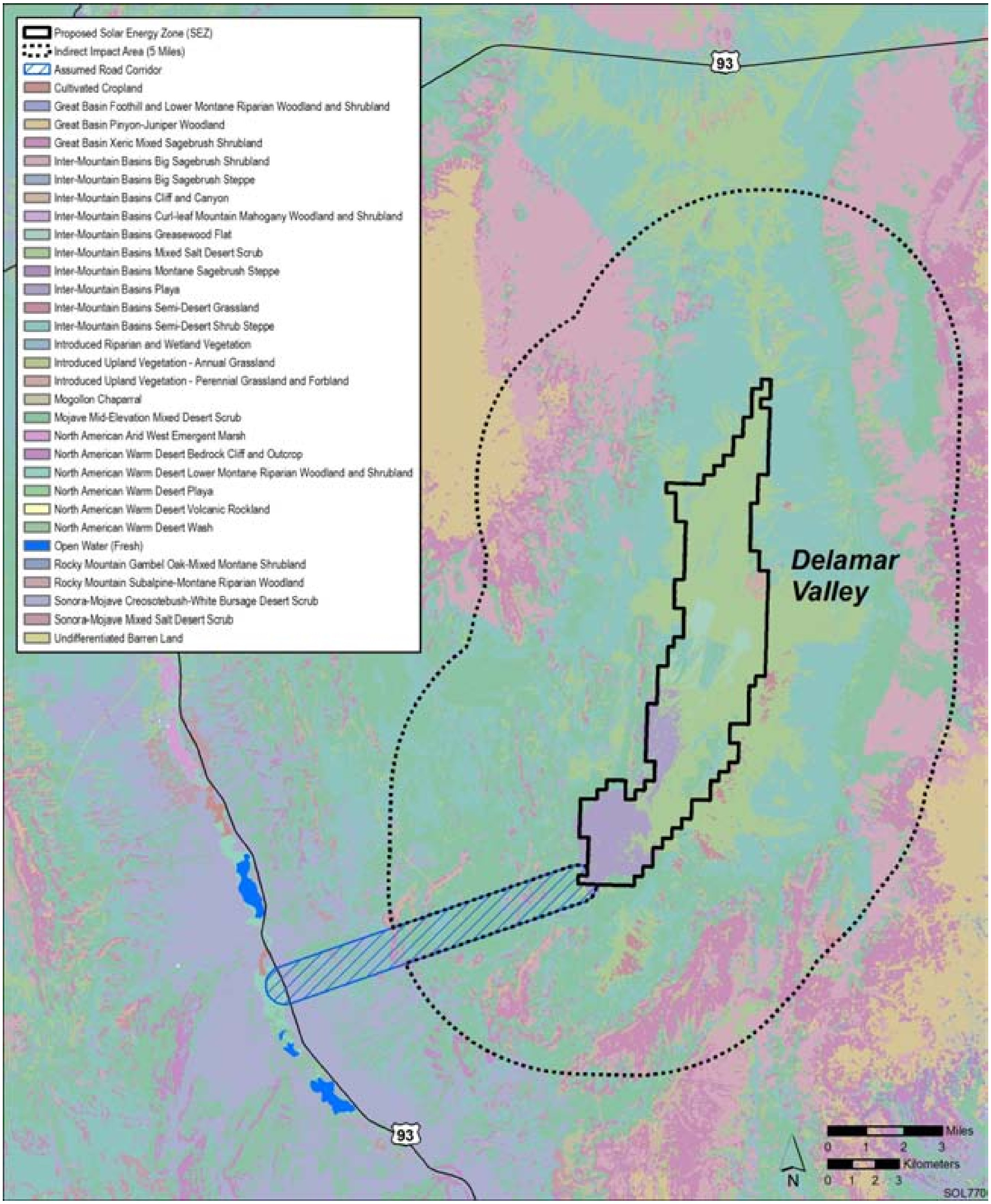

FIGURE 11.2.10.1-1 Land Cover Types within the Proposed Delamar Valley SEZ (Source: USGS 2004)

TABLE 11.2.10.1-1 Land Cover Types within the Potentially Affected Area of the Proposed Delamar Valley SEZ and Potential Impacts

Land Cover Type[a]	Area of Cover Type Affected (acres)[b]			
	Within SEZ (Direct Effects)[c]	Access Road (Direct Effects)[d]	Corridor and Outside SEZ (Indirect Effects)[e]	Overall Impact Magnitude[f]
Inter-Mountain Basins Mixed Salt Desert Scrub: Generally consists of open shrublands that include at least one species of *Atriplex*, along with other shrubs. Perennial grasses dominate a sparse to moderately dense herbaceous layer.	10,269 acres[g] (2.6%, 2.7%)	2 acres (<0.1%)	21,848 acres (5.6%)	Moderate
Inter-Mountain Basins Playa: Playa habitats are intermittently flooded and generally barren or sparsely vegetated. Depressions may contain small patches of grass, and sparse shrubs may occur around playa margins.	3,088 acres (18.3%, 18.5%)	1 acre (<0.1%)	526 acres (3.1%)	Large
Inter-Mountain Basins Semi-Desert Shrub Steppe: Generally consists of perennial grasses with an open shrub and dwarf shrub layer.	1,072 acres (0.2%, 0.3%)	13 acres (<0.1%)	46,797 acres (10.1%)	Small
Mojave Mid-Elevation Mixed Desert Scrub: The vegetation composition is quite variable. Dominant species include shrubs forbs, and grasses and may include *Yucca* spp.	977 acres (0.1%, 0.1%)	31 acres (<0.1%)	40,770 acres (4.3%)	Small
Inter-Mountain Basins Greasewood Flat: Dominated or codominated 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 codominated by, other shrubs and may include a graminoid herbaceous layer.	964 acres (5.5%, 7.0%)	<1 acres (<0.1%)	163 acres (0.9%)	Moderate

TABLE 11.2.10.1-1 (Cont.)

Land Cover Type[a]	Area of Cover Type Affected (acres)[b] Within SEZ (Direct Effects)[c]	Access Road (Direct Effects)[d]	Corridor and Outside SEZ (Indirect Effects)[e]	Overall Impact Magnitude[f]
Introduced Upland Vegetation – Perennial Grassland and Forbland: Dominated by non-native perennial grass and forb species.	171 acres (5.3%, 6.2%)	0 acres	375 acres (11.7%)	Moderate
Inter-Mountain Basins Semi-Desert Grassland: Consists of perennial bunchgrasses as dominants or codominants. Scattered shrubs or dwarf shrubs may also be present.	10 acres (0.1%, 0.2%)	0 acres	885 acres (12.4%)	Small
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.	1 acre (<0.1%, 0.3%)	0 acres	1 acre (<0.1%)	Small
Sonora–Mojave Creosotebush–White Bursage Desert Scrub: Occurs in broad valleys, lower bajadas, plains, and low hills in the Mojave and Sonoran Deserts. Shrubs form a sparse to moderately dense cover (2 to 50%), although the ground surface may be mostly barren. The dominant species are typically creosotebush (*Larrea tridentata*) and white bursage (*Ambrosia dumosa*). Other shrubs, dwarf-shrubs, and cacti may also be dominant or form sparse understories. Herbaceous species are typically sparse, but may be seasonally abundant.	0 acres	12 acres (<0.1%)	3,540 acres (0.4%)	Small
North American Warm Desert Lower Montane Riparian Woodland and Shrubland: Occurs along perennial and seasonally intermittent streams in mountain canyons and valleys. Consists of a mix of woodlands and shrublands.	0 acres	1 acre (<0.1%)	125 acres (2.0%)	Small

TABLE 11.2.10.1-1 (Cont.)

Land Cover Type[a]	Area of Cover Type Affected (acres)[b] Within SEZ (Direct Effects)[c]	Access Road (Direct Effects)[d]	Corridor and Outside SEZ (Indirect Effects)[e]	Overall Impact Magnitude[f]
Great Basin Xeric Mixed Sagebrush Shrubland: Generally occurs on level plains, slopes, and ridges. The dominant shrub species are black sagebrush (*Artemisia nova*) or, at higher elevations, little sagebrush (*Artemisia arbuscula*), and codominants may be Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) or yellow rabbitbrush (*Chrysothamnus viscidiflorus*). Other shrub species, as well as sparse perennial bunchgrasses, may also be present.	0 acres	1 acre (<0.1%)	12,382 acres (2.8%)	Small
North American Warm Desert Bedrock Cliff and Outcrop: Occurs on subalpine to foothill steep cliff faces, narrow canyons, rock outcrops, and unstable scree and talus slopes. Consists of barren and sparsely vegetated areas (generally <10% plant cover) with desert species, especially succulents. Lichens are predominant in some areas.	0 acres	1 acre (<0.1%)	160 acres (0.1%)	Small
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	1 acre (<0.1%)	23,226 acres 3.8 %)	Small
Sonora-Mojave Mixed Salt Desert Scrub: Extensive open-canopied shrublands in the Mojave and Sonoran deserts, usually occurring around playas and in valley bottoms or basins with saline soils. Vegetation is typically composed of one or more *Atriplex* species; other salt-tolerant plants are often present or even codominant. Grasses occur at varying densities.	0 acres	1 acre (<0.1%)	193 acres (1.2%)	Small

TABLE 11.2.10.1-1 (Cont.)

	Area of Cover Type Affected (acres)[b]			
Land Cover Type[a]	Within SEZ (Direct Effects)[c]	Access Road (Direct Effects)[d]	Corridor and Outside SEZ (Indirect Effects)[e]	Overall Impact Magnitude[f]
Inter-Mountain Basins Cliff and Canyon: Includes barren and sparsely vegetated (generally <10% plant cover) steep cliff faces, narrow canyons, small rock outcrops, and scree and talus slopes. Composed of widely scattered coniferous trees and a variety of shrubs.	0 acres	<1 acre (<0.1%)	1,546 acres (6.7%)	Small
North American Warm Desert Wash: Consists of intermittently flooded linear or braided strips within desert scrub or grassland landscapes on bajadas, mesas, plains, and basin floors. Although often dry, washes are associated with rapid sheet and gully flow. The vegetation varies from sparse and patchy to moderately dense and typically occurs along the banks, but may occur within the channel. Shrubs and small trees are typically intermittent to open. Common upland shrubs often occur along the edges.	0 acres	<1 acre (<0.1%)	27 acres (0.2%)	Small
Introduced Riparian and Wetland Vegetation: Dominated by non-native riparian and wetland plant species.	0 acres	<1 acre (<0.1%)	5 acres (0.3%)	Small
Great Basin Pinyon-Juniper Woodland: Occurs on low-elevation slopes and ridges. Singleleaf pinyon (*Pinus monophylla*), Utah juniper (*Juniperus osteosperma*), or both are the dominant species, generally associating with curl-leaf mountain mahogany (*Cercocarpus ledifolius*). Understory species include shrubs and grasses.	0 acres	0 acres	2,920 acres (0.4%)	Small
Introduced Upland Vegetation – Annual Grassland: Dominated by non-native annual grass species.	0 acres	0 acres	408 acres (15.3%)	Small

TABLE 11.2.10.1-1 (Cont.)

	Area of Cover Type Affected (acres)[b]			
Land Cover Type[a]	Within SEZ (Direct Effects)[c]	Access Road (Direct Effects)[d]	Corridor and Outside SEZ (Indirect Effects)[e]	Overall Impact Magnitude[f]
Inter-Mountain Basins Montane Sagebrush Steppe: Occurs on flats, ridges, level ridgetops, and mountain slopes. Mountain big sagebrush (*Artemisia tridentata vaseyana*) and related taxa such as big sagebrush (*Artemisia tridentata spiciformis*) are typically the dominant species. Perennial herbaceous species, especially grasses, are usually abundant, although shrublands are also present.	0 acres	0 acres	16 acres (0.1%)	Small
Great Basin Foothill and Lower Montane Riparian Woodland and Shrubland: Composed of a mosaic of multiple tree-dominated communities with diverse shrubs. Sedges, rushes, perennial grasses; mesic forbs are the dominant herbaceous species. Disturbed areas often include non-native grasses.	0 acres	0 acres	6 acres (<0.1%)	Small
Undifferentiated Barren Land: Includes a variety of barren areas, generally with less than 15% cover of vegetation.	0 acres	0 acres	2 acres (1.6%)	Small

a Land cover descriptions are from USGS (2005a). Full descriptions of land cover types, including plant species, can be found in Appendix I.

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.

d For access road development, direct effects were estimated within an 8-mi (13-km) long, 60-ft (18-m) wide road ROW from the SEZ to the nearest state highway. Direct impacts within this area were determined from the proportion of the cover type within the 1-mi (1.6-km) wide road corridor. Impacts are for the area of the cover type within the assumed ROW, and the percentage that area represents of all occurrences of that cover type within the SEZ region.

Footnotes continued on next page.

TABLE 11.2.10.1-1 (Cont.)

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[e] 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 the 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. 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.

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

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

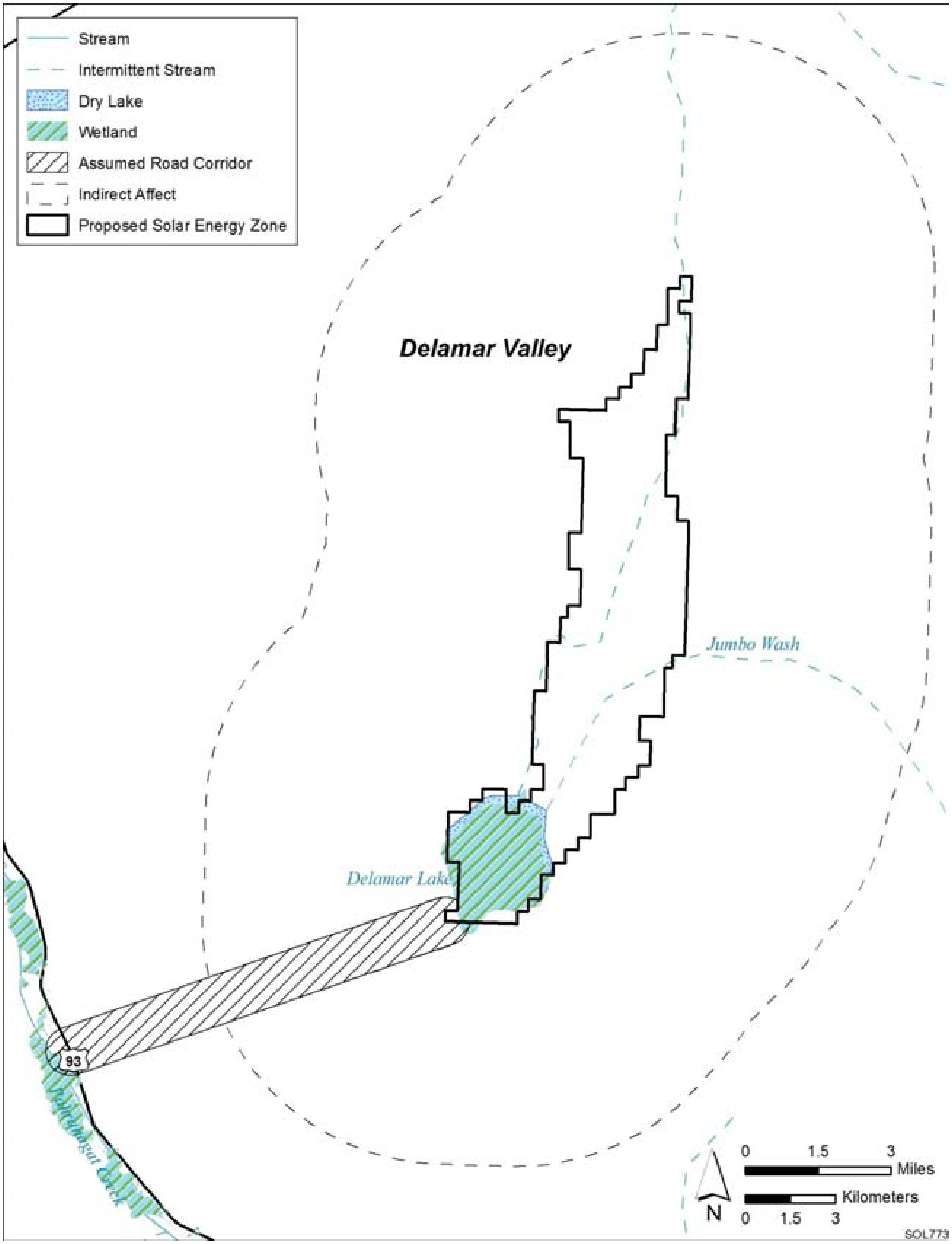

FIGURE 11.2.10.1-2 Wetlands within the Proposed Delamar Valley SEZ (Source USFWS 2009a)

Basins Mixed Salt Desert Scrub. Approximately 2,364 acres (9.6 km^2) of this 2,648.8-acre (10.7-km^2) wetland is located within the SEZ. The remaining portion is located entirely within the indirect effects area. Smaller playa areas not mapped by the NWI occur north of Delamar Lake. A 1-acre (0.004-km^2) area mapped as Northern American Arid West Emergent Marsh is located within the SEZ, south of Delamar Lake playa. Numerous dry washes occur within the SEZ, generally flowing to the south and terminating in the large playa. These washes typically do not support wetland or riparian habitats. Jumbo Wash is an intermittent stream and, along with an unnamed intermittent stream, is a major surface drainage on the SEZ. The dry washes and playas typically contain water for short periods during or following precipitation events. Springs occur in the vicinity of the SEZ, but are disconnected from the main groundwater flow system (see Section 11.2.9).

Approximately 133 acres (0.5 km^2) of wetlands, including a large wetland complex and several smaller wetlands, occurs along and near Pahranagat Creek, a riverine wetland, within the southwestern end of the assumed access road corridor. A portion of these wetlands is supported by springs and is part of the Pahranagat NWR. These wetlands are predominantly palustrine wetlands with emergent plant communities, ranging from temporarily flooded to saturated, seasonally flooded, and semipermanently flooded. Small areas of permanently flooded palustrine wetlands with sparse plant communities and saturated and seasonally flooded palustrine forested wetlands also occur. All except 2.4 acres (0.01 km^2) of wetland occur to the west of U.S. 93. The wetlands are mapped as North American Warm Desert Lower Montane Riparian Woodland and Shrubland, North American Warm Desert Wash, Introduced Riparian and Wetland Vegetation, Sonora-Mojave Creosotebush-White Bursage Desert Scrub, and small areas of Mojave Mid-Elevation Mixed Desert Scrub. An additional 29.3 acres (0.1 km^2) of wetland within the corridor occurs adjacent to the SEZ and is associated with Delamar Lake.

The State of Nevada maintains an official list of weed species designated as noxious species. Table 11.2.10.1-2 provides a summary of the noxious weed species regulated in Nevada that are known to occur in Lincoln County (USDA 2010; Creech et al. 2010), which includes the proposed Delamar Valley SEZ. Sahara mustard is known to occur in the southern portion of the SEZ. Halogeton and tumbleweed, invasive species not regulated by Nevada, were observed on the SEZ in August 2009.

The Nevada Department of Agriculture classifies noxious weeds into one of three categories (NDA 2010):

- "Category A: Weeds not found or limited in distribution throughout the state; actively excluded from the state and actively eradicated wherever found; actively eradicated from nursery stock dealer premises; control required by the state in all infestations."

- "Category B: Weeds established in scattered populations in some counties of the state; actively excluded where possible, actively eradicated from nursery stock dealer premises; control required by the state in areas where populations are not well established or previously unknown to occur."

TABLE 11.2.10.1-2 Designated Noxious Weeds of Nevada Occurring in Lincoln County

Common Name	Scientific Name	Category
Black henbane[a]	*Hyoscyamus niger*	A
Dalmatian toadflax[a,b]	*Linaria dalmatica*	A
Diffuse knapweed[a]	*Centaurea diffusa*	B
Hoary cress[b]	*Cardaria draba*	C
Johnsongrass[a]	*Sorghum halepense*	C
Mayweed chamomile[b]	*Anthemis cotula*	A
Malta star thistle[a]	*Centaurea melitensis*	A
Puncture vine[b]	*Tribulus terrestris*	C
Sahara/African mustard[a]	*Brassica tournefortii*	B
Saltcedar[b]	*Tamarix* spp.	C
Spotted knapweed[a,b]	*Centaurea maculosa*	A
Water hemlock[a]	*Cicuta maculata*	C

[a] Creech et al. (2010).

[b] USDA (2010).

- "Category C: Weeds currently established and generally widespread in many counties of the state; actively eradicated from nursery stock dealer premises; abatement at the discretion of the state quarantine officer."

11.2.10.2 Impacts

The construction of solar energy facilities within the proposed Delamar Valley SEZ would result in direct impacts on plant communities due to the removal of vegetation within the facility footprint during land-clearing and land-grading operations. Approximately 80% of the SEZ (13,242 acres [53.6 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 elimination of a community or the replacement of one community type by another. The proper implementation of programmatic design features, however, would reduce indirect effects to a minor or small level of impact.

Possible impacts from solar energy facilities on vegetation within the SEZ 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 from any additional mitigation applied. Section 11.2.10.2.3, below, identifies design features of particular relevance to the proposed Delamar Valley SEZ.

11.2.10.2.1 Impacts on Native Species

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

Solar facility construction and operation in the proposed Delamar Valley SEZ would primarily affect communities of the Inter-Mountain Basins Mixed Salt Desert Scrub cover type. Additional cover types that would be affected within the SEZ include Inter-Mountain Basins Playa, Inter-Mountain Basins Semi-Desert Shrub Steppe, Mojave Mid-Elevation Mixed Desert Scrub, Inter-Mountain Basins Greasewood Flat, Introduced Upland Vegetation – Perennial Grassland and Forbland, Inter-Mountain Basins Semi-Desert Grassland, and North American Arid West Emergent Marsh. Additional cover types that would be affected only by the assumed access road include Sonora–Mojave Creosotebush–White Bursage Desert Scrub, North American Warm Desert Lower Montane Riparian Woodland and Shrubland, Great Basin Xeric Mixed Sagebrush Shrubland, North American Warm Desert Bedrock Cliff and Outcrop, Inter-Mountain Basins Big Sagebrush Shrubland, Sonora-Mojave Mixed Salt Desert Scrub, Inter-Mountain Basins Cliff and Canyon, North American Warm Desert Wash, and Introduced Riparian and Wetland Vegetation. The Introduced Upland Vegetation – Perennial Grassland and Forbland and Introduced Riparian and Wetland Vegetation cover types would likely have relatively minor populations of native species. Table 11.2.10.1-1 summarizes the potential impacts on land cover types resulting from solar energy facilities in the proposed Delamar Valley SEZ. Most of these cover types are relatively common in the SEZ region; however, several cover types are relatively uncommon, representing 1% or less of the land area within the SEZ region: Inter-Mountain Basins Cliff and Canyon (0.5%), Inter-Mountain Basins Playa (0.3%), Inter-Mountain Basins Greasewood Flat (0.3%), North American Warm Desert Wash (0.3%), Inter-Mountain Basins Semi-Desert Grassland (0.1%), North American Arid West Emergent Marsh (0.08%), Introduced Upland Vegetation –Perennial Grassland and Forbland (0.06%), and Introduced Riparian and Wetland Vegetation (0.03%). Desert dry washes, playas, wetlands, and Joshua tree communities are sensitive habitats on the SEZ.

The construction, operation, and decommissioning of solar projects within the proposed Delamar Valley SEZ would result in large impacts on the Inter-Mountain Basins Playa cover type. Solar project development within the SEZ would result in moderate impacts on Inter-Mountain Basins Mixed Salt Desert Scrub, Inter-Mountain Basins Greasewood Flat, and Introduced Upland Vegetation – Perennial Grassland and Forbland cover types, and small impacts on all other cover types within the affected area.

Solar project development within the northern portion of the SEZ could result in direct and indirect impacts on the Joshua tree forest community that occurs within the Inter-Mountain Basins Mixed Salt Desert Scrub and Inter-Mountain Basins Semi-Desert Shrub Steppe cover types. Joshua tree communities within the assumed access road corridor could also be directly and indirectly affected.

Because of the arid conditions, reestablishment of shrub, shrub steppe, or grassland communities in temporarily disturbed areas would likely be very difficult and might require extended periods of time. It is unlikely that winterfat communities on the SEZ would be effectively restored. 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. Cryptogamic soil crusts occur in many of the shrubland communities in the region. Damage to these crusts, by the operation of heavy equipment or other vehicles, can alter important soil characteristics, such as nutrient cycling and availability, and affect plant community characteristics (Lovich and Bainbridge 1999).

The deposition of fugitive dust from large areas of disturbed soil onto habitats outside a solar project area could result in reduced productivity or changes in plant community composition. Fugitive dust deposition could affect plant communities of each of the cover types occurring within the indirect effects area identified in Table 11.2.10.1-1.

Communities associated with Delamar Lake and other playa habitats, Jumbo Wash and the unnamed intermittent stream, greasewood flats communities, riparian habitats, marsh, or other intermittently flooded areas within or downgradient from solar projects or access road could be affected by ground-disturbing activities. Site-clearing and -grading could disrupt surface water flow patterns, resulting in changes in the frequency, duration, depth, or extent of inundation or soil saturation, and could potentially alter playa, riparian, marsh, or greasewood flats plant communities, including occurrences outside the SEZ, and affect community function. Increases in surface runoff from a solar energy project site or access road could also affect hydrologic characteristics of these communities. The introduction of contaminants into these habitats could result from spills of fuels or other materials used on a project site. Soil disturbance could result in sedimentation in these areas, which could degrade or eliminate sensitive plant communities. Grading could also affect dry wash habitats within the SEZ or access road footprint. 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.

Potential impacts on wetlands as a result of solar energy facility development are described in Section 5.6.1. Approximately 2,364 acres (9.6 km^2) of wetland habitat has been identified within the SEZ, associated with the Delamar Lake playa, and could be affected by project development. In addition, a 1-acre (0.004-km^2) area mapped as North American Arid West Emergent Marsh could be affected in the southern portion of the SEZ. Direct impacts on the wetland would occur if fill material were placed within the playa or marsh for solar facility construction. Indirect impacts, as described above, could occur with project construction near or upgradient from Delamar Lake.

The construction of access roads within the assumed road corridor could potentially result in direct impacts on wetlands that may occur in or near the roadway if fill material were placed within wetland areas or could result in indirect impacts. Approximately 162 acres (0.7 km^2) of wetland habitat within the assumed access road corridor could be affected by construction. Grading could result in direct impacts on the wetlands within the access road corridor. Approximately 132.8 acres (0.5 km^2) occurs near the western end of the corridor, near U.S. 93, with the remaining wetland area associated with Delamar Lake. However, all except 2.4 acres (0.01 km^2) of wetland near U.S. 93 occurs to the west of the highway and would be unlikely to be directly affected. Grading near wetlands in or near the corridor 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 wetland function. Increases in surface runoff from an access road could also affect wetland hydrologic characteristics. The introduction of contaminants into wetlands in or near the corridor could result from spills of fuels or other materials. Soil disturbance could result in sedimentation in wetland areas, which could degrade or eliminate wetland plant communities. Sedimentation effects or hydrologic changes could extend to wetlands outside of the corridor.

The use of groundwater within the proposed Delamar Valley SEZ for technologies with high water requirements, such as wet-cooling systems, could disrupt the groundwater flow pattern and adversely affect the springs and wetlands within the Pahranagat NWR, southwest of the SEZ (see Section 11.2.9). Subsequent reductions in groundwater discharges at the springs could result in degradation of these habitats. The potential for impacts on springs would need to be evaluated through project-specific hydrological studies.

11.2.10.2.2 Impacts from Noxious Weeds and Invasive Plant Species

Executive Order (E.O.) 13112, "Invasive Species," directs federal agencies to prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological, and human health impacts of invasive species (*Federal Register*, Volume 64, page 61836, Feb. 8, 1999). Potential effects of noxious weeds and invasive plant species that could result from solar energy facilities are described in Section 5.10.1. Noxious weeds and invasive species could inadvertently be brought to a project site by equipment previously used in infested areas, or they may be present on or near a project site. 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 the affected area of the proposed Delamar Valley SEZ, and increase the probability that weeds could be transported into areas that were previously relatively weed-free. This could result in reduced restoration success and possible widespread habitat degradation.

Invasive species, including halogeton and tumbleweed, occur on the SEZ. Additional species designated as noxious weeds in Nevada, and known to occur in Lincoln County, are given in Table 11.2.10.1-2. Approximately 171 acres (0.7 km^2) of Introduced Upland Vegetation – Perennial Grassland and Forbland occurs within the SEZ and 375 acres (1.5 km^2) in the indirect effects area; <1 acre (0.004 km^2) of Introduced Riparian and Wetland Vegetation occurs in the assumed access road corridor and 5 acres (0.02 km^2) in the indirect effects area;

approximately 171 acres (0.7 km^2) of Introduced Upland Vegetation – Annual Grassland occurs within the indirect effects area. Disturbance associated with solar project development may promote the establishment and spread of invasive species associated with these cover types. Past or present land uses, such as grazing or OHV activity, may affect the susceptibility of plant communities to the establishment of noxious weeds and invasive species. Disturbance associated with existing roads and transmission lines within the SEZ area of potential impacts also likely contributes to the susceptibility of plant communities to the establishment and spread of noxious weeds and invasive species.

11.2.10.3 SEZ-Specific Design Features and Design Feature Effectiveness

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

- An Integrated Vegetation Management Plan, addressing invasive species control, and an Ecological Resources Mitigation and Monitoring Plan addressing habitat restoration should be approved and implemented to increase the potential for successful restoration of affected habitats and minimize the potential for the spread of invasive species, such as halogeton or tumbleweed. Invasive species control should focus on biological and mechanical methods where possible to reduce the use of herbicides.

- Dry washes, Delamar Lake playa, and the nearby marsh should be avoided to the extent practicable, and any impacts minimized and mitigated. Appropriate engineering controls should be used to minimize impacts on wetlands within the assumed access road corridor, as well as dry washes, Delamar Lake and other playas, and riparian, marsh, and greasewood flat habitats within the SEZ and corridor, including downstream occurrences, resulting from surface water runoff, erosion, sedimentation, altered hydrology, accidental spills, or fugitive dust deposition. All wetland, dry wash, and riparian 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, playas, dry washes, and riparian areas to reduce the potential for impacts. Appropriate buffers and engineering controls would be determined through agency consultation.

- Joshua tree communities are protected by the State of Nevada and should be avoided in the northern areas of the SEZ and along the assumed access road corridor. Any Joshua trees in areas of direct impacts should be salvaged.

- Cactus species, including cholla, or ocotillo should be avoided. Any cacti that cannot be avoided should be salvaged.

- Groundwater withdrawals should be limited to reduce the potential for indirect impacts on springs and wetlands in the vicinity of the SEZ, at Pahranagat NWR. Potential impacts on springs should be determined through hydrological studies.

If these SEZ-specific design features are implemented in addition to other programmatic design features, it is anticipated that a high potential for impacts from invasive species and impacts on Joshua tree communities, dry washes, playas, springs, riparian habitats, greasewood flats, and wetlands would be reduced to a minimal potential for impacts.

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11.2.11 Wildlife and Aquatic Biota

This section addresses wildlife (amphibians, reptiles, birds, and mammals) and aquatic biota that could occur within the potentially affected area of the proposed Delamar Valley SEZ. Wildlife known to occur within 50 mi (80 km) of the SEZ (i.e., the SEZ region) were determined from SWReGAP (USGS 2007). Land cover types suitable for each species were determined from SWReGAP (USGS 2004, 2005a, 2007). The amount of aquatic habitat within the SEZ region was determined by estimating the length of linear perennial stream features and the area of standing water body features (i.e., ponds, lakes, and reservoirs) within 50 mi (80 km) of the SEZ using available GIS surface water datasets.

The affected area considered in this assessment included the areas of direct and indirect effects. The area of direct effects was defined as the area that would be physically modified during project development (i.e., where ground-disturbing activities would occur) and included the SEZ and a 60-ft (18-m) wide portion of an assumed 8-mi (13-km) long access road corridor. The maximum developed area within the SEZ would be 13,242 acres (53.6 km^2).

The area of indirect effects was defined as the area within 5 mi (8 km) of the SEZ boundary and within a 1.0-mi (1.6-km) access road corridor 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 road construction area). Potentially suitable habitat within the SEZ greater than the maximum of 13,242 acres (53.6 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.

The primary land cover habitat type within the affected area is Inter-Mountain Basins Mixed Salt Desert Scrub (see Section 11.2.10). Temporary aquatic habitats that occur in the SEZ and the area of indirect effects include Delamar Lake (a dry lake), Jumbo Wash, and an unnamed dry wash (see Figure 11.2.9.1-1).

11.2.11.1 Amphibians and Reptiles

11.2.11.1.1 Affected Environment

This section addresses amphibian and reptile species that are known to occur, or for which potentially suitable habitat occurs, on or within the potentially affected area of the proposed Delamar Valley SEZ. The list of amphibian and reptile species potentially present in the SEZ area was determined from species lists available from the NNHP (NDCNR 2002) and range maps and habitat information available from the SWReGAP (USGS 2007). Land cover types suitable for each species were determined from SWReGAP (USGS 2004, 2005a, 2007). See Appendix M for additional information on the approach used.

Based on species distributions within the area of the SEZ and habitat preferences of the amphibian species, the Great Basin spadefoot (*Spea intermontana*) and red-spotted toad (*Bufo punctatus*) would be expected to occur within the SEZ (USGS 2007; Stebbins 2003). They would most likely occur in the portions of the SEZ that overlap the dry lake and wash habitats.

More than 25 reptile species occur within the area that encompasses the proposed Delamar Valley SEZ (USGS 2007; Stebbins 2003). The desert tortoise (*Gopherus agassizii*) is a federal and state-listed threatened species and is discussed in Section 11.2.12. Lizard species expected to occur within the SEZ include the desert horned lizard (*Phrynosoma platyrhinos*), Great Basin collared lizard (*Crotaphytus bicinctores*), long-nosed leopard lizard (*Gambelia wislizenii*), side-blotched lizard (*Uta stansburiana*), western fence lizard (*Sceloporus occidentalis*), western whiptail (*Cnemidophorus tigris*), and zebra-tailed lizard (*Callisaurus draconoides*). Snake species expected to occur within the SEZ are the coachwhip (*Masticophis flagellum*), glossy snake (*Arizona elegans*), gophersnake (*Pituophis catenifer*), groundsnake (*Sonora semiannulata*), and nightsnake (*Hypsiglena torquata*). The sidewinder (*Crotalus cerastes*) would be the most common poisonous snake species expected to occur on the SEZ.

Table 11.2.11.1-1 provides habitat information for representative amphibian and reptile species that could occur within the proposed Delamar Valley SEZ. Special status amphibian and reptile species are addressed in Section 11.2.12.

11.2.11.1.2 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 in Appendix A, Section A.2.2, and through any additional mitigation applied. Section 11.2.11.1.3, below, identifies SEZ-specific design features of particular relevance to the proposed Delamar Valley 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 11.2.11.1.1 following the analysis approach described in Appendix M. Additional NEPA assessments and coordination with state natural resource agencies may be needed to address project-specific impacts more thoroughly. These assessments and consultations could result in additional required actions to avoid or mitigate impacts on amphibians and reptiles (see Section 11.2.11.1.3).

In general, impacts on amphibians and reptiles would result from habitat disturbance (i.e., habitat reduction, fragmentation, and alteration) and from disturbance, injury, or mortality to individual amphibians and reptiles. On the basis of the magnitude of impacts on amphibians and reptiles summarized in Table 11.2.11.1-1, direct impacts on representative amphibian and

TABLE 11.2.11.1-1 Habitats, Potential Impacts, and Potential Mitigation for Representative Amphibian and Reptile Species That Could Occur on or in the Affected Area of the Proposed Delamar Valley SEZ

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Maximum Area of Potential Habitat Affected[b]: Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Amphibians					
Great Basin spadefoot (*Spea intermontana*)	Sagebrush flats, semidesert shrublands, pinyon-juniper woodlands, and spruce-fir forests. Breeds in temporary and permanent waters including rain pools, pools in intermittent streams, and flooded areas along streams. About 2,199,200 acres[h] of potentially suitable habitat occurs within the SEZ region.	10,269 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat) during construction and operations	60,070 acres of potentially suitable habitat (2.7% of available potentially suitable habitat)	3.5 acres of potentially suitable habitat lost (<0.0002% of available potentially suitable habitat) and 306.5 acres in area of indirect effects	Small overall impact. Avoid Delamar Lake and wash habitats.
Red-spotted toad (*Bufo punctatus*)	Dry, rocky areas at lower elevations near desert springs and persistent pools along rocky arroyos, desert streams and oases, open grassland, scrubland oaks, and dry woodlands. About 3,069,900 acres of potentially suitable habitat occurs within the SEZ region.	11,427 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat) during construction and operations	66,999 acres of potentially suitable habitat (2.2% of available potentially suitable habitat)	45 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 3,941 acres in area of indirect effects	Small overall impact. Avoid Delamar Lake and wash habitats.
Lizards					
Desert horned lizard (*Phrynosoma platyrhinos*)	Deserts dominated by sagebrush, creosotebush, greasewood, or cactus. Occurs on sandy flats, alluvial fans, washes, and edge of dunes. Burrows in soil during periods of inactivity. About 4,068,300 acres of potentially suitable habitat occurs in the SEZ region.	13,242 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	147,352 acres of potentially suitable habitat (3.6% of available potentially suitable habitat)	64 acres of potentially suitable habitat lost (<0.002% of available potentially suitable habitat) and 5,534 acres in area of indirect effects	Small overall impact. Avoid wash habitats; otherwise no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.

TABLE 11.2.11.1-1 (Cont.)

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]	
Lizards (Cont.)					
Great Basin collared lizard (*Crotaphytus bicinctores*)	Usually inhabits alluvia, lava flows, mountain slopes, canyons, buttes, rock outcrops, washes, and rocky plains. Limiting factors are the presence of large boulders and open/sparse vegetation. About 3,410,000 acres of potentially suitable habitat occurs in the SEZ region.	12,318 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat) during construction and operations	121,938 acres of potentially suitable habitat (3.6% of available potentially suitable habitat)	61 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 5,327 acres in area of indirect effects	Small overall impact. Avoid wash habitats; otherwise no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Long-nosed leopard lizard (*Gambelia wislizenii*)	Desert and semidesert areas with scattered shrubs. Prefers sandy or gravelly flats and plains. Also prefers areas with abundant rodent burrows that they occupy when inactive. About 3,390,900 acres of potentially suitable habitat occurs in the SEZ region.	11,246 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	97,859 acres of potentially suitable habitat (2.9% of available potentially suitable habitat)	47 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 4,102 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Side-blotched lizard (*Uta stansburiana*)	Low to moderate elevations in washes, arroyos, boulder-strewn ravines, rocky cliff bases, and flat shrubby areas in canyon bottoms. Often along sandy washes. Usually in areas with a lot of bare ground. About 2,714,400 acres of potentially suitable habitat occurs within the SEZ region.	987 acres of potentially suitable habitat lost (0.04% of available potentially suitable habitat) during construction and operations	45,951 acres of potentially suitable habitat (1.7% of available potentially suitable habitat)	45 acres of potentially suitable habitat lost (<0.002% of available potentially suitable habitat) and 3,598 acres in area of indirect effects	Small overall impact. Avoid wash habitats.

TABLE 11.2.11.1-1 (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.)					
Western fence lizard (*Sceloporus occidentalis*)	Disturbed areas, roadsides, gravel beds, rock quarries, lava flows, outcrops, talus slopes, shrublands, riparian areas, and coniferous woodlands. About 3,975,900 acres of potentially suitable habitat occurs within the SEZ region.	11,341 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	110,016 acres of potentially suitable habitat (2.8% of available potentially suitable habitat)	32 acres of potentially suitable habitat lost (<0.001% of available potentially suitable habitat) and 2,749 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Western whiptail (*Cnemidophorus tigris*)	Arid and semiarid habitats with sparse plant cover. About 3,997,400 acres of potentially suitable habitat occurs within the SEZ region.	13,242 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	124,221 acres of potentially suitable habitat (3.1% of available potentially suitable habitat)	61 acres of potentially suitable habitat lost (<0.002% of available potentially suitable habitat) and 5,285 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Zebra-tailed lizard (*Callisaurus draconoides*)	Open, warm-desert habitats, especially dry washes and canyons with fine gravel and sand. About 2,820,300 acres of potentially suitable habitat occurs in the SEZ region.	11,246 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat) during construction and operations	74,686 acres of potentially suitable habitat (2.6% of available potentially suitable habitat)	47 acres of potentially suitable habitat lost (<0.002% of available potentially suitable habitat) and 4,075 acres in area of indirect effects	Small overall impact. Avoid wash habitats; otherwise no species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.

TABLE 11.2.11.1-1 (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					
Coachwhip (*Masticophis flagellum*)	Creosotebush desert, shortgrass prairie, shrub-covered flats and hills. Sandy to rocky substrates. Avoids dense vegetation. About 3,320,000 acres of potentially suitable habitat occurs within the SEZ region.	2,046 acres of potentially suitable habitat lost (0.06% of available potentially suitable habitat) during construction and operations	89,206 acres of potentially suitable habitat (2.7% of available potentially suitable habitat)	28 acres of potentially suitable habitat lost (<0.001% of available potentially suitable habitat) and 2,430 acres in area of indirect effects	Small overall impact.
Glossy snake (*Arizona elegans*)	Light shrubby to barren deserts, sagebrush flats, grasslands, and chaparral-covered slopes and woodlands. Prefers sandy grasslands, shrublands and woodlands. About 2,041,300 acres of potentially suitable habitat occurs within the SEZ region.	4,170 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	72,721 acres of potentially suitable habitat (3.6% of available potentially suitable habitat)	26 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 2,298 acres in area of indirect effects	Small overall impact.
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 3,938,700 acres of potentially suitable habitat occurs in the SEZ region.	4,075 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	80,418 acres of potentially suitable habitat (2.0% of available potentially suitable habitat)	48 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 4,179 acres in area of indirect effects	Small overall impact.

TABLE 11.2.11.1-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Maximum Area of Potential Habitat Affected[b]: Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Snakes (Cont.)					
Groundsnake (*Sonora semiannulata*)	Arid and semiarid regions with rocky to sandy soils. River bottoms, desert flats, sand hummocks, and rocky hillsides. About 4,077,100 acres of potentially suitable habitat occurs in the SEZ region.	2,059 acres of potentially suitable habitat lost (0.05% of available potentially suitable habitat) during construction and operations	125,481 acres of potentially suitable habitat (3.1% of available potentially suitable habitat)	59 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 5,166 acres in area of indirect effects	Small overall impact.
Nightsnake (*Hypsiglena torquata*)	Arid and semiarid desert flats, plains, and woodlands; areas with rocky and sandy soils are preferred. During cold periods of the year, it seeks refuge underground, in crevices, or under rocks. About 2,733,300 acres of potentially suitable habitat occurs within the SEZ region.	13,242 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat) during construction and operations	76,936 acres of potentially suitable habitat (2.8% of available potentially suitable habitat)	29 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 2,484 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Sidewinder (*Crotalus cerastes*)	Windblown sand habitats near rodent burrows. Most common in areas of sand hummocks topped with creosote, mesquite, or other desert plants. About 1,825,400 acres of potentially suitable habitat occurs within the SEZ region.	977 acres of potentially suitable habitat lost (0.05% of available potentially suitable habitat) during construction and operations	40,561 acres of potentially suitable habitat (2.2% of available potentially suitable habitat)	45 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 3,874 acres in area of indirect effects	Small overall impact.

[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.

Footnotes continued on next page.

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TABLE 11.2.11.1-1 (Cont.)

[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. A maximum of 13,242 acres of direct effects within the SEZ was assumed.

[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.

[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 13,242 acres of direct effects was also added to the area of indirect effects. 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 an 8-mi (13-km) long, 60-ft (18-m) wide access road ROW from the SEZ to the nearest existing highway. Indirect effects were estimated within a 1-mi (1.6-km) wide access road corridor to the existing highway, less the assumed area of direct effects.

[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.

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

Sources: CDFG (2008); NatureServe (201); NDCNR (2002); USGS (2004, 2005a, 2007).

reptile species would be small, ranging from 0.05% for the side-blotched lizard to 0.5% for the nightsnake (Table 11.2.11.1-1). Larger areas of potentially suitable habitats for the amphibian and reptile species occur within the area of potential indirect effects (e.g., up to 3.6% of available habitat for the desert horned lizard, Great Basin collared lizard, and glossy snake). Indirect 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 after operations cease could result in short-term negative impacts on individuals and habitats within and adjacent to the SEZ. The negative impacts of decommissioning would be reduced or eliminated as reclamation proceeds. Potentially long-term benefits could accrue as habitats are 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 desert scrub, playa, and wash habitats.

11.2.11.1.3 SEZ-Specific Design Features and Design Feature Effectiveness

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

- Delamar Lake, Jumbo Wash, and the unnamed wash should be avoided.

If this SEZ-specific design feature is implemented in addition to the programmatic design features, impacts on amphibian and reptile species could be reduced. However, as potentially suitable habitats for a number of the amphibian and reptile species occur throughout much of the SEZ, additional species-specific mitigation of direct effects for those species would be difficult or infeasible.

11.2.11.2 Birds

11.2.11.2.1 Affected Environment

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

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 Delamar Valley SEZ. The list of bird species potentially present in the SEZ area was determined from the NNHP (NDCNR 2002) and range maps and habitat information available from the California Wildlife Habitat Relationships System (CDFG 2008) and SWReGAP (USGS 2007). Land cover types suitable for each species were determined from SWReGAP (USGS 2004, 2005a, 2007). See Appendix M for additional information on the approach used.

Eight bird species that could occur on or in the affected area of the SEZ are considered focal species in the *Desert Bird Conservation Plan* (CalPIF 2009): ash-throated flycatcher (*Myiarchus cinerascens*), black-throated sparrow (*Amphispiza bilineata*), burrowing owl (*Athene cunicularia*), common raven (*Corvus corax*), Costa's hummingbird (*Calypte costae*), ladder-backed woodpecker (*Picoides scalaris*), Le Conte's thrasher (*Toxostoma lecontei*), and verdin (*Auriparus flaviceps*). Habitats for most of these species are described in Table 11.2.11.2-1. Due to its special species status, the burrowing owl is discussed in Section 11.2.12.

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 solar study area. However, within the proposed Delamar Valley SEZ, waterfowl, wading birds, and shorebird species would be mostly absent to uncommon. Playa and wash habitats within the SEZ may attract shorebird species, but the perennial streams within 50 mi (80 km) of the SEZ would provide more viable habitat for this group of birds. The killdeer (*Charadrius vociferus*) is the shorebird species most likely to occur within the SEZ.

Neotropical Migrants

As discussed in Section 4.10.2.2.3, neotropical migrants represent the most diverse category of birds within the six-state solar energy study area. Species expected to occur within the proposed Delamar Valley SEZ include the ash-throated flycatcher, Bewick's wren (*Thryomanes bewickii*), black-throated sparrow, cactus wren (*Campylorhynchus brunneicapillus*), common poorwill (*Phalaenoptilus nuttallii*), common raven, Costa's

TABLE 11.2.11.2-1 Habitats, Potential Impacts, and Potential Mitigation for Representative Bird Species That Could Occur on or in the Affected Area of the Proposed Delamar Valley 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]	
Shorebirds					
Killdeer (*Charadrius vociferus*)	Open areas such as fields, meadows, lawns, mudflats, and shores. Nests on ground in open dry or gravelly locations. About 51,700 acres[h] of potentially suitable habitat occurs within the SEZ region.	3,089 acres of potentially suitable habitat lost (6.0% of available potentially suitable habitat) during construction and operations	457 acres of potentially suitable habitat (0.9% of available potentially suitable habitat)	1 acre of potentially suitable habitat lost (<0.002% of available potentially suitable habitat) and 71 acres in area of indirect effects	Moderate overall impact. Avoid Delamar Lake and wash habitats. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Neotropical Migrants					
Ash-throated flycatcher (*Myiarchus cinerascens*)	Common in scrub and woodland habitats, including desert riparian and desert washes. Requires hole/cavity for nesting. Uses shrubs or small trees for foraging perches. About 4,306,500 acres of potentially suitable habitat occurs within the SEZ region.	12,210 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	100,946 acres of potentially suitable habitat (2.3% of available potentially suitable habitat)	49 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 4,254 acres in area of indirect effects	Small overall impact. Avoid wash habitats; otherwise 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.

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TABLE 11.2.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat[a]	Maximum Area of Potential Habitat Affected[b]: Within SEZ (Direct Effects)[c]	Maximum Area of Potential Habitat Affected[b]: Outside SEZ (Indirect Effects)[d]	Maximum Area of Potential Habitat Affected[b]: Within Road Corridor (Indirect and Direct Effects)[e]	Overall Impact Magnitude[f] and Species-Specific Mitigation[g]
Neotropical Migrants (Cont.)					
Bewick's wren (*Thryomanes bewickii*)	Generally associated with dense, brushy habitats. It is a permanent resident of lowland deserts and pinyon-juniper forests of southern Utah. Breeding occurs in brushy areas of open woodlands and other open habitats. It is a cavity nester with nests constructed in small enclosed areas such as tree cavities, nesting boxes, rock crevices, or the center of a brush pile. About 3,511,800 acres of potentially suitable habitat occurs within the SEZ region.	5,124 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	88,783 acres of potentially suitable habitat (2.5% of available potentially suitable habitat)	31 acres of potentially suitable habitat lost (<0.001% of available potentially suitable habitat) and 2,657 acres in area of indirect effects	Small overall impact. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Black-throated sparrow (*Amphispiza bilineata*)	Chaparral and desert-scrub habitats with sparse to open stands of shrubs. Often in areas with scattered Joshua trees. Nests in thorny shrubs or cactus. About 2,655,300 acres of potentially suitable habitat occurs within the SEZ region.	977 acres of potentially suitable habitat lost (0.04% of available potentially suitable habitat) during construction and operations	43,481 acres of potentially suitable habitat (1.6% of available potentially suitable habitat)	43 acres of potentially suitable habitat lost (<0.002% of available potentially suitable habitat) and 3,750 acres in area of indirect effects	Small overall impact. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Cactus wren (*Campylorhynchus brunneicapillus*)	Desert (especially areas with cholla cactus or yucca), mesquite, arid scrub, coastal sage scrub, and trees in towns in arid regions. Nests in *Opuntia* spp.; twiggy, thorny trees and shrubs; and sometimes in buildings. Nests may be used as winter roost. About 1,211,300 acres of potentially suitable habitat occurs within the SEZ region.	977 acres of potentially suitable habitat lost (0.08% of available potentially suitable habitat) during construction and operations	38,118 acres of potentially suitable habitat (3.1% of available potentially suitable habitat)	34 acres of potentially suitable habitat lost (0.003% of available potentially suitable habitat) and 2,964 acres in area of indirect effects	Small overall impact. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.2.11.2-1 (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]
Neotropical Migrants (Cont.)					
Common poorwill (*Phalaenoptilus nuttallii*)	Scrubby and brushy areas, prairie, desert, rocky canyons, open woodlands, and broken forests. Mostly in arid and semiarid habitats. Nests in open areas on a bare site. About 3,491,800 acres of potentially suitable habitat occurs within the SEZ region.	11,233 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	63,000 acres of potentially suitable habitat (1.8% of available potentially suitable habitat)	17 acres of potentially suitable habitat lost (0.0005% of available potentially suitable habitat) and 1,475 acres in area of indirect effects	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.
Common raven (*Corvus corax*)	Occurs in most habitats. Trees and cliffs provide cover. Roosts primarily in trees. Nests on cliffs, bluffs, tall trees, or man-made structures. Forages in sparse, open terrain. About 4,836,400 acres of potentially suitable habitat occurs in the SEZ region.	13,242 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	150,024 acres of potentially suitable habitat (3.1% of available potentially suitable habitat)	62 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 5,400 acres in area of indirect effects	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 11.2.11.2-1 (Cont.)

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]	
Neotropical Migrants (Cont.)					
Costa's hummingbird (*Calypte costae*)	Desert and semidesert areas, arid brushy foothills, and chaparral. Main habitats are desert washes, edges of desert riparian and valley foothill riparian areas, coastal shrub, desert scrub, desert succulent shrub, lower-elevation chaparral, and palm oasis. Also in mountains, meadows, and gardens during migration and winter. Most common in canyons and washes when nesting. Nests are located in trees, shrubs, vines, or cacti. About 1,966,700 acres of potentially suitable habitat occurs within the SEZ region.	977 acres of potentially suitable habitat lost (0.05% of available potentially suitable habitat) during construction and operations	40,709 acres of potentially suitable habitat (2.1% of available potentially suitable habitat)	45 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 3,947 acres in area of indirect effects	Small overall impact. Avoid wash habitats. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Greater roadrunner (*Geococcyx californianus*)	Desert scrub, chaparral, edges of cultivated lands, and arid open areas with scattered brush. Fairly common in all desert habitats. Requires thickets, large bushes, or small trees for shade, refuge, and roosting. Usually nests low in trees, shrubs, or clumps of cactus. Rarely nests on ground. About 4,449,200 acres of potentially suitable habitat occurs in the SEZ region.	11,246 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	102,364 acres of potentially suitable habitat (2.3% of available potentially suitable habitat)	49 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 4,250 acres in area of indirect effects	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 11.2.11.2-1 (Cont.)

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]	
Neotropical Migrants (Cont.)					
Horned lark (*Eremophila alpestris*)	Common to abundant resident in a variety of open habitats. Breeds in grasslands, sagebrush, semidesert shrublands, and alpine tundra. During migration and winter, inhabits the same habitats other than tundra, and occurs in agricultural areas. Usually occurs where plant density is low and there are exposed soils. About 3,932,400 acres of potentially suitable habitat occurs in the SEZ region.	13,242 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	148,184 acres of potentially suitable habitat (3.8% of available potentially suitable habitat)	61 acres of potentially suitable habitat lost (<0.002% of available potentially suitable habitat) and 5,304 acres in area of indirect effects	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.
Ladder-backed woodpecker (*Picoides scalaris*)	Fairly common in Mojave and Colorado Deserts. Variety of habitats, including deserts, arid scrub, riparian woodlands, mesquite, scrub oak, pinyon-juniper woodlands. Digs nest hole in rotted stub or dead or dying branches of various trees. Also nests in saguaro, agave, yucca, fence posts, and utility poles. Nests on ledges; branches of trees, shrubs, and cactus; and holes in trees or walls. About 3,254,800 acres of potentially suitable habitat occurs within the SEZ region.	11,246 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	66,841 acres of potentially suitable habitat (2.1% of available potentially suitable habitat)	48 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 4,134 acres in area of indirect effects	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 11.2.11.2-1 (Cont.)

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]	
Neotropical Migrants (Cont.)					
Le Conte's thrasher (*Toxostoma lecontei*)	Open desert wash, alkali desert scrub, and desert succulent shrub habitats. Prefers to nest and forage in arroyos and washes lined with dense stands of creosotebush and salt bush. About 2,223,200 acres of potentially suitable habitat occurs in the SEZ region.	11,246 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat) during construction and operations	62,263 acres of potentially suitable habitat (2.8% of available potentially suitable habitat)	45 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 3,922 acres in area of indirect effects	Small overall impact. Avoid wash habitats; otherwise 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.
Lesser nighthawk (*Chordeiles acutipennis*)	Open country, desert regions, scrub, savanna, and cultivated areas. Usually near water, including open marshes, salt ponds, large rivers, rice paddies, and beaches. Roosts on low perches or the ground. Nests in the open on bare sites. About 3,646,400 acres of potentially suitable habitat occurs within the SEZ region.	11,246 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	97,940 acres of potentially suitable habitat (2.7% of available potentially suitable habitat)	48 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 4,208 acres in area of indirect effects	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 11.2.11.2-1 (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]
Neotropical Migrants (Cont.)					
Loggerhead shrike (*Lanius ludovicianus*)	Open country with scattered trees and shrubs, savanna, desert scrub, desert riparian, Joshua tree, and occasionally open woodland habitats. Perches on poles, wires, or fence posts (suitable hunting perches are important aspect of habitat). Nests in shrubs and small trees. About 4,837,500 acres of potentially suitable habitat occurs in the SEZ region.	13,242 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	149,068 acres of potentially suitable habitat (3.1% of available potentially suitable habitat)	62 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 5,432 acres in area of indirect effects	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.
Northern mockingbird (*Mimus polyglottos*)	Parkland, cultivated lands, second-growth habitats, desert scrub, and riparian areas at low elevations. Forages on ground in short, grassy to nearly barren substrates. About 4,983,600 acres of potentially suitable habitat occurs within the SEZ region.	13,242 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	152,695 acres of potentially suitable habitat (3.1% of available potentially suitable habitat)	64 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 5,577 acres in area of indirect effects	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 11.2.11.2-1 (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]
Neotropical Migrants (Cont.)					
Rock wren (*Salpinctes obsoletus*)	Arid and semiarid habitats. Breeds in areas with talus slopes, scrublands, or dry washes. Nests, constructed of plant materials, are located in rock crevices and the nest entrance is paved with small rocks and stones. About 4,856,900 acres of potentially suitable habitat occurs within the SEZ region.	13,242 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	152,547 acres of potentially suitable habitat (3.1% of available potentially suitable habitat)	64 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 5,531 acres in area of indirect effects	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.
Sage sparrow (*Amphispiza belli*)	Prefers shrubland, grassland, and desert habitats. The nest, constructed of twigs and grasses, is located either low in a shrub or on the ground. About 3,005,900 acres of potentially suitable habitat occurs within the SEZ region.	12,315 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat) during construction and operations	108,451 acres of potentially suitable habitat (3.6% of available potentially suitable habitat)	18 acres of potentially suitable habitat lost (0.0006% of available potentially suitable habitat) and 1,525 acres in area of indirect effects	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 11.2.11.2-1 (Cont.)

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]	
Neotropical Migrants (Cont.)					
Say's phoebe (*Sayornis saya*)	Arid open country, deserts, sagebrush plains, dry barren foothills, canyons, cliffs, ranches, and rural homes. Nests in cliff crevices, holes in banks, sheltered ledges, tree cavities, under bridges and roofs, and in mines. About 3,205,400 acres of potentially suitable habitat occurs within the SEZ region.	1,941 acres of potentially suitable habitat lost (0.06% of available potentially suitable habitat) during construction and operations	77,919 acres of potentially suitable habitat (2.4% of available potentially suitable habitat)	47 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 4,079 acres in area of indirect effects	Small overall impact. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Scott's oriole (*Icterus parisorum*)	Desert-facing slopes of mountains or semiarid plains between mountain ranges. Nests in trees or yuccas. About 1,811,900 acres of potentially suitable habitat occurs within the SEZ region.	977 acres of potentially suitable habitat lost (0.05% of available potentially suitable habitat) during construction and operations	40,957 acres of potentially suitable habitat (2.2% of available potentially suitable habitat)	31 acres of potentially suitable habitat lost (<0.002% of available potentially suitable habitat) and 2,734 acres in area of indirect effects	Small overall impact. Avoid Mojave mid-elevation mixed desert scrub habitat. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Verdin (*Auriparus flaviceps*)	Desert riparian, desert wash, desert scrub, and alkali desert scrub areas with large shrubs and small trees. Nests in shrubs, small trees, or cactus. About 1,842,300 acres of potentially suitable habitat occurs within the SEZ region.	977 acres of potentially suitable habitat lost (0.05% of available potentially suitable habitat) during construction and operations	40,561 acres of potentially suitable habitat (2.2% of available potentially suitable habitat)	45 acres of potentially suitable habitat lost (0.0002% of available potentially suitable habitat) and 3,901 acres in area of indirect effects	Small overall impact. Avoid Mojave mid-elevation mixed desert scrub habitat. Also avoid Delamar Lake and wash habitats. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 11.2.11.2-1 (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]
Neotropical Migrants (Cont.)					
Western kingbird (*Tyrannus verticalis*)	Occurs in a variety of habitats, including riparian forests and woodlands, savannahs, shrublands, agricultural lands, deserts, and urban areas. Nesting occurs in trees, bushes, and other raised areas, such as buildings. It migrates to Central America or the southeastern United States for the winter. About 3,946,100 acres of potentially suitable habitat occurs within the SEZ region.	12,318 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	144,904 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	62 acres of potentially suitable habitat lost (<0.002% of available potentially suitable habitat) and 5,353 acres in area of indirect effects	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.
Birds of Prey					
American kestrel (*Falco sparverius*)	Occurs in most open habitats, in various shrub and early successional forest habitats, forest openings, and various ecotones. Perches on trees, snags, rocks, utility poles and wires, and fence posts. Uses cavities in trees, snags, rock areas, banks, and buildings for nesting and cover. About 4,844,100 acres of potentially suitable habitat occurs in the SEZ region.	13,242 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	149,149 acres of potentially suitable habitat (3.1% of available potentially suitable habitat)	63 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 5,479 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.

TABLE 11.2.11.2-1 (Cont.)

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]	
Birds of Prey (Cont.)					
Golden eagle (*Aquila chrysaetos*)	Grasslands, shrublands, pinyon-juniper woodlands, and ponderosa pine forests. Occasionally in most other habitats, especially during migration and winter. Nests on cliffs and sometimes trees in rugged areas, with breeding birds ranging widely over surrounding areas. About 4,994,200 acres of potentially suitable habitat occurs in the SEZ region.	13,242 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	149,149 acres of potentially suitable habitat (3.0% of available potentially suitable habitat)	63 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 5,506 acres in area of indirect effects	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 Bald and Golden Eagle Protection Act.
Great horned owl (*Bubo virginianus*)	Needs large abandoned bird nest or large cavity for nesting. Usually lives on forest edges and hunts in open areas. In desert areas, requires wooded cliff areas for nesting. About 5,026,500 acres of potentially suitable habitat occurs within the SEZ region.	13,242 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	153,651 acres of potentially suitable habitat (3.1% of available potentially suitable habitat)	64 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 5,582 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.

TABLE 11.2.11.2-1 (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.)					
Long-eared owl (*Asio otus*)	Nests and roosts in dense vegetation and hunts in open areas (e.g., creosotebush-bursage flats, desert scrub, grasslands, and agricultural fields). About 4,634,000 acres of potentially suitable habitat occurs within the SEZ region.	13,242 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	147,410 acres of potentially suitable habitat (3.2% of available potentially suitable habitat)	61 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 5,317 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
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 2,581,100 acres of potentially suitable habitat occurs in the SEZ region.	12,328 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat) during construction and operations	131,116 acres of potentially suitable habitat (5.1% of available potentially suitable habitat)	48 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 4,150 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Turkey vulture (*Cathartes aura*)	Occurs in open stages of most habitats that provide adequate cliffs or large trees for nesting, roosting, and resting. Migrates and forages over most open habitats. Will roost communally in trees, exposed boulders, and occasionally transmission line support towers. About 3,237,800 acres of potentially suitable habitat occurs in the SEZ region.	11,246 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	66,922 acres of potentially suitable habitat (2.1% of available potentially suitable habitat)	48 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 4,192 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.

TABLE 11.2.11.2-1 (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]
Upland Game Birds					
Chukar (*Alectoris chukar*)	Steep, semiarid slopes with rocky outcrops and shrubs with a grass and forb understory. Sources of water are required during hot, dry periods, with most birds found within 0.25 mi (0.4 km) of water during the brooding period. About 4,781,900 acres of potentially suitable habitat occurs in the SEZ region.	12,328 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	147,761 acres of potentially suitable habitat (3.1% of available potentially suitable habitat)	62 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 5,356 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Gambel's quail (*Callipepla gambelii*)	Deserts, especially in areas with brushy or thorny growth, and adjacent cultivated areas. Usually occurs near water. Nests on the ground under cover of small trees, shrubs, and grass tufts. About 3,819,600 acres of potentially suitable habitat occurs within the SEZ region.	3,023 acres of potentially suitable habitat lost (0.08% of available potentially suitable habitat) during construction and operations	124,461 acres of potentially suitable habitat (3.3% of available potentially suitable habitat)	62 acres of potentially suitable habitat lost (<0.002% of available potentially suitable habitat) and 5,365 acres in area of indirect effects	Small overall impact. Avoid Delamar Lake and wash habitats.
Mourning dove (*Zenaida macroura*)	Habitat generalist, occurring in grasslands, shrublands, croplands, lowland and foothill riparian forests, ponderosa pine forests, deserts, and urban and suburban areas. Rarely in aspen and other forests, coniferous woodlands, and alpine tundra. Nests on ground or in trees. Winters mostly in lowland riparian forests adjacent to cropland. About 4,415,200 acres of potentially suitable habitat occurs in the SEZ region.	13,242 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	139,241 acres of potentially suitable habitat (3.2% of available potentially suitable habitat)	62 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 5,352 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.

TABLE 11.2.11.2-1 (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]
Upland Game Birds (Cont.)					
White-winged dove (*Zenaida asiatica*)	Nests in low to medium height trees with dense foliage and fairly open ground cover. Feeds on wild seeds, grains, and fruit. About 1,959,800 acres of potentially suitable habitat occurs within the SEZ region.	977 acres of potentially suitable habitat lost (0.05% of available potentially suitable habitat) during construction and operations	40,709 acres of potentially suitable habitat (2.1% of available potentially suitable habitat)	44 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 3,827 acres in area of indirect effects	Small overall impact. Avoid Mojave mid-elevation mixed desert scrub habitat.
Wild turkey (*Meleagris gallopavo*)	Lowland riparian forests, foothill shrubs, pinyon-juniper woodlands, foothill riparian forests, and agricultural areas. About 2,497,200 acres of potentially suitable habitat occurs within the SEZ region.	4,170 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	86,902 acres of potentially suitable habitat (3.5% of available potentially suitable habitat)	18 acres of potentially suitable habitat lost (<0.001% of available potentially suitable habitat) and 1,556 acres in area of indirect effects	Small overall impact.

[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 using SWReGAP habitat suitability and land cover models. This approach probably overestimates the amount of suitable habitat in the project area. A maximum of 13,242 acres of direct effects within the SEZ was assumed.

[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.

[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 13,242 acres of direct effects was also added to the area of indirect effects. 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.

Footnotes continued on next page.

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TABLE 11.2.11.2-1 (Cont.)

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[e] For access road development, direct effects were estimated within an 8-mi (13-km) long, 60-ft (18-m) wide access road ROW from the SEZ to the nearest existing highway. Indirect effects were estimated within a 1-mi (1.6-km) wide access road corridor to the existing highway, less the assumed area of direct effects.

[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: CDFG (2008); NatureServe (2010); NDCNR (2002); USGS (2004, 2005a, 2007).

hummingbird, greater roadrunner (*Geococcyx californianus*), horned lark (*Eremophila alpestris*), ladder-backed woodpecker, Le Conte's thrasher, lesser nighthawk (*Chordeiles acutipennis*), loggerhead shrike (*Lanius ludovicianus*), northern mockingbird (*Mimus polyglottos*), rock wren (*Salpinctes obsoletus*), sage sparrow (*Amphispiza belli*), Say's phoebe (*Sayornis saya*), Scott's oriole (*Icterus parisorum*), verdin, and western kingbird (*Tyrannus verticalis*) (USGS 2007).

Birds of Prey

Section 4.10.2.2.4 provided an overview of the birds of prey (raptors, owls, and vultures) within the six-state solar study area. Raptor species that could occur within the proposed Delamar Valley SEZ include the American kestrel (*Falco sparverius*), golden eagle (*Aquila chrysaetos*), great horned owl (*Bubo virginianus*), long-eared owl (*Asio otus*), red-tailed hawk (*Buteo jamaicensis*), and turkey vulture (*Cathartes aura*) (USGS 2007). Several other special status birds of prey are discussed in Section 11.2.12. These include the ferruginous hawk (*Buteo regalis*), northern goshawk (*Accipiter gentilis*), prairie falcon (*Falco mexicanus*), and burrowing owl.

Upland Game Birds

Section 4.10.2.2.5 provided an overview of the upland game birds (primarily pheasants, grouse, quail, and doves) that occur within the six-state solar study area. Upland game species that could occur within the proposed Delamar Valley SEZ include the chukar (*Alectoris chukar*), Gambel's quail (*Callipepla gambelii*), mourning dove (*Zenaida macroura*), white-winged dove (*Zenaida asiatica*), and wild turkey (*Meleagris gallopavo*) (USGS 2007).

Table 11.2.11.2-1 provides habitat information for representative bird species that could occur within the proposed Delamar Valley SEZ. Special status bird species are discussed in Section 11.2.12.

11.2.11.2.2 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 the application of any additional mitigation measures. Section 11.2.11.2.3, below, identifies design features of particular relevance to the proposed Delamar Valley 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 11.2.11.2.1 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 11.2.11.2.3).

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 11.2.11.2-1 summarizes the magnitude of potential impacts on representative bird species resulting from solar energy development in the proposed Delamar Valley SEZ. On the basis of the impacts on birds summarized in Table 11.2.11.2-1, direct impacts on representative bird species would be moderate for the killdeer (loss of 6.0% of potentially suitable habitat) and small for all other bird species (ranging from 0.04% for the black-throated sparrow to 0.5% for Le Conte's thrasher (Table 11.2.11.2-1). Larger areas of potentially suitable habitats for the bird species occur within the area of potential indirect effects (e.g., up to 5.1% of available habitat for the red-tailed hawk). Indirect impacts on birds 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 after operations cease could result in short-term negative impacts on individuals and habitats within and adjacent to the SEZ. The negative impacts of decommissioning would be reduced or eliminated as reclamation proceeds. Potentially long-term benefits could accrue as habitats are 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 desert scrub, playa, and wash habitats.

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

- 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 NDOW. A permit may be required under the Bald and Golden Eagle Protection Act.

- Delamar Lake, Jumbo Wash, and the unnamed wash should be avoided.

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

11.2.11.3 Mammals

11.2.11.3.1 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 Delamar Valley SEZ. The list of mammal species potentially present in the SEZ area was determined from the NNHP (NDCNR 2002) and range maps and habitat information available from the SWReGAP (USGS 2007). Land cover types suitable for each species were determined from SWReGAP (USGS 2004, 2005a, 2007). See Appendix M for additional information on the approach used.

Over 55 species of mammals have ranges that encompass the area of the proposed Delamar Valley SEZ (NDCNR 2002; USGS 2007); however, suitable habitats for a number of these species are limited or nonexistent within the SEZ (USGS 2007). Similar to the overview of mammals provided for the six-state solar energy study area (Section 4.10.2.3), the following discussion for the SEZ 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 important habitats.

Big Game

The big game species that could occur within the vicinity of the proposed Delamar Valley SEZ include cougar (*Puma concolor*), elk (*Cervis canadensis*), mule deer (*Odocoileus hemionus*), Nelson's bighorn sheep (*Ovis canadensis nelsoni*), and pronghorn (*Antilocapra americana*) (USGS 2007). Due to its special species status, the Nelson's bighorn sheep is addressed in Section 11.2.12. Among the other big game species, potentially suitable habitats for the cougar, mule deer, and pronghorn occur within the SEZ. No potentially suitable habitat for elk occurs within the SEZ, while only limited potentially suitable habitat for this species occurs within the area of indirect effects. Figure 11.2.11.3-1 shows the location of the SEZ relative to mapped elk habitat; Figure 11.2.11.3-2 shows the location of the SEZ relative to the mapped range of mule deer habitat; and Figure 11.2.11.3-3 shows the location of the SEZ relative to mapped pronghorn habitat.

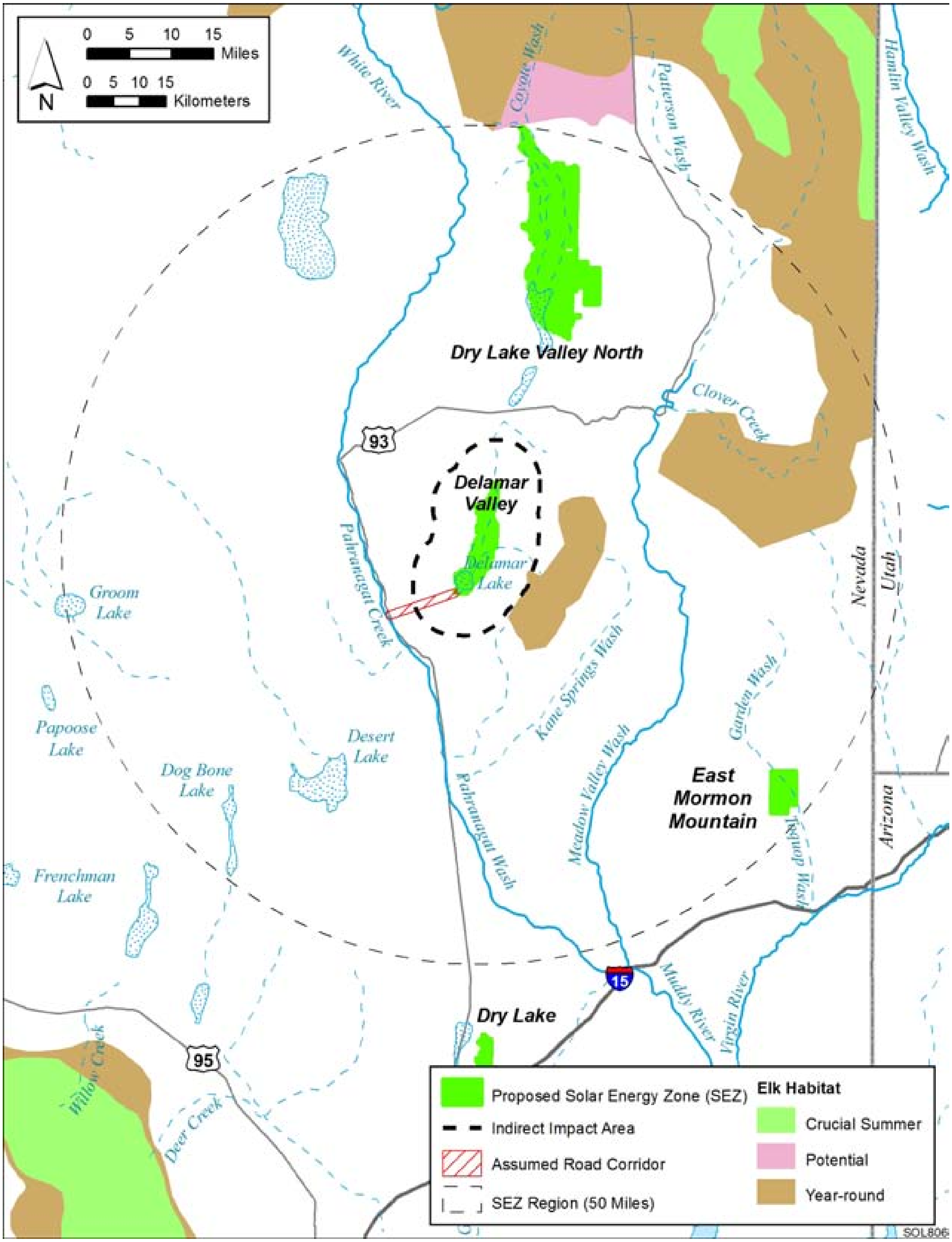

FIGURE 11.2.11.3-1 Location of the Proposed Delamar Valley SEZ Relative to the Mapped Range of Elk (Source: NDOW 2010)

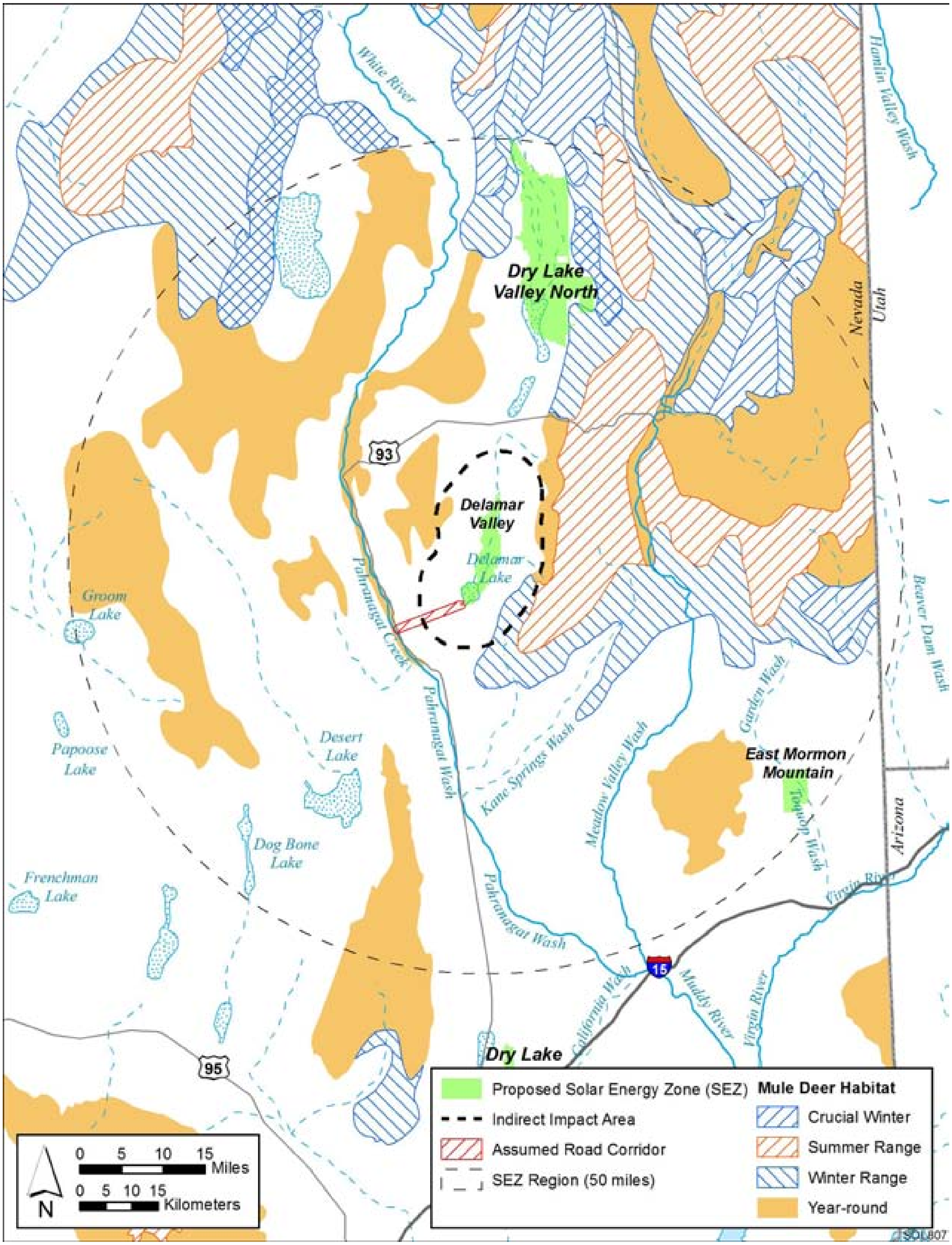

FIGURE 11.2.11.3-2 Location of the Proposed Delamar Valley SEZ Relative to the Mapped Range of Mule Deer (Source: NDOW 2010)

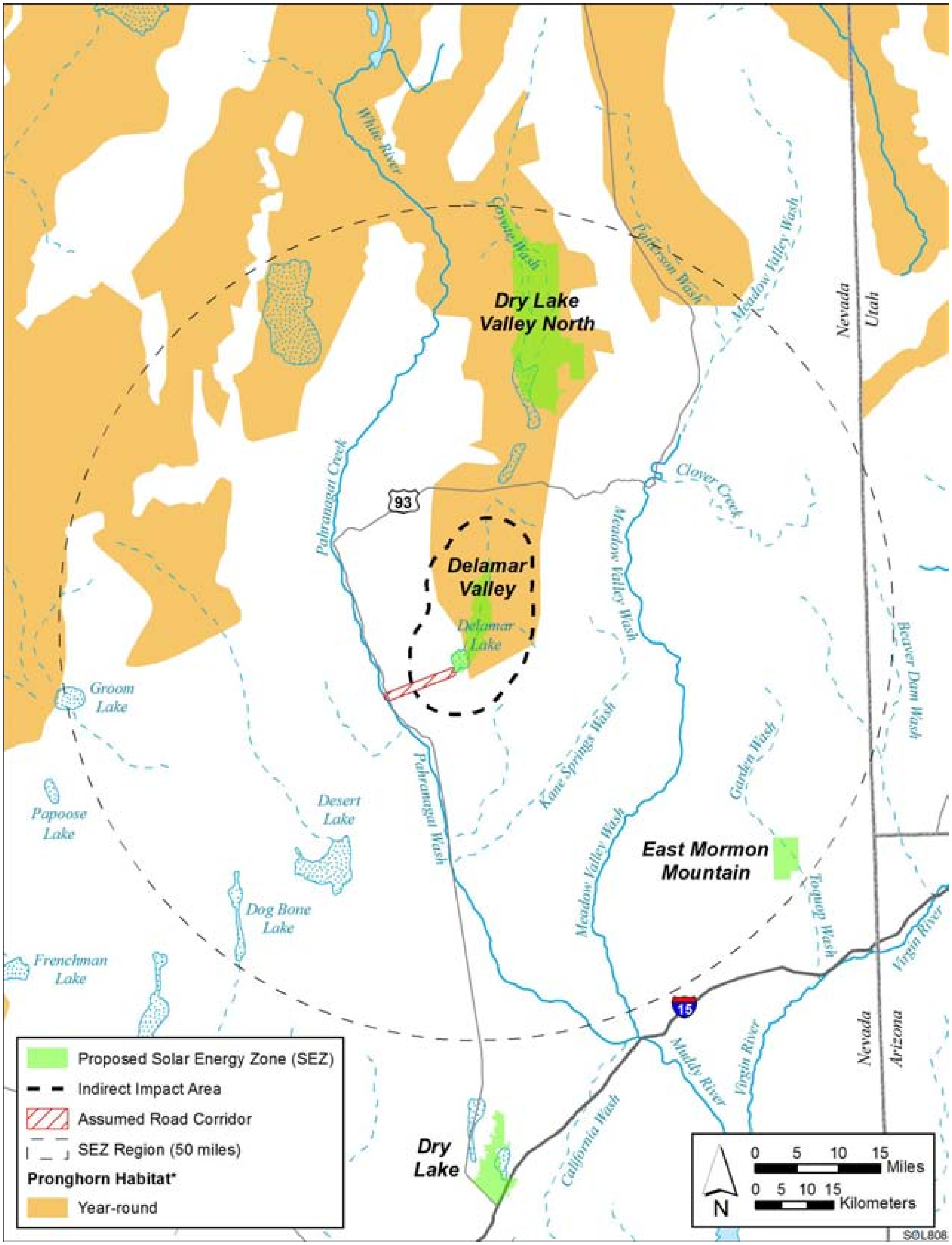

FIGURE 11.2.11.3-3 Location of the Proposed Delamar Valley SEZ Relative to the Mapped Range of Pronghorn (Source: NDOW 2010)

Other Mammals

A number of small game and furbearer species occur within the area of the proposed Delamar Valley SEZ. Species that could occur within the area of the SEZ would include the American badger (*Taxidea taxus*), black-tailed jackrabbit (*Lepus californicus*), bobcat (*Lynx rufus*), coyote (*Canis latrans*, common), desert cottontail (*Sylvilagus audubonii*), gray fox (*Urocyon cinereoargenteus*), kit fox (*Vulpes macrotis*), and red fox (*Vulpes vulpes*) (USGS 2007).

The nongame (small) mammals include rodents, bats, and shrews. Representative species for which potentially suitable habitat occurs within the proposed Delamar Valley SEZ include Botta's pocket gopher (*Thomomys bottae*), cactus mouse (*Peromyscus eremicus*), canyon mouse (*P. crinitis*), deer mouse (*P. maniculatus*), desert shrew (*Notiosorex crawfordi*), desert woodrat (*Neotoma lepida*), little pocket mouse (*Perognathus longimembris*), long-tailed pocket mouse (*Chaetodipus formosus*), Merriam's pocket mouse (*Dipodomys merriami*), northern grasshopper mouse (*Onychomys leucogaster*), southern grasshopper mouse (*O. torridus*), western harvest mouse (*Reithrodontomys megalotis*), and white-tailed antelope squirrel (*Ammospermophilus leucurus*) (USGS 2007). Bat species that may occur within the area of the SEZ include the big brown bat (*Eptesicus fuscus*), Brazilian free-tailed bat (*Tadarida brasiliensis*), California myotis (*Myotis californicus*), hoary bat (*Lasiurus cinereus*), little brown myotis (*M. lucifugus*), long-legged myotis (*M. volans*), silver-haired bat (*Lasionycteris noctivagans*), and western pipistrelle (*Parastrellus hesperus*) (USGS 2007). However, roost sites for the bat species (e.g., caves, hollow trees, rock crevices, or buildings) would be limited to absent within the SEZ. Several other special status bat species that could occur within the SEZ area are addressed in Section 11.2.12.

Table 11.2.11.3-1 provides habitat information for representative mammal species that could occur within the proposed Delamar Valley SEZ. Special status mammal species are discussed in Section 11.2.12.

11.2.11.3.2 Impacts

The types of impacts that mammals could incur from construction, operation, and decommissioning of utility-scale solar energy facilities are discussed in Section 5.10.2.1. Any such impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2, and through the application of any additional mitigation measures. Section 11.2.11.3.3, below, identifies design features of particular relevance to mammals for the proposed Delamar Valley 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 11.2.11.3.1 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 11.2.11.3.3).

Table 11.2.11.3-1 summarizes the magnitude of potential impacts on representative mammal species resulting from solar energy development (with the inclusion of programmatic design features) in the proposed Delamar Valley SEZ.

Cougar

Up to 12,391 acres (50.1 km^2) of potentially suitable cougar habitat could be lost through solar energy and access road development within the proposed Delamar Valley SEZ. This represents about 0.2% of potentially suitable cougar habitat within the SEZ region. About 154,416 acres (624.9 km^2) of potentially suitable cougar habitat occurs within the area of indirect effects for the SEZ and access road. This is about 3.1% of potentially suitable cougar habitat within the SEZ region. Overall, impacts on cougar from solar energy development in the SEZ would be small.

Elk

Based on land cover analyses, potentially suitable elk habitat does not occur within the proposed Delamar Valley SEZ. Slightly more than 160 acres (0.6 km^2) of potentially suitable habitat occurs within the proposed access road corridor and could directly affect about 2 acres (0.008 km^2) of habitat. Thus, solar energy development in the SEZ would have little direct impact on elk habitat. About 35,470 acres (143.5 km^2) of potentially suitable elk habitat occurs within the area of indirect effects, or more than 2.8% of potentially suitable elk habitat within the SEZ region. Based on mapped ranges, the closest year-round elk habitat is about 4.4 mi (7.1 km) from the SEZ, while the closest crucial summer habitat is about 19 mi (31 km) from the SEZ (Figure 11.2.11.3-1). About 530 acres (2.1 km^2) of mapped year-round elk habitat occurs within the area of indirect effects. Overall, impacts on elk from solar energy development in the SEZ would be small to none.

Mule Deer

Based on land cover analyses, up to 13,303 acres (53.9 km^2) of potentially suitable mule deer habitat could be lost through solar energy and access road development within the proposed Delamar Valley SEZ. This represents about 0.3% of potentially suitable mule deer habitat within the SEZ region. About 149,047 acres (603.2 km^2) of potentially suitable mule deer habitat occurs within the area of indirect effects for the SEZ and access road. This is about 3.7% of potentially suitable mule deer habitat within the SEZ region. Based on mapped range, the closest year-round mule deer habitat is about 3 mi (5 km) from the SEZ (Figure 11.2.11.3-2). About 6,465 acres (26.2 km^2) of year-round mule deer habitat occurs within the area of indirect effects, or about 0.6% of the year-round mule deer habitat within the SEZ region. The closest winter mule deer habitat occurs 2.5 mi (4.0 km) from the SEZ; while the closest summer range is 4.9 mi (7.9 km) from the SEZ (Figure 11.2.11.3-2). About 9,740 acres (39.4 km^2) of winter range and 31 acres (0.1 km2) of summer range occur within the area of indirect effects. Overall, impacts on mule deer from solar energy development in the SEZ would be small.

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TABLE 11.2.11.3-1 Habitats, Potential Impacts, and Potential Mitigation for Representative Mammal Species That Could Occur on or in the Affected Area of the Proposed Delamar Valley 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]	
Big Game					
Cougar (*Puma concolor*)	Most common in rough, broken foothills and canyon country, often in association with montane forests, shrublands, and pinyon-juniper woodlands. About 4,934,200 acres[h] of potentially suitable habitat occurs in the SEZ region.	12,328 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	148,938 acres of potentially suitable habitat (3.0% of available potentially suitable habitat)	63 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 5,478 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
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 provides abundant browse and cover. About 3,999,800 acres of potentially suitable habitat occurs in the SEZ region.	13,242 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	144,498 acres of potentially suitable habitat (3.6% of available potentially suitable habitat)	61 acres of potentially suitable habitat lost (<0.002% of available potentially suitable habitat) and 4,549 acres in area of indirect effects	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. About 1,691,100 acres of potentially suitable habitat occurs in the SEZ region.	2,046 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	82,177 acres of potentially suitable habitat (4.9% of available potentially suitable habitat)	15 acres of potentially suitable habitat lost (<0.0001% of available potentially suitable habitat) and 1,292 acres in area of indirect effects	Small overall impact.

TABLE 11.2.11.3-1 (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]
Small Game and Furbearers					
American badger (*Taxidea taxus*)	Open grasslands and deserts, meadows in subalpine and montane forests, alpine tundra. Digs burrows in friable soils. Most common in areas with abundant populations of ground squirrels, prairie dogs, and pocket gophers. About 4,605,600 acres of potentially suitable habitat occurs in the SEZ region.	13,242 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	152,466 acres of potentially suitable habitat (3.3% of available potentially suitable habitat)	62 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 5,426 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Black-tailed jackrabbit (*Lepus californicus*)	Open plains, fields, and deserts with scattered thickets or patches of shrubs. Also open, early stages of forests and chaparral habitats. Rests during the day in shallow depressions, and uses shrubs for cover. About 4,851,700 acres of potentially suitable habitat occurs in the SEZ region.	13,242 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	152,547 acres of potentially suitable habitat (3.1% of available potentially suitable habitat)	62 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 5,407 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Bobcat (*Lynx rufus*)	Most habitats except subalpine coniferous forest and montane meadow grasslands. Most common in rocky country from deserts through ponderosa forests. About 4,288,600 acres of potentially suitable habitat occurs in the SEZ region.	6,112 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	126,105 acres of potentially suitable habitat (2.9% of available potentially suitable habitat)	60 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 5,265 acres in area of indirect effects	Small overall impact.

TABLE 11.2.11.3-1 (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]
Small Game and Furbearers (Cont.)					
Coyote (*Canis latrans*)	All habitats at all elevations. Least common in dense coniferous forest. Where human control efforts occur, they are restricted to broken, rough country with abundant shrub cover and a good supply of rabbits or rodents. About 5,025,783 acres of potentially suitable habitat occurs in the SEZ region.	13,242 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	153,651 acres of potentially suitable habitat (3.1% of available potentially suitable habitat)	64 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 5,582 acres in area of indirect effects	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*)	Abundant to common in grasslands, open forests, and desert shrub habitats. Can occur in areas with minimal vegetation as long as adequate cover (e.g., rock piles, fallen logs, fence rows) is present. Thickets and patches of shrubs, vines, and brush also used as cover. About 3,730,100 acres of potentially suitable habitat occurs in the SEZ region.	12,315 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	109,331 acres of potentially suitable habitat (2.9% of available potentially suitable habitat)	29 acres of potentially suitable habitat lost (<0.001% of available potentially suitable habitat) and 2,480 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Gray fox (*Urocyon cinereoargenteus*)	Deserts, open forests, and brush. Prefers wooded areas, broken country, brushlands, and rocky areas. Tolerant of low levels of residential development. About 2,836,200 acres of potentially suitable habitat occurs in the SEZ region.	13,242 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat) during construction and operations	78,063 acres of potentially suitable habitat (2.8% of available potentially suitable habitat)	30 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 2,637 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.

TABLE 11.2.11.3-1 (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]
Small Game and Furbearers (Cont.)					
Kit fox (*Vulpes macrotis*)	Desert and semidesert areas with relatively open vegetative cover and soft soils. Seeks shelter in underground burrows. About 4,055,200 acres of potentially suitable habitat occurs in the SEZ region.	13,242 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	146,162 acres of potentially suitable habitat (3.6% of available potentially suitable habitat)	61 acres of potentially suitable habitat lost (<0.002% of available potentially suitable habitat) and 5,330 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Red fox (*Vulpes vulpes*)	Most common in open woodlands, pasturelands, riparian areas, and agricultural lands. About 3,250,200 acres of potentially suitable habitat occurs in the SEZ region.	4,171 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	89,427 acres of potentially suitable habitat (2.8% of available potentially suitable habitat)	29 acres of potentially suitable habitat lost (<0.001% of available potentially suitable habitat) and 2,546 acres in area of indirect effects	Small overall impact.
Nongame (small) Mammals					
Big brown bat (*Eptesicus fuscus*)	Most habitats from lowland deserts to timberline meadows. Roosts in hollow trees, rock crevices, mines, tunnels, and buildings. About 2,785,100 acres of potentially suitable habitat occurs in the SEZ region.	13,242 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat) during construction and operations	78,061 acres of potentially suitable habitat (2.8% of available potentially suitable habitat)	29 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 2,485 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.

TABLE 11.2.11.3-1 (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]
Nongame (small) Mammals (Cont.)					
Botta's pocket gopher (*Thomomys bottae*)	Variety of habitats, including shortgrass plains, oak savanna, agricultural lands, and deserts. Burrows are more common in disturbed areas such as roadways and stream floodplains. About 2,533,400 acres of potentially suitable habitat occurs in the SEZ region.	13,242 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat) during construction and operations	96,745 acres of potentially suitable habitat (3.8% of available potentially suitable habitat)	28 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 2,444 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Brazilian free-tailed bat (*Tadarida brasiliensis*)	Cliffs, deserts, grasslands, old fields, savannas, shrublands, woodlands, and suburban/urban areas. Roosts in buildings, caves, and hollow trees. May roost in rock crevices, bridges, signs, or cliff swallow nests during migration. Large maternity colonies inhabit caves, buildings, culverts, and bridges. About 3,425,900 acres of potentially suitable habitat occurs in the SEZ region.	13,242 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat) during construction and operations	99,748 acres of potentially suitable habitat (2.9% of available potentially suitable habitat)	30 acres of potentially suitable habitat lost (<0.001% of available potentially suitable habitat) and 2,648 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Cactus mouse (*Peromyscus eremicus*)	Variety of areas, including desert scrub, semidesert chaparral, desert wash, semidesert grassland, and cliff and canyon habitats. About 3,205,500 acres of potentially suitable habitat occurs in the SEZ region.	3,024 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat) during construction and operations	91,847 acres of potentially suitable habitat (2.9% of available potentially suitable habitat)	59 acres of potentially suitable habitat lost (<0.002% of available potentially suitable habitat) and 5,089 acres in area of indirect effects	Small overall impact. Avoid wash habitats.

TABLE 11.2.11.3-1 (Cont.)

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]	
Nongame (small) Mammals (Cont.)					
California myotis (*Myotis californicus*)	Desertscrub, semidesert shrublands, lowland riparian, swamps, riparian suburban areas, plains grasslands, scrub-grasslands, woodlands, and forests. Roosts in caves, mine tunnels, hollow trees, and loose rocks. About 2,717,300 acres of potentially suitable habitat occurs in the SEZ region.	13,242 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat) during construction and operations	96,834 acres of potentially suitable habitat (3.6% of available potentially suitable habitat)	30 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 2,648 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Canyon mouse (*Peromyscus crinitus*)	Associated with rocky substrates in a variety of habitats, including desert scrub, sagebrush shrublands, woodlands, cliffs and canyons, and volcanic rock and cinder lands. Source of free water not required. About 3,119,700 acres of potentially suitable habitat occurs in the SEZ region.	977 acres of potentially suitable habitat lost (0.03% of available potentially suitable habitat) during construction and operations	76,157 acres of potentially suitable habitat (2.4% of available potentially suitable habitat)	47 acres of potentially suitable habitat lost (<0.002% of available potentially suitable habitat) and 4,081 acres in area of indirect effects	Small overall impact. Avoid Mojave mid-elevation mixed desert scrub habitat.
Deer mouse (*Peromyscus maniculatus*)	Tundra; alpine and subalpine grasslands; plains grasslands; open, sparsely vegetated deserts; warm temperate swamps and riparian forests; and Sonoran desert scrub habitats. About 4,801,800 acres of potentially suitable habitat occurs in the SEZ region.	13,242 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	148,987 acres of potentially suitable habitat (3.1% of available potentially suitable habitat)	62 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 5,434 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.

TABLE 11.2.11.3-1 (Cont.)

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]	
Nongame (small) Mammals (Cont.)					
Desert shrew (*Notiosorex crawfordi*)	Usually in arid areas with adequate cover such as semiarid grasslands, shortgrass plains, desert scrub, chaparral slopes, shortgrass plains, oak savannas and woodlands, and alluvial fans. About 3,059,300 acres of potentially suitable habitat occurs in the SEZ region.	13,242 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat) during construction and operations	112,817 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	62 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 5,378 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Desert woodrat (*Neotoma lepida*)	Sagebrush scrub; chaparral; deserts and rocky slopes with scattered cactus, yucca, pine-juniper, or other low vegetation; creosotebush desert; Joshua tree woodlands; scrub oak woodlands, pinyon-juniper woodlands; and riparian zones. Most abundant in rocky areas with Joshua trees. Dens built of debris on ground, among cacti or yucca, along cliffs, among rocks, or occasionally in trees. About 4,936,500 acres of potentially suitable habitat occurs in the SEZ region.	13,242 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	149,149 acres of potentially suitable habitat (3.0% of available potentially suitable habitat)	63 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 5,506 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Hoary bat (*Lasiurus cinereus*)	Chaparral, shortgrass plains, scrub-grassland, desertscrub, forests and woodlands. Usually roosts in trees, also in caves, rock crevices, and houses. About 2,398,100 acres of potentially suitable habitat occurs in the SEZ region.	5,134 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat) during construction and operations	54,198 acres of potentially suitable habitat (2.3% of available potentially suitable habitat)	28 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 2,470 acres in area of indirect effects	Small overall impact.

TABLE 11.2.11.3-1 (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]
Nongame (small) Mammals (Cont.)					
Little brown myotis (*Myotis lucifugus*)	Various habitats, including pinyon-juniper woodlands, montane shrublands, and riparian woodlands. It uses man-made structures for summer roosting, although caves and hollow trees are also utilized. Winter hibernation often occurs in caves or mines. Most foraging activity occurs in woodlands over or near water. About 3,360,100 acres of potentially suitable habitat occurs within the SEZ region.	12,329 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat) during construction and operations	133,976 acres of potentially suitable habitat (4.0% of available potentially suitable habitat)	50 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 4,308 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Little pocket mouse (*Perognathus longimembris*)	Mostly sandy and gravelly soils, but also stony soils and rarely rocky sites. About 3,871,400 acres of potentially suitable habitat occurs in the SEZ region.	12,318 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	143,526 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	60 acres of potentially suitable habitat lost (<0.002% of available potentially suitable habitat) and 5,259 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Long-legged myotis (*Myotis volans*)	Prefers pine forest, desert, and riparian habitats. Old buildings, rock crevices, and hollow trees are used for daytime roosting and winter hibernation. It forages in open areas, such as forest clearings. About 2,822,000 acres of potentially suitable habitat occurs within the SEZ region.	13,242 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat) during construction and operations	78,079 acres of potentially suitable habitat (2.8% of available potentially suitable habitat)	30 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 2,610 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.

TABLE 11.2.11.3-1 (Cont.)

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]	
Nongame (small) Mammals (Cont.)					
Long-tailed pocket mouse (*Chaetodipus formosus*)	Prefers pine forest, desert, and riparian habitats. Old buildings, rock crevices, and hollow trees used for daytime roosting and winter hibernation. It forages in open areas, such as forest clearings. About 4,022,700 acres of potentially suitable habitat occurs within the SEZ region.	12,318 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	145,111 acres of potentially suitable habitat (3.6% of available potentially suitable habitat)	62 acres of potentially suitable habitat lost (<0.002% of available potentially suitable habitat) and 5,380 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Merriam's kangaroo rat (*Dipodomys merriami*)	Plains grasslands, scrub-grasslands, desertscrub, shortgrass plains, oak and juniper savannahs, mesquite dunes, and creosote flats. About 4,023,100 acres of potentially suitable habitat occurs in the SEZ region.	13,242 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat) during construction and operations	148,166 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	61 acres of potentially suitable habitat lost (<0.002% of available potentially suitable habitat) and 5,331 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Northern grasshopper mouse (*Onychomys leucogaster*)	Occurs in grasslands, sagebrush deserts, overgrazed pastures, weedy roadside ditches, sand dunes, and other habitats with sandy soil and sparse vegetation. About 4,262,300 acres of potentially suitable habitat occurs within the SEZ region.	2,059 acres of potentially suitable habitat lost (0.05% of available potentially suitable habitat) during construction and operations	125,503 acres of potentially suitable habitat (2.9% of available potentially suitable habitat)	59 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 5,166 acres in area of indirect effects	Small overall impact.

TABLE 11.2.11.3-1 (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]
Nongame (small) Mammals (Cont.)					
Silver-haired bat (*Lasionycteris noctivagans*)	Urban areas, chaparral, alpine and subalpine grasslands, forests, scrub-grassland, oak savannah, and desertscrub habitats. Roosts under bark, and in hollow trees, caves and mines. Forages over clearings and open water. About 3,409,300 acres of potentially suitable habitat occurs in the SEZ region.	13,242 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat) during construction and operations	99,232 acres of potentially suitable habitat (2.9% of available potentially suitable habitat)	31 acres of potentially suitable habitat lost (<0.001% of available potentially suitable habitat) and 2,662 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Southern grasshopper mouse (*Onychomys torridus*)	Low, arid, shrub and semiscrub vegetation of deserts. About 2,828,700 acres of potentially suitable habitat occurs within the SEZ region.	12,328 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat) during construction and operations	108,963 acres of potentially suitable habitat (3.9% of available potentially suitable habitat)	60 acres of potentially suitable habitat lost (0.002% of available potentially suitable habitat) and 5,227 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects
Western harvest mouse (*Reithrodontomys megalotis*)	Various habitats, including scrub-grasslands, temperate swamps and riparian forests, salt marshes, shortgrass plains, oak savannah, dry fields, agricultural areas, deserts, and desertscrub. Grasses are the preferred cover. About 2,525,700 acres of potentially suitable habitat occurs in the SEZ region.	13,242 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat) during construction and operations	76,480 acres of potentially suitable habitat (3.0% of available potentially suitable habitat)	27 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 2,364 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.

TABLE 11.2.11.3-1 (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]
Nongame (small) Mammals (Cont.)					
Western pipistrelle (*Parastrellus hesperus*)	Deserts and lowlands, desert mountain ranges, desert scrub flats, and rocky canyons. Roosts mostly in rock crevices, sometimes mines and caves, and rarely in buildings. Suitable roosts occur in rocky canyons and cliffs. Most abundant bat in desert regions. About 2,649,400 acres of potentially suitable habitat occurs in the SEZ region.	13,242 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat) during construction and operations	96,828 acres of potentially suitable habitat (5.9% of available potentially suitable habitat)	29 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 2,496 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
White-tailed antelope squirrel (*Ammospermophilus leucurus*)	Low deserts, semidesert and montane shrublands, plateaus, and foothills in areas with sparse vegetation and hard gravelly surfaces. Spends its nights and other periods of inactivity in underground burrows. About 3,414,400 acres of potentially suitable habitat occurs within the SEZ region.	13,242 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat) during construction and operations	124,926 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	61 acres of potentially suitable habitat lost (<0.002% of available potentially suitable habitat) and 5,311 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Yuma myotis (*Myotis yumanensis*)	Riparian areas, grasslands, semidesert shrubland, mountain brush, woodlands, and deserts. It occurs where there is open water, regardless of the habitat. Roosts in caves, mines, cliffs, crevices, buildings, and swallow nests. About 2,715,000 acres of potentially suitable habitat occurs in the SEZ region.	13,242 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat) during construction and operations	95,709 acres of potentially suitable habitat (3.5% of available potentially suitable habitat)	30 acres of potentially suitable habitat lost (0.001% of available potentially suitable habitat) and 2,625 acres in area of indirect effects	Small overall impact. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.

Footnotes on next page.

TABLE 11.2.11.3-1 (Cont.)

[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 using SWReGAP habitat suitability and land cover models. This approach probably overestimates the amount of suitable habitat in the project area. A maximum of 13,242 acres of direct effects within the SEZ was assumed.

[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.

[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 13,242 acres of direct effects was also added to the area of indirect effects. 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 an 8-mi (13-km) long, 60-ft (18-m) wide access road ROW from the SEZ to the nearest existing highway. Indirect effects were estimated within a 1-mi (1.6-km) wide access road corridor to the existing highway, less the assumed area of direct effects.

[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: CDFG (2008); NatureServe (2010); NDCNR (2002); USGS (2004, 2005a, 2007).

Pronghorn

Based on land cover analyses, up to 2,061 acres (8.3 km^2) of potentially suitable pronghorn habitat could be lost through solar energy and access road development within the proposed Delamar Valley SEZ. This represents about 0.1% of potentially suitable pronghorn habitat within the SEZ region. About 83,469 acres (337.8 km^2) of potentially suitable pronghorn habitat occurs within the area of indirect effects for the SEZ and access road. This is about 4.9% of potentially suitable pronghorn habitat within the SEZ region. Based on mapped range, 14,035 acres (56.8 km^2) of year-round pronghorn habitat would be directly affected by solar energy development within the SEZ (Figure 11.2.11.3-3), or about 1.5% of the year-round habitat mapped within the SEZ region. About 93,360 (378 km^2) of habitat occurs within the area of indirect effects (Figure 11.2.11.3-3). Overall, impacts on pronghorn from solar energy development in the SEZ would be small (based on land cover) to moderate (based on mapped range).

Other Mammals

Direct impacts on all other representative mammal species would be small (Table 11.2.11.3-1). Direct impacts (percent loss of potentially available habitat) for these species would range from 0.03% for the canyon mouse to 0.5% for the gray fox, big brown bat, Botta's pocket gopher, California myotis, long-legged myotis, western harvest mouse, western pipistrelle, and Yuma myotis (Table 11.2.11.3-1). Larger areas of potentially suitable habitats for these mammal species occur within the area of potential indirect effects (e.g., up to 5.9% of available habitat for the western pipistrelle).

Summary

Overall, impacts on mammal species, based on land cover analyses, would be small (Table 11.2.11.3-1). Based on mapped ranges for big game, a moderate impact could occur to pronghorn. In addition to habitat loss, other direct impacts on mammals could result from collision with vehicles and infrastructure (e.g., fences). Indirect impacts on mammals could result from surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, accidental spills, collection, and harassment. Indirect impacts are expected to be negligible with implementation of programmatic design features.

Decommissioning after operations cease could result in short-term negative impacts on individuals and habitats within and adjacent to the SEZ. The negative impacts of decommissioning would be reduced or eliminated as reclamation proceeds. Potentially long-term benefits could accrue as habitats are restored in previously disturbed areas. Section 5.10.2.1.4 provides an overview of the impacts of decommissioning and reclamation on wildlife. Of particular importance for mammal species would be the restoration of original ground surface contours, soils, and native plant communities associated with desert scrub, playa, and wash habitats.

11.2.11.3.3 SEZ-Specific Design Features and Design Feature Effectiveness

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

- The fencing around the solar energy development should not block the free movement of mammals, particularly big game species.

- Delamar Lake and the unnamed wash should be avoided.

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

11.2.11.4 Aquatic Biota

11.2.11.4.1 Affected Environment

This section addresses aquatic habitats and biota known to occur in the proposed Delamar Valley SEZ itself or within an area that could be affected, either directly or indirectly, by activities associated with solar energy development within the SEZ. There are no surface water bodies or perennial streams within the proposed Delamar Valley SEZ or within the area of direct effects associated with the assumed new road corridor (Figure 11.2.1.1-1). As described in Section 11.2.9.1.1, 4 mi (6 km) of the intermittent Jumbo Wash and 8 mi (13 km) of an unnamed wash cross through the SEZ. These washes are typically dry and flow only after precipitation, at which time they carry water to Delamar Lake, a dry lake, 2,465 acres (10 km^2) of which are also located within the SEZ. Other ephemeral washes may also cross the SEZ, but they typically do not support wetland or riparian habitats. As described in Section 11.2.9.1.1, Delamar Lake is classified as a lacustrine wetland by the NWI. However, in the desert southwest, wetlands near dry lakes rarely have water (USFS 1998). Consequently, aquatic habitat and communities are not likely to be present in the proposed Delamar Valley SEZ, although opportunistic crustaceans and aquatic insect larvae adapted to desert conditions may be present even under dry conditions.

There are no permanent surface water bodies or perennial streams located within the area of indirect effects associated with the proposed Delamar Valley SEZ. However, the boundary of the area of indirect effects associated with the presumed new road corridor does extend to the spring-fed perennial Pahranagat Creek, which flows into Pahranagat National Wildlife Refuge.

Pahranagat NWR contains stream and wetland habitat critical for aquatic biota, including several protected endemic fish species, such as the White River springfish (*Crenichthys baileyi baileyi*) and the Pahranagat roundtail chub (*Gila robusta jordani*). There are no intermittent surface water features in the area of indirect effects associated with the presumed road corridors, but there are several within the area of indirect effects associated with the SEZ, including 141 acres (0.6 km^2) of Delamar Lake, 6 mi (7 km) of Jumbo Wash, and 9 mi (14 km) of an unnamed intermittent stream. The intermittent/ephemeral nature of these features suggests aquatic habitat and biota are unlikely. However, more detailed site survey data would be needed to characterize the aquatic biota, if present.

Outside of the potential indirect effects area, but within 50 mi (80 km) of the SEZ, there are several dry lakes, the area of which totals approximately 152,193 acres (616 km^2). There are 319 mi (513 km) of intermittent stream and 223 mi (359 km) of perennial stream located within 50 mi (80 km) of the SEZ. Ash Spring and the Pahranagat NWR are also located within 50 mi (80 km) of the SEZ. Within the SEZ and the area of potential indirect effects, intermittent streams and dry lakes are the only surface-water features present, representing approximately 7% of the amount of intermittent stream and 2% of dry lake available within the overall analysis area.

11.2.11.4.2 Impacts

Section 5.10.3 discusses in detail the types of impacts that could occur to aquatic habitats and biota due to the development of utility-scale solar energy facilities. Effects that are particularly relevant to aquatic habitats and communities include water withdrawal and changes in water, sediment, and contaminant inputs associated with runoff.

No permanent water bodies or streams are present within the area of direct or indirect effects associated with the proposed Delamar Valley SEZ. The nearest perennial surface waters are located more than 8 mi (13 km) from the SEZ and the intermittent streams in the SEZ do not drain into any permanent surface waters. Therefore, no direct impacts on perennial aquatic habitat are expected to result from solar development activities within the SEZ. Ground disturbance related to the presumed new access road terminates at U.S. 93, less than 1 mi (2 km) from Pahranagat Creek. Therefore, indirect impacts on the creek may result from the deposition of fugitive dust following ground disturbance. Intermittent surface water features are present within the area of direct and indirect effects associated with the SEZ, and ground disturbance could result in airborne and waterborne sediment deposition into these habitats. However, intermittent streams and water bodies within the SEZ are typically dry and no aquatic habitat or communities are expected to exist. Consequently, impacts on aquatic biota are expected to be minimal, although more detailed site surveys for biota in ephemeral and intermittent surface waters would be necessary to determine whether solar energy development activities would result in direct or indirect impacts to aquatic biota, if present. The implementation of commonly used engineering practices to control water runoff and sediment deposition into Pahranagat Creek, intermittent washes, and Delamar Lake would further minimize the potential for impacts on aquatic habitat.

As identified in Section 5.10.3, 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. Within the SEZ, there is the potential for contaminants to enter washes and Delamar Lake, especially if heavy machinery is used in or near the channel. The potential for introducing contaminants into permanent surface waters would be small, given the relatively large distance from any features to solar development activities (minimum of approximately 8 mi [13 km]).

In arid environments, reductions in the quantity of water in aquatic habitats are of particular concern. Water quantity in aquatic habitats, including surface water features outside of the SEZ and area of indirect effects, could also be affected if significant amounts of surface water or groundwater were utilized for power plant cooling water, for washing mirrors, or for other needs. Of the technologies available, a PV system is the most practical given the amount of groundwater present and the existing water allotments (Section 11.2.9.2). The associated impacts would ultimately depend on the water source used (including groundwater from aquifers at various depths). 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.

11.2.11.4.3 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 when specific project details are being considered, a design feature that can be identified at this time includes the following:

- Appropriate engineering controls should be implemented to minimize the amount of contaminants and sediment entering washes and Delamar Lake and Pahranagat Creek.

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 aquatic habitats, the potential impacts on aquatic biota and habitats from solar energy development at the Delamar Valley SEZ would be negligible.

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11.2.12 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 Delamar Valley SEZ. Special status species include the following types of species[3]:

- 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 BLM as sensitive;
- Species that are listed by the state of Nevada[4]; and
- Species that have been ranked as S1 or S2 by the state of Nevada, or as species of concern by the state of Nevada or the USFWS; hereafter referred to as "rare" species.

Special status species known to occur within 50 mi (80 km) of the Delamar Valley SEZ (i.e., the SEZ region) were determined from natural heritage records available through NatureServe Explorer (NatureServe 2010), information provided by the NNHP (NDCNR 2004, 2005, 2009a,b; Miskow 2009), SWReGAP (USGS 2004, 2005, 2007), and ECOS (USFWS 2010c). Information reviewed consisted of county-level occurrences as determined from NatureServe and the NNHP, element occurrences provided by the NNHP, and 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 Clark, Lincoln, and Nye Counties, Nevada, as well as Washington County, Utah. However, the affected area around the SEZ occurs entirely within Lincoln County, Nevada. See Appendix M for additional information on the approach used to identify species that could be affected by development within the SEZ.

11.2.12.1 Affected Environment

The affected area considered in our 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 proposed Delamar Valley SEZ, the area of direct effects included the SEZ and the portions of the road corridor where ground-disturbing activities are assumed to occur. Due to the proximity of

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[3] 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.

[4] State-listed species for the state of Nevada are those protected under NRS 501.110 (animals) or NRS 527 (plants).

existing infrastructure, the impacts of construction and operation of transmission lines outside of the SEZ are not assessed, assuming that the existing transmission infrastructure might be used to connect some new solar facilities to load centers, and that additional project-specific analysis would be conducted for new transmission construction or line upgrades (see Section 11.2.1.2 for development assumptions for this SEZ). The area of indirect effects was defined as the area within 5 mi (8 km) of the SEZ boundary and portions 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 effects. Indirect effects considered in the assessment included effects from surface runoff, dust, noise, lighting, and accidental spills from the SEZ and road construction area, 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 effects was identified on the basis of professional judgment and was considered sufficiently large to bound the area that would potentially be subject to indirect effects. The affected area includes both the direct and indirect effects areas.

The primary land cover habitat type within the affected area is inter-mountain basin semidesert shrubland (Section 11.2.10). Potentially unique habitats in the affected area in which special status species may reside include rocky cliffs and outcrops, riparian woodlands, desert washes, and playa habitats. Aquatic habitats that occur in the affected area include Jumbo Wash and other small ephemeral streams that drain into Delamar Lake (approximately 2,500 acres [10 km^2] in size), which exists in the southern portion of the SEZ. Although the assumed access road corridor for the SEZ does not cross any surface water features, approximately 0.5 mi (0.8 km) of Pahranagat Creek intersects the area of potential indirect effects for the access road corridor (Figure 11.2.12.1-1).

In scoping comments regarding the proposed Delamar Valley SEZ (Stout 2009), the USFWS expressed concern that groundwater withdrawals associated with solar energy development on the SEZ may reduce the White River Valley regional groundwater supply that supports spring-fed aquatic habitats in the SEZ region, including habitats in the White River, Pahranagat, and Moapa Valleys. The spatial extent of this groundwater system extends from Ely in central Nevada to the Moapa Valley in southern Nevada. However, as discussed in Section 11.2.9.2, groundwater in the Delamar Valley is not a major contributor to the far northern or far southern extents of the White River Valley regional groundwater system. Instead, groundwater interaction from the Delamar Valley with the White River Regional groundwater system is highly localized, occurring primarily within the Pahranagat Valley. For these reasons, the analysis in this section does not consider impacts on some of the species mentioned in the USFWS scoping letter. Instead, only those species dependent on groundwater-supported habitats within the Pahranagat Valley are included in our assessment here. This includes species that occur in aquatic and riparian habitat associated with the following springs: Ash Springs, Crystal Spring, and Hiko Spring (Figure 11.2.12.1-1). Although these areas are outside of the affected area as defined above, they are included in our evaluation because of the possible effect of groundwater withdrawals.

All special status species that are known to occur within the Delamar Valley SEZ region (i.e., within 50 mi [80 km] of the center of the SEZ) are listed, with their status, nearest recorded occurrence, and habitats in Appendix J. Of these species, there are 49 that could be affected by

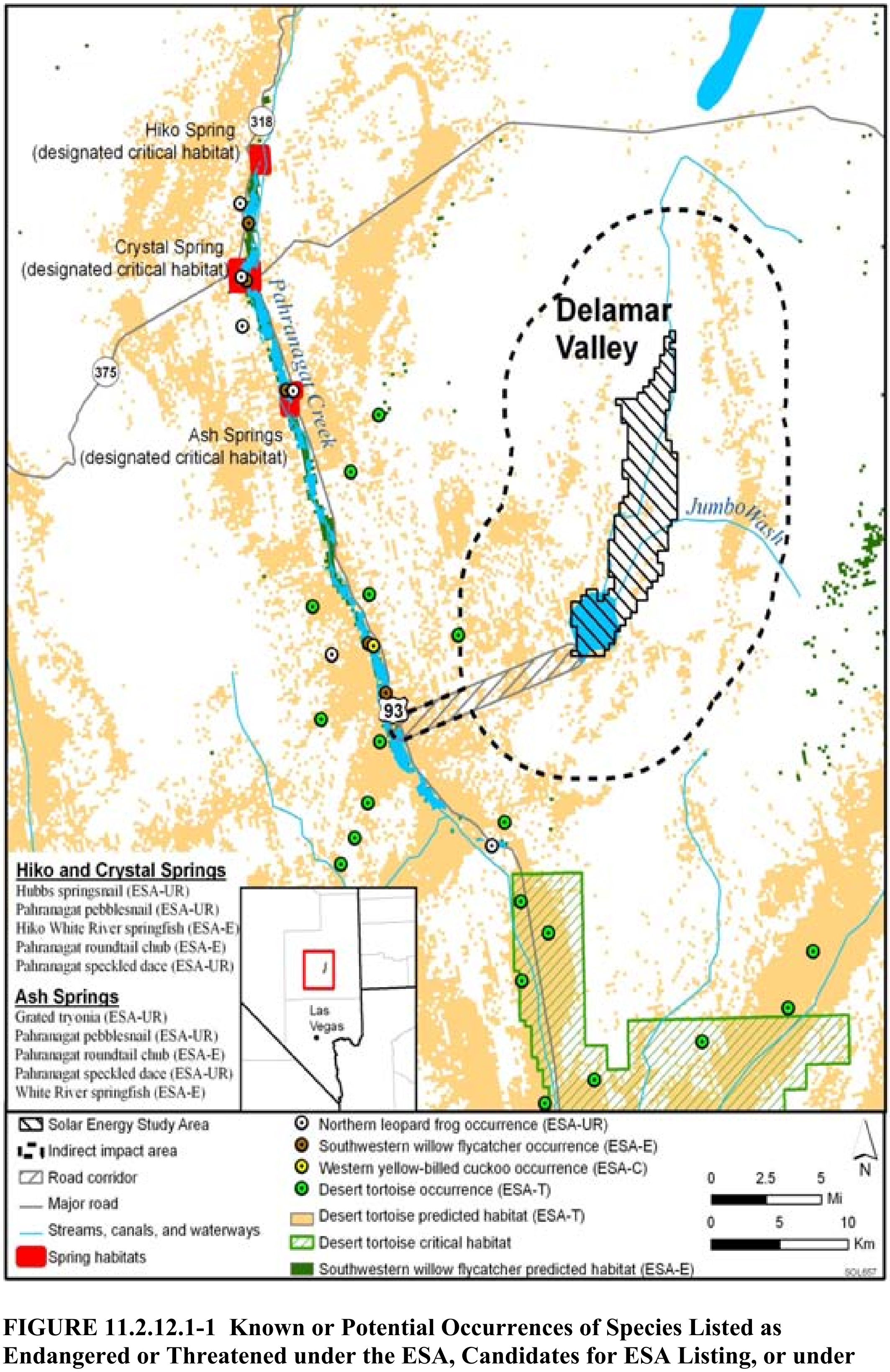

FIGURE 11.2.12.1-1 Known or Potential Occurrences of Species Listed as Endangered or Threatened under the ESA, Candidates for ESA Listing, or under Review for Listing in the Affected Area of the Proposed Delamar Valley SEZ (Sources: Miskow 2009; USFWS 2010c; USGS 2007).

solar energy development on the SEZ (including those dependent on groundwater discharge in the region), on the basis of recorded occurrences or the presence of potentially suitable habitat in the area. These species, their status, and their habitats are presented in Table 11.2.12.1-1. 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 more than 20 mi (32 m) away from the SEZ.

Based on NNHP records and information provided by the USFWS, only the desert tortoise is known to occur within the affected area of the Delamar Valley SEZ. In addition to this species, there are 16 groundwater-dependent species or species with habitats that may be affected by groundwater discharge in the White River Valley regional groundwater system from withdrawals in the Delamar Valley. These species include the Ash Springs riffle beetle, grated tryonia, Hubbs springsnail, nearctic riffle beetle, Pahranagat naucorid, Pahranagat pebblesnail, Hiko White River springfish, Pahranagat roundtail chub, Pahranagat speckled dace, White River desert sucker, White River springfish, northern leopard frog, southwestern toad, phainopepla, southwestern willow flycatcher, and western yellow-billed cuckoo. Ten additional groundwater-dependent species were identified in the FWS scoping letter (Stout 2009): Moapa pebblesnail, Moapa Valley springsnail, Moapa Warm Spring riffle beetle, Big Spring spinedace, Moapa dace, Moapa speckled dace, Moapa White River springfish, Pahrump poolfish, Railroad Valley springfish, and White River spinedace. However, these species occur outside the Pahranagat Valley, and, as discussed above, are considered to be unaffected by groundwater withdrawals on the Delamar Valley SEZ.

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

In scoping comments regarding the proposed Delamar Valley SEZ, the USFWS expressed concern for impacts of project development within the SEZ on the Mojave population of the desert tortoise—a species listed as threatened under the ESA in the SEZ region (Stout 2009). The USFWS also expressed concern that groundwater withdrawals to serve development on the SEZ from the White River Valley regional groundwater system may also reduce the groundwater supply that supports aquatic and riparian habitats for various ESA-listed species in the SEZ region. The following ESA-listed species that may occur outside the area of indirect effects but that could be impacted from groundwater withdrawals within the SEZ are considered: Hiko White River springfish (endangered), Pahranagat roundtail chub (endangered), White River springfish (endangered), and southwestern willow flycatcher (endangered). These species are discussed below and information on their habitats is presented in Table 11.2.12.1-1; additional basic information on life history, habitat needs, and threats to populations of these species is provided in Appendix J.

TABLE 11.2.12.1-1 Habitats, Potential Impacts, and Potential Mitigation for Special Status Species That Could be Affected by Solar Energy Development on the Proposed Delamar Valley SEZ

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Access Road (Direct Effects)[e]	Maximum Area of Potential Habitat Affected[c]: Indirect Effects (Outside SEZ)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Plants							
Ackerman milkvetch	*Astragalus ackermanii*	NV-S2	Endemic to the Sheep and Pintwater ranges of southern Nevada in crevices and ledges of carbonate cliffs in the mixed shrub, sagebrush, and juniper woodland habitat communities at elevations between 4,000 and 6,200 ft.[i] Nearest recorded occurrence is from the Desert National Wildlife Range, approximately 21 mi[j] southwest of the SEZ. About 2,689,000 acres[k] of potentially suitable habitat occurs within the SEZ region.	976 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	78 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	48,900 acres of potentially suitable habitat (1.8% of available potentially suitable habitat)	Small overall impact. Pre-disturbance surveys and avoidance or minimization of disturbance to occupied habitats in the areas of direct effects; translocation of individuals from areas of direct effects; or compensatory mitigation of direct effects on occupied habitats could reduce impacts. Note that these same potential mitigations apply to all special status plants.
Antelope Canyon goldenbush	*Ericameria cervina*	NV-S1	Rock crevices and talus in shadscale and Douglas-fir-bristlecone pine communities often on calcareous substrates; less commonly on ash flow tuff. Elevation ranges between 3,100 and 8,800 ft. Nearest recorded occurrence is from BLM-administered lands, approximately 33 mi southeast of the SEZ. About 850,600 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	0 acres	3,000 acres of potentially suitable habitat (0.4% of available potentially suitable habitat)	Small overall impact; no direct effects. No species-specific mitigation is warranted.

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TABLE 11.2.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Access Road (Direct Effects)[e]	Indirect Effects (Outside SEZ)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Plants (Cont.)							
Charleston ground-daisy	*Townsendia jonesii* var. *tumulosa*	BLM-S; FWS-SC	Endemic to Nevada, where the species is known from 27 occurrences encompassing an area of less than 10 acres. Occurs in open, sparsely vegetated calcareous areas, on shallow gravelly carbonate soils of slopes and exposed knolls in forest clearings. Most commonly in montane conifer habitat, but also in pinyon-juniper, and lower subalpine conifer communities. Elevation ranges between 5,200 and 11,000 ft. Nearest recorded occurrence is from the Desert National Wildlife Range, approximately 40 mi southwest of the SEZ. About 1,950,000 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)	45,500 acres of potentially suitable habitat (2.3% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing impacts on rocky cliffs and outcrops would reduce impacts. See Ackerman milkvetch for a list of other potential mitigations.

TABLE 11.2.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Access Road (Direct Effects)[e]	Indirect Effects (Outside SEZ)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Plants (Cont.)							
Eastwood milkweed	*Asclepias eastwoodiana*	BLM-S; FWS-SC; NV-S2	Endemic to Nevada from public and private lands in Esmeralda, Lander, Lincoln, and Nye Counties in open areas on a wide variety of basic (pH usually >8) soils, including calcareous clay knolls, sand, carbonate or basaltic gravels, or shale outcrops, generally barren and lacking competition. Small washes or other moisture-accumulating microsites at elevations between 4,700 and 7,100 ft. Nearest recorded occurrence is from BLM-administered lands, approximately 31 mi north of the SEZ. About 663,500 acres of potentially suitable habitat occurs within the SEZ region.	2,000 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	25 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	48,000 acres of potentially suitable habitat (7.2% of available potentially suitable habitat)	Small overall impact. See Ackerman milkvetch for a list of other potential mitigations.
Jaeger beardtongue	*Penstemon thompsoniae* ssp. *jaegeri*	NV-S2	Endemic to southern Nevada, where it is known from 24 occurrences on limestone soils of knolls and slopes, drainages, and under conifers within pinyon-juniper through the subalpine conifer zones. Elevation ranges between 5,600 and 11,000 ft. Nearest recorded occurrence is from the Desert National Wildlife Range, approximately 41 mi southwest of the SEZ. About 724,000 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	0 acres	2,900 acres of potentially suitable habitat (0.4% of available potentially suitable habitat)	Small overall impact; no direct effects. No species-specific mitigation is warranted.

TABLE 11.2.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Access Road (Direct Effects)[e]	Indirect Effects (Outside SEZ)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Plants (Cont.)							
Long-calyx milkvetch	*Astragalus oophorus* var. *lonchocalyx*	BLM-S; FWS-SC; NV-S2	Regionally endemic to the Great Basin in western Utah and eastern Nevada in pinyon-juniper woodlands, sagebrush, and mixed shrub communities at elevations between 5,800 and 7,500 ft. Nearest recorded occurrence is from BLM-administered lands, approximately 11 mi east of the SEZ. About 3,145,000 acres of potentially suitable habitat occurs within the SEZ region.	11,200 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	61 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	101,000 acres of potentially suitable habitat (3.2% of available potentially suitable habitat)	Small overall impact. See Ackerman milkvetch for a list of other potential mitigations.
Meadow Valley sandwort	*Eremogone stenomeres*	NV-S2	Endemic to Nevada, where it is restricted to Clark and Lincoln Counties on limestone cliffs at elevations between 2,950 and 3,950 ft. Nearest recorded occurrence is from BLM-administered lands, approximately 31 mi south of the SEZ. About 129,000 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	0 acres	161 acres of potentially suitable habitat (0.1% of available potentially suitable habitat)	Small overall impact; no direct effects. No species-specific mitigation is warranted.

TABLE 11.2.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Access Road (Direct Effects)[e]	Indirect Effects (Outside SEZ)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Plants (Cont.)							
Needle Mountains milkvetch	*Astragalus eurylobus*	BLM-S; FWS-SC; NV-S2	Gravel washes, playa margins, and arid grasslands on sandy soils at elevations between 4,250 and 6,250 ft. Nearest recorded occurrence is from BLM-administered lands, approximately 26 mi northeast of the SEZ. About 68,000 acres of potentially suitable habitat occurs within the SEZ region.	3,100 acres of potentially suitable habitat lost (4.6% of available potentially suitable habitat)	2 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	1,800 acres of potentially suitable habitat (2.7% of available potentially suitable habitat)	Moderate overall impact. Avoiding or minimizing disturbance of playa habitat could reduce impacts. See the Ackerman milkvetch for a list of other potential mitigations.
Nevada willowherb	*Epilobium nevadense*	BLM-S; FWS-SC; NV-S2	Pinyon-juniper woodlands and oak/mountain mahogany communities, on talus slopes and rocky limestone outcrops. Elevation ranges between 5,000 and 8,800 ft. Nearest recorded occurrence is from BLM-administered lands, approximately 20 mi east of the SEZ. About 879,500 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	0 acres	3,000 acres of potentially suitable habitat (0.3% of available potentially suitable habitat)	Small overall impact; no direct effects. No species-specific mitigation is warranted.

TABLE 11.2.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Access Road (Direct Effects)[e]	Indirect Effects (Outside SEZ)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Plants (Cont.)							
Pioche blazingstar	*Mentzelia argillicola*	BLM-S; NV-S1	Endemic to Nevada on dry, soft, silty clay soils on knolls and slopes with sparse vegetation consisting mainly of sagebrush. Nearest recorded occurrence is from the Patterson Wash, approximately 40 mi northeast of the SEZ. About 1,980,500 acres of potentially suitable habitat occurs within the SEZ region.	12,000 acres of potentially suitable habitat lost (0.6% of available potentially suitable habitat)	29 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	105,000 acres of potentially suitable habitat (5.3% of available potentially suitable habitat)	Small overall impact. See Ackerman milkvetch for a list of other potential mitigations.
Rock phacelia	*Phacelia petrosa*	BLM-S; NV-S2	Dry limestone and volcanic talus slopes of foothills, washes, and gravelly canyon bottoms on substrates derived from calcarous material in mixed desert scrub, creosotebush, and blackbrush communities at elevations between 2,500 and 5,800 ft. Nearest recorded occurrence is from the Desert National Wildlife Range, approximately 40 mi southwest of the SEZ. About 2,100,000 acres of potentially suitable habitat occurs within the SEZ region.	976 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat)	80 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	46,000 acres of potentially suitable habitat (2.2% of available potentially suitable habitat)	Small overall impact. See Ackerman milkvetch for a list of other potential mitigations.

TABLE 11.2.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Access Road (Direct Effects)[e]	Indirect Effects (Outside SEZ)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Plants (Cont.)							
Rock purpusia	*Ivesia arizonica* var. *saxosa*	BLM-S; NV-S1	Endemic to southern Nevada in crevices of cliffs and boulders on volcanic substrates in pinyon-juniper communities at elevations between 4,900 and 6,900 ft. Nearest recorded occurrence is from BLM-administered lands, approximately 11 mi north of the SEZ. About 850,000 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)	4,600 acres of potentially suitable habitat (0.4% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing impacts on rocky cliffs and outcrops would reduce impacts. See Ackerman milkvetch for a list of other potential mitigations.
Sheep Mountain milkvetch	*Astragalus amphioxys* var. *musimonum*	BLM-S; FWS-SC; NV-S2	Restricted to the foothills of the Sheep Mountains in southern Nevada (historically occurred in Arizona) on carbonate alluvial gravels, particularly along drainages, roadsides, and in other microsites with enhanced runoff, at elevations between 4,400 and 6,000 ft. Nearest recorded occurrence is from the Desert National Wildlife Range, approximately 40 mi southwest of the SEZ. About 1,977,000 acres of potentially suitable habitat occurs within the SEZ region.	976 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat)	78 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	46,000 acres of potentially suitable habitat (2.3% of available potentially suitable habitat)	Small overall impact. See Ackerman milkvetch for a list of other potential mitigations.

TABLE 11.2.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Access Road (Direct Effects)[e]	Indirect Effects (Outside SEZ)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Plants (Cont.)							
St. George blue-eyed grass	*Sisyrinchium radicatum*	NV-S1	Primarily occurs in the Las Vegas–St. George region in moist, sometimes alkaline meadows, stream banks, and spring borders at elevations between 2,000 and 4,300 ft. Nearest recorded occurrence is along the Pahranagat Creek, approximately 15 mi west of the SEZ. About 24,000 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	0 acres	138 acres of potentially suitable habitat (0.6% of available potentially suitable habitat)	Small overall impact; no direct effects. No species-specific mitigation is warranted.
Tiehm blazingstar	*Mentzelia tiehmii*	BLM-S; NV-S1	Endemic to Nevada on hilltops of white soil, sparsely vegetated white calcareous knolls, and bluffs with scattered perennials. Nearest recorded occurrence is along the White River, approximately 38 mi north of the SEZ. About 1,520,000 acres of potentially suitable habitat occurs within the SEZ region.	12,000 acres of potentially suitable habitat lost (0.8% of available potentially suitable habitat)	27 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	92,700 acres of potentially suitable habitat (6.1% of available potentially suitable habitat)	Small overall impact. See Ackerman milkvetch for a list of other potential mitigations.

TABLE 11.2.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Access Road (Direct Effects)[e]	Indirect Effects (Outside SEZ)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Plants (Cont.)							
Veyo milkvetch	*Astragalus ensiformis* var. *gracilior*	NV-S1	Restricted to Lincoln County, Nevada, and Washington County, Utah, on clay soil of open washes, valley floors, and hillsides under sagebrush within pinyon-juniper communities. Elevation ranges between 4,200 and 5,000 ft. Nearest recorded occurrence is from BLM-administered lands, approximately 43 mi east of the SEZ. About 2,790,000 acres of potentially suitable habitat occurs within the SEZ region.	2,000 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat)	80 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	113,500 acres of potentially suitable habitat (4.1% of available potentially suitable habitat)	Small overall impact. See Ackerman milkvetch for a list of other potential mitigations.
White bearpoppy	*Arctomecon merriamii*	BLM-S	Endemic to the Death Valley region of California and Nevada in barren gravelly areas, rocky slopes, and limestone outcrops at elevations between 2,000 and 5,900 ft. Nearest recorded occurrence is from BLM-administered lands, approximately 17 mi south of the SEZ. About 152,000 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)	1,700 acres of potentially suitable habitat (1.1% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing impacts on rocky cliffs and outcrops would reduce impacts. See Ackerman milkvetch for a list of other potential mitigations.

TABLE 11.2.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Access Road (Direct Effects)[e]	Indirect Effects (Outside SEZ)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Plants (Cont.)							
White River cat's-eye	*Cryptantha welshii*	BLM-S; FWS-SC	Endemic to southern Nevada on dry, open, sparsely vegetated outcrops. Known to occur on carbonate substrates at elevations between 4,500 and 6,600 ft. Nearest recorded occurrence is along the Meadow Valley Wash, approximately 25 mi northeast of the SEZ. About 152,000 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)	1,700 acres of potentially suitable habitat (1.1% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing impacts on rocky cliffs and outcrops would reduce impacts. See Ackerman milkvetch for a list of other potential mitigations.
Invertebrates							
Ash Springs riffle beetle	*Stenelmis lariversi*	NV-S1	Endemic to Ash Springs in Lincoln County, Nevada approximately 15 mi west of the SEZ. About 198 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	0 acres	0 acres within the 5-mi area surrounding the SEZ and within the road corridor, but approximately 198 acres of potentially suitable habitat in Ash Springs could be affected by groundwater withdrawals.	Small to large overall impact. The impact of water withdrawal on the White River Valley regional ground-water system that supports aquatic and mesic habitat in the SEZ region would depend on the volume of water withdrawn to support construction and operations. Limiting with-drawals from this regional ground-water system could

TABLE 11.2.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Access Road (Direct Effects)[e]	Indirect Effects (Outside SEZ)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Invertebrates (Cont.)							
Ash Springs riffle beetle *(Cont.)*							reduce impacts on this species to negligible levels. Note that these potential impact magnitudes and potential mitigation measures apply to all groundwater-dependent special status species that may occur in the SEZ region.
Grated tryonia	*Tryonia clathrata*	ESA-UR; BLM-S; NV-S2	Endemic to the Muddy River spring system in southeastern Nevada. Occurs in on or in algae and detritus substrates of slow-moving freshwater spring systems. Nearest recorded occurrence is from Ash Springs, approximately 15 mi west of the SEZ. The amount of suitable habitat in the SEZ region has not been determined.	0 acres	0 acres	0 acres within the 5-mi area surrounding the SEZ and within the road corridor, but approximately 198 acres of potentially suitable habitat in Ash Springs could be affected by groundwater withdrawals.	Small to large overall impact. Habitats may be affected by groundwater withdrawal. See Ash Springs riffle beetle for potential mitigation measures applicable to all groundwater-dependent special status species.

TABLE 11.2.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Access Road (Direct Effects)[e]	Indirect Effects (Outside SEZ)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Invertebrates (Cont.)							
Hubbs springsnail	*Pyrgulopsis hubbsi*	ESA-UR; NV-S1	Endemic to Nevada, where it is restricted to Hiko and Crystal Spring. Nearest recorded occurrence is from Crystal Spring, approximately 18 mi west of the SEZ. About 361 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	0 acres	0 acres within the 5-mi area surrounding the SEZ and within the road corridor, but approximately 361 acres of potentially suitable habitat in Hiko and Crystal Springs could be affected by groundwater withdrawals.	Small to large overall impact. Habitats may be affected by groundwater withdrawal. See Ash Springs riffle beetle for potential mitigation measures applicable to all groundwater-dependent special status species.
Mojave poppy bee	*Perdita meconis*	BLM-S; NV-S2	Known only from Clark County, Nevada, where the species is dependent on poppy plants (*Arctomecon* spp.) in roadsides, washes, and barren desert areas on gypsum soils. Nearest recorded occurrence is from BLM-administered lands, approximately 35 mi south of the SEZ. About 130,000 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	0 acres	163 acres of potentially suitable habitat (0.1% of available potentially suitable habitat)	Small overall impact; no direct effects. No species-specific mitigation is warranted.

TABLE 11.2.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Access Road (Direct Effects)[e]	Indirect Effects (Outside SEZ)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Invertebrates (Cont.)							
Nearctic riffle beetle	*Stenelmis occidentalis*	NV-S1	High-gradient creeks as well as low-gradient medium rivers, springs, and brooks with woody debris, rocks, and exposed, submerged, or overhanging vegetation. Nearest recorded occurrence is from Ash Springs, approximately 15 mi west of the SEZ. The amount of suitable habitat in the SEZ region has not been determined.	0 acres	0 acres	0 acres within the 5-mi area surrounding the SEZ and within the road corridor, but suitable habitat elsewhere in the SEZ region could be affected by groundwater withdrawals.	Small to large overall impact. Habitats may be affected by groundwater withdrawal. See Ash Springs riffle beetle for potential mitigation measures applicable to all groundwater-dependent special status species.
Pahranagat naucorid	*Pelocoris shoshone shoshone*	BLM-S; NV-S1	Known only to occur in the Muddy and White River Basins in southern Nevada. Inhabits quiet waters of warm, spring-fed habitats. Nearest recorded occurrence is from Ash Springs, approximately 15 mi west of the SEZ. The amount of suitable habitat in the SEZ region has not been determined.	0 acres	0 acres	0 acres within the 5-mi area surrounding the SEZ and within the road corridor, but suitable habitat elsewhere in the SEZ region could be affected by groundwater withdrawals.	Small to large overall impact. Habitats may be affected by groundwater withdrawal. See Ash Springs riffle beetle for potential mitigation measures applicable to all groundwater-dependent special status species.

TABLE 11.2.12.1-1 (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]	Access Road (Direct Effects)[e]	Indirect Effects (Outside SEZ)[f]	
Invertebrates (Cont.)							
Pahranagat pebblesnail	*Pyrgulopsis merriami*	ESA-UR; NV-S1	Endemic to spring-fed systems in southern Nevada on rocks and emergent vegetation near the outflow of freshwater springs. Nearest recorded occurrence is from Ash Springs, approximately 15 mi west of the SEZ. The amount of suitable habitat in the SEZ region has not been determined.	0 acres	0 acres	0 acres within the 5-mi area surrounding the SEZ and within the road corridor, but suitable habitat elsewhere in the SEZ region could be affected by groundwater withdrawals.	Small to large overall impact. Habitats may be affected by groundwater withdrawal. See Ash Springs riffle beetle for potential mitigation measures applicable to all groundwater-dependent special status species.
Red-tailed blazing star bee	*Megandrena mentzeliae*	NV-S2	Endemic to southern Nevada, where it is known only from Clark County and associated with the host plant *Mentzelia tricuspis* in open, dry, barren areas with gypsum to gravelly soils. Nearest recorded occurrence is from BLM-administered lands, approximately 34 mi south of the SEZ. About 1,910,000 acres of potentially suitable habitat occurs within the SEZ region.	11,300 acres of potentially suitable habitat lost (0.6% of available potentially suitable habitat)	29 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	104,000 acres of potentially suitable habitat (5.4% 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 could reduce impacts.

TABLE 11.2.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Access Road (Direct Effects)[e]	Indirect Effects (Outside SEZ)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Fish							
Hiko White River springfish	*Crenichthys baileyi grandis*	ESA-E; NV-P; NV-S1	Endemic to Lincoln and Mineral Counties, Nevada, where it is restricted to the remaining waters of the White River and the stream and outflow habitats of Hiko and Crystal Springs. The species has also been introduced into Blue Link Spring. Nearest recorded occurrence is from Crystal Spring, approximately 18 mi west of the SEZ. About 361 acres of critical habitat associated with the Hiko and Crystal Springs occurs within the SEZ region.	0 acres	0 acres	0 acres within the 5-mi area surrounding the SEZ and within the road corridor, but suitable habitat elsewhere in the SEZ region could be affected by groundwater withdrawals.	Small to large overall impact. Habitats may be affected by groundwater withdrawal. See Ash Springs riffle beetle for potential mitigation measures applicable to all groundwater-dependent special status species.
Pahranagat roundtail chub	*Gila robusta jordani*	ESA-E; NV-P; NV-S1	Endemic to Nevada, where it is restricted to the White River system. Nearest recorded occurrence is from Ash Springs, approximately 15 mi west of the SEZ. About 37 mi of potentially suitable habitat in the Pahranagat Valley occurs within the SEZ region.	0 acres	0 acres	0 acres within the 5-mi area surrounding the SEZ and within the road corridor, but suitable habitat elsewhere in the SEZ region could be affected by groundwater withdrawals.	Small to large overall impact. Habitats may be affected by groundwater withdrawal. See Ash Springs riffle beetle for potential mitigation measures applicable to all groundwater-dependent special status species.

TABLE 11.2.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Access Road (Direct Effects)[e]	Indirect Effects (Outside SEZ)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Fish (Cont.)							
Pahranagat speckled dace	*Rhinichthys osculus velifer*	ESA-UR; BLM-S; NV-P; NV-S1	Endemic to Nevada, where it is restricted to the White River Valley system. Inhabits rivers, streams, tributaries, springs, brooks, marshes, lakes, and reservoirs. Nearest recorded occurrence is from the Pahranagat Creek, approximately 15 mi west of the SEZ. About 37 mi of potentially suitable habitat in the Pahranagat Valley occurs within the SEZ region.	0 acres	0 acres	0 acres within the 5-mi area surrounding the SEZ and within the road corridor, but suitable habitat elsewhere in the SEZ region could be affected by groundwater withdrawals.	Small to large overall impact. Habitats may be affected by groundwater withdrawal. See Ash Springs riffle beetle for potential mitigation measures applicable to all groundwater-dependent special status species.
White River desert sucker	*Catostomus clarkii intermedius*	BLM-S; NV-P; NV-S1	Endemic to Nevada, where it is restricted to remnant streams of the White River system, especially small to medium rivers. Nearest recorded occurrence is from the Pahranagat Creek, approximately 15 mi west of the SEZ. About 37 mi of potentially suitable habitat in the Pahranagat Valley occurs within the SEZ region.	0 acres	0 acres	0 acres within the 5-mi area surrounding the SEZ and within the road corridor, but suitable habitat elsewhere in the SEZ region could be affected by groundwater withdrawals.	Small to large overall impact. Habitats may be affected by groundwater withdrawal. See Ash Springs riffle beetle for potential mitigation measures applicable to all groundwater-dependent special status species.

TABLE 11.2.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Access Road (Direct Effects)[e]	Indirect Effects (Outside SEZ)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Fish (Cont.)							
White River springfish	*Crenichthys baileyi baileyi*	ESA-E; NV-P; NV-S1	Restricted to the Ash Spring system approximately 15 mi west of the SEZ. About 198 acres of critical habitat in the White River system occurs within the SEZ region.	0 acres	0 acres	0 acres within the 5-mi area surrounding the SEZ and within the road corridor, but suitable habitat elsewhere in the SEZ region could be affected by groundwater withdrawals.	Small to large overall impact. Habitats may be affected by groundwater withdrawal. See Ash Springs riffle beetle for potential mitigation measures applicable to all groundwater-dependent special status species.
Amphibians							
Northern leopard frog	*Rana pipiens*	ESA-UR; BLM-S; NV-S2	Low-gradient creeks, moderate-gradient rivers, pools, springs, canals, flood plains, reservoirs, shallow lakes, and wet meadows, especially with rooted aquatic vegetation. Also found in fields. Nearest recorded occurrence is from riparian areas along the Pahranagat Creek, approximately 8 mi southwest of the SEZ. About 2,400 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	0 acres	0 acres within the 5-mi area surrounding the SEZ and within the road corridor, but suitable habitat elsewhere in the SEZ region could be affected by groundwater withdrawals.	Small to large overall impact. Habitats may be affected by groundwater withdrawal. See Ash Springs riffle beetle for potential mitigation measures applicable to all groundwater-dependent special status species.

TABLE 11.2.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Access Road (Direct Effects)[e]	Indirect Effects (Outside SEZ)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Amphibians (Cont.)							
Southwestern toad	*Bufo microscaphus*	BLM-S; FWS-SC; NV-S2	Woodlands and low-elevation riparian habitats in association with permanent or semipermanent water bodies, also in and along streams, ditches, flooded fields, irrigated croplands, and permanent reservoirs. Nearest recorded occurrence is from riparian areas along the Meadow Valley Wash, approximately 15 mi east of the SEZ. About 22,600 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	0 acres	0 acres within the 5-mi area surrounding the SEZ and within the road corridor, but suitable habitat elsewhere in the SEZ region could be affected by groundwater withdrawals.	Small to large overall impact. Habitats may be affected by groundwater withdrawal. See Ash Springs riffle beetle for potential mitigation measures applicable to all groundwater-dependent special status species.
Reptiles							
Desert tortoise[l]	***Gopherus agassizii***	ESA-T; NV-P; NV-S2	Mojave and Sonoran Deserts in desert creosotebush communities on firm soils for digging burrows, and often along riverbanks, washes, canyon bottoms, creosote flats, and desert oases. Nearest recorded occurrence is 5 mi west of the SEZ. About 1,366,000 acres of potentially suitable habitat occurs within the SEZ region.	910 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat)	58 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	29,000 acres of potentially suitable habitat (2.1% of available potentially suitable habitat)	Small overall impact. Pre-disturbance surveys and avoiding or minimizing disturbance of occupied habitats on the SEZ, translocation of individuals from areas of direct effects, or compensatory mitigation of direct effects on occupied habitats could

TABLE 11.2.12.1-1 (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]: Access Road (Direct Effects)[e]	Maximum Area of Potential Habitat Affected[c]: Indirect Effects (Outside SEZ)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Reptiles (Cont.)							
Desert tortoise *(Cont.)*							reduce impacts. The potential for impact and need for mitigation should be determined in consultation with the USFWS and NDOW.
Birds							
Ferruginous hawk	*Buteo regalis*	BLM-S; FWS-SC	Grasslands, sagebrush, and saltbrush habitats, as well as the periphery of pinyon-juniper woodlands. Usually nests in tall trees or on rock outcrops along cliff faces. Known to occur in Lincoln County, Nevada. About 1,277,000 acres of potentially suitable habitat occurs within the SEZ region. Although much of the habitat in the SEZ region is year-round foraging and nesting habitat, only winter foraging habitat occurs in the affected area.	910 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat)	7 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	37,000 acres of potentially suitable habitat (2.9% of available potentially suitable habitat)	Small overall impact on foraging habitat only. Avoidance of direct impacts on all foraging habitat is not feasible because suitable foraging habitat is widespread in the area of direct effects.

TABLE 11.2.12.1-1 (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]: Access Road (Direct Effects)[e]	Maximum Area of Potential Habitat Affected[c]: Indirect Effects (Outside SEZ)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Birds (Cont.)							
Phainopepla	*Phainopepla nitens*	BLM-S; NV-P; FWS-SC; NV-S2	Summer breeding resident in SEZ region in desert scrub, mesquite, and pinyon-juniper woodland communities, also desert riparian areas and orchards. Nests in trees or shrubs from 3 to 45 ft above the ground. Nearest recorded occurrence is from riparian areas along Pahranagat Creek, approximately 19 mi northwest of the SEZ. About 1,077,000 acres of potentially suitable foraging and nesting habitat occurs within the SEZ region.	0 acres	46 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	15,900 acres of potentially suitable habitat (1.5% of available potentially suitable habitat). Potentially suitable habitat elsewhere in the SEZ region could be affected by groundwater withdrawals.	Small to large overall impact. Potentially suitable nesting habitat in riparian habitats in the White River and Pahranagat Valleys may be affected by groundwater withdrawal. See Ash Springs riffle beetle for potential mitigation measures applicable to all species that may be affected by groundwater withdrawal. In addition, avoiding or minimizing disturbance of potentially suitable riparian habitat in the area of direct effects may reduce impacts.

TABLE 11.2.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Access Road (Direct Effects)[e]	Indirect Effects (Outside SEZ)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Birds (Cont.)							
Prairie falcon	*Falco mexicanus*	BLM-S	Year-round resident in the SEZ region, primarily in open habitats in mountainous areas, steppe, grasslands, or cultivated areas. Typically nests in well-sheltered ledges of rocky cliffs and outcrops. Known to occur in Lincoln County, Nevada. About 2,534,000 acres of potentially suitable foraging and nesting habitat occurs within the SEZ region.	11,300 acres of potentially suitable foraging habitat lost (0.4% of available potentially suitable habitat)	52 acres of potentially suitable foraging and nesting habitat lost (<0.1% of available potentially suitable habitat)	87,700 acres of potentially suitable foraging and nesting habitat (3.5% of available potentially suitable habitat)	Small overall impact on foraging and nesting habitat. Pre-disturbance surveys, avoiding or minimizing disturbance of all occupied nesting habitat, or compensatory mitigation may reduce impacts.
Southwestern willow flycatcher	*Empidonax traillii extimus*	ESA-E; NV-P; NV-S1	Summer breeding resident in SEZ region in riparian shrublands and woodlands. Nests in thickets, scrubby and brushy areas, open second growth, swamps, and open woodlands. Nearest recorded occurrence is from riparian areas along Pahranagat Creek, approximately 8 mi west of the SEZ. About 40,000 acres of potentially suitable foraging and nesting habitat occurs within the SEZ region.	0 acres	5 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	200 acres of potentially suitable foraging and nesting habitat (0.5% of available potentially suitable habitat). Potentially suitable foraging and nesting habitat elsewhere in the SEZ region could be affected by groundwater withdrawals.	Small to large overall impact. Potentially suitable nesting habitat in riparian habitats in the White River and Pahranagat Valleys may be affected by groundwater withdrawal. See Ash Springs riffle beetle for potential mitigation measures applicable to all species that may be affected by groundwater withdrawal. In addition, avoiding

TABLE 11.2.12.1-1 (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]	Access Road (Direct Effects)[e]	Indirect Effects (Outside SEZ)[f]	
Birds (Cont.)							
Southwestern willow flycatcher *(Cont.)*							or minimizing disturbance of potentially suitable riparian habitat in the area of direct effects may reduce impacts.
Swainson's hawk	*Buteo swainsoni*	BLM-S; NV-P; CA-S2; NV-S2	Summer breeding resident in SEZ region in savanna, open pine-oak woodlands, grasslands, and cultivated lands. Nests typically in solitary trees, bushes, or small groves. Known to occur in Lincoln County, Nevada. About 2,165,000 acres of potentially suitable foraging and nesting habitat occurs within the SEZ region.	1,950 acres of potentially suitable foraging habitat lost (0.1% of available potentially suitable habitat)	75 acres of potentially suitable foraging habitat lost (<0.1% of available potentially suitable habitat)	91,600 acres of potentially suitable foraging and nesting habitat (4.2% of available potentially suitable habitat)	Small overall impact. Direct impact on foraging habitat only. Avoidance of direct impacts on all foraging habitat is not feasible because suitable foraging habitat is widespread in the area of direct effects.

TABLE 11.2.12.1-1 (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]	Access Road (Direct Effects)[e]	Indirect Effects (Outside SEZ)[f]	
Birds (Cont.)							
Western burrowing owl	*Athene cunicularia hypugaea*	BLM-S; FWS-SC	Summer breeding resident in SEZ region in open grasslands and prairies, as well as disturbed sites such as golf courses, cemeteries, and airports. Nests in burrows constructed by mammals (prairie dog, badger, etc.). Known to occur in Lincoln County, Nevada. About 3,910,000 acres of potentially suitable habitat occurs within the SEZ region.	15,400 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	108 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	150,000 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 burrows in the area of direct effects or compensatory mitigation of direct effects on occupied habitats could reduce impacts.
Western yellow-billed cuckoo	*Coccyzus americanus occidentalis*	ESA-C; NV-P; NV-S1	Summer breeding resident in SEZ region. Riparian obligate, usually in large tracts of cottonwood/willow habitats with dense sub-canopies. Nearest recorded occurrence is from riparian areas along Pahranagat Creek, approximately 8 mi west of the SEZ. About 50 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	0 acres	0 acres within the 5-mi area surrounding the SEZ and within the road corridor, but suitable nesting habitat elsewhere in the SEZ region could be affected by groundwater withdrawals.	Small to large overall impact. Potentially suitable nesting habitat in riparian habitats in the White River and Pahranagat Valleys may be affected by groundwater with-drawal. See Ash Springs riffle beetle for potential mitigation measures applicable to all species that may be affected by ground-water withdrawal.

TABLE 11.2.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Access Road (Direct Effects)[e]	Indirect Effects (Outside SEZ)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Mammals							
Desert Valley kangaroo mouse	*Microdipodops megacephalus albiventer*	BLM-S; NV-P; FWS-SC; NV-S2	Endemic to central Nevada in desert areas at playa margins and in dune habitats. Nearest recorded occurrence is 20 mi north of the SEZ. About 617,000 acres of potentially suitable habitat occurs within the SEZ region.	10,900 acres of potentially suitable habitat lost (1.8% of available potentially suitable habitat)	2 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	29,000 acres of potentially suitable habitat (4.7% of available potentially suitable habitat)	Moderate overall impact. Avoidance of all playa habitats within the SEZ could reduce impacts. In addition, pre-disturbance surveys and avoiding or minimizing disturbance of occupied habitats in the areas of direct effects or compensatory mitigation of direct effects on occupied habitats could reduce impacts.
Fringed myotis	*Myotis thysanodes*	BLM-S; NV-P; FWS-SC; NV-S2	Year-round resident in SEZ region in lowland riparian, desert shrub, pinyon-juniper, and sagebrush habitats. Roosts in buildings and caves. Summer or year-round resident throughout the six-state solar energy region. Known to occur in Lincoln County, Nevada. About 4,534,000 acres of potentially suitable habitat occurs within the SEZ region.	13,200 acres of potentially suitable foraging habitat lost (0.3% of available potentially suitable habitat)	106 acres of potentially suitable foraging or roosting habitat lost (<0.1% of available potentially suitable habitat)	142,000 acres of potentially suitable foraging and roosting habitat (3.1% of available potentially suitable habitat)	Moderate overall impact primarily on foraging habitat. Pre-disturbance surveys and avoiding or minimizing disturbance of cliffs and rock outcrops in the access road corridor could reduce impacts.

TABLE 11.2.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Access Road (Direct Effects)[e]	Indirect Effects (Outside SEZ)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Mammals (Cont.)							
Nelson's bighorn sheep	*Ovis canadensis nelsoni*	BLM-S; FWS-SC	Open, steep rocky terrain in mountainous habitats of the eastern Mojave and Sonoran Deserts in California. Rarely uses desert lowlands, except as corridors for travel between mountain ranges. Known to occur in Lincoln County, Nevada. About 1,400,000 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	18 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	32,600 acres of potentially suitable habitat (2.3% of available potentially suitable habitat)	Small overall impact. Pre-disturbance surveys and avoiding or minimizing disturbance of habitats within the area of direct effects that serve as movement corridors could further reduce impacts.
Pahranagat Valley montane vole	*Microtus montanus fucosus*	BLM-S; NV-P; FWS-SC; NV-S2	Endemic to Lincoln County, Nevada, where it is restricted to spring-fed riparian habitats in the Pahranagat Valley. Within that area, isolated populations utilize mesic montane and desert riparian patches. Nearest recorded occurrence is from riparian areas along Pahranagat Creek, approximately 9 mi west of the SEZ. About 12,500 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	0 acres	780 acres of potentially suitable habitat (6.3% of available potentially suitable habitat). Potentially suitable habitat elsewhere in the SEZ region could be affected by groundwater withdrawals.	Small to large overall impact. Potentially suitable riparian habitats in the White River and Pahranagat Valleys may be affected by groundwater withdrawal. See Ash Springs riffle beetle for potential mitigation measures applicable to all species that may be affected by groundwater withdrawal.

TABLE 11.2.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Access Road (Direct Effects)[e]	Indirect Effects (Outside SEZ)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Mammals (Cont.)							
Silver-haired bat	*Lasionycteris noctivagans*	BLM-S; FWS-SC	Year-round resident in SEZ region in high-elevation (1,600 to 8,500 ft) forested areas comprised of aspen, cottonwood, white fir, pinyon-juniper, subalpine fir, willow, and spruce communities. Roosts in forests in tree foliage, cavities, or under loose bark. Nearest recorded occurrence is 42 mi south of the SEZ. About 3,400,000 acres of potentially suitable habitat occurs within the SEZ region.	14,500 acres of potentially suitable foraging habitat lost (0.4% of available potentially suitable habitat)	52 acres of potentially suitable foraging habitat lost (<0.1% of available potentially suitable habitat)	101,000 acres of potentially suitable foraging and roosting habitat (3.0% of available potentially suitable habitat)	Small overall impact. Direct impact on foraging habitat only. Avoidance of direct impacts on all foraging habitat is not feasible because suitable foraging habitat is widespread in the area of direct effects.
Spotted bat	*Euderma maculatum*	BLM-S; NV-P; FWS-SC; NV-S2	Year-round resident in the SEZ region forests and shrubland habitats. Uses caves and rock crevices for roosting and winter hibernation. Nearest recorded occurrence is from the vicinity of Panaca, Nevada, approximately 35 mi northeast of the SEZ. About 3,750,000 acres of potentially suitable habitat occurs within the SEZ region.	12,150 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	87 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	94,000 acres of potentially suitable habitat (2.5% of available potentially suitable habitat)	Small overall impact primarily on foraging habitat. Pre-disturbance surveys and avoiding or minimizing disturbance of cliffs and rock outcrops in the access road corridor could reduce impacts.

TABLE 11.2.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Access Road (Direct Effects)[e]	Indirect Effects (Outside SEZ)[f]	Overall Impact Magnitude[g] and Species-Specific Mitigation[h]
Mammals (Cont.)							
Townsend's big-eared bat	*Corynorhinus townsendii*	BLM-S; NV-P; NV-S2	Year-round resident in the SEZ region in forests and shrubland habitats below 9,000 ft elevation. Uses caves, mines, and buildings for day roosting and winter hibernation. Nearest recorded occurrence is 42 mi south of the SEZ. About 2,870,000 acres of potentially suitable habitat occurs within the SEZ region.	14,500 acres of potentially suitable foraging habitat lost (0.5% of available potentially suitable habitat)	48 acres of potentially suitable foraging or roosting habitat lost (<0.1% of available potentially suitable habitat)	77,500 acres of potentially suitable foraging and roosting habitat (2.7% of available potentially suitable habitat)	Small overall impact primarily on foraging habitat. Pre-disturbance surveys and avoiding or minimizing disturbance of cliffs and rock outcrops in the access road corridor could reduce impacts.
Western small-footed bat	*Myotis ciliolabrum*	BLM-S; FWS-SC	Year-round resident in a variety of woodlands and riparian habitats at elevations below 9,000 ft. Roosts in caves, buildings, mines, and crevices of cliff faces. Known to occur in Lincoln County, Nevada. About 4,977,000 acres of potentially suitable habitat occurs within the SEZ region.	16,300 acres of potentially suitable foraging habitat lost (0.3% of available potentially suitable habitat)	112 acres of potentially suitable foraging or roosting habitat lost (<0.1% of available potentially suitable habitat)	155,000 acres of potentially suitable foraging and roosting habitat (3.1% of available potentially suitable habitat)	Small overall impact primarily on foraging habitat. Pre-disturbance surveys and avoiding or minimizing disturbance of cliffs and rock outcrops in the access road corridor could reduce impacts on roosting and habitat.

[a] BLM-S = listed as a sensitive species by the BLM; ESA-E = listed as endangered under the ESA; ESA-T = listed as threatened under the ESA; ESA-UR = under review for listing under the ESA; FWS-SC = USFWS species of concern; NV-P = protected in the state of Nevada under NRS 501.110 (animals) or NRS 527 (plants); NV-S1 = ranked as S1 in the state of Nevada; NV-S2 = ranked as S2 in the state of Nevada.

Footnotes continued on next page.

TABLE 11.2.12.1-1 (Cont.)

[b] For plant species, potentially suitable habitat was determined by using SWReGAP land cover types. For terrestrial vertebrate species, potentially suitable habitat was determined 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.

[c] Maximum area of potentially suitable habitat that could be affected relative to availability within the SEZ region. Habitat availability for each species within the region was determined by using SWReGAP habitat suitability and land cover models. This approach probably overestimates the amount of suitable habitat in the project area. No new transmission lines are assumed to be needed due to the proximity of transmission infrastructures 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 an 8-mi (13-km) long, 60-ft (18-m) wide road corridor 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.

[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 portions of the road and transmission corridors where ground-disturbing activities would not occur. Indirect effects include effects from surface runoff, dust, noise, lighting, and so on from project developments. The potential degree of indirect effects would decrease with increasing distance away from the SEZ. Indirect effects on groundwater-dependent species were considered outside these defined areas.

[g] Overall impact magnitude categories were based on professional judgment and are as follows: (1) *small*: $\leq$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 $\leq$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.

[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 within 5 mi (8 km) of the SEZ boundary.

Desert Tortoise

The Mojave population of the desert tortoise is listed as threatened under the ESA and is known to occur in the SEZ region in desert shrubland habitats. The nearest recorded occurrences of this species are 5 mi (8 km) west of the SEZ; designated critical habitat occurs outside the affected area approximately 9 mi (14 km) south of the SEZ (Figure 11.2.12.1-1).

In the scoping letter for the Delamar Valley SEZ (Stout 2009), the USFWS identified the potential for the desert tortoise to occur on the SEZ despite the lack of monitoring data in areas adjacent to the SEZ. According to the SWReGAP habitat suitability model, approximately 30,000 acres (121 km^2) of potentially suitable habitat for this species occurs in the affected area; 910 acres (3.7 km^2) occurs within the SEZ, 58 acres (0.2 km^2) occurs within the road corridor, and 29,000 acres (117 km^2) occurs in the area of indirect effects. The USGS desert tortoise model (Nussear et al. 2009) identifies the affected area as having overall low habitat suitability for desert tortoise (average suitability score: 0.1). According to the USGS model, the nearest high-quality habitat (greater than or equal to 0.8 out of 1.0) is along Pahranagat Creek, approximately 15 mi (24 km) west of the SEZ. According to the SWReGAP habitat suitability model, approximately 1,366,000 acres (5,500 km^2) of potentially suitable habitat for this species occurs in the SEZ region (Table 11.2.12.1-1).

Southwestern Willow Flycatcher

The southwestern willow flycatcher is a small neotropical migrant bird that inhabits riparian shrublands, woodlands, and thickets in the southwestern United States. The nearest recorded occurrence of this species is from riparian areas along Pahranagat Creek in the Desert National Wildlife Range, approximately 8 mi (13 km) west of the SEZ. Potentially suitable breeding and foraging habitats for this species within the Pahranagat Valley are dependent upon surface discharges from the White River Valley regional groundwater system. According to the SWReGAP habitat suitability model, suitable habitat for this species does not occur on the SEZ. However, approximately 5 acres (<0.1 km^2) of potentially suitable habitat are expected to occur within the direct impact area of the access road corridor near Pahranagat Creek; approximately 200 acres (1 km^2) of potentially suitable habitat occurs in the area of indirect effects. Approximately 40,000 acres (162 km^2) of potentially suitable habitat occurs throughout the SEZ region (Figure 11.2.12.1-1).

Groundwater-Dependent Species

The USFWS (Stout 2009) identified the potential for impacts on nine ESA-listed species that could result from groundwater withdrawals that would serve solar energy development on the SEZ. As discussed previously, on the basis of the analysis presented in Section 11.2.9.2, five of these ESA-listed species are considered outside of the area that could be affected by groundwater withdrawals on the Delamar Valley SEZ. Only those species dependent on springs and spring-fed habitats within the Pahranagat Valley are considered here. The southwestern willow flycatcher, which could also be affected in the Pahranagat Valley by groundwater withdrawals on the SEZ, is discussed above.

Hiko White River Springfish. The Hiko White River springfish is a small fish that is listed as endangered under the ESA and is restricted to the remnant waters of the White River and outflow habitats of the Hiko and Crystal Springs in Lincoln County, Nevada. The nearest known occurrence of this species is from the Hiko Springs area, approximately 18 mi (29 km) west of the SEZ. Approximately 360 acres (1.5 km^2) of critical habitat has been designated at Hiko and Crystal Springs (Figure 11.2.12.1-1).

Pahranagat Roundtail Chub. The Pahranagat roundtail chub is a small fish that is listed as endangered under the ESA and is restricted to the remnant waters of the White River and Pahranagat Creek in Lincoln County, Nevada. The nearest known occurrence of this species is from the Ash Springs area, approximately 15 mi (24 km) west of the SEZ (Figure 11.2.12.1-1). Critical habitat has not been designated for this species.

White River Springfish. The White River springfish is a small fish that is listed as endangered under the ESA and is currently restricted to the Ash Springs system in southeastern Nevada. The nearest recorded occurrences and designated critical habitat are from the Ash Springs, approximately 15 mi (24 km) west of the SEZ (Figure 11.2.12.1-1).

11.2.12.1.2 Species That Are Candidates for Listing under the ESA

In scoping comments regarding the proposed Delamar Valley SEZ, the USFWS identified one ESA candidate species that may be directly or indirectly affected by solar energy development within the SEZ, the western yellow-billed cuckoo (Stout 2009). This species is a neotropical migrant bird that inhabits large riparian woodlands in the western United States. The nearest recorded occurrence of this species is from riparian areas along Pahranagat Creek in the Desert National Wildlife Range, approximately 8 mi (13 km) west of the SEZ (Figure 11.2.12.1-1; Table 11.2.12.1-1). Additional basic information on life history, habitat needs, and threats to populations of these species is provided in Appendix J.

In the scoping letter for the Delamar Valley SEZ (Stout 2009), the USFWS identified the potential for impacts on this species from groundwater withdrawals to serve solar energy development on the SEZ. Groundwater withdrawals from the White River Valley regional groundwater system could affect surface discharge from this system in portions of the SEZ region. Potentially suitable breeding and foraging habitats for this species within the Pahranagat Valley are dependent upon surface discharges from this groundwater system.

11.2.12.1.3 Species That Are under Review for Listing under the ESA

The USFWS (Stout 2009) identified three invertebrate species (mollusks) under review for ESA listing that may be directly or indirectly affected by solar energy development within the SEZ (Stout 2009). These species include the following: grated tryonia, Hubbs springsnail, and Pahranagat pebblesnail. These species do not occur within 5 mi (8 km) of the SEZ boundary, but they do occur in areas dependent on groundwater discharge in the Pahranagat Valley that could be affected by groundwater withdrawals in the Delamar Valley SEZ. In addition to the species identified by the USFWS, the northern leopard frog is another groundwater-dependent species under ESA review that may occur within the Pahranagat Valley (Table 11.2.12.1-1). Appendix J provides basic information on life history, habitat needs, and threats to populations of these species. General information on each species is provided below.

Grated Tryonia

The grated tryonia is a freshwater mollusk known from the Muddy River system in southern Nevada. The nearest known occurrence of this species is from Ash Springs, approximately 15 mi (24 km) west of the SEZ (Figure 11.2.12.1-1).

Hubbs Springsnail

The Hubbs springsnail is a freshwater mollusk restricted to Hiko and Crystal Springs in southern Nevada. The nearest known occurrence of this species is from Crystal Spring, approximately 18 mi (29 km) west of the SEZ (Figure 11.2.12.1-1).

Pahranagat Pebblesnail

The Pahranagat pebblesnail is a freshwater mollusk restricted to spring-fed habitats in the White River system of southern Nevada. The nearest known occurrence of this species is from Ash Springs, approximately 15 mi (24 km) west of the SEZ (Figure 11.2.12.1-1).

Northern Leopard Frog

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 the state of Nevada, is currently under review for ESA listing. Within this DPS, populations are known to occur in various wetland communities, including creeks, rivers, pools, springs, canals, and flooded fields. The nearest known occurrence of this species is from the Pahranagat Creek, approximately 8 mi (13 km) southwest of the SEZ. According to the SWReGAP habitat suitability model, suitable habitat for this species does not occur within 5 mi (8 km) of the SEZ border or within the access road corridor. However, potentially suitable habitat is predicted to occur along Pahranagat Creek and other portions of the White River system (Figure 11.2.12.1-1).

11.2.12.1.4 BLM-Designated Sensitive Species

There are 34 BLM-designated sensitive species that may occur in the affected area of the Delamar Valley SEZ or that may be affected by solar energy development on the SEZ (Table 11.2.12.1-1). These BLM-designated sensitive species include the following (1) plants: Charleston ground-daisy, Eastwood milkweed, long-calyx milkvetch, Needle Mountains milkvetch, Nevada willowherb, Pioche blazingstar, rock phacelia, rock purpusia, Sheep Mountain milkvetch, Tiehm blazingstar, white bearpoppy, and White River cat's-eye; (2) invertebrates: Mojave poppy bee and Pahranagat naucorid; (3) fish: White River desert sucker; (4) amphibian: southwestern toad; (5) birds: ferruginous hawk, phainopepla, prairie falcon, Swainson's hawk, and western burrowing owl; and (6) mammals: Desert Valley kangaroo mouse, fringed myotis, Nelson's bighorn sheep, Pahranagat Valley montane vole, silver-haired bat, spotted bat, Townsend's big-eared bat, and western small-footed myotis. Several additional BLM-designated species that may occur in the affected area were discussed in Section 11.2.12.1.4 as species under review for ESA listing. These include the grated tryonia, Pahranagat speckled dace, and northern leopard frog. None of these BLM-designated sensitive species have been recorded within 5 mi (8 km) of the SEZ boundary. Habitats in which BLM-designated sensitive 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 11.2.12.1-1. These 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.

Charleston Ground-Daisy

The Charleston ground-daisy is a perennial forb that is endemic to Nevada, where it occurs on gravelly slopes and knolls in montane forested areas. The species is known to occur in the Desert National Wildlife Range, approximately 40 mi (64 km) southwest of the SEZ. The species is not known to occur in the affected area and potentially suitable habitat is not known to occur on the SEZ. However, potentially suitable pinyon-juniper and rocky cliff habitat for this species may occur in the access road corridor and in portions of the area of indirect effects (Table 11.2.12.1-1).

Eastwood Milkweed

The Eastwood milkweed is a perennial forb that is endemic to Nevada from public and private lands in Esmeralda, Lander, Lincoln, and Nye Counties. It occurs in open areas on a wide variety of basic (pH usually >8) soils, including calcareous clay knolls, sand, carbonate or basaltic gravels, washes, or shale outcrops at elevations between 4,700 and 7,100 ft (1,430 and 2,150 m). The species is known to occur about 31 mi (50 km) north of the SEZ. Although it is not known to occur in the affected area, potentially suitable shrubland and desert wash habitat may occur in the SEZ and access road corridor (Table 11.2.12.1-1).

Long-Calyx Milkvetch

The long-calyx milkvetch is a perennial forb that is regionally endemic to the Great Basin in southwestern Utah and eastern Nevada. It occurs in pinyon-juniper woodlands, sagebrush, and mixed shrub communities at elevations between 5,800 and 7,500 ft (1,760 and 2,290 m). The species is known to occur about 11 mi (18 mi) east of the SEZ. Although it is not known to occur in the affected area, potentially suitable shrubland and desert wash habitat may occur in the SEZ and access road corridor (Table 11.2.12.1-1).

Needle Mountains Milkvetch

The Needle Mountains milkvetch is a perennial forb that occurs on gravel washes and sandy soils in alkaline desert and arid grasslands at elevations between 4,250 and 6,250 ft (1,295 and 1,900 m). The species is known to occur about 26 mi (42 km) northeast of the SEZ. Although it is not known to occur in the affected area, potentially suitable grassland and desert wash habitat may occur in the SEZ and access road corridor (Table 11.2.12.1-1).

Nevada Willowherb

The Nevada willowherb is a perennial forb endemic to eastern Nevada and western Utah. It occurs in pinyon-juniper woodlands and oak/mountain mahogany communities, on talus slopes and rocky limestone outcrops at elevations between 5,000 and 8,800 ft (1,525 and 2,680 m). The species is known to occur about 20 mi (32 km) east of the SEZ. The species is not known to occur in the affected area and potentially suitable habitat is not known to occur on the SEZ or access road corridor. However, potentially suitable woodland and rocky cliff habitat for this species may occur in portions of the area of indirect effects (Table 11.2.12.1-1).

Pioche Blazingstar

The Pioche blazingstar is a perennial forb endemic to Nevada. It occurs on dry, soft, silty clay soils on knolls and slopes with sparse vegetation consisting mainly of sagebrush. The nearest known occurrences are from Patterson Wash, approximately 40 mi (64 km) northeast of the SEZ. Although it is not known to occur in the affected area, potentially suitable shrubland and desert wash habitat may occur in the SEZ and access road corridor (Table 11.2.12.1-1).

Rock Phacelia

The rock phacelia is an annual forb known only from Arizona, Nevada, and Utah. It occurs in limestone and volcanic talus slopes of foothills, washes, and gravelly canyon bottoms on substrates derived from calcarous material in mixed desert scrub, creosotebush, and blackbrush communities at elevations between 2,500 and 5,800 ft (750 and 1,750 m). The species is known to occur in the Desert National Wildlife Range, approximately 40 mi (64 km) southwest of the SEZ. The species is not known to occur in the affected area, but potentially suitable desert wash habitat may occur in the SEZ and potentially suitable desert wash habitat and rocky cliff and outcrop habitat may occur in the access road corridor (Table 11.2.12.1-1).

Rock Purpusia

The rock purpusia is a perennial forb endemic to southern Nevada. It occurs in crevices of cliffs and boulders on volcanic substrates in pinyon-juniper communities at elevations between 4,900 and 6,900 ft (1,490 and 2,100 m). The species is known to occur about 11 mi (18 km) north of the SEZ. The species is not known to occur in the affected area and potentially suitable habitat is not known to occur on the SEZ. On the basis of an evaluation of SWReGAP land cover types, approximately 120 acres (0.5 km^2) of potentially suitable cliff and rock outcrop habitat occurs in the access road corridor, and approximately 4,600 ac (19 km^2) of potentially suitable woodland and rocky cliff habitat for this species may occur in portions of the area of indirect effects (Table 11.2.12.1-1).

Sheep Mountain Milkvetch

The Sheep Mountains milkvetch is a perennial forb that is restricted to the foothills of the Sheep Mountains in southern Nevada. The species is known to occur in the Desert National Wildlife Range, approximately 40 mi (64 km) southwest of the SEZ. Although it is not known to occur in the affected area, potentially suitable desert wash habitat may occur in the SEZ and access road corridor (Table 11.2.12.1-1).

Tiehm Blazingstar

The Tiehm blazingstar is a perennial forb endemic to Nevada. It occurs on hilltops, sparsely vegetated white calcareous knolls, and bluffs with other scattered perennial plant species. The nearest recorded occurrences are from the White River, approximately 38 mi (61 km) north of the SEZ. Although it is not known to occur in the affected area, potentially suitable shrubland habitat may occur in the SEZ and access road corridor (Table 11.2.12.1-1).

White Bearpoppy

The white bearpoppy is a perennial forb that is endemic to the desert regions of southeastern California and southern Nevada. It occurs in barren gravelly areas, rocky slopes, and limestone outcrops at elevations between 2,000 and 5,900 ft (600 and 1,800 m). The nearest known occurrences are approximately 17 mi (27 km) south of the SEZ. The species is not known to occur in the affected area and potentially suitable habitat is not known to occur on the SEZ. On the basis of an evaluation of SWReGAP land cover types, approximately 120 acres (0.5 km^2) of potentially suitable cliff and rock outcrop habitat occurs in the access road corridor, and approximately 1,700 ac (6.9 km^2) of potentially suitable cliff and rocky slope habitat for this species may occur in portions of the area of indirect effects (Table 11.2.12.1-1).

White River Cat's-Eye

The White River cat's-eye is a perennial herb endemic to southern Nevada. It occurs on dry, open, sparsely vegetated outcrops on carbonate substrates at elevations between 4,500 and 6,600 ft (1,370 and 2,010 m). The nearest recorded occurrences are 25 mi (40 km) northeast of the SEZ. The species is not known to occur in the affected area and potentially suitable habitat is not known to occur on the SEZ. On the basis of an evaluation of SWReGAP land cover types, approximately 120 acres (0.5 km^2) of potentially suitable cliff and rock outcrop habitat occurs in the access road corridor, and approximately 1,700 ac (6.9 km^2) of potentially suitable cliff and rocky slope habitat for this species may occur in portions of the area of indirect effects (Table 11.2.12.1-1).

Mojave Poppy Bee

The Mojave poppy bee is an insect known only from Clark County, Nevada, where it is dependent on poppy plants (*Arctemocon* spp.). Such habitats include roadsides, washes, and barren desert areas. The nearest recorded occurrence is approximately 35 mi (56 km) south of the SEZ. The species is not known to occur in the affected area and potentially suitable habitat is not known to occur on the SEZ or access road corridor. However, potentially suitable habitat for this species may occur in portions of the area of indirect effects (Table 11.2.12.1-1).

Ferruginous Hawk

According to the SWReGAP habitat suitability model, only potentially suitable winter habitat for the ferruginous hawk is predicted to occur within the affected area of the Delamar Valley SEZ, although potentially suitable year-round habitat is expected to occur outside of the affected area within the SEZ region. The species inhabits open grasslands, sagebrush flats, desert scrub, and the edges of pinyon-juniper woodlands. This species is known to occur in Lincoln County, Nevada, and potentially suitable foraging habitat occurs on the SEZ and in other portions of the affected area (Table 11.2.12.1-1).

Phainopepla

The phainopepla occurs in the southwestern United States and Mexico, where it breeds in suitable habitats throughout much of the Delamar Valley SEZ region. The species occurs in desert scrub, mesquite, and pinyon-juniper woodland communities, as well as desert riparian areas and orchards. Nests are typically constructed in trees and shrubs from 3 to 45 ft (1 to 15 m) above the ground. This species is known to occur in Lincoln County, Nevada. According to SWReGAP, potentially suitable foraging or nesting habitat does not occur on the SEZ; however, potentially suitable foraging and nesting habitat may occur in the access road corridor and in other portions of the affected area (Table 11.2.12.1-1). Potentially suitable nesting habitat in riparian areas in the Pahranagat Valley (outside of the 5-mi [8-km] affected area surrounding the SEZ) could be affected by groundwater withdrawals from the White River Valley regional groundwater system to serve construction and operations of solar energy facilities on the Delamar Valley SEZ. The availability of suitable nesting habitat throughout the affected area has not been determined.

Prairie Falcon

The prairie falcon occurs throughout the western United States. According to the SWReGAP habitat suitability model for the prairie falcon, it is considered a year-round resident throughout the Delamar Valley SEZ region. The species occurs in open habitats in mountainous areas, sagebrush-steppe, grasslands, or cultivated areas. Nests are typically constructed in well-sheltered ledges of rocky cliffs and outcrops. This species occurs in Lincoln County, Nevada, and potentially suitable foraging habitat occurs on the SEZ and throughout most of the affected area (Table 11.2.12.1-1). On the basis of an evaluation of SWReGAP land cover types, there is no suitable nesting habitat within the SEZ, but approximately 120 acres (0.5 km^2) of cliff and rock outcrop habitat that may be potentially suitable nesting habitat occurs in the access road corridor. An additional 5,000 acres (20 km^2) of cliff and rock outcrop habitat that might be potentially suitable nesting habitat occurs in the area of indirect effects outside of the SEZ and access road corridor.

Swainson's Hawk

The Swainson's hawk occurs throughout the southwestern United States. According to the SWReGAP habitat suitability model for the Swainson's hawk, only summer breeding habitat occurs in the Delamar Valley SEZ region. This species inhabits desert, savanna, open pine-oak woodland, grassland, and cultivated habitats. Nests are typically constructed in solitary trees, bushes, or small groves. This species occurs in Lincoln County, Nevada, and potentially suitable foraging habitat occurs on the SEZ and in other portions of the affected area (Table 11.2.12.1-1). On the basis of an evaluation of SWReGAP land cover types, there is no suitable nesting habitat (solitary trees) within the area of direct effects, but approximately 2,900 acres (12 km^2) of pinyon-juniper woodland that may be potentially suitable nesting habitat occurs in the area of indirect effects.

Western Burrowing Owl

According to the SWReGAP habitat suitability model for the western burrowing owl, the species is a summer (breeding) resident of open, dry grasslands and desert habitats in the Delamar Valley SEZ region. The species occurs locally in open areas with sparse vegetation, where it forages in grasslands, shrublands, and open disturbed areas, and nests in burrows typically constructed by mammals. The species occurs in Lincoln County, Nevada, and potentially suitable summer breeding habitat may occur in the SEZ, access road corridor, and in other portions of the affected area (Table 11.2.12.1-1). The availability of nest sites (burrows) within the affected area has not been determined, but shrubland habitat that may be suitable for either foraging or nesting occurs throughout the affected area.

Desert Valley Kangaroo Mouse

The Desert Valley kangaroo mouse is endemic to central Nevada, where it inhabits desert areas at playa margins and in dune habitats. This species is known to occur as near as the Dry Lake Valley, approximately 20 mi (32 km) north of the SEZ. According to the SWReGAP habitat suitability model for the kangaroo mouse, potentially suitable year-round habitat occurs within the SEZ, access road corridor, and throughout the affected area (Table 11.2.12.1-1).

Fringed Myotis

The fringed myotis is a year-round resident in the Delamar Valley SEZ region, where it occurs in a variety of habitats, including riparian, shrubland, sagebrush, and pinyon-juniper woodlands. The species roosts in buildings and caves. It is known to occur in Lincoln County, Nevada, and the SWReGAP habitat suitability model for the species indicates that potentially suitable foraging habitat may occur on the SEZ and throughout most of the affected area (Table 11.2.12.1-1). On the basis of an evaluation of SWReGAP land cover types, there is no suitable roosting habitat within the SEZ, but approximately 120 acres (0.5 km^2) of cliff and rock outcrop habitat that may be potentially suitable roosting habitat occurs in the access road corridor. An additional 5,000 acres (20 km^2) of cliff and rock outcrop habitat that might be potentially suitable roosting habitat occurs in the area of indirect effects outside of the SEZ and access road corridor.

Nelson's Bighorn Sheep

The Nelson's bighorn sheep (also called the desert bighorn sheep) is a subspecies of bighorn sheep that occurs in the Delamar Valley SEZ region. This species occurs in desert mountain ranges in Arizona, California, Nevada, Oregon, and Utah. The Nelson's bighorn sheep uses primarily montane shrubland, forest, and grassland habitats, and may utilize desert valleys as corridors for travel between portions of its range. It is known to occur in Lincoln County, Nevada. According to the SWReGAP habitat suitability model for the species, suitable habitat does not occur on the SEZ; however, habitat that is potentially suitable as a migration corridor may occur in the affected area (Table 11.2.12.1-1).

Silver-Haired Bat

According to the SWReGAP habitat suitability model, the silver-haired bat is a year-round resident in the Delamar Valley SEZ region, where it occurs in montane forested habitats such as aspen, pinyon-juniper, and spruce communities. Foraging may occur in desert shrubland habitats. This species roosts in tree foliage or cavities, or under loose bark. The species is known to occur about 42 mi (67 km) south of the SEZ. Potentially suitable foraging habitat may occur on the SEZ and in other portions of the affected area (Table 11.2.12.1-1). On the basis of an evaluation of SWReGAP land cover types, there is no suitable roosting habitat (trees) within the area of direct effects, but approximately 2,900 acres (12 km^2) of pinyon-juniper woodland that may be potentially suitable nesting habitat occurs in the area of indirect effects.

Spotted Bat

According to the SWReGAP habitat suitability model, the spotted bat is a year-round resident in the Delamar Valley SEZ region, where it occurs in a variety of forested and shrubland habitats. It roosts in caves and rock crevices. The species is known to occur in the vicinity of Panaca, Nevada, approximately 35 mi (56 km) northeast of the SEZ. Potentially suitable foraging habitat may occur on the SEZ and throughout most of the affected area (Table 11.2.12.1-1). On the basis of an evaluation of SWReGAP land cover types, there is no suitable roosting habitat within the SEZ, but approximately 120 acres (0.5 km^2) of cliff and rock outcrop habitat that may be potentially suitable roosting habitat occurs in the access road corridor. An additional 5,000 acres (20 km^2) of cliff and rock outcrop habitat that might be potentially suitable roosting habitat occurs in the area of indirect effects outside of the SEZ and access road corridor.

Townsend's Big-Eared Bat

The Townsend's big-eared bat is widely distributed throughout the western United States. According to the SWReGAP habitat suitability model, the species forages year-round in a wide variety of desert and non-desert habitats in the Delamar Valley SEZ region. The species roosts in caves, mines, tunnels, buildings, and other man-made structures. The nearest recorded occurrences are approximately 42 mi (67 km) south of the Delamar Valley SEZ. Potentially suitable foraging habitat may occur on the SEZ and throughout most of the affected area (Table 11.2.12.1-1). On the basis of an evaluation of SWReGAP land cover types, there is no suitable roosting habitat within the SEZ, but approximately 120 acres (0.5 km^2) of cliff and rock outcrop habitat that may be potentially suitable roosting habitat occurs in the access road corridor. An additional 5,000 acres (20 km^2) of cliff and rock outcrop habitat that might be potentially suitable roosting habitat occurs in the area of indirect effects outside of the SEZ and access road corridor.

Western Small-Footed Bat

The western small-footed bat is widely distributed throughout the western United States. According to the SWReGAP habitat suitability model, this species is a year-round resident in southern Nevada, where it occupies a wide variety of desert and non-desert habitats, including cliffs and rock outcrops, grasslands, shrubland, and mixed woodlands. The species roosts in caves, mines, and tunnels, beneath boulders or loose bark, and in buildings, and other man-made structures. The species is known to occur in Lincoln County, Nevada, and potentially suitable foraging habitat may occur on the SEZ and throughout most of the affected area (Table 11.2.12.1-1). On the basis of an evaluation of SWReGAP land cover types, there is no suitable roosting habitat within the SEZ, but approximately 120 acres (0.5 km^2) of cliff and rock outcrop habitat that may be potentially suitable roosting habitat occurs in the access road corridor. An additional 5,000 acres (20 km^2) of cliff and rock outcrop habitat that might be potentially suitable roosting habitat occurs in the area of indirect effects outside of the SEZ and access road corridor.

Groundwater-Dependent Species

There are a number of species that do not occur within 5 mi (8 km) of the SEZ boundary or within the access road corridor but that do occur in areas dependent on groundwater discharge from the White River Valley regional groundwater system in habitats within the Pahranagat Valley that may interact with groundwater of the Delamar Valley. Groundwater from the Delamar Valley to serve solar energy development on the SEZ could affect aquatic and riparian habitats supported by groundwater discharge in the Pahranagat Valley. The phainopepla, which could also be affected in the Pahranagat Valley by groundwater withdrawals on the SEZ, is discussed above.

Pahranagat Naucorid. The Pahranagat naucorid is an aquatic insect known only to occur in the Muddy and White River Basins in southern Nevada. It inhabits warm, quiet waters of spring-fed systems. The nearest recorded occurrence is from Ash Springs, approximately 15 mi (24 km) west of the SEZ (Table 11.2.12.1-1).

White River Desert Sucker. The White River desert sucker is a small fish endemic to Nevada, where it is restricted to remnant streams of the White River system. The nearest recorded occurrence of this species is from the Pahranagat Creek, approximately 15 mi (24 km) west of the SEZ (Table 11.2.12.1-1).

Southwestern Toad. The southwestern toad is an amphibian that occupies scattered habitats in Arizona, Nevada, New Mexico, and Utah. It occurs in woodlands and low-elevation riparian habitats in association with permanent or semipermanent water bodies. The nearest recorded occurrence of this species is from riparian areas along the Meadow Valley Wash, approximately 15 mi (24 km) east of the SEZ (Table 11.2.12.1-1).

Pahranagat Valley Montane Vole. The Pahranagat Valley montane vole is endemic to Lincoln County, Nevada, where it is restricted to springs in the Pahranagat Valley. Within that area, isolated populations utilize mesic montane and desert riparian habitat. The species is known to occur near Pahranagat Creek, approximately 9 mi (14 km) west of the SEZ. According to the SWReGAP habitat suitability model, potentially suitable habitat for this species does not occur in the SEZ or within the access road corridor; however, a potentially suitable habitat may occur in portions of the affected area. Potentially suitable riparian habitats for this species that occurs outside of the 5-mi (8-km) area surrounding the SEZ could be dependent on groundwater discharge from the White River Valley regional groundwater system.

11.2.12.1.5 State-Listed Species

There are 15 species listed by the State of Nevada that may occur in the Delamar Valley SEZ affected area or that may be affected by solar energy development on the SEZ (Table 11.2.12.1-1). These state-listed species include the following (1) fish: Hiko White River springfish, Pahranagat roundtail chub, Pahranagat speckled dace, White River desert sucker, and White River springfish; (2) reptile: desert tortoise; (3) birds: phainopepla, southwestern willow flycatcher, Swainson's hawk, and western yellow-billed cuckoo; and (4) mammals: Desert Valley kangaroo mouse, fringed myotis, Pahranagat Valley montane vole, spotted bat, and Townsend's big-eared bat. All of these species are protected in the state of Nevada under NRS 501.110. Each of these species has been previously discussed because of its known or review status under the ESA (Section 11.2.12.1.1 or 11.2.12.1.2) or the BLM (Section 11.2.12.1.3). Additional life history information for these species is provided in Appendix J.

11.2.12.1.6 Rare Species

There are 47 rare species (i.e., state rank of S1 or S2 in the state of Nevada or ranked as a species of concern by the State of Nevada or USFWS) that may be affected by solar energy development on the Delamar Valley SEZ (Table 11.2.12.1-1). Of these species, there are nine that have not been previously discussed because of their known or pending status under the ESA (Section 11.2.12.1.1 or 11.2.12.1.2) or the BLM (Section 11.2.12.1.3). These nine species include the following (1) plants: Ackerman milkvetch, Antelope Canyon goldenbush, Jaeger beardtongue, Meadow Valley sandwort, St. George blue-eyed grass, and Veyo milkvetch; and (2) invertebrates: Ash Springs riffle beetle, nearctic riffle beetle, and red-tailed blazing star bee. The habitats and known occurrences of these species relative to the SEZ are shown in Table 11.2.12.1-1. Additional life history information is provided in Appendix J.

11.2.12.2 Impacts

The potential for impacts on special status species from utility-scale solar energy development within the proposed Delamar Valley 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 11.2.12.1, 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 11.2.12.3).

Solar energy development within the Delamar Valley SEZ could affect a variety of habitats (see Sections 11.2.9 and 11.2.10). These impacts on habitats could in turn affect special status species that are dependent on those habitats. Based on NNHP records, the desert tortoise is the only special status species known to occur within 5 mi (8 km) of the Delamar Valley SEZ boundary. There are 15 species that occur more than 5 mi (8 km) from the SEZ boundary in habitats in the Pahranagat Valley that could be affected by groundwater withdrawals from the Delamar Valley SEZ. These species include the following (1) invertebrates: Hubbs springsnail, nearctic riffle beetle, Pahranagat naucorid, and Pahranagat pebblesnail; (2) fish: Hiko White River springfish, Pahranagat roundtail chub, Pahranagat speckled dace, White River desert sucker, and White River springfish; (3) amphibians: northern leopard frog and southwestern toad; (4) birds: phainopepla, southwestern willow flycatcher, and western yellow-billed cuckoo; and (5) mammals: Pahranagat Valley montane vole. Withdrawals from this regional groundwater system may be needed to support construction and operations of solar energy facilities on the Delmar Valley SEZ, which could in turn affect those special status species with habitats that are dependent on groundwater. 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 11.2.12.1, this approach to identifying the species that could occur in the affected area probably overestimates the number of species that actually occur in the affected area, and may therefore overestimate impacts on some special status species.

Potential direct and indirect impacts on special status species within the SEZ and in the area of indirect effects outside the SEZ are presented in Table 11.2.12.1-1. 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 11.2.1.2, a 9-mi (14-km) long access road corridor is assumed to be needed to serve solar facilities within this

SEZ. Impacts of transmission line construction, upgrade, or operation are not assessed in this evaluation due to the proximity of existing infrastructure to the SEZ.

Direct impacts would result from habitat destruction or modification. It is assumed that direct impacts would occur only within the SEZ and the access road construction area where ground-disturbing activities are expected to occur. Indirect impacts could result from depletions of groundwater resources, 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 over the long-term, conditions would improve especially if original land contours and native plant communities were restored in previously disturbed areas.

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

11.2.12.2.1 Impacts on Species Listed under the ESA

Impacts on the five ESA-listed species that may occur in the Delamar Valley SEZ affected area, or that may be affected by solar energy development on the SEZ, are discussed below. These assessments are based on the best information available, but discussions of potential impacts and mitigation options should be held in consultation with the USFWS. Formal consultation with the USFWS under Section 7 of the ESA is required for any federal action that may adversely affect an ESA-listed species.

Desert Tortoise

The Mojave population of the desert tortoise is listed as threatened under the ESA and the species is known to occur about 5 mi (8 km) west of the SEZ (Figure 11.2.12.1-1). According to the USFWS (Stout 2009), desert tortoise populations have the potential to occur on the Delamar Valley SEZ and access road corridor despite the lack of monitoring effort in adjacent areas and the relatively low habitat suitability (as determined by the USGS habitat suitability model [Nussear et al. 2009]). According to the SWReGAP habitat suitability model, approximately 910 acres (4 km^2) of potentially suitable habitat on the SEZ and 58 acres (0.2 km^2) of potentially suitable habitat within the access road corridor could be directly affected by construction and operations of solar energy development on the SEZ (Table 11.2.12.1-1). This direct effects area represents about 0.1% of available suitable habitat of the desert tortoise in the region. About 29,000 acres (117 km^2) of suitable habitat occurs in the area of potential indirect effects; this area represents about 2.1% of the available suitable habitat in the region (Table 11.2.12.1-1).

The overall impact on the desert tortoise from construction, operation, and decommissioning of utility-scale solar energy facilities within the Delamar Valley SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the region. The implementation of programmatic design features alone is unlikely to reduce these impacts to negligible levels. Avoidance of potentially suitable habitats for this species is not a feasible means of mitigating impacts because these habitats (desert scrub) are widespread throughout the area of direct effects. Pre-disturbance surveys to determine the abundance of desert tortoises on the SEZ to remove them from the affected area, and the implementation of a desert tortoise translocation plan and compensation plan could further reduce direct impacts.

Development of actions to reduce impacts (e.g., reasonable and prudent alternatives, reasonable and prudent measures, and terms and conditions of incidental take statements) for the desert tortoise, including development of a survey protocol, avoidance measures, minimization measures, and, potentially, translocation actions and compensatory mitigation, would require formal consultation with the USFWS under Section 7 of the ESA. Consultation with the Nevada Department of Wildlife (NDOW) should also occur to determine any state mitigation requirements.

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

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

Southwestern Willow Flycatcher

The southwestern willow flycatcher is listed as endangered under the ESA and is known to occur in the Pahranagat Valley, approximately 8 mi (13 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 5 acres (<0.1 km^2) of potentially suitable habitat within the access road corridor could be directly affected by construction and operations of solar energy development on the SEZ (Table 11.2.12.1-1). This direct effects area represents less than 0.1% of available suitable habitat of the southwestern willow flycatcher in the region. About 200 acres (1 km^2) of suitable habitat occurs in the area of potential indirect effects; this area represents about 0.5% of the available suitable habitat in the region (Table 11.2.12.1-1).

Riparian habitats in the Pahranagat Valley that may provide suitable nesting and foraging habitat for the southwestern willow flycatcher may be affected by spring discharges associated with the White River Valley regional groundwater system from groundwater withdrawals from the Delamar Valley to serve development on the SEZ. Solar energy development on the SEZ may require water from the same regional groundwater system that supports the riparian habitats for this species in the Pahranagat Valley. As discussed below for other groundwater-dependent species, impacts on this species could range from small to large depending upon the solar energy technology deployed, the scale of development within the SEZ, and the cumulative rate of groundwater withdrawals (Table 11.2.12.1-1).

The implementation of programmatic design features and complete avoidance or limitations of groundwater withdrawals from the regional groundwater system could reduce impacts on the southwestern willow flycatcher to small or negligible levels. Impacts can be better quantified for specific projects once water needs are identified. In addition, the avoidance of construction activities within riparian areas within the access road corridor would further reduce impacts.

Development of actions to reduce impacts (e.g., reasonable and prudent alternatives, reasonable and prudent measures, and terms and conditions of incidental take statements) for the southwestern willow flycatcher, including development of a survey protocol, avoidance measures, minimization measures, and, potentially, compensatory mitigation, would require formal consultation with the USFWS under Section 7 of the ESA. Consultation with the NDOW should also occur to determine any state mitigation requirements.

Groundwater-Dependent Species

There are three species listed as threatened or endangered under the ESA that do not occur within 5 mi (8 km) of the SEZ boundary or within the access road corridor but that do occur in areas dependent on groundwater discharge from the White River Valley regional groundwater system in the Pahranagat Valley. These species include the following fish: Hiko White River springfish, Pahranagat roundtail chub, and White River springfish. The southwestern willow flycatcher also could be affected by groundwater withdrawals. Groundwater withdrawn from the Delamar Valley to serve construction and operations of solar energy facilities on the SEZ could affect aquatic and riparian habitats within the Pahranagat Valley. These withdrawals could affect habitat for the ESA-listed species that are dependent on groundwater. Such impacts would result from the lowering of the water table and alteration of hydrologic processes.

Impacts of groundwater depletion from solar energy development in the Delamar Valley SEZ cannot be quantified without identification of the cumulative amount of groundwater withdrawals needed to support development on the SEZ. Consequently, the overall impact on these species could range from small to large, and would depend in part on the solar energy technology deployed, the scale of development within the SEZ, the type of cooling system used, and the degree of influence water withdrawals in the SEZ would have on drawdown and surface water discharges in habitats supporting these species (Table 11.2.12.1-1).

The implementation of programmatic design features and complete avoidance or limitations of groundwater withdrawals from the regional groundwater system would reduce impacts on the groundwater-dependent species to small or negligible levels. Impacts can be better quantified for specific projects once water needs are identified and through application of a regional groundwater model.

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

According to the USFWS scoping letter (Stout 2009) and as verified by NNHP records, the western yellow-billed cuckoo is the only ESA candidate species that may be affected by solar energy development on the Delamar Valley SEZ. This species is known to occur in riparian areas along the Pahranagat Creek, approximately 8 mi (13 km) west of the SEZ (Figure 11.2.12.1-1). According to the SWReGAP habitat suitability model, potentially suitable habitat for this species does not occur anywhere within 5 mi (8 km) of the SEZ boundary or within the access road corridor. However, riparian habitats in the White River and Pahranagat Valleys may provide suitable nesting and foraging habitat for this species; these habitats may be affected by spring discharges associated with the White River Valley regional groundwater system. Solar energy development on the SEZ may require water from the same regional groundwater system that supports the riparian habitats for this species in the Pahranagat Valley. For this reason, and as discussed for the groundwater-dependent species above, impacts on the western yellow-billed cuckoo could range from small to large depending upon the solar energy technology deployed, the scale of development within the SEZ, and the cumulative rate of groundwater withdrawals (Table 11.2.12.1-1).

The implementation of programmatic design features and complete avoidance or limitations of groundwater withdrawals from the regional groundwater system could reduce impacts on the western yellow-billed cuckoo. Impacts can be better quantified for specific projects once water needs are identified. Coordination with the USFWS and NDOW should be conducted to identify an appropriate survey protocol and mitigation requirements, which may include avoidance, minimization, or compensation.

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

There are four species currently under review for ESA listing that may be affected by solar energy development on the Delamar Valley SEZ. These include the grated tryonia, Hubbs springsnail, Pahranagat pebblesnail, and northern leopard frog. These species do not occur within 5 mi (8 km) of the SEZ boundary, but they do occur in areas dependent on groundwater discharge within the Pahranagat Valley, which is hydrologically connected to groundwater in the Delamar Valley. Potential impacts on these species (which could range from small to large) and mitigations that could reduce those impacts would be similar to those described for groundwater-dependent ESA-listed species in Section 11.2.12.2.1. For all of these species, potential impacts and mitigation options should be discussed with the USFWS prior to project development.

11.2.12.2.4 Impacts on BLM-Designated Sensitive Species

BLM-designated sensitive species that may be affected by solar energy development on the Delamar Valley SEZ and are not previously discussed as ESA-listed (Section 11.2.12.2.1), candidates for ESA listing (Section 11.2.12.2.2), or under review for ESA listing (Section 11.2.12.2.3) are discussed below.

Charleston Ground-Daisy

The Charleston ground-daisy is not known to occur in the affected area of the Delamar Valley SEZ and potentially suitable habitat does not occur on the SEZ; however, approximately 5 acres (<0.1 km^2) of potentially suitable habitat within the access road corridor could be directly affected by construction and operations (Table 11.2.12.1-1). This direct impact area represents less than 0.1% of potentially suitable habitat in the SEZ region. About 45,500 acres (184 km^2) of potentially suitable habitat occur in the area of indirect effects; this area represents about 2.3% of the potentially suitable habitat in the SEZ region (Table 11.2.12.1-1).

The overall impact on the Charleston ground-daisy from construction, operation, and decommissioning of utility-scale solar energy facilities within the Delamar Valley 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 to negligible levels.

Avoiding or minimizing impacts on rocky cliffs and outcrops in the access road corridor may be sufficient to reduce impacts on the Charleston ground-daisy to small or negligible levels. For this species and other special status plants, impacts also could be reduced by conducting pre-disturbance surveys and avoiding or minimizing impacts of occupied habitats in the area of direct effects. If avoidance and 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.

Eastwood Milkweed

The Eastwood milkweed is not known to occur in the affected area of the Delamar Valley SEZ; however, approximately 2,000 acres (8 km^2) of potentially suitable habitat on the SEZ and 25 acres (0.1 km^2) of potentially suitable habitat in the road corridor could be directly affected by construction and operations (Table 11.2.12.1-1). This direct impact area represents about 0.3% of potentially suitable habitat in the SEZ region. About 48,000 acres (194 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 7.2% of the potentially suitable habitat in the SEZ region (Table 11.2.12.1-1).

The overall impact on the Eastwood milkweed from construction, operation, and decommissioning of utility-scale solar energy facilities within the Delamar Valley 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 to negligible levels.

Avoidance of all potentially suitable habitats to mitigate impacts on the Eastwood milkweed is not feasible because potentially suitable sagebrush and mixed shrubland habitat is widespread throughout the area of direct effects. However, impacts could be reduced with the implementation of programmatic design features and the mitigation options described previously for the Charleston ground-daisy. 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.

Long-Calyx Milkvetch

The long-calyx milkvetch is not known to occur in the affected area of the Delamar Valley SEZ; however, approximately 11,200 acres (45 km^2) of potentially suitable habitat on the SEZ and 61 acres (0.2 km^2) of potentially suitable habitat in the road corridor could be directly affected by construction and operations (Table 11.2.12.1-1). This direct impact area represents about 0.4% of potentially suitable habitat in the SEZ region. About 101,000 acres (409 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 3.2% of the potentially suitable habitat in the SEZ region (Table 11.2.12.1-1).

The overall impact on the long-calyx milkvetch from construction, operation, and decommissioning of utility-scale solar energy facilities within the Delamar Valley 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 to negligible levels.

Avoidance of all potentially suitable habitats to mitigate impacts on the long-calyx milkvetch is not feasible because potentially suitable sagebrush and mixed shrubland habitat is widespread throughout the area of direct effects. However, impacts could be reduced with the implementation of programmatic design features and the mitigation options described previously for the Charleston ground-daisy. 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.

Needle Mountains Milkvetch

The Needle Mountains milkvetch is not known to occur in the affected area of the Delamar Valley SEZ; however, approximately 3,100 acres (13 km^2) of potentially suitable habitat on the SEZ and 2 acres (<1 km^2) of potentially suitable habitat within the road corridor could be directly affected by construction and operations (Table 11.2.12.1-1). This direct impact area represents about 4.6% of potentially suitable habitat in the SEZ region. About 1,800 acres (7 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 2.7% of the potentially suitable habitat in the SEZ region (Table 11.2.12.1-1).

The overall impact on the Needle Mountains milkvetch from construction, operation, and decommissioning of utility-scale solar energy facilities within the Delamar Valley SEZ is considered moderate because the amount of potentially suitable habitat for this species in the area of direct effects represents greater than or equal to 1% but less than 10% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts to negligible levels.

Avoiding or minimizing impacts on all playa habitats on the SEZ may be sufficient to reduce impacts on the Needle Mountains milkvetch to small or negligible levels, but this would restrict development on a large portion of the SEZ. Impacts also could be reduced with the implementation of programmatic design features and the mitigation options described previously for the Charleston ground-daisy. 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.

Nevada Willowherb

The Nevada willowherb is not known to occur in the affected area of the Delamar Valley SEZ, and potentially suitable habitat for the species does not occur in the area of direct effects. However, approximately 3,000 acres (12 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 0.3% of the potentially suitable habitat in the SEZ region (Table 11.2.12.1-1).

The overall impact on the Nevada willowherb from construction, operation, and decommissioning of utility-scale solar energy facilities within the Delamar Valley 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.

Pioche Blazingstar

The Pioche blazingstar is not known to occur in the affected area of the Delamar Valley SEZ; however, approximately 12,000 acres (49 km^2) of potentially suitable habitat on the SEZ and 29 acres (0.1 km^2) of potentially suitable habitat in the road corridor could be directly affected by construction and operations (Table 11.2.12.1-1). This direct impact area represents about 0.6% of potentially suitable habitat in the SEZ region. About 105,000 acres (425 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 5.3% of the potentially suitable habitat in the SEZ region (Table 11.2.12.1-1).

The overall impact on the Pioche blazingstar from construction, operation, and decommissioning of utility-scale solar energy facilities within the Delamar Valley 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 to negligible levels.

Avoidance of all potentially suitable habitats to mitigate impacts on the Pioche blazingstar is not feasible because potentially suitable shrubland habitat is widespread throughout the area of direct effects. However, impacts could be reduced with the implementation of programmatic design features and the mitigation options described previously for the Charleston ground-daisy. 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.

Rock Phacelia

The rock phacelia is not known to occur in the affected area of the Delamar Valley SEZ; however, approximately 976 acres (4 km^2) of potentially suitable habitat on the SEZ and 80 acres (0.3 km^2) of potentially suitable habitat in the road corridor could be directly affected by construction and operations (Table 11.2.12.1-1). This direct impact area represents about 0.1% of potentially suitable habitat in the SEZ region. About 46,000 acres (186 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 2.2% of the potentially suitable habitat in the SEZ region (Table 11.2.12.1-1).

The overall impact on the rock phacelia from construction, operation, and decommissioning of utility-scale solar energy facilities within the Delamar Valley 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 to negligible levels.

Avoidance of all potentially suitable habitats to mitigate impacts on the rock phacelia is not feasible because potentially suitable mixed desert scrub habitat is widespread throughout the area of direct effects. However, impacts could be reduced with the implementation of programmatic design features and the mitigation options described previously for the Charleston ground-daisy. 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.

Rock Purpusia

The rock purpusia is not known to occur in the affected area of the Delamar Valley SEZ and potentially suitable habitat for the species does not occur in the area of direct effects. However, approximately 3,000 acres (12 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 0.4% of the potentially suitable habitat in the SEZ region (Table 11.2.12.1-1).

The overall impact on the rock purpusia from construction, operation, and decommissioning of utility-scale solar energy facilities within the Delamar Valley 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 to negligible levels.

Avoiding or minimizing impacts on rocky cliffs and outcrops in the access road corridor may be sufficient to reduce impacts on the rock purpusia to small or negligible levels. Impacts also could be reduced with the implementation of programmatic design features and the mitigation options described previously for the Charleston ground-daisy. 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.

Sheep Mountain Milkvetch

The Sheep Mountain milkvetch is not known to occur in the affected area of the Delamar Valley SEZ; however, approximately 976 acres (4 km^2) of potentially suitable habitat on the SEZ and 78 acres (0.3 km^2) of potentially suitable habitat in the road corridor could be directly affected by construction and operations (Table 11.2.12.1-1). This direct impact area represents about 0.1% of potentially suitable habitat in the SEZ region. About 46,000 acres (186 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 2.3% of the potentially suitable habitat in the SEZ region (Table 11.2.12.1-1).

The overall impact on the Sheep Mountain milkvetch from construction, operation, and decommissioning of utility-scale solar energy facilities within the Delamar Valley 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 to negligible levels.

Avoidance of all potentially suitable habitats to mitigate impacts on the Sheep Mountain milkvetch is not feasible because potentially suitable mixed desert scrub habitat is widespread throughout the area of direct effects. However, impacts could be reduced with the implementation of programmatic design features and the mitigation options described previously for the Charleston ground-daisy. 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.

Tiehm Blazingstar

The Tiehm blazingstar is not known to occur in the affected area of the Delamar Valley SEZ; however, approximately 12,000 acres (49 km^2) of potentially suitable habitat on the SEZ and 27 acres (0.1 km^2) of potentially suitable habitat in the road corridor could be directly affected by construction and operations (Table 11.2.12.1-1). This direct impact area represents about 0.8% of potentially suitable habitat in the SEZ region. About 92,700 acres (375 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 6.1% of the potentially suitable habitat in the SEZ region (Table 11.2.12.1-1).

The overall impact on the Tiehm blazingstar from construction, operation, and decommissioning of utility-scale solar energy facilities within the Delamar Valley 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 to negligible levels.

Avoidance of all potentially suitable habitats to mitigate impacts on the Tiehm blazingstar is not feasible because potentially suitable shrubland habitat is widespread throughout the area of direct effects. However, impacts could be reduced with the implementation of programmatic design features and the mitigation options described previously for the Charleston ground-daisy. 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.

White Bearpoppy

The white bearpoppy is not known to occur in the affected area of the Delamar Valley SEZ, and potentially suitable habitat for the species does not occur in the area of direct effects. However, approximately 161 acres (0.7 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 0.1% of the available potentially suitable habitat in the SEZ region (Table 11.2.12.1-1).

The overall impact on the white bearpoppy from construction, operation, and decommissioning of utility-scale solar energy facilities within the Delamar Valley 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 to negligible levels.

Avoiding or minimizing impacts on rocky cliffs and outcrops in the access road corridor may be sufficient to reduce impacts on the white bearpoppy to small or negligible levels. Impacts also could be reduced with the implementation of programmatic design features and the mitigation options described previously for the Charleston ground-daisy. 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.

White River Cat's-Eye

The White River cat's-eye is not known to occur in the affected area of the Delamar Valley SEZ and potentially suitable habitat for the species does not occur in the area of direct effects. However, approximately 1,700 acres (7 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 1.1% of the potentially suitable habitat in the SEZ region (Table 11.2.12.1-1).

The overall impact on the White River cat's-eye from construction, operation, and decommissioning of utility-scale solar energy facilities within the Delamar Valley 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 to negligible levels.

Avoiding or minimizing impacts on rocky cliffs and outcrops in the access road corridor may be sufficient to reduce impacts on the White River cat's-eye to small or negligible levels. Impacts also could be reduced with the implementation of programmatic design features and the mitigation options described previously for the Charleston ground-daisy. 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.

Mojave Poppy Bee

The Mojave poppy bee is not known to occur in the affected area of the Delamar Valley SEZ, and potentially suitable habitat for the species does not occur in the area of direct effects. However, approximately 163 acres (0.7 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 0.1% of the potentially suitable habitat in the SEZ region (Table 11.2.12.1-1).

The overall impact on the Mojave poppy bee from construction, operation, and decommissioning of utility-scale solar energy facilities within the Delamar Valley 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 occurs only as a winter resident in the vicinity of the Delamar Valley SEZ and potentially suitable foraging habitat is expected to occur in the affected area. Approximately 910 acres (4 km^2) of potentially suitable foraging habitat on the SEZ and 7 acres (<0.1 km^2) within the road corridor could be directly affected by construction and operations (Table 11.2.12.1-1). This direct impact area represents 0.1% of potentially suitable habitat in the SEZ region. About 37,000 acres (150 km^2) of potentially suitable foraging habitat occurs in the area of indirect effects; this area represents about 2.9% of the available suitable foraging habitat in the SEZ region (Table 11.2.12.1-1).

The overall impact on the ferruginous hawk from construction, operation, and decommissioning of utility-scale solar energy facilities within the Delamar Valley 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 to negligible levels. Avoidance of all potentially suitable habitats to mitigate impacts on the ferruginous hawk is not feasible because potentially suitable shrubland habitat is widespread throughout the area of direct effects.

Phainopepla

The phainopepla is not known to occur within 5 mi (8 km) of the Delamar Valley SEZ, and suitable habitat does not occur on the site. However, approximately 46 acres (0.2 km^2) of potentially suitable foraging or nesting habitat within the access road corridor could be directly affected by construction and operations of solar energy facilities on the SEZ (Table 11.2.12.1-1). This direct effects area represents less than 0.1% of available suitable habitat of the phainopepla in the region. About 15,900 acres (64 km^2) of suitable habitat occurs in the area of potential indirect effects; this area represents about 1.5% of the available suitable habitat in the region (Table 11.2.12.1-1).

Riparian habitats in the White River and Pahranagat Valleys that may provide suitable nesting and foraging habitat for the phainopepla may be affected by spring discharges associated with the White River Valley regional groundwater system. Solar energy development on the SEZ may require water from the same regional groundwater system that supports these riparian habitats. As discussed above for other groundwater-dependent species in Section 11.2.12.2.1, impacts on this species could range from small to large depending upon the solar energy technology deployed, the scale of development within the SEZ, and the cumulative rate of groundwater withdrawals (Table 11.2.12.1-1).

The implementation of programmatic design features and complete avoidance of or limitations on groundwater withdrawals from the regional groundwater system would reduce impacts on the phainopepla to small or negligible levels. Impacts can be better quantified for specific projects once water needs are identified. In addition, the complete avoidance of riparian areas in the access road corridor would further reduce impacts.

Prairie Falcon

The prairie falcon is a year-round resident in the Delamar Valley SEZ region, and potentially suitable foraging and nesting habitat may occur in the affected area. Approximately 11,300 acres (46 km^2) of potentially suitable foraging habitat on the SEZ and 52 acres (0.2 km^2) of potentially suitable foraging or nesting habitat in the road corridor could be directly affected by construction and operations (Table 11.2.12.1-1). This direct impact area represents 0.4% of potentially suitable habitat in the SEZ region. About 87,700 acres (355 km^2) of potentially suitable foraging and nesting habitat occurs in the area of indirect effects; this area represents about 3.5% of the potentially suitable habitat in the SEZ region (Table 11.2.12.1-1). Most of this area could serve as foraging habitat (open shrublands). On the basis of SWReGAP land cover data, potentially suitable nesting habitat (cliffs and rock outcrops) does not occur on the SEZ. However, approximately 120 acres (0.5 km^2) of cliff and rock outcrop habitat that may be potentially suitable nesting habitat occurs in the area of indirect effects.

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

Avoidance of all potentially suitable foraging habitats to mitigate impacts on the prairie falcon is not feasible because potentially suitable shrubland habitat is widespread throughout the area of direct effects. However, the complete avoidance of cliff and rock outcrop habitats within the access road corridor would reduce impacts on nesting habitats of this species to negligible levels. Impacts also could be reduced by conducting pre-disturbance surveys and avoiding or minimizing impacts of occupied habitats (especially nesting habitats) in the area of direct effects. If avoidance and minimization 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 surveys for the species and its habitat in the area of direct effects.

Swainson's Hawk

The Swainson's hawk is considered a summer breeding resident within the Delamar Valley SEZ region, and potentially suitable foraging habitat is expected to occur in the affected area. Approximately 1,950 acres (8 km^2) of potentially suitable foraging habitat on the SEZ and 75 acres (0.3 km^2) of potentially suitable foraging habitat in the road corridor could be directly affected by construction and operations (Table 11.2.12.1-1). This direct impact area represents 0.1% of potentially suitable habitat in the SEZ region. About 91,600 acres (371 km^2) of potentially suitable foraging and nesting habitat occurs in the area of indirect effects; this area represents about 4.2% of the potentially suitable habitat in the SEZ region (Table 11.2.12.1-1). On the basis of an evaluation of SWReGAP land cover types, there is no suitable nesting habitat (solitary trees) within the area of direct effects, but approximately 2,900 acres (12 km^2) of pinyon-juniper woodland that may be potentially suitable nesting habitat occurs in the area of indirect effects.

The overall impact on the Swainson's hawk from construction, operation, and decommissioning of utility-scale solar energy facilities within the Delamar Valley 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 foraging habitats to mitigate impacts on the prairie falcon is not feasible because potentially suitable foraging habitats are widespread throughout the area of direct effects and readily available in other portions of the affected area.

Western Burrowing Owl

The western burrowing owl is a summer breeding resident within the Delamar Valley SEZ region and potentially suitable foraging habitat is expected to occur in the affected area. Approximately 15,400 acres (62 km^2) of potentially suitable habitat on the SEZ and 108 acres (0.4 km^2) of potentially suitable habitat in the road corridor could be directly affected by construction and operations (Table 11.2.12.1-1). This direct impact area represents 0.4% of potentially suitable habitat in the SEZ region. About 150,000 acres (607 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 3.8% of the potentially suitable habitat in the SEZ region (Table 11.2.12.1-1). 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 Delamar Valley 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 to negligible levels.

Avoidance of all potentially suitable habitats is not a feasible way to mitigate impacts on the western burrowing owl because potentially suitable shrubland habitats are widespread throughout the area of direct effects and readily available in other portions of the SEZ region. Impacts on the western burrowing owl could be reduced through the implementation of programmatic design features and by conducting pre-disturbance surveys and avoiding occupied burrows on the SEZ. If avoidance and minimization 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 surveys for the species and its habitat within the area of direct effects.

Desert Valley Kangaroo Mouse

The Desert Valley kangaroo mouse is not known to occur in the affected area of the Delamar Valley SEZ. However, approximately 10,900 acres (44 km^2) of potentially suitable habitat on the SEZ and 2 acres (<0.1 km^2) of potentially suitable habitat in the road corridor could be directly affected by construction and operations (Table 11.2.12.1-1). This direct impact area represents 1.8% of potentially suitable habitat in the SEZ region. About 29,000 acres (117 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 4.7% of the potentially suitable habitat in the SEZ region (Table 11.2.12.1-1).

The overall impact on the Desert Valley kangaroo mouse from construction, operation, and decommissioning of utility-scale solar energy facilities within the Delamar Valley SEZ is considered moderate because the amount of potentially suitable foraging and nesting habitat for this species in the area of direct effects represents greater than or equal to 1% but less than 10% 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.

Avoiding or minimizing impacts on all playa habitats in the SEZ could reduce impacts on this species, but this would restrict development on a large portion of the SEZ. Pre-disturbance surveys and avoidance of occupied habitats in the area of direct effects also could reduce impacts. If avoidance and minimization are not feasible options, a compensatory mitigation plan could be developed and implemented to mitigate direct effects on occupied habitats. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that uses one or both of these options could be designed to completely offset the impacts of development.

Fringed Myotis

The fringed myotis is a year-round resident within the Delamar Valley SEZ region. On the basis of SWReGAP land cover data, suitable roosting habitats (caves) do not occur on the SEZ. However, approximately 120 acres (0.5 km^2) of cliff and rock outcrop habitat that may be potentially suitable roosting habitat occurs in the access road corridor. Approximately 13,200 acres (53 km^2) of potentially suitable foraging habitat on the SEZ and 106 acres (0.4 km^2) of potentially suitable foraging or roosting habitat in the road corridor could be directly affected by construction and operations (Table 11.2.12.1-1). This direct impact area represents about 0.3% of potentially suitable habitat in the region. About 142,000 acres (575 km^2) of potentially suitable foraging and roosting habitat occurs in the area of indirect effects; this area represents about 3.1% of the available suitable habitat in the region (Table 11.2.12.1-1).

The overall impact on the fringed myotis from construction, operation, and decommissioning of utility-scale solar energy facilities within the Delamar Valley SEZ is considered small because the amount of potentially suitable foraging and roosting 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.

Avoiding or minimizing direct impacts on all foraging habitat is not feasible because suitable foraging habitat is widespread in the area of direct effects and readily available in other portions of the affected area. Impacts on the fringed myotis could be reduced by conducting pre-disturbance surveys and avoiding or minimizing disturbance to occupied roosts in the area of direct effects. If avoidance and minimization are not feasible options, a compensatory mitigation plan could be developed and implemented to mitigate direct effects on occupied habitats. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that used one or both of these options could be designed to completely offset the impacts of development. The need for mitigation, other than programmatic design features, should be determined by conducting pre disturbance surveys for the species and its habitat in the area of direct effects.

Nelson's Bighorn Sheep

The Nelson's bighorn sheep is not known to occur in the affected area of the Delamar Valley SEZ, and suitable habitat is not expected to occur on the site. However, approximately 18 acres (0.1 km^2) of potentially suitable habitat in the road corridor could be directly affected by construction and operations (Table 11.2.12.1-1). This direct impact area represents less than 0.1% of potentially suitable habitat in the region. About 32,600 acres (132 km^2) of potentially suitable foraging habitat occurs in the area of indirect effects; this area represents about 2.3% of the available suitable habitat in the region (Table 11.2.12.1-1).

The overall impact on the Nelson's bighorn sheep from construction, operation, and decommissioning of utility-scale solar energy facilities within the Delamar Valley 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 the potentially suitable habitat in the region. The implementation of programmatic design features are expected to be sufficient to reduce indirect impacts on this species to negligible levels.

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

Silver-Haired Bat

The silver-haired bat is a year-round resident within the Delamar Valley SEZ region. On the basis of an evaluation of SWReGAP land cover types, there is no suitable roosting habitat (trees) within the area of direct effects, but approximately 2,900 acres (12 km^2) of pinyon-juniper woodland that may be potentially suitable nesting habitat occurs in the area of indirect effects. Approximately 14,500 acres (59 km^2) of potentially suitable foraging habitat on the SEZ and 52 acres (0.2 km^2) of potentially suitable foraging habitat in the road corridor could be directly affected by construction and operations (Table 11.2.12.1-1). This direct impact area represents about 0.4% of potentially suitable habitat in the region. About 101,000 acres (409 km^2) of potentially suitable foraging and roosting habitat occurs in the area of indirect effects; this area represents about 3.0% of the potentially suitable habitat in the region (Table 11.2.12.1-1).

The overall impact on the silver-haired bat from construction, operation, and decommissioning of utility-scale solar energy facilities within the Delamar Valley 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 habitat in the region. The implementation of programmatic design features are expected to be sufficient to reduce indirect impacts on this species to negligible levels. Avoiding or minimizing direct impacts on all foraging habitat is not feasible because suitable foraging habitat is widespread in the area of direct effects and readily available in other portions of the affected area.

Spotted Bat

The spotted bat is a year-round resident within the Delamar Valley SEZ region. On the basis of SWReGAP land cover data, suitable roosting habitats (caves) do not occur on the SEZ.

However, approximately 120 acres (0.5 km^2) of cliff and rock outcrop habitat that may be potentially suitable roosting habitat occurs in the access road corridor. Approximately 12,150 acres (49 km^2) of potentially suitable foraging habitat on the SEZ and 87 acres (0.4 km^2) of potentially suitable foraging or roosting habitat in the road corridor could be directly affected by construction and operations (Table 11.2.12.1-1). This direct impact area represents about 0.3% of potentially suitable habitat in the region. About 94,000 acres (380 km^2) of potentially suitable foraging and nesting habitat occurs in the area of indirect effects; this area represents about 2.5% of the potentially suitable habitat in the region (Table 11.2.12.1-1).

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

Avoidance of all potentially suitable foraging habitat is not a feasible way to mitigate impacts on the spotted bat because potentially suitable habitats are widespread throughout the area of direct effects and readily available in other portions of the SEZ region. However, implementation of mitigation measures described previously for the fringed myotis could reduce direct impacts on this species to negligible levels. 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.

Townsend's Big-Eared Bat

The Townsend's big-eared bat is a year-round resident within the Delamar Valley SEZ region. On the basis of SWReGAP land cover data, suitable roosting habitats (caves) do not occur on the SEZ. However, approximately 120 acres (0.5 km^2) of cliff and rock outcrop habitat that may be potentially suitable roosting habitat occurs in the access road corridor. Approximately 14,500 acres (59 km^2) of potentially suitable foraging habitat on the SEZ and 48 acres (0.2 km^2) of potentially suitable foraging or roosting habitat in the road corridor could be directly affected by construction and operations (Table 11.2.12.1-1). This direct impact area represents about 0.5% of potentially suitable habitat in the region. About 77,500 acres (314 km^2) of potentially suitable foraging and roosting habitat occurs in the area of indirect effects; this area represents about 2.7% of the potentially suitable habitat in the region (Table 11.2.12.1-1).

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

Avoidance of all potentially suitable foraging habitat is not a feasible way to mitigate impacts on the Townsend's big-eared bat because potentially suitable habitats are widespread throughout the area of direct effects and readily available in other portions of the SEZ region. However, implementation of mitigation measures described previously for the fringed myotis could reduce direct impacts on this species to negligible levels. 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.

Western Small-Footed Bat

The western small-footed bat is a year-round resident within the Delamar Valley SEZ region. On the basis of SWReGAP land cover data, suitable roosting habitats (caves) do not occur on the SEZ. However, approximately 120 acres (0.5 km^2) of cliff and rock outcrop habitat that may be potentially suitable roosting habitat occurs in the access road corridor. Approximately 16,300 acres (66 km^2) of potentially suitable foraging habitat on the SEZ and 112 acres (0.5 km^2) of potentially suitable foraging or roosting habitat in the road corridor could be directly affected by construction and operations (Table 11.2.12.1-1). This direct impact area represents about 0.3% of potentially suitable habitat in the region. About 155,000 acres (627 km^2) of potentially suitable foraging and roosting habitat occurs in the area of indirect effects; this area represents about 3.1% of the potentially suitable habitat in the region (Table 11.2.12.1-1).

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

Avoidance of all potentially suitable foraging habitat is not a feasible way to mitigate impacts on the western small-footed bat because potentially suitable habitats are widespread throughout the area of direct effects and readily available in other portions of the SEZ region. However, implementation of mitigation measures described previously for the fringed myotis could reduce direct impacts on this species to negligible levels. 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.

Groundwater-Dependent Species

There are four BLM-designated sensitive species that may be affected by solar energy development in the Delamar Valley SEZ affected area, or that may be affected by solar energy development on the SEZ. These include the Pahranagat naucorid, White River desert sucker, southwestern toad, and Pahranagat Valley montane vole. These species do not occur within 5 mi (8 km) of the SEZ boundary, but they do occur in areas dependent on groundwater discharge within the Pahranagat Valley, which is hydrologically connected to groundwater in the Delamar Valley. Potential impacts on these species (which could range from small to large) and mitigations that could reduce those impacts would be similar to those described for groundwater-dependent ESA-listed species in Section 11.2.12.2.1. For all of these species, potential impacts and mitigation options should be discussed with the USFWS prior to project development.

11.2.12.2.5 Impacts on State-Listed Species

There are 15 species listed by the state of Nevada that may occur in the Delamar Valley SEZ affected area or that may be affected by solar energy development on the SEZ (Table 11.2.12.1-1). Impacts on each of these species have been previously discussed because of their known or pending status under the ESA (Section 11.2.12.2.1, 11.2.12.2.2, or 11.2.12.2.3) or their designation by the BLM as a sensitive species (Section 11.2.12.2.4).

11.2.12.2.6 Impacts on Rare Species

There are 47 rare species (state rank of S1 or S2 in Nevada or a species of concern by the state of Nevada or USFWS) that may be affected by solar energy development on the Delamar Valley SEZ. Impacts on 35 of these species have been previously discussed due to the species' known or pending status under the ESA (Section 11.2.12.2.1, 11.2.12.2.2, or 11.2.12.2.3) or designation under the BLM (Section 11.2.12.2.4). The remaining nine species that have not been previously discussed included the following (1) plants: Ackerman milkvetch, Antelope Canyon goldenbush, Jaeger beardtongue, Meadow Valley sandwort, St. George blue-eyed grass, and Veyo milkvetch; and (2) invertebrates: Ash Springs riffle beetle, nearctic riffle beetle, and red-tailed blazing star bee. Impacts and potentially applicable mitigation measures (if necessary) for each of these species are provided in Table 11.2.12.1-1. Additional life history information is provided in Appendix J.

11.2.12.3 SEZ-Specific Design Features and Design Feature Effectiveness

The implementation of required programmatic design features described in Appendix A**,** Section A.2.2, would greatly reduce or eliminate the potential for effects of utility-scale solar energy development on special status species. While some SEZ-specific design features are best established when 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 (i.e., area of direct effects) to determine the presence and abundance of special status species, including those identified in Table 11.2.12.1-1; 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 effects, 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 disturbance of wetland habitats within the area of direct effects, including riparian, desert wash, and playa habitats, could reduce or eliminate impacts on the Needle Mountains milkvetch, phainopepla, southwestern willow flycatcher, and Desert Valley kangaroo mouse.

- Avoiding or minimizing disturbance of cliffs and rock outcrops in the access road corridor could reduce or eliminate impacts on the following nine special status species: Charleston ground-daisy, Rock purpusia, White bearpoppy, White River cat's-eye, prairie falcon, fringed myotis, spotted bat, Townsend's big-eared bat, and western small-footed bat.

- Avoidance or minimization of groundwater withdrawals from the Delamar Valley to serve solar energy development on the SEZ would reduce or prevent impacts on the following 15 groundwater-dependent species: Ash Springs riffle beetle, grated tryonia, Hubbs springsnail, nearctic riffle beetle, Pahranagat naucorid, Pahranagat pebblesnail, Hiko White River springfish, Pahranagat roundtail chub, Pahranagat speckled dace, White River desert sucker, White River springfish, northern leopard frog, southwestern toad, phainopepla, southwestern willow flycatcher, and western yellow-billed cuckoo. Potential impacts on these species, and mitigations, should be quantified through hydrologic modeling once water needs are identified for specific projects.

- Consultation with the USFWS and NDOW should be conducted to address the potential for impacts on the following five species listed as threatened or endangered under the ESA that may be affected by solar energy development on the SEZ: Hiko White River springfish, Pahranagat roundtail chub, White River springfish, desert tortoise, and southwestern willow flycatcher. Consultation would identify an appropriate survey protocol, avoidance and minimization measures, and, if appropriate, reasonable and prudent alternatives, reasonable and prudent measures, and terms and conditions for incidental take statements.

- Coordination with the USFWS and NDOW should be conducted for the following four species under review for listing under the ESA that may be affected by solar energy development on the SEZ: grated tryonia, Hubbs springsnail, Pahranagat pebblesnail, and northern leopard frog. Coordination would identify an appropriate survey protocol, and mitigation requirements, which may include avoidance, minimization, translocation, or compensation.

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

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

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11.2.13 Air Quality and Climate

11.2.13.1 Affected Environment

11.2.13.1.1 Climate

The proposed Delamar Valley SEZ is located in southeastern Nevada, in the south central portion of Lincoln County. Nevada lies on the eastern lee side of the Sierra Nevada Range, which markedly influences the climate of the state under the prevailing westerlies (NCDC 2010a). In addition, the mountains east and north of Nevada act as a barrier to the cold arctic air masses, and thus long periods of extremely cold weather are uncommon. The SEZ lies at an average elevation of about 4,600 ft (1,400 m) in the south central portion of the Great Basin Desert, which has a high desert climate marked by year-round pleasant weather (mild winters and warm summers), large daily temperature swings due to dry air, scant precipitation, low relative humidity, and abundant sunshine. Meteorological data collected at the Ely Yelland Field, about 124 mi (200 km) north of the Delamar Valley SEZ boundary, and Pahranagat NWR, about 9 mi (14 km) southwest, are summarized below.

A wind rose from the Ely Yelland Field, Nevada, for the 5-year period 2005 to 2009, taken at a level of 33 ft (10 m), is presented in Figure 11.2.13.1-1 (NCDC 2010b).[5] During this period, the annual average wind speed at the airport was about 9.2 mph (4.1 m/s), with a prevailing wind direction from the south (about 24.4% of the time) and secondarily from the south–southeast (about 16.0% of the time). The southerly wind component predominates, with about 52% of wind directions ranging from south–southeast clockwise to south–southwest. Winds blew predominantly from the south every month throughout the year. Wind speeds categorized as calm (less than 1.1 mph [0.5 m/s]) occurred frequently (about 10% of the time) because of the stable conditions caused by strong radiative cooling from late night to sunrise. Average wind speeds by season were relatively uniform; they are the highest in spring at 9.7 mph (4.3 m/s), lower in summer and fall at 9.2 mph (4.1 m/s), and lowest in winter at 8.7 mph (3.9 m/s).

For the 1964 to 2009 period, the annual average temperature at Pahranagat NWR was 59.5°F (15.3°C) (WRCC 2010f).[6] December was the coldest month, with an average minimum temperature of 26.7°F (–2.9°C), and July was the warmest month, with an average maximum of 98.6°F (37.0°C). In summer, daytime maximum temperatures were frequently in the 90s, and

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[5] Although the Ely Yelland Field is rather far away from the Delamar Valley SEZ, it was chosen to be representative of the SEZ, considering the similar north–south orientation of valley and mountain ranges.

[6] Pahranagat NWR is located closer (about 9 mi [14 km]) to the Delamar Valley SEZ than Caliente (22 mi [35 km]) but is lower in elevation by about 1,200 ft (366 m) and 1,000 ft (305 m) than the SEZ and Caliente, respectively. Annual-average temperature at Pahranagat NWR is about 6.1°F (3.4°C) higher than that at Caliente, while precipitation and snowfall at Pahranagat NWR are about 71% and 13% of those at Caliente, respectively.

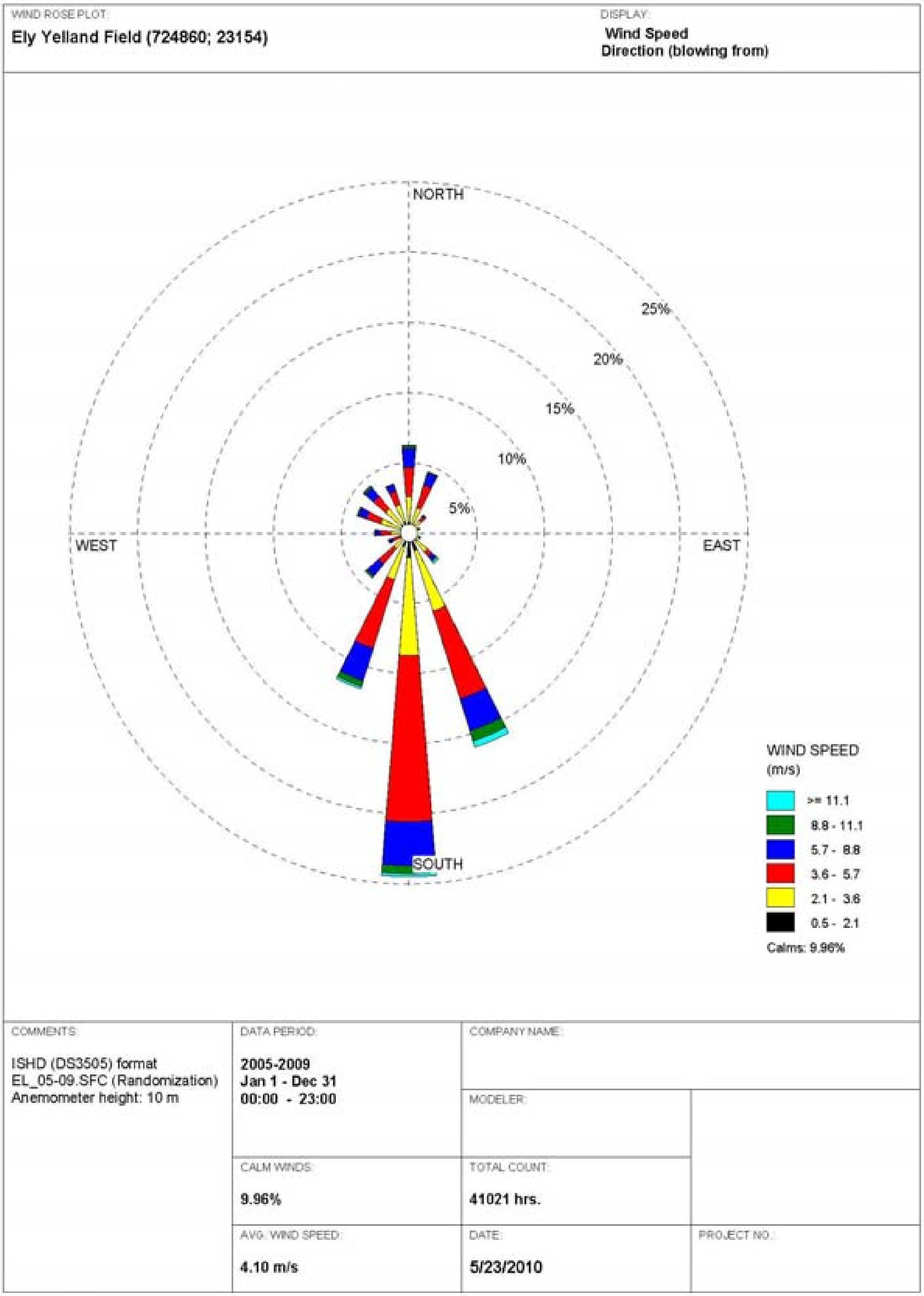

FIGURE 11.2.13.1-1 Wind Rose at 33 ft (10 m) at Ely Yelland Field, Nevada, 2005 to 2009 (Source: NCDC 2010b)

minimums were in the mid-50s or higher. The minimum temperatures recorded were below freezing (≤32°F [0°C]) during the colder months (most days in December and January). During the same period, the highest temperature, 113°F (45.0°C), was reached in July 2007, and the lowest, –1°F (–18.3°C), in December 1990. In a typical year, about 100 days had a maximum temperature of greater than or equal to 90°F (32.2°C), while about 95 days had minimum temperatures at or below freezing.

For the 1964 to 2009 period, annual precipitation at Pahranagat NWR averaged about 6.19 in. (15.7 cm) (WRCC 2010f). On average, there are 31 days annually with measurable precipitation (0.01 in. [0.025 cm] or higher). Precipitation is relatively evenly distributed by season, although recorded precipitation is slightly higher in winter and spring than in summer and fall. Snow falls as early as November and continues as late as April; most of the snow falls in December and January. The annual average snowfall at Pahranagat NWR is about 1.4 in. (3.6 cm); the highest monthly snowfall recorded was 9.0 in (22.9 cm) in December 1992.

Because the area surrounding the proposed Delamar Valley SEZ is far from major water bodies (more than 300 mi [483 km]) and because surrounding mountain ranges block air masses from penetrating into the area, severe weather events, such as thunderstorms and tornadoes, are rare.

In Nevada, flooding could occur from melting of heavy snowpack. On occasion, heavy summer thunderstorms also cause flooding of local streams, usually in sparsely populated mountainous areas, but they are seldom destructive (NCDC 2010a). Since 1996, 18 floods (17 flash floods and 1 flood) were reported in Lincoln County; most of these occurred in the nestled mountain communities and some caused property damage. In January 2005, heavy rain and rapid snow melt caused extensive flooding in southern Lincoln and northeast Clark Counties, bringing about significant property damage.

In Lincoln County, 7 hail storms have been reported since 1981, none of which caused property damage (NCDC 2010c). Hail measuring 1.5 in (3.8 cm) in diameter was reported in 1981. In Lincoln County, 22 high-wind events have been reported since 1995, which caused some property damage. Such events, with a maximum wind speed of 83 mph (37 m/s), have occurred any time of the year with a peak during spring months. In addition, four thunderstorm wind events have been reported since 1964. Thunderstorm winds, with a maximum wind speed of 69 mph (31 m/s). occurred mostly during summer months on occasion, one of which caused minor property damage.

TABLE 11.2.13.1-1 Annual Emissions of Criteria Pollutants and VOCs in Lincoln County, Nevada, Encompassing the Proposed Delamar Valley SEZ, 2002[a]

Pollutant[b]	Emissions (tons/yr)
SO_2	230
NO_x	3,453
CO	47,458
VOCs	172,491
PM_{10}	2,586
$PM_{2.5}$	1,604

[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 Lincoln County, no dust storms have been reported (NCDC 2010c). However, about 85% of the SEZ is covered with fine sandy loams and silt loams, which have moderate dust storm potential. On occasion, high winds and dry soil conditions could result in blowing dust in Lincoln County. Dust storms can deteriorate air quality and visibility and have adverse effects on health.

Hurricanes and tropical storms formed off the coast of Central America and Mexico weaken over the cold waters off the California coast. Accordingly, hurricanes never hit Nevada. Historically, one tropical depression has passed within 100 mi (160 km) of the proposed Delamar Valley SEZ (CSC 2010). Tornadoes in Lincoln County, which encompasses the proposed Delamar Valley SEZ, occur infrequently. In the period 1950 to July 2010, a total of six tornadoes (0.1 per year) were reported in Lincoln County (NCDC 2010c). However, all tornadoes occurring in Lincoln County were relatively weak (i.e., one was uncategorized, four were F0, and one was F1 on the Fujita tornado scale). None of these tornadoes caused injuries or deaths, but one of them caused some property damage. All tornadoes in Lincoln County were reported far from the proposed Delamar Valley SEZ.

11.2.13.1.2 Existing Air Emissions

Lincoln County has several industrial emission sources scattered over the county, but their emissions are relatively small. No emission sources are located around the proposed Delamar Valley SEZ. Because of the sparse population, only a handful of major roads, such as U.S. 93 and State Routes 318, 319, and 375, exist in Lincoln County. Thus, onroad mobile source emissions are not substantial. Data on annual emissions of criteria pollutants and VOCs in Lincoln County are presented in Table 11.2.13.1-1 for 2002 (WRAP 2009). Emission data are classified into six source categories: point, area, onroad mobile, nonroad mobile, biogenic, and fire (wildfires, prescribed fires, agricultural fires, structural fires). In 2002, nonroad sources were major contributors to total SO_2 and NO_x emissions (about 56% and 57%, respectively). Biogenic sources (i.e., vegetation—including trees, plants, and crops—and soils) that release naturally occurring emissions contributed primarily to CO emissions (about 56%) and secondarily to NO_x emissions (about 22%), and accounted for most of VOC emissions (about 99%). Fire sources were primary contributors to PM_{10} and $PM_{2.5}$ emissions (about 60% and 83%, respectively) and secondary contributors to SO_2 and CO emissions (41% and 33%, respectively). Area sources accounted for about 37% of PM_{10} and 13% of $PM_{2.5}$. In Lincoln County, point sources were minor contributors to criteria pollutants and VOCs.

In 2005, Nevada produced about 56.3 MMt of *gross*[7] CO_2e[8] emissions, which is about 0.8% of the total U.S. GHG emissions in that year (NDEP 2008). Gross GHG emissions in

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

8 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.

Nevada increased by about 65% from 1990 to 2005 because of Nevada's rapid population growth, compared to 16.3% growth in U.S. GHG emissions during the same period. In 2005, electrical generation (48%) and transportation (30%) were the primary contributors to gross GHG emission sources in Nevada. Fuel use in the residential, commercial, and industrial sectors combined accounted for about 12% of total state emissions. Nevada's *net* emissions were about 51.3 MMt CO_2e, considering carbon sinks from forestry activities and agricultural soils throughout the state. The EPA (2009a) also estimated 2005 emissions in Nevada. Its estimate of CO_2 emissions from fossil fuel combustion was 49.6 MMt, which was comparable to the state's estimate. Electric power generation and transportation accounted for about 52.7% and 33.6% of the CO_2 emissions total, respectively, while the residential, commercial, and industrial sectors accounted for the remainder (about 13.7%).

11.2.13.1.3 Air Quality

The EPA set NAAQS for six criteria pollutants (EPA 2010a): SO_2, NO_2, CO, O_3, PM (PM_{10} and $PM_{2.5}$), and Pb. Nevada has its own SAAQS, which are similar to the NAAQS but have some differences (NAC 445B.22097). In addition, Nevada has set standards for 1-hour H_2S emissions, which are not addressed by the NAAQS. The NAAQS and Nevada SAAQS for criteria pollutants are presented in Table 11.2.13.1-2.

Lincoln County is located administratively within the Nevada Intrastate AQCR, along with 10 other counties in Nevada. This excludes Las Vegas Intrastate AQCR, including Clark County only—which encompasses Las Vegas—and Northwest Nevada Intrastate AQCR, including five northwest counties—which encompasses Reno. Currently, the area surrounding the proposed SEZ is designated as being unclassifiable/attainment of NAAQS for all criteria pollutants (40 CFR 81.329).

Because of Lincoln County's low population density, it has no significant emission sources of its own and only minor mobile emissions along major highways. Accordingly, ambient air quality in Lincoln County is relatively good. There are no ambient air-monitoring stations in Lincoln County. To characterize ambient air quality around the SEZ, one monitoring station in Clark County was chosen: Apex in the northeast corner of North Las Vegas in Clark County, about 63 mi (101 km) to the south of the SEZ. The Apex station, which is located downwind of the Las Vegas area along with predominant southwesterly winds, but upwind of the SEZ, can be considered representative of the proposed SEZ. Ambient concentrations of NO_2, O_3, PM_{10}, and $PM_{2.5}$ are recorded at the Apex station. The East Sahara Avenue station, which is on the outskirts of Las Vegas, has only one SO_2 monitor in the area. CO concentrations at the East Tonopah Avenue station in Las Vegas, which is the farthest downwind of Las Vegas among CO monitoring stations, were presented. No Pb measurements have been made in the state of Nevada because of low Pb concentration levels after the phaseout of leaded gasoline. The background concentrations of criteria pollutants at these stations for the period 2004 to 2008 are presented in Table 11.2.13.1-2 (EPA 2010b). Monitored concentration levels were lower than their respective standards (up to 65%), except O_3, which approaches the 1-hour NAAQS/SAAQS but exceeds the 8-hour NAAQS. However, ambient concentrations around the SEZ are anticipated to be

TABLE 11.2.13.1-2 NAAQS, SAAQS, and Background Concentration Levels Representative of the Proposed Delamar Valley SEZ in Lincoln County, Nevada, 2004 to 2008

				Background Concentration Level	
Pollutant[a]	Averaging Time	NAAQS	SAAQS	Concentration[b,c]	Measurement Location, Year
SO_2	1-hour	75 ppb[d]	–[e]	–	–
	3-hour	0.5 ppm	0.5 ppm	0.009 ppm (1.8%)	Las Vegas, Clark County, 2005
	24-hour	0.14 ppm	0.14 ppm	0.008 ppm (5.7%)	Las Vegas, Clark County, 2005
	Annual	0.030 ppm	0.030 ppm	0.006 ppm (20%)	Las Vegas, Clark County, 2005
NO_2	1-hour	100 ppb[f]	–	–	–
	Annual	0.053 ppm	0.053 ppm	0.006 ppm (11%)	North Las Vegas, Clark County, 2007
CO	1-hour	35 ppm	35 ppm	5.7 ppm (16%)	Las Vegas, Clark County, 2004
	8-hour	9 ppm	9 ppm[g]	3.9 ppm (43%)	Las Vegas, Clark County, 2005
O_3	1-hour	0.12 ppm[h]	0.12 ppm[i]	0.104 ppm (87%)	North Las Vegas, Clark County, 2005
	8-hour	0.075 ppm	–	0.081 ppm (108%)	North Las Vegas, Clark County, 2007
PM_{10}	24-hour	150 $\mu g/m^3$	150 $\mu g/m^3$	97 $\mu g/m^3$ (65%)	North Las Vegas, Clark County, 2006
	Annual	–	50 $\mu g/m^3$	22 $\mu g/m^3$ (44%)	North Las Vegas, Clark County, 2008
$PM_{2.5}$	24-hour	35 $\mu g/m^3$	–	10.2 $\mu g/m^3$ (29%)	North Las Vegas, Clark County, 2005
	Annual	15.0 $\mu g/m^3$	–	4.05 $\mu g/m^3$ (27%)	North Las Vegas, Clark County, 2005
Pb	30-day	–	1.5 $\mu g/m^3$	–	–
	Calendar quarter	1.5 $\mu g/m^3$	–	–	–
	Rolling 3-month	0.15 $\mu g/m^3$ [j]	–	–	–

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

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

[c] Values in parentheses are background concentration levels as a percentage of NAAQS or SAAQS. Calculation of 1-hour SO_2 and NO_2 to NAAQS was not made, because no measurement data based on new NAAQS are available.

[d] Effective August 23, 2010.

[e] A dash indicates not applicable or not available.

[f] Effective April 12, 2010.

[g] CO standard for the area less than 5,000 ft (1,524 m) above mean sea level. CO standard for the area at or greater than 5,000 ft (1,524 m) above mean sea level is 6 ppm.

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

[i] O_3 standard for the Lake Tahoe Basin, #90, is 0.10 ppm.

[j] Effective January 12, 2009.

Sources: EPA (2010a,b); NAC 445B.22097.

lower than those presented in the table, except PM_{10} and $PM_{2.5}$, which can be either higher or lower.

PSD regulations (see 40 CFR 52.21), which are designed to limit the growth of air pollution in clean areas, apply to a major new source or the 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 be located within 62 mi (100 km) of a sensitive Class I area. There are several Class I areas around the proposed Delamar Valley SEZ, none of which is situated within 62 mi (100 km) of the SEZ, in Arizona, Nevada, and Utah. The nearest Class I area is Zion NP in Utah (40 CFR 81.430), about 89 mi (143 km) east of the proposed Delamar Valley SEZ. This Class I area is not located downwind of prevailing winds at the proposed Delamar Valley SEZ (Figure 11.2.13.1-1). The next nearest Class I area is Grand Canyon NP in Arizona, which is about 98 mi (158 km) southeast of the SEZ.

11.2.13.2 Impacts

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

Air quality impacts shared by all solar technologies are discussed in detail in Section 5.11.1, and technology-specific impacts are discussed in Section 5.11.2. Impacts specific to the proposed Delamar Valley 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 the application of any additional mitigation measures. Section 11.2.13.3 below identifies SEZ-specific design features of particular relevance to the Delamar Valley SEZ.

11.2.13.2.1 Construction

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

Methods and Assumptions

Air quality modeling for PM_{10} and $PM_{2.5}$ emissions associated with construction activities was performed using the EPA-recommended AERMOD model (EPA 2009b). Details for emissions estimation, the description of AERMOD, input data processing procedures, and modeling assumption are described in Appendix M, Section M.13. Estimated air concentrations were compared with the applicable NAAQS/SAAQS levels at the site boundaries and nearby communities and with Prevention of Significant Deterioration (PSD) increment levels at nearby Class I areas.[9] However, no receptors were modeled for PSD analysis at the nearest Class I area, Zion NP in Utah, because it is about 89 mi (143 km) from the SEZ, which is over the maximum modeling distance of 31 mi (50 km) for the AERMOD. Rather, several regularly spaced receptors in the direction of the Zion NP were selected as surrogates for the PSD analysis. For the Delamar Valley SEZ, the modeling was conducted based on the following assumptions and input:

- Uniformly distributed emissions of 3,000 acres (12.1 km^2) each and 6,000 acres (24.3 km^2) in total, in the southern portion of the SEZ, close to the nearest residence and the town of Alamo,

- Surface hourly meteorological data from Ely Yelland Field[10] and upper air sounding data from the Mercury/Desert Rock Airport for the 2005 to 2009 period, and

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

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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.

10 The number of missing hours at the Ely Yelland Field amounts to about 17.7% of the total hours, which may not be acceptable for regulatory applications because that percentage exceeds the 10% limit defined by the EPA. However, because the wind patterns at Ely Yelland Field are more representative of wind at the Delamar Valley SEZ than the wind patterns at other airports (which have more complete data but are located in different topographic features), the former values were used for the screening analysis.

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 11.2.13.2-1. Maximum 24-hour PM_{10} concentration increments modeled to occur at the site boundaries would be an estimated 408 μg/m^3, which far exceeds the relevant standard level of 150 μg/m^3. Total 24-hour PM_{10} concentrations of 505 μg/m^3 would also exceed the standard level at the SEZ boundary. However, high PM_{10} concentrations would be limited to the immediate areas surrounding the SEZ boundary and would decrease quickly with distance. Predicted maximum 24-hour PM_{10} concentration increments would be about 9 μg/m^3 at the nearest residence, Alamo, and Ash Springs (about 9 mi (14 km) west-southwest, 11 mi [18 km] west, and 15 mi [24 km] west-northwest of the SEZ, respectively), about 5 μg/m^3 at Crystal Springs and Hiko, and about 1.5 μg/m^3 at Caliente and Panaca. Annual average modeled PM_{10} concentration increments and total concentration (increment plus background) at the SEZ boundary would be about 74.6 μg/m^3 and 96.6 μg/m^3, respectively, which are higher than the SAAQS level of 50 μg/m^3. Annual PM_{10} increments would be much lower, 0.2 μg/m^3 at Alamo and Ash Springs and 0.1 μg/m^3 or less at all nearby towns, including the nearest residence. Total 24-hour $PM_{2.5}$ concentrations would be 36.1 μg/m^3 at the SEZ boundary, which is slightly higher than the NAAQS level of 35 μg/m^3; modeled increments contribute about two times more than background concentration to this total. The total annual average $PM_{2.5}$ concentration would be 11.5 μg/m^3, which is below the NAAQS 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 0.1 and 0.01 μg/m^3, respectively.

TABLE 11.2.13.2-1 Maximum Air Quality Impacts from Emissions Associated with Construction Activities for the Proposed Delamar Valley SEZ

			Concentration (μg/m^3)				Percentage of NAAQS/SAAQS	
Pollutant[a]	Averaging Time	Rank[b]	Maximum Increment[b]	Background[c]	Total	NAAQS/ SAAQS	Increment	Total
PM_{10}	24 hours	H6H	408	97	505	150	272	337
	Annual	–[d]	74.6	22	96.6	50	149	193
$PM_{2.5}$	24 hours	H8H	25.9	10.2	36.1	35	74	103
	Annual	–	7.5	4.1	11.5	15.0	50	77

[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.

[c] See Table 11.2.13.1-2.

[d] A dash = not applicable.

Predicted 24-hour and annual PM_{10} concentration increments at the surrogate receptors for the nearest Class I Area—Zion NP in Utah—would be about 4.0 and 0.08 $\mu g/m^3$, or 50% and 2.0% of the PSD increments for a Class I area, respectively. These surrogate receptors are more than 58 mi (93 km) from the Zion NP; thus predicted concentrations in Zion NP would be much lower than the above values (about 18% of the PSD increments for 24-hour PM_{10}), considering the same decay ratio with distance.

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

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

For this analysis, the impacts of construction and operation of transmission lines outside of the SEZ were not assessed, assuming that the existing regional 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 impacts on ambient air quality would be a minor component of construction impacts in comparison with solar facility construction and would be temporary.

11.2.13.2.2 Operations

Emission sources associated with the operation of a solar facility would include auxiliary boilers; vehicle (commuter, visitor, support, and delivery) traffic; maintenance (e.g., mirror cleaning and repair and replacement of damaged mirrors); and drift from cooling towers for the parabolic trough or power tower technology if wet cooling was implemented (drift comprises low-level PM emissions). The type of emission sources caused by and offset by operation of a solar facility are discussed in Appendix M, Section M.13.4.

Potential air emissions displaced by the solar project development at the Delamar Valley SEZ are presented in Table 11.2.13.2-2. Total power generation capacity ranging from 1,471 to 2,648 MW is estimated for the Delamar Valley SEZ for various solar technologies (see Section 11.2.2). The estimated amount of emissions avoided for the solar technologies evaluated depends only on the megawatts of conventional fossil fuel–generated power displaced, because a composite emission factor per megawatt-hour of power by conventional technologies is assumed (EPA 2009c). If the Delamar Valley SEZ were fully developed, it is expected that emissions avoided could be substantial. Development of solar power in the SEZ could result in avoided air emissions ranging from 6.8 to 12% of total emissions of SO_2, NO_x, Hg, and CO_2 from electric power systems in the state of Nevada (EPA 2009c). Avoided emissions could be up to 2.6% of total emissions from electric power systems in the six-state study area. When compared with all source categories, power production from the same solar facilities could displace up to 9.9% of SO_2, 3.7% of NO_x, and 6.6% of CO_2 emissions in the state of Nevada

TABLE 11.2.13.2-2 Annual Emissions from Combustion-Related Power Generation Avoided by Full Solar Development of the Proposed Delamar Valley 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
16,552	1,471–2,648	2,578–4,640	3,637–6,546	3,119–5,615	0.021–0.037	2,002–3,604
Percentage of total emissions from electric power systems in Nevada[d]			6.8–12%	6.8–12%	6.8–12%	6.8–12%
Percentage of total emissions from all source categories in Nevada[e]			5.5–9.9%	2.1–3.7%	–[f]	3.7–6.6%
Percentage of total emissions from electric power systems in the six-state study area[d]			1.4–2.6%	0.84–1.5%	0.71–1.3%	0.76–1.4%
Percentage of total emissions from all source categories in the six-state study area[e]			0.77–1.4%	0.12–0.21%	–	0.24–0.43%

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

[b] Assumed a capacity factor of 20%.

[c] Composite combustion-related emission factors for SO_2, NO_x, Hg, and CO_2 of 2.82, 2.42, 1.6×10^{-5}, and 1,553 lb/MWh, respectively, were used for the state of Nevada.

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

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

[f] A dash indicates not estimated.

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

(EPA 2009a; WRAP 2009). These emissions could be up to 1.4% of total emissions from all source categories in the six-state study area. Power generation from fossil fuel–fired power plants accounts for about 93% of the total electric power generated in Nevada for which contribution of natural gas and coal combustion is comparable (EPA 2009c). Thus, solar facilities to be built in the Delamar Valley SEZ could be more important than those built in other states in terms of reducing fuel combustion–related emissions.

As discussed in Section 5.11.2.5, the operation of associated transmission lines would generate some air pollutants from activities such as periodic site inspections and maintenance. However, these activities would occur infrequently, and the amount of emissions would be small. In addition, transmission lines could produce minute amounts of O_3 and its precursor NO_x, associated with corona discharge (i.e., the breakdown of air near high-voltage conductors), which is most noticeable for high-voltage lines during rain or very humid conditions. Since the Delamar Valley SEZ is located in an arid desert environment, these emissions would be small; potential impacts on ambient air quality associated with transmission lines would be negligible, considering the infrequent occurrences and small amount of emissions from corona discharges.

11.2.13.2.3 Decommissioning/Reclamation

As discussed in Section 5.11.2.4, decommissioning/reclamation activities are similar to construction activities but are on a more limited scale and of shorter duration. Potential impacts on ambient air quality would be correspondingly less than those from construction activities. Decommissioning activities would last for a short period, and their potential impacts would be moderate and temporary. The same mitigation measures adopted during the construction phase would also be implemented during the decommissioning phase (Section 5.11.3).

11.2.13.3 SEZ-Specific Design Features and Design Feature Effectiveness

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

11.2.14 Visual Resources

11.2.14.1 Affected Environment

The proposed Delamar Valley SEZ is located in Lincoln County in southeastern Nevada, 45 mi (72 km) west of the Utah border. The SEZ occupies 16,552 acres (66.984 km^2) within the Delamar Valley, and extends approximately 3.0 mi (4.8 km) east to west and approximately 13 mi (21 km) north to south. The SEZ ranges in elevation from approximately 4,540 ft (1,380 m) in the southern portion to 4,760 ft (1,450 m) in the northern portion.

The SEZ lies within the Central Basin and Range Level III ecoregion, which is composed of northerly trending fault-block ranges and intervening drier basins (Bryce et al. 2003). Valleys, lower slopes, and alluvial fans are either shrub- and grass-covered, or shrub-covered. Higher elevation mountain slopes support woodland, mountain brush, and scattered forests. Land uses within the ecoregion include grazing with some irrigated cropland found in valleys near mountain water sources. At Level IV, the proposed Delamar Valley SEZ is located within the Tonopah Basin ecoregion, which is a transition between the Great Basin and the more southerly Mojave Desert. It is typified by broad, nearly flat to rolling valleys containing lake plains, scattered hills, alluvial fans, bajadas, sand dunes, and hot springs. Ephemeral washes occur. Surface water comes from springs and sporadic foothill precipitation events, but is generally scarce (Bryce et al. 2003).

Delamar Valley is bounded by mountain ranges to the east, southeast, and west, with open views to the north. The Delamar Mountains rise about 4.7 mi (7.6 km) east of the SEZ. The foothills of the South Pahroc Mountain range are located approximately 2.4 mi (3.9 km) west of the SEZ. These ranges include peaks that are generally between 3,000 and 5,000 ft (914 and 1,524 m) in elevation, but some peaks are over 7,000 ft (2,134 m). From north to south, the broad Delamar Valley extends approximately 20 mi (32 km) and 8.5 mi (13.7 km) wide. The SEZ and surrounding mountain ranges are shown in Figure 11.2.14.1-1.

Vegetation is generally sparse in much of the SEZ, with low-height shrubs, grasses, and bare soil. Vegetation within the SEZ is predominantly winterfat, with Joshua trees, spiny hopsage, and other low shrubs dominating the Delamar Valley floor. During an August 2009 site visit, the vegetation presented a limited range of muted colors, with medium to coarse textures, and generally low visual interest. Within the SEZ, soils are somewhat sandy, fine textured, and very light brown to tan in color.

The southern portion of the SEZ has more visual variety and scenic quality than the rest of the SEZ. A very flat playa (Delamar Lake) is located at the southern end of the SEZ, with nearly white soil that provides a strong visual contrast visible at great distances. Immediately west of the playa are large boulders and a rocky ridge that provide strong form, color, and texture contrast to the playa. They also contain rock art that attracts visitors. The northern portion of the SEZ is a broad, flat valley with distant mountains and is of low scenic quality. There are no visible water features; however, much of the SEZ collects surface water temporarily.

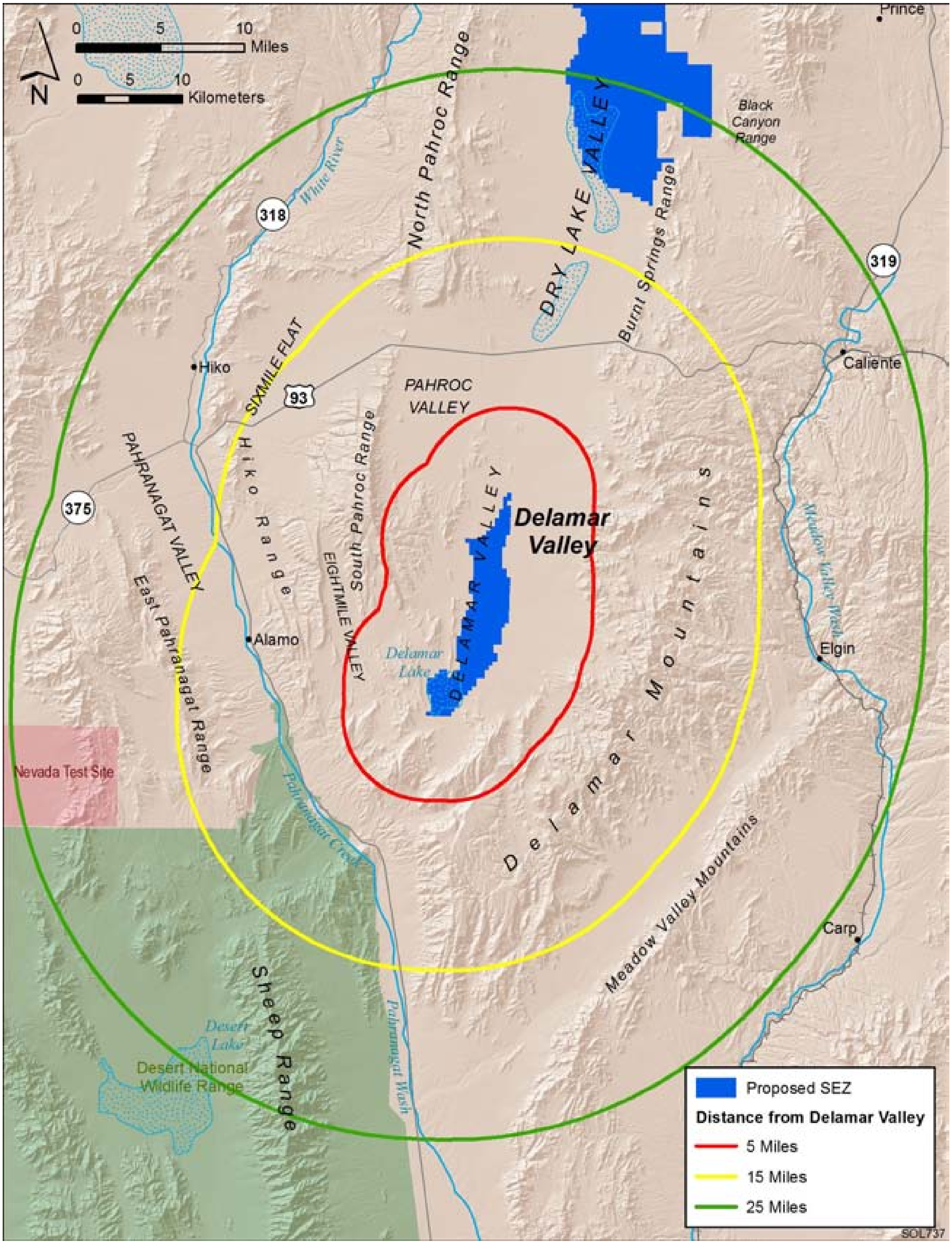

FIGURE 11.2.14.1-1 Proposed Delamar Valley SEZ and Surrounding Lands

Cultural disturbances visible within the SEZ include unpaved roads, transmission lines, fences, corrals, and trash. Delamar Lake is used for various recreational activities, including driving OHVs, racing, setting off pyrotechnics, and launching model rockets. Grazing occurs outside of the dry lakebed. These cultural modifications generally detract from the scenic quality of the SEZ; however, the SEZ is so large that from many locations within the SEZ these features are either not visible or are so distant as to have minimal effect on views. From most locations within the SEZ the landscape is generally natural in appearance, with little visible disturbance.

The general lack of topographic relief, water, and variety results in low scenic value within the SEZ itself; however, because of the flatness of the landscape and the breadth of the Delamar Valley, the SEZ and surrounding valley floor present a panoramic landscape with sweeping views of the surrounding mountains that add to the scenic values within the SEZ viewshed. The mountain slopes and peaks to the east and west of the SEZ are, in general, visually pristine. As viewed from the SEZ, most of the surrounding mountains appear to be devoid of vegetation, and their generally jagged, irregular form, and brown colors provide dramatic visual contrasts to the strong horizontal line, green vegetation, and light-colored soils of the valley floor, particularly when viewed from nearby locations within the SEZ. Panoramic views of the SEZ are shown in Figures 11.2.14.1-2, 11.2.14.1-3, and 11.2.14.1-4.

The BLM conducted a VRI for the SEZ and surrounding lands in 2004. 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 Visual Resource Inventory Classes, which represent the relative value of the visual resources. Classes I and II are the most valued; Class III represents a moderate value; and Class IV represents the least value. Class I is reserved for specially designated areas, such as national wildernesses and other congressionally and administratively designated areas for which 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 presented in Section 5.12 and in *Visual Resource Inventory*, BLM Manual Handbook 8410-1 (BLM 1986a).

The VRI values for the SEZ are VRI Class 4, indicating low relative visual values. Most of the immediate surroundings are also VRI Class 4, with the exception of the area immediately to the east of the SEZ, which is VRI Class 3 (BLM 2009d). The BLM conducted a new VRI for the SEZ and surrounding lands in 2010; however, the VRI was not completed in time for the new data to be included in the draft PEIS. The new VRI data will be incorporated into the analyses presented in the final PEIS.

The *Ely District Record of Decision and Approved Resource Management Plan* (BLM 2008b) indicates that the site is managed as VRM Class IV, which permits major modification of the existing character of the landscape. More information about the BLM VRM program is presented in Section 5.12 and in *Visual Resource Management*, BLM Manual Handbook 8400 (BLM 1984).

FIGURE 11.2.14.1-2 Approximately 180° Panoramic View of the Proposed Delamar Valley SEZ, Facing West across Delamar Flat toward South Pahroc Range from Stock Pond in the South–Central Portion of the SEZ

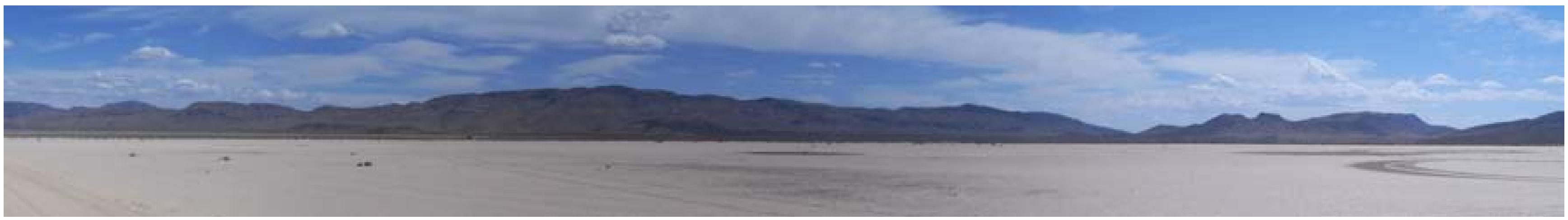

FIGURE 11.2.14.1-3 Approximately 120° Panoramic View of the Proposed Delamar Valley SEZ, Facing South toward Delamar Mountain WA from the Northern Boundary of Delamar Lake

FIGURE 11.2.14.1-4 Approximately 120° Panoramic View of the Proposed Delamar Valley SEZ from the Far Northern Portion of the SEZ, Facing South across the Delamar Flat, with Delamar Mountains at Left and Center and the South Pahroc Range on the Right

11.2.14.2 Impacts

The potential for impacts from utility-scale solar energy development on visual resources within the proposed Delamar Valley 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, a relatively complete and accurate description of its major components, and their layout, it is not possible to assess precisely the visual impacts associated with the facility. However, if the general nature and location of a facility are known, a more generalized assessment of potential visual impacts can be made by describing the range of expected visual changes and discussing contrasts typically associated with these changes. In addition, a general analysis can identify sensitive resources that may be at risk if a future project is sited in a particular area. Detailed information about the methodology employed for the visual impact assessment used in this PEIS, including assumptions and limitations, is presented in Appendix M.

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. 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 discussed in the following analysis do not account for potential glint and glare effects; however, these effects would be incorporated into a future site- and project-specific assessment that would be conducted for specific proposed utility-scale solar energy projects. For more information about potential glint and glare impacts associated with utility-scale solar energy facilities, see Section 5.12 of this PEIS.

11.2.14.2.1 Impacts on the Proposed Delamar Valley 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 be associated with solar facilities utilizing highly reflective surfaces or major light-emitting facility components (solar dish, parabolic trough, and power tower technologies), with somewhat lesser impacts expected for PV facilities. These impacts would be expected to involve major modification of the existing character of the landscape and would likely dominate the views nearby. Additional, and potentially large impacts would occur as a result of the construction, operation, and decommissioning of related facilities, such as access roads and electric transmission lines. While the primary visual impacts associated with solar energy development within the SEZ would occur during daylight hours, lighting required for utility-scale solar energy facilities would be a potential source of visual impacts at night, both within the SEZ and on surrounding lands.

Common and technology-specific visual impacts from utility-scale solar energy development, as well as impacts associated with electric transmission lines, are discussed in Section 5.12 of this PEIS. Impacts would last throughout construction, operation, and decommissioning, and some impacts could continue after project decommissioning. Visual impacts resulting from solar energy development in the SEZ would be in addition to impacts from solar energy development and other development that may occur on other public or private lands within the SEZ viewshed. For discussion of cumulative impacts, see Section 11.2.22.4.13 of this PEIS.

The changes described above would be expected to be consistent with BLM VRM objectives for VRM Class IV, as viewed from nearby KOPs. The current VRM class designated for the SEZ is VRM Class IV. More information about impact determination using the BLM VRM program is presented in Section 5.12 and in *Visual Resource Contrast Rating*, BLM Manual Handbook 8431-1 (BLM 1986b).

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

11.2.14.2.2 Impacts on Lands Surrounding the Proposed Delamar Valley 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 depend on a number of visibility factors and viewer distance (for a detailed discussion of visibility and related factors, see Section 5.7). 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 run to identify which lands surrounding the proposed SEZ are visible from the SEZ (see Appendix M for important information on assumptions and limitations of the methods used). Four viewshed analyses were run, 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 11.2.14.2-1 shows the combined results of the viewshed analyses for all four solar technologies. The colored segments indicate areas with clear lines of sight to one or more areas within the SEZ and from which solar facilities within these areas of the SEZ would be expected to be visible, assuming the absence of screening vegetation or structures and adequate lighting and other atmospheric conditions. The light brown areas are locations from which PV and parabolic trough arrays located in the SEZ could be visible. Solar dishes and power blocks for CSP technologies would be visible from the areas shaded in light brown and the additional areas shaded in light purple. Transmission towers and short solar power towers would be visible from the areas shaded light brown and light purple, and the additional areas shaded in dark purple. Power tower facilities located in the SEZ could be visible from areas shaded light brown, light purple, and dark purple, and at least the upper portions of power tower receivers could be visible from the additional areas shaded in medium brown.

For the following visual impact discussion, the tall solar power tower (650 ft [198.1 m]) and PV and parabolic trough array (24.6 ft [7.5 m]) viewsheds are shown in figures and discussed in the text. These heights represent the maximum and minimum landscape visibility for solar energy technologies analyzed in this PEIS. Viewsheds for solar dish and CSP technology power blocks (38 ft [11.6 m]) and transmission towers and short solar power towers (150 ft [45.7 m]) are presented in Appendix N. The visibility of these facilities would fall between that for tall power towers and PV and parabolic trough arrays.

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

Figure 11.2.14.2-2 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 would have views of solar facilities within the SEZ and therefore are potentially 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 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.

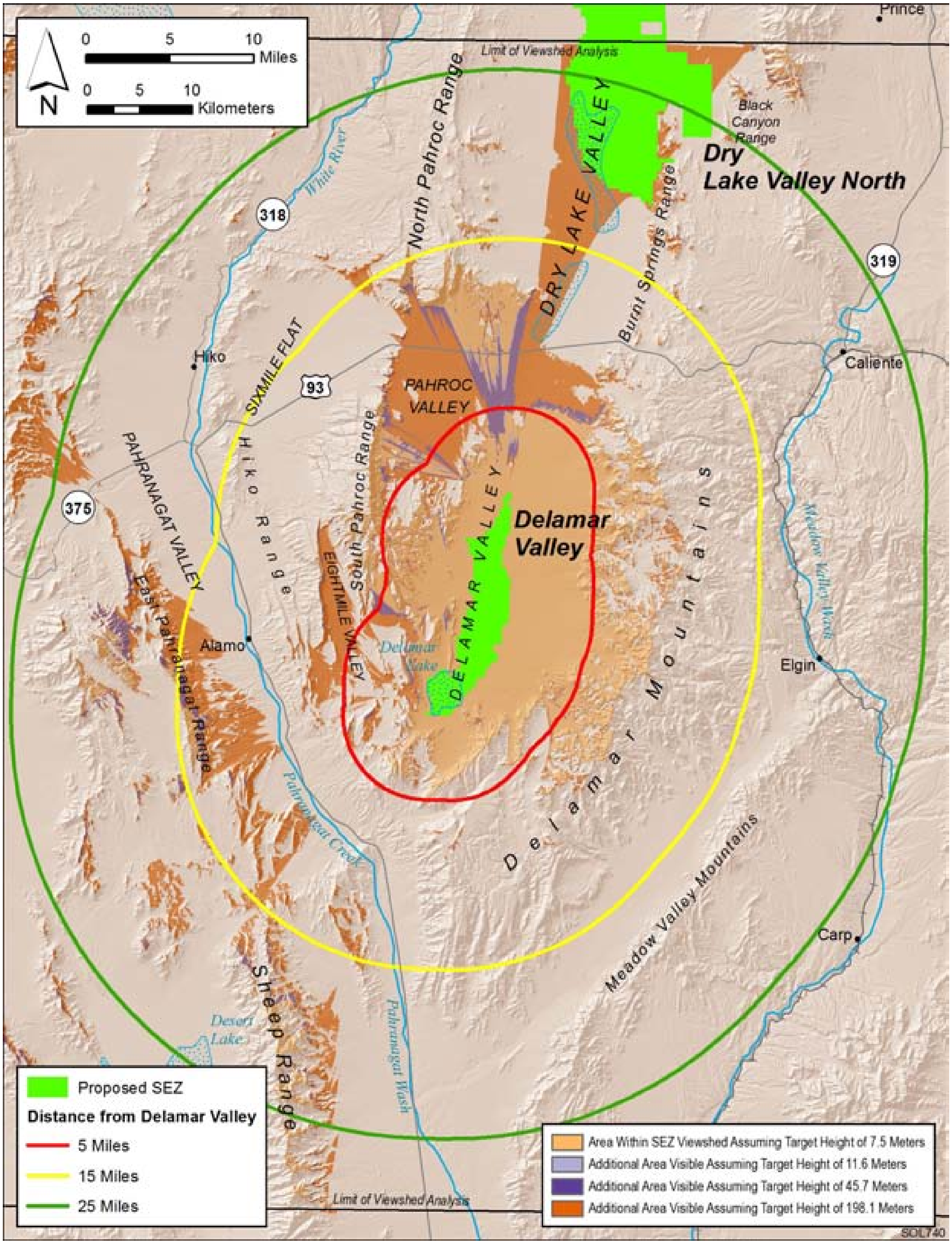

FIGURE 11.2.14.2-1 Viewshed Analyses for the Proposed Delamar Valley SEZ and Surrounding Lands, Assuming Solar Technology Heights of 24.6 ft (7.5 m), 38 ft (11.6 m), 150 ft (45.7 m), and 650 ft (198.1 m) (shaded areas indicate lands from which solar development within the SEZ could be visible)

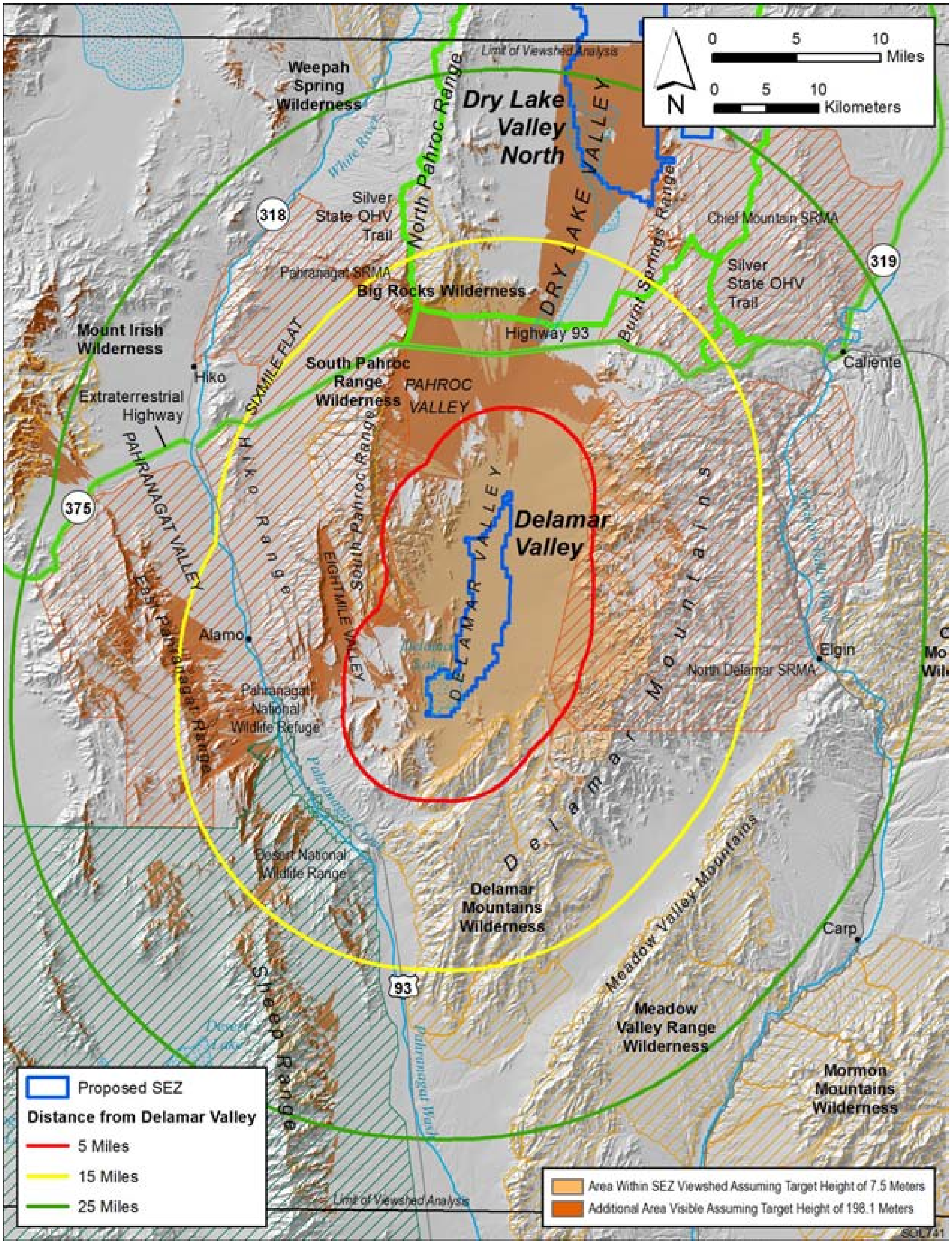

FIGURE 11.2.14.2-2 Overlay of Selected Sensitive Visual Resource Areas onto Combined 650-ft (198.1-m) and 24.6-ft (7.5-m) Viewsheds for the Proposed Delamar Valley SEZ

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 Delamar Valley SEZ are discussed below. The results of this analysis are also summarized in Table 11.2.14.2-1. Further discussion of impacts on these areas is presented in Sections 11.2.3 (Specially Designated Areas and Lands with Wilderness Characteristics) and 11.2.17 (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 the PEIS analysis. These variables would be incorporated into a future site-and project-specific assessment that would be conducted for specific proposed utility-scale solar energy projects. For more discussion of visual contrasts and impacts, see Section 5.12 of the PEIS.

TABLE 11.2.14.2-1 Selected Potentially Affected Sensitive Visual Resources within 25-mi (40-km) Viewshed of the Proposed Delamar Valley SEZ, Assuming Power Tower Technology with a Target Height of 650 ft (198.1 m)

		Feature Area or Linear Distance		
			Visible between	
Feature Type	Feature Name and Total Acreage/ Length[a]	Visible within 5 mi	5 mi and 15 mi	15 mi and 25 mi
WAs	Big Rocks (12,929 acres)	0 acres	2,531 acres (20%)[b]	3 acres (0.2%)
	Delamar Mountains (111,060 acres)	5,179 acres (5%)[b]	663 acres (0.6%)	0 acres
	Mount Irish (28,283 acres)	0 acres	0 acres	198 acres (0.7%)
	South Pahroc Range (25,674 acres)	1,566 acres (6%)	4,846 acres (19%)	36 acres (0.1%)
National Wildlife Range	Desert (1,626,903 acres)	0 acres	4,948 acres (0.3%)	14,463 acres (0.9%)
NWR	Pahranagat (5,540 acres)	0 acres	10 acres (0.2%)	0 acres
SRMAs	Chief Mountain (111,151 acres)	0 acres	222 acres (0.2%)	1,549 acres (1%)
	North Delamar (202,839 acres)	9,947 acres (5%)	27,700 acres (14%)	0 acres
	Pahranagat (298,567 acres)	3,504 acres (1%)	35,341 acres (12%)	13,774 acres (5%)
Scenic Highways	U.S. 93 (149 mi, 240 km)	0 mi	8.8 mi	0 mi
	Silver State Trail	0 mi	14 mi	0 mi

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

b Percentage of total feature area for areal features.

GOOGLE EARTH™ VISUALIZATIONS

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

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

Wilderness Areas

- *Big Rocks*—Big Rocks Wilderness is a 12,929-acre (52.322 km^2) congressionally designated WA located 12 mi (19km) north–northwest of the SEZ. Recreational opportunities include climbing, bouldering, camping, hiking, backpacking, hunting, and horseback riding.

  As shown in Figure 11.2.14.2-2, solar energy facilities within the SEZ could be visible from the southern portion of the WA (approximately 2,534 acres [10.26 km^2] in the 650-ft [198.1-m] viewshed, or 20% of the total WA acreage, and 2,221 acres [8.988 km^2] in the 24.6-ft [7.5-m] viewshed, or 17% of the total WA acreage). The visible area of the WA extends to approximately 15mi (24 km) from the northern boundary of the SEZ.

  Figure 11.2.14.2-3 is a Google Earth visualization of the SEZ (highlighted in orange) as seen from an unnamed peak in the southern portion of the WA, approximately 14 mi (23 km) from the northernmost boundary of 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 visualization are properly scaled models of a 459-ft (139.9-m) power tower with an 867-acre (3.5-km^2) field of 12-ft (3.7-m) heliostats, each representing approximately 100 MW of electric generating capacity. Four 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.

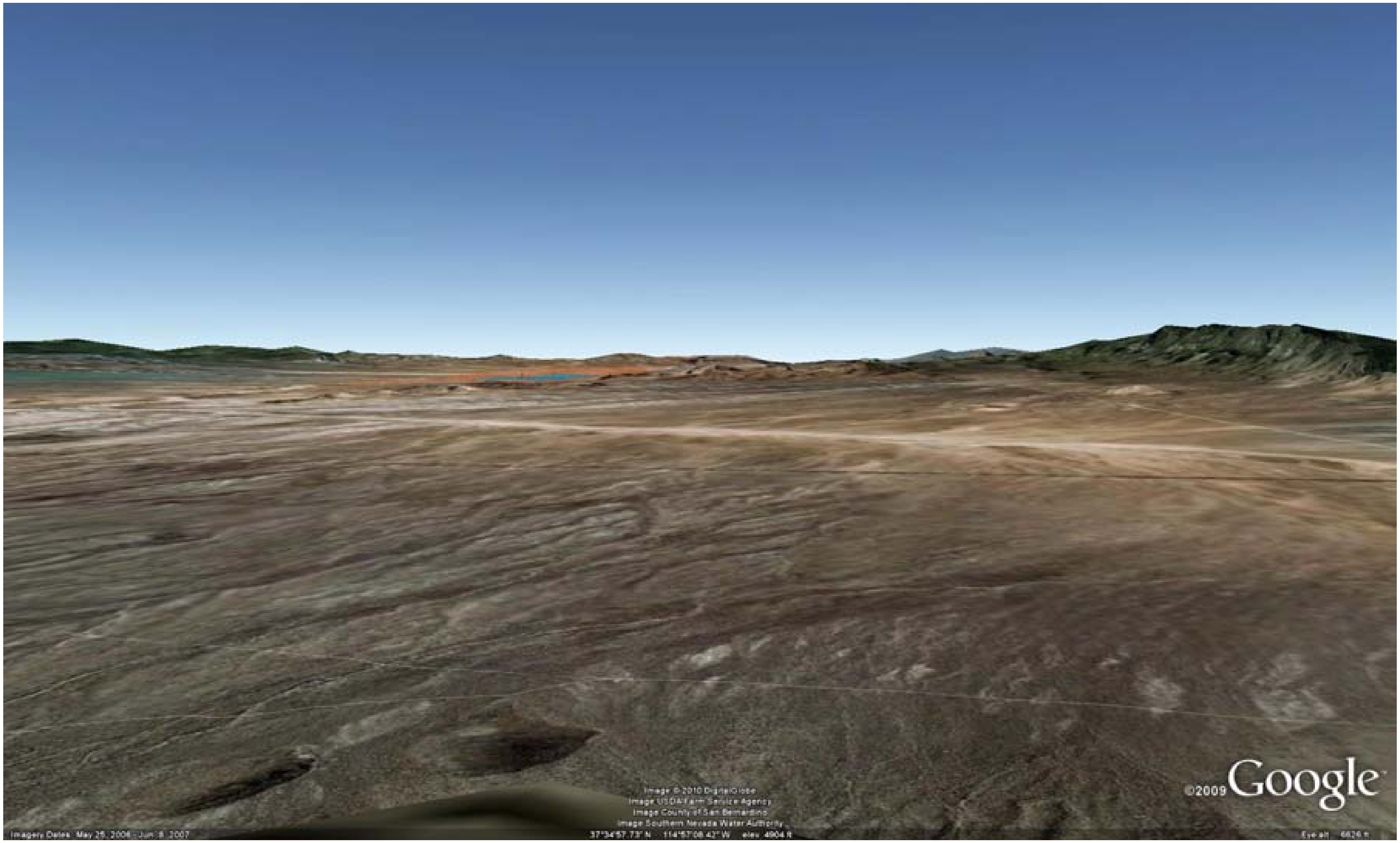

FIGURE 11.2.14.2-3 Google Earth Visualization of the Proposed Delamar Valley SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from an Unnamed Peak within the Southern Portion of Big Rocks WA

The visualization suggests that as seen from the WA, the southern portion of the SEZ would be screened from view by the South Pahroc Range and, in addition, the horizontal angle of view would be along the narrow, north-south axis of the SEZ, so the SEZ would occupy a very small portion of the field of view. Furthermore, because of the relatively long distance to the SEZ, the vertical angle of view would be low, and solar facilities within the SEZ would be seen edge-on, which would reduce their apparent size, conceal their strong regular geometry, and cause them to appear to repeat the strong line of the horizon, all of which would tend to reduce associated visual contrasts.

If power towers were located in the visible portions of the SEZ, when operating, they would likely appear as points of light under the southern horizon, against a backdrop of the valley floor. At night, if more than 200 ft (61 m) tall, power towers would have navigation warning lights that could potentially be visible from this location in the WA, and could be prominent in the dark night skies of this remote area.

The small apparent size of the SEZ and low angle of view suggest that under the 80% development scenario analyzed in this PEIS, weak levels of visual contrast would be expected from solar development within the SEZ, as seen from Big Rocks WA.

- *Delamar Mountains*—Delamar Mountains is an 111,060-acre (449.444-km^2) congressionally designated WA located 1.8 mi (2.9 km) southeast of the SEZ at the point of closest approach. Recreational opportunities include camping, hiking, rock scrambling, backpacking, hunting, and horseback riding. The higher peaks in the central and eastern portions provide expansive views of nearby mountains and valleys, including the Delamar Dry Lake bed.

  As shown in Figure 11.2.14.2-2, within 25 mi (40 km) of the SEZ, solar energy facilities within the SEZ could be visible from portions of the northern part of the WA. Visible areas of the WA within the 25-mi (40-km) radius of analysis total approximately 5,827 acres (23.58 km^2) in the 650-ft (198.1-m) viewshed, or 5% of the total WA acreage, and 5,171 acres (20.93 km^2) in the 24.6-ft (7.5-m) viewshed, or 5% of the total WA acreage. The visible area of the WA extends to approximately 4.5 mi (7.2 km) from the southeastern corner of the SEZ; thus the entire visible area is within the BLM VRM program's foreground–middleground distance (5 mi [8 km]).

  Figure 11.2.14.2-4 is a Google Earth visualization of the SEZ (highlighted in orange) as seen from an unnamed peak in the northwestern portion of the WA (elevation approximately 6,340 ft [1,930 m]), approximately 2.8 mi (2.5 km) from the southeastern boundary of the SEZ. The viewpoint is about 1,800 ft (550 m) above the nearest point in the SEZ. The visualization suggests that from this viewpoint the SEZ would nearly fill the horizontal field of view. The SEZ would be visible as a wide band across the valley floor, and the proposed

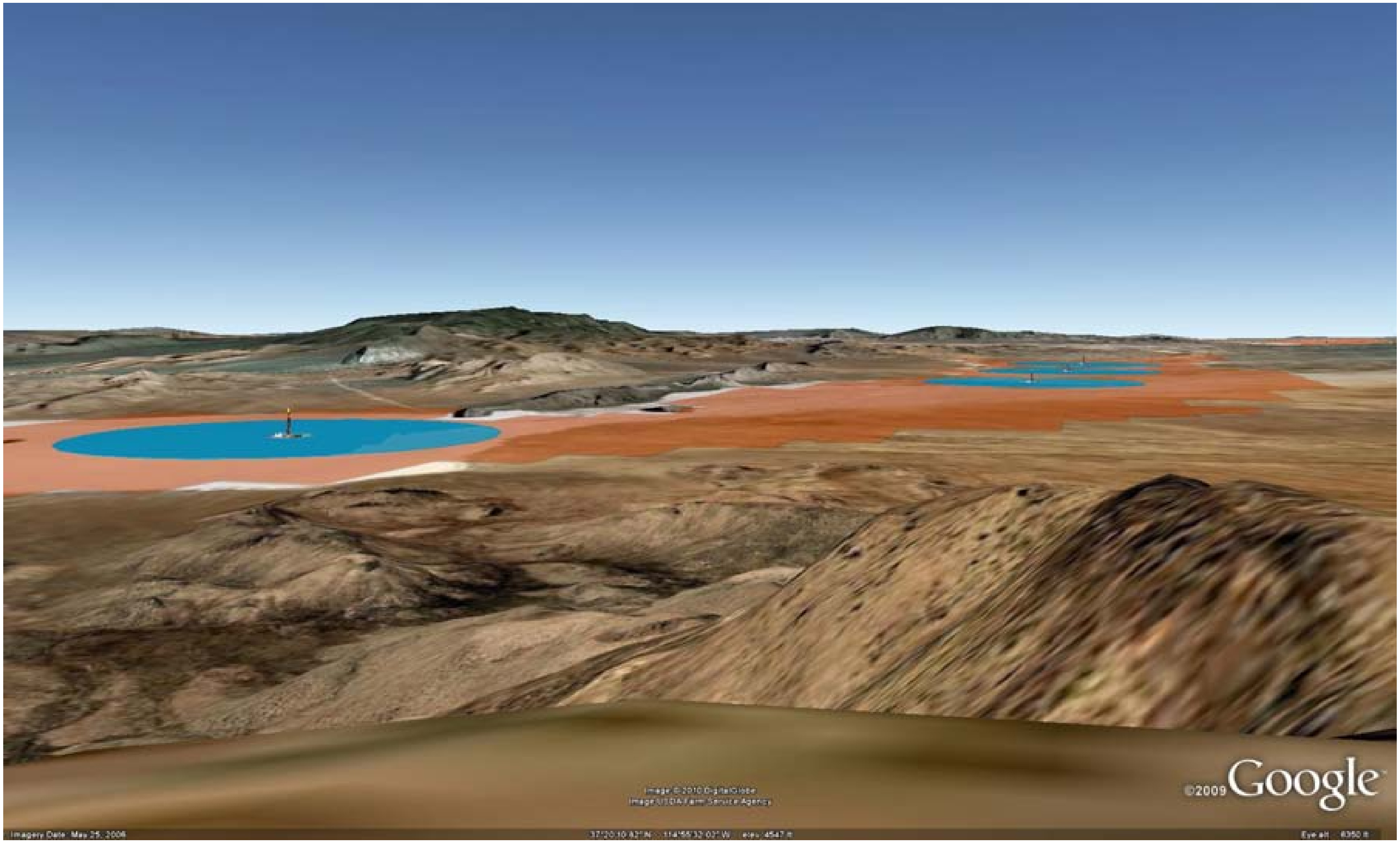

FIGURE 11.2.14.2-4 Google Earth Visualization of the Proposed Delamar Valley SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from an Unnamed Peak within the Northwestern Portion of the Delamar Mountains WA

Dry Lake North SEZ would be visible in the far distance north of the Delamar Lake SEZ. The tops of solar collector/reflector arrays associated with solar facilities within the SEZ would be visible, increasing the facilities' apparent sizes and making the strong regular geometry of the collector/reflector arrays more apparent, and thus introducing form, texture, and color contrasts to an otherwise natural-appearing setting. Under the 80% development scenario analyzed in the PEIS, a variety of solar facilities within the SEZ would likely be visible, and the contrasting project layouts and associated infrastructure could appear cluttered and lacking in visual unity.

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

When operating, the receivers of power towers within the SEZ would be visible as very bright nonpoint light sources (i.e., having cylindrical or rectangular surface area visible) against the backdrop of the valley floor. The tower structures would likely be visible. At night, if more than 200 ft (61 m) tall, power towers would have navigation warning lights that would likely be visible from this location and could be conspicuous, given the dark night skies typical of the area. Other lighting associated with solar facilities could be visible as well.

Visual contrasts associated with solar facilities within the SEZ would depend on the numbers, types, sizes and locations of solar facilities in the SEZ, and other visibility factors. Under the 80% development scenario analyzed in the PEIS, Depending on project location within the SEZ, the types of solar facilities and their designs, and other visibility factors, strong visual contrasts from solar energy development within the SEZ would be expected at this viewpoint.

Figure 11.2.14.2-5 is a Google Earth visualization of the SEZ (highlighted in orange) as seen from the side slope of a much lower elevation ridge in the northeastern portion of the WA (elevation approximately 5,100 ft [1,560 m]), approximately 3.1 mi (5.0 km) from the southeastern boundary of the SEZ. The visualization suggests that from this viewing angle and short distance to the SEZ, the SEZ would be too large to be encompassed in one view, and viewers would need to turn their heads to scan across the whole SEZ. The relatively low elevation (approximately 500 ft [150 m] above the nearest point in the SEZ) would reduce the vertical angle of view, and the SEZ would be

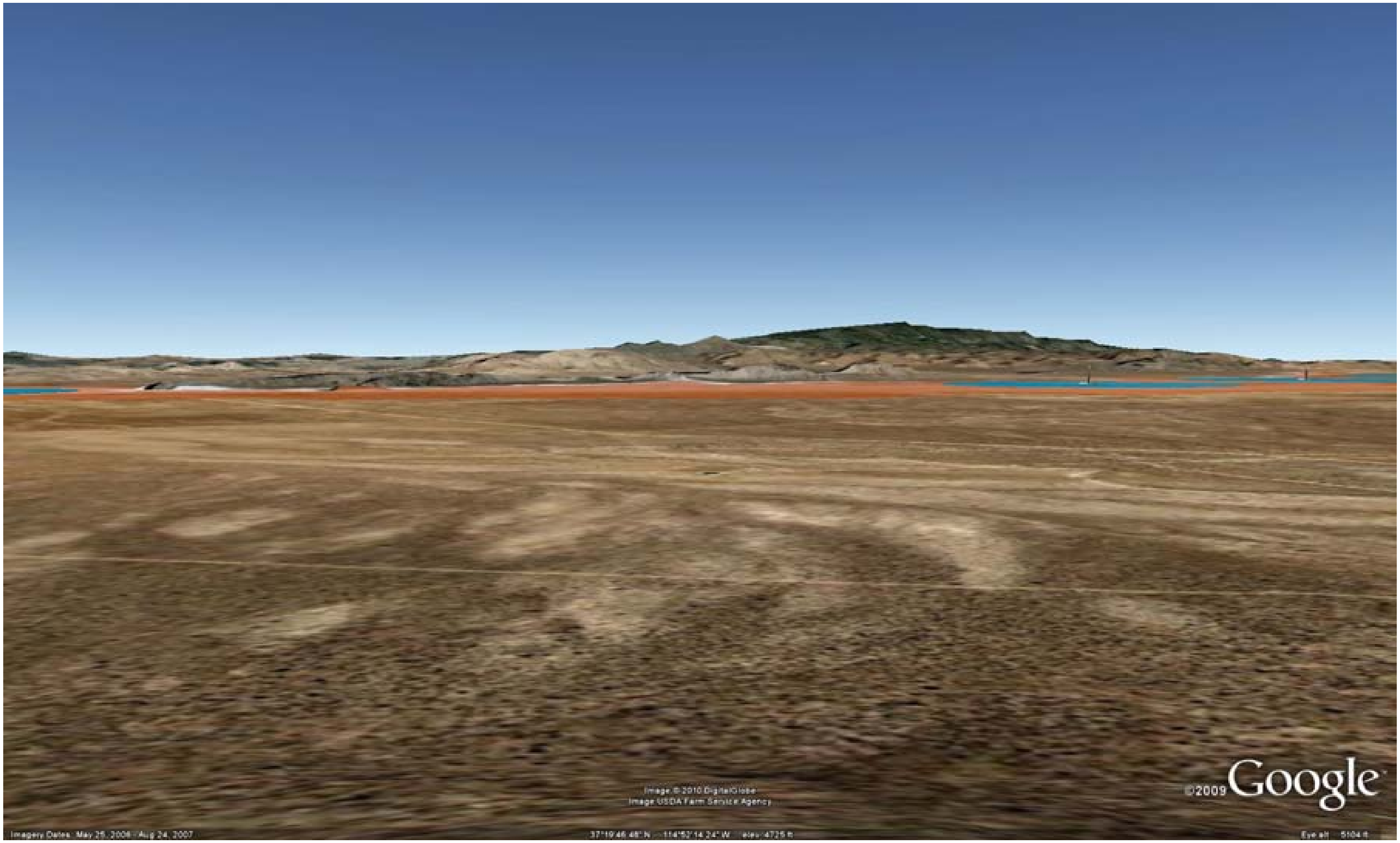

FIGURE 11.2.14.2-5 Google Earth Visualization of the Proposed Delamar Valley SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from an Unnamed Peak within the Far Northeastern Portion of the Delamar Mountains WA

visible as a narrow band across the valley floor. The tops of solar collector/ reflector arrays associated with solar facilities within the SEZ would be visible, increasing the facilities' apparent sizes slightly and making the strong regular geometry of the collector/reflector arrays somewhat more apparent.

Taller ancillary facilities, such as buildings, transmission structures, and cooling towers; and plumes (if present) would likely be visible, and their structural details could be evident. The ancillary facilities could create form and line contrasts with the strongly horizontal, regular, and repeating forms and lines of the collector/reflector arrays, with color and texture contrasts dependent on the materials and surface treatments utilized in the facilities.

The receivers of operating power towers within the SEZ would be visible as very bright nonpoint light sources against the backdrop of the mountains across the Delamar Valley during the day and, if more than 200 ft (61 m) tall, would have navigation warning lights at night that could be conspicuous from this location. Under the 80% development scenario analyzed in this PEIS, strong levels of visual contrast would be expected.

Overall, under the 80% development scenario, strong visual contrasts would be expected from solar energy facilities within the SEZ, as viewed from portions of the Delamar Mountains WA within the SEZ 25 mi (40 km) viewshed. The highest contrast levels would be expected at the highest elevations in the northwest portions of the WA, with slightly lower levels of contrast expected for lower elevations within the WA, where the lower viewing angle would decrease the apparent size and visual contrast of solar facilities within the SEZ.

- *Mount Irish*—Mount Irish Wilderness is a 22,283-acre (90.176-km^2) congressionally designated WA located 22 mi (35 km) northwest of the SEZ at the point of closest approach. Opportunities for recreation in this area include hiking, backpacking, horseback riding, photography, nature study, and hunting.

  As shown in Figure 11.2.14.2-2, within 25 mi (40 km) of the SEZ, solar energy facilities within the SEZ could be visible from the far eastern portion of the WA. Visible areas of the WA within the 25-mi (40-km) radius of analysis total approximately 198 acres (0.801 km^2) in the 650-ft (198.1-m) viewshed, or 0.7% of the total WA acreage. None of the WA is within the 24.6-ft (7.5-m) viewshed. The area of the WA with potential visibility of solar facilities in the SEZ extends to beyond 25 mi (40 km) from the northwestern corner of the SEZ.

  The South Pahroc Range entirely screens the ground surface of the SEZ from view from the WA. Only the upper portions of sufficiently tall power towers within the SEZ would be visible from a very small area within the WA. From within this area, if power tower receivers were located at specific locations within the SEZ, the light atop the receiver towers might be visible as distant points of light just over the tops of the South Pahroc Range east–southeast of the WA. At night hazard warning lights on taller power towers might be visible. Under the 80% development scenario analyzed in the PEIS, expected visual contrasts associated with solar energy development within the SEZ would be minimal.

- *South Pahroc Range*—South Pahroc Range Wilderness is a 25,674-acre (103.90-km^2) congressionally designated wilderness area (WA) located 3.6 mi (5.8 km) west of the SEZ at the point of closest approach. Hiking, backpacking, horseback riding, camping, and rock climbing are popular activities in the WA, with scenic overlooks and wide vistas available; the WA provides vantage points for views of vast desert valleys, interrupted by chains of distant mountains.

  Within 25 mi (40 km) of the SEZ, solar energy facilities within the SEZ could be visible from the eastern edge of the mountain range within the WA (approximately 6,448 acres [26.09 km^2] in the 650-ft [198.1-m] viewshed, or 25% of the total WA acreage, and 5,007 acres [20.26 km^2] in the 24.6-ft [7.5-m] viewshed, or 20% of the total WA acreage). The visible area of the WA extends from the point of closest approach to approximately 6.5 mi (10.5 km) from the western boundary of the SEZ.

  Figure 11.2.14.2-6 is a Google Earth visualization of the SEZ (highlighted in orange) as seen from Hyko Benchmark (elevation approximately 7,950 ft [2,420 m]) in the south central portion of the South Pahroc Range, approximately 6.5 mi (10.4 km) from the western boundary of the SEZ. The visualization suggests that almost the entire SEZ would be visible, and it would stretch across the horizontal field of view. Because of the relatively short distance to the SEZ and the large elevation difference, the vertical angle of view is relatively high. The SEZ would be visible as a broad band across the valley floor. The tops of solar collector/reflector arrays associated with solar facilities within the SEZ would be visible, increasing the facilities' apparent sizes and making the strong regular geometry of the collector/reflector arrays more apparent, and thus introducing form, texture, and color contrasts to an otherwise natural-appearing setting. Under the 80% development scenario analyzed in this PEIS, a variety of solar facilities within the SEZ would likely be visible, and the contrasting project layouts and associated infrastructure could appear cluttered and lacking in visual unity. Taller solar facility components, such as transmission towers, cooling towers, STG components, and plumes (if present) would likely be visible, and if so, could contrast substantially with the strongly horizontal and regular geometry of the collector/reflector arrays. The receivers of operating power towers within the SEZ would be visible as very bright nonpoint or point light sources against the backdrop of the valley floor during the day and, if more than 200 ft

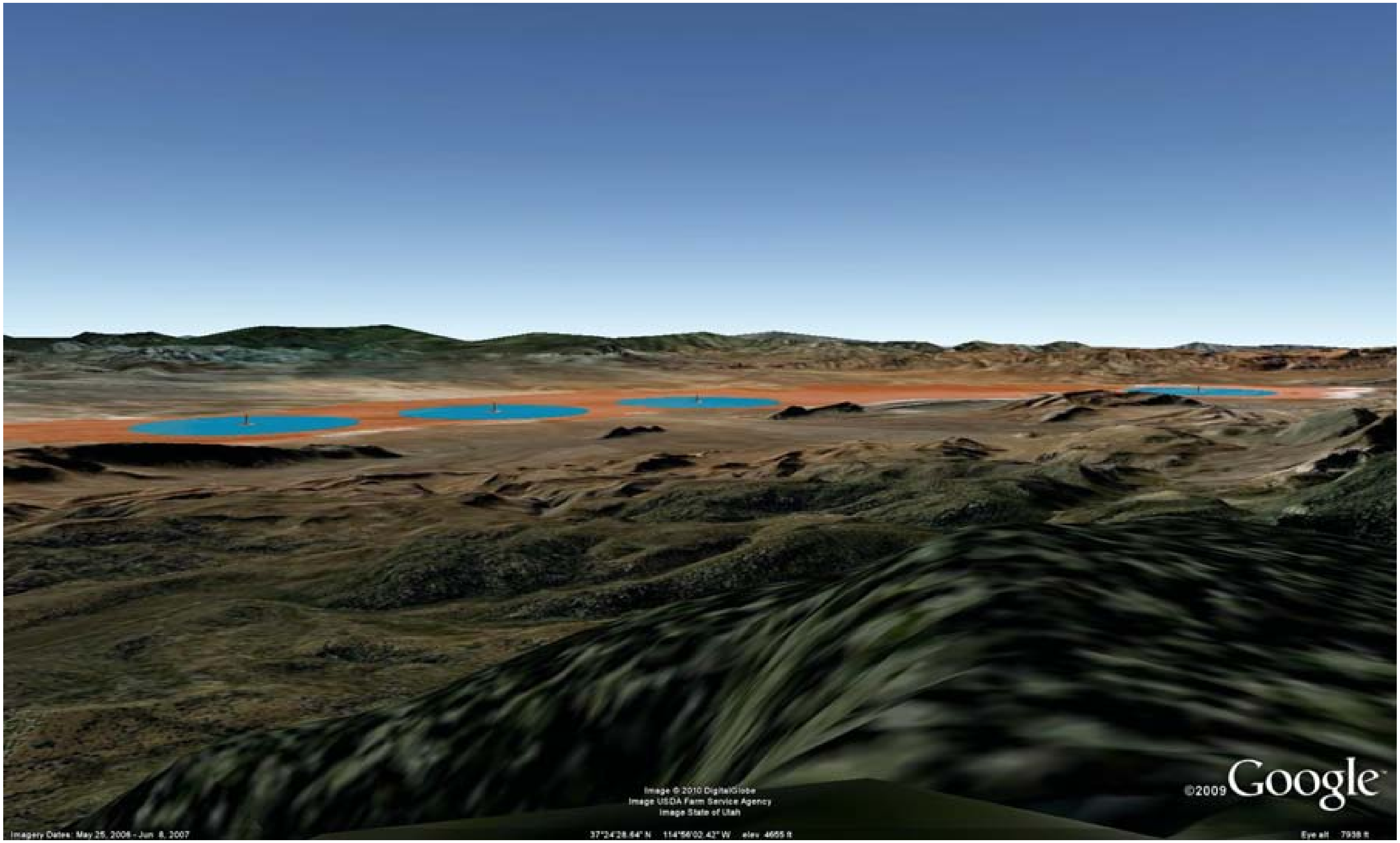

FIGURE 11.2.14.2-6 Google Earth Visualization of the Proposed Delamar Valley SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from Hyko Benchmark within the South Pahroc Range WA

(61 m) tall, would have navigation warning lights at night that could be conspicuous from this location. Under the 80% development scenario analyzed in this PEIS, strong levels of visual contrast would be expected.

Figure 11.2.14.2-7 is a Google Earth visualization of the SEZ (highlighted in orange) as seen from an unnamed ridge in the far southern end of the WA (elevation approximately 6,160 ft [1,880 m]), approximately 4.5 mi (7.2 km) from the western boundary of the SEZ. This distance is within the BLM VRM program's foreground–middleground viewing distance. The visualization suggests that from this viewpoint the SEZ would be too large to be encompassed in one view, and viewers would need to turn their heads to scan across the whole SEZ. The SEZ would be visible as a band across the valley floor. The tops of solar collector/reflector arrays associated with solar facilities within the SEZ would be visible, increasing the facilities' apparent sizes and making the strong regular geometry of the collector/reflector arrays more apparent, and thus introducing form, texture, and color contrasts to an otherwise natural-appearing setting. Under the 80% development scenario analyzed in this PEIS, a variety of solar facilities within the SEZ would likely be visible, and the contrasting project layouts and associated infrastructure could appear cluttered and lacking in visual unity. 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 could contrast substantially with the strongly horizontal and regular geometry of the collector/reflector arrays. The receivers of operating power towers within the SEZ would be visible as very bright nonpoint light sources against the backdrop of the valley floor, and if sufficiently tall, would have hazard warning lighting that could be conspicuous from this viewpoint, given the dark night skies typical in the vicinity of the SEZ. Under the 80% development scenario analyzed in this PEIS, strong levels of visual contrast would be expected.

At lower elevations within the WA, intervening mountains screen much of the SEZ from view. Viewing angles are lower, further reducing the apparent size of solar facilities within the SEZ. Weak visual contrast would be expected for many of these locations.

In general, visual contrasts associated with solar facilities within the SEZ would depend on viewer location in the WA, the numbers, types, sizes and locations of solar facilities in the SEZ, and other project- and site-specific factors. Under the 80% development scenario analyzed in the PEIS, where there were unobstructed views, contrasts would be expected to be weak to strong, as viewed from portions of the South Pahroc WA within the SEZ viewshed. The highest contrast levels would be expected at the highest elevations in the central and southern portions of the WA, with lower levels of contrast expected for lower elevations within the WA, where the lower

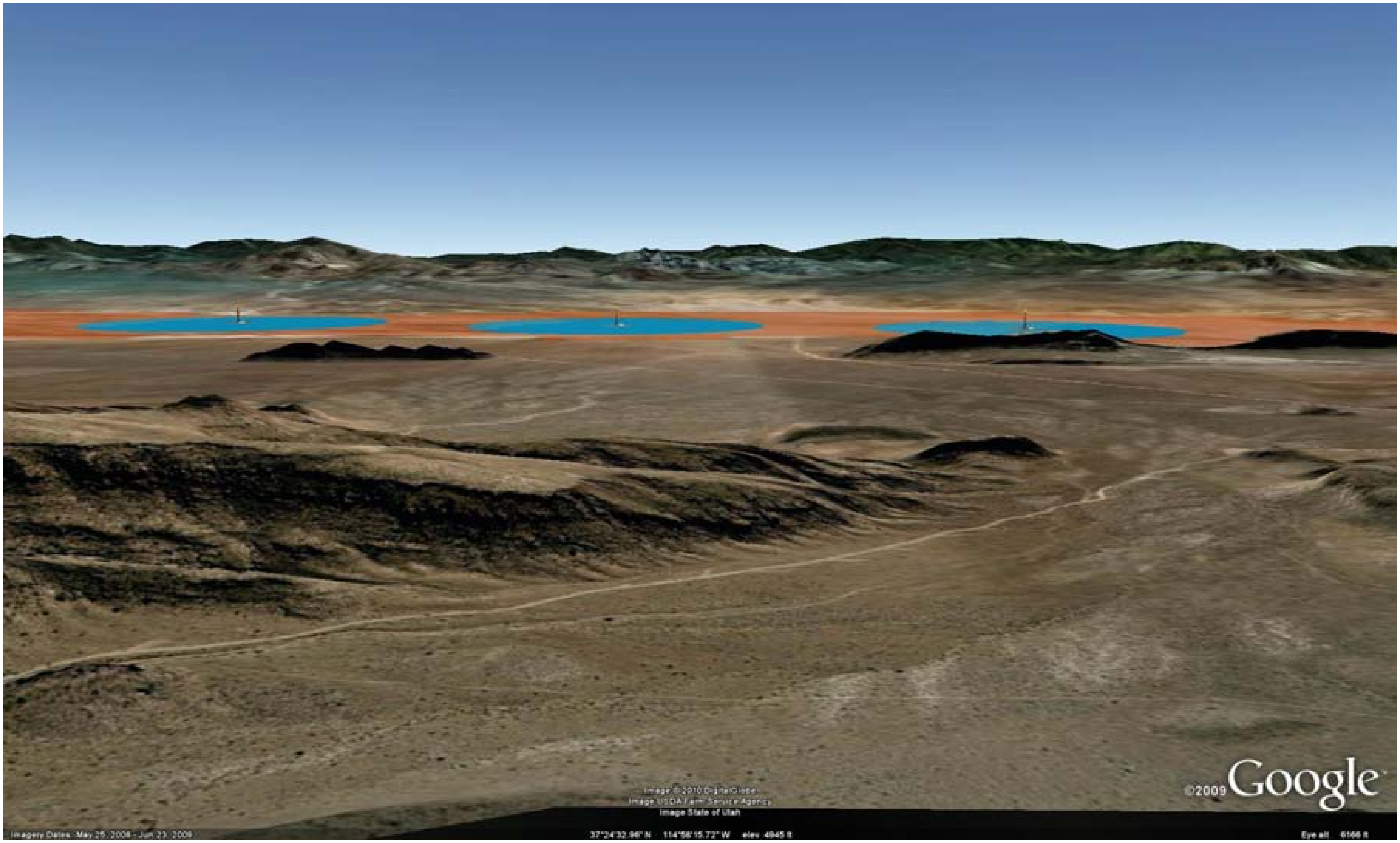

FIGURE 11.2.14.2-7 Google Earth Visualization of the Proposed Delamar Valley SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from an Unnamed Peak within the Southern Portion of the South Pahroc Range WA

viewing angle and proximity of intervening mountains would decrease visibility of the SEZ.

National Wildlife Range

- *Desert*—The 1,626,903-acre (6,583.843-km^2) Desert National Wildlife Range is located 8.7 mi (14.0 km) west of the SEZ at the point of closest approach. The Wildlife Range contains six major mountain ranges, the highest rising from 2,500-ft (762-m) valleys to nearly 10,000 ft (3,048 m). Camping, hiking, backpacking, horseback riding, hunting, and bird watching are all popular activities enjoyed by refuge visitors.

  Approximately 19,411 acres (78.554 km^2), or 1% of the Wildlife Range, are within the 650-ft (198.1-m) viewshed of the SEZ, and 2,836 acres (11.477 km^2), 0.2% of the Wildlife Range, are within the 24.6-ft (7.5-m) viewshed. The portions of the Wildlife Range that would potentially have views of solar facilities within the SEZ extend from approximately 8.7 mi (14.0 km) from the SEZ to scattered locations within 24 mi (39 km) of the SEZ.

  Visibility of the SEZ ground surface from the Wildlife Range would be limited to the highest elevations within the range. From these viewpoints, the closest of which is approximately 17 mi (27 km) from the SEZ, the South Pahroc Range partially screens views of the SEZ and, in addition, the horizontal angle of view is along the narrow southwest-northeast axis of the SEZ, so the SEZ occupies a very small portion of the horizontal field of view. In addition, because of the long distance to the SEZ, the angle of view is very low, further decreasing visibility of the SEZ and any solar facilities within it. Weak visual contrasts from solar development within the SEZ would be expected for these viewpoints.

  The upper portions of sufficiently tall power tower receivers could be visible from a much greater area of the Wildlife Range, and from lower elevations, but views of the SEZ are partially screened by the South Pahroc Range, so views of power tower receivers would be limited to gaps in the intervening mountain range. Because the viewing direction is along the narrow southwest–northeast axis of the southern portion of the SEZ, the likelihood of seeing a power tower receiver within a gap is very low, and therefore expected visual contrasts would be minimal.

National Wildlife Refuge

- *Pahranagat*—The 5,540-acre (22.42-km^2) Pahranagat NWR is located 8.2 mi (13.2 km) southwest of the SEZ at the closest point of approach. Pahranagat

NWR was established to provide habitat for migratory birds, especially waterfowl.

Approximately 10 acres (0.04 km^2), or 0.2% of the NWR, are within the 650-ft (198.1-m) viewshed of the SEZ. None of the NWR is visible within the 24.6-ft (7.5-m) viewshed. Visibility is limited to two very small areas on the slopes of low hills on the far western edge of the NWR. The areas of visibility do not include trails or other user facilities. From these areas, the tops of sufficiently tall power towers might just be visible over the mountains of the South Pahroc Range, but the area of the SEZ within view is so small as to make this very unlikely. Visual impacts on the NWR would not be expected.

SRMAs

- *Chief Mountain*—The 111,151 acre (449.812 km^2) Chief Mountain SRMA is located approximately 10 mi (16 km) northeast of the SEZ, and portions of the SRMA are within the SEZ 650-ft (198.1-m) viewshed. Approximately 1,771 acres (7.167 km^2), or 2% of the SRMA, are within the 650-ft (198.1-m) viewshed of the SEZ, and 73 acres (0.30 km^2), 0.1% of the SRMA, are within the 24.6-ft (7.5-m) viewshed. The portions of the SRMA within the viewshed extend from approximately 12 mi (19.0 km) from the SEZ to scattered locations within 24 mi (39 km) of the SEZ.

  Areas within the SRMA with potential visibility of solar facilities within the SEZ are limited to small, scattered locations on the western slopes and peaks of the Burnt Springs Range. Within all but 73 acres of these areas, potential visibility of solar facilities within the SEZ would be limited to the upper portions of power towers located in a very small portion of the northern end of the SEZ, as nearly the entire SEZ is screened from view by mountains in the Burnt Springs Range south of the SRMA. Expected visual contrast levels observed from within the SRMA are likely to be minimal, based primarily on the extensive screening of the SEZ, but also the distance to the SEZ and the very low angle of view between viewpoints in the SRMA and the SEZ.

  North Delamar—The 202,839 acre (820.860 km^2) North Delamar SRMA is located approximately 3.3 mi (5.3 km) east of the SEZ at the point of closest approach, and much of the western portion of the SRMA is within the SEZ viewshed. The primary recreational values for the North Delamar SRMA include non-motorized recreation, equestrianism, hiking, and mountain biking (BLM 2007d).

  As shown in Figure 11.2.14.2-2, approximately 37,647 acres (152.35 km^2), or 19% of the SRMA, are within the 650-ft (198.1-m) viewshed of the SEZ, and 32,966 acres (133.41 km^2), 16% of the SRMA, are within the 24.6-ft (7.5-m) viewshed. The portions of the SRMA within the viewshed extend from the point of closest approach to within 11 mi (18 km) of the SEZ.

Figure 11.2.14.2-8 is a Google Earth visualization of the SEZ (highlighted in orange) as seen from a road in the SRMA (elevation approximately 5,350 ft [1,630 m]) on a low ridge on the western slopes of the Delamar Mountains, approximately 4.8 mi (7.7 km) from the eastern boundary of the SEZ. The view is perpendicular to the SEZ's relatively long north-south axis. The visualization suggests that from this viewing angle and short distance to the SEZ, the SEZ would be too large to be encompassed in one view, and viewers would need to turn their heads to scan across the whole SEZ. The relatively low elevation (approximately 740 ft [230 m] above the SEZ) would reduce the vertical angle of view, and the SEZ would be visible as a narrow band across the valley floor. The tops of solar collector/reflector arrays associated with solar facilities within the SEZ would be visible, increasing the facilities' apparent sizes slightly and making the strong regular geometry of the collector/reflector arrays somewhat more apparent.

Taller solar facility components, such as transmission towers, cooling towers, STG components, and plumes (if present) would likely be visible, and if so, could contrast substantially with the strongly horizontal and regular geometry of the collector/reflector arrays. The receivers of operating power towers within the SEZ would be visible as very bright nonpoint light sources against the backdrop of the valley floor or the mountains west of the SEZ during the day and, if more than 200 ft (61 m) tall, would have navigation warning lights at night that could be conspicuous from this location.. Under the 80% development scenario analyzed in this PEIS, strong levels of visual contrast would be expected at this location.

Figure 11.2.14.2-9 is a Google Earth visualization of the SEZ (highlighted in orange) as seen from a peak farther north and east than the viewpoint shown in Figure 11.2.14.2-8. The viewpoint is about 2,600 ft,(m) higher in elevation than the SEZ, and about 7.5 mi (12.1 km) east of the northernmost point in the SEZ. The view is oblique to the SEZ's relatively long north-south axis. The visualization demonstrates that moving further east into the SRMA, while increasing distance to the SEZ also increases the vertical angle of view as the viewpoints are closer to the peaks of the Delamar Mountains. From this viewpoint, the SEZ could be encompassed in one view, but would still cross much of the visible horizon, and the vertical angle of view is sufficiently high that the tops of solar collector/reflector arrays associated with solar facilities within the SEZ would be visible, increasing the facilities' apparent sizes slightly and making the strong regular geometry of the collector/reflector arrays somewhat more apparent.

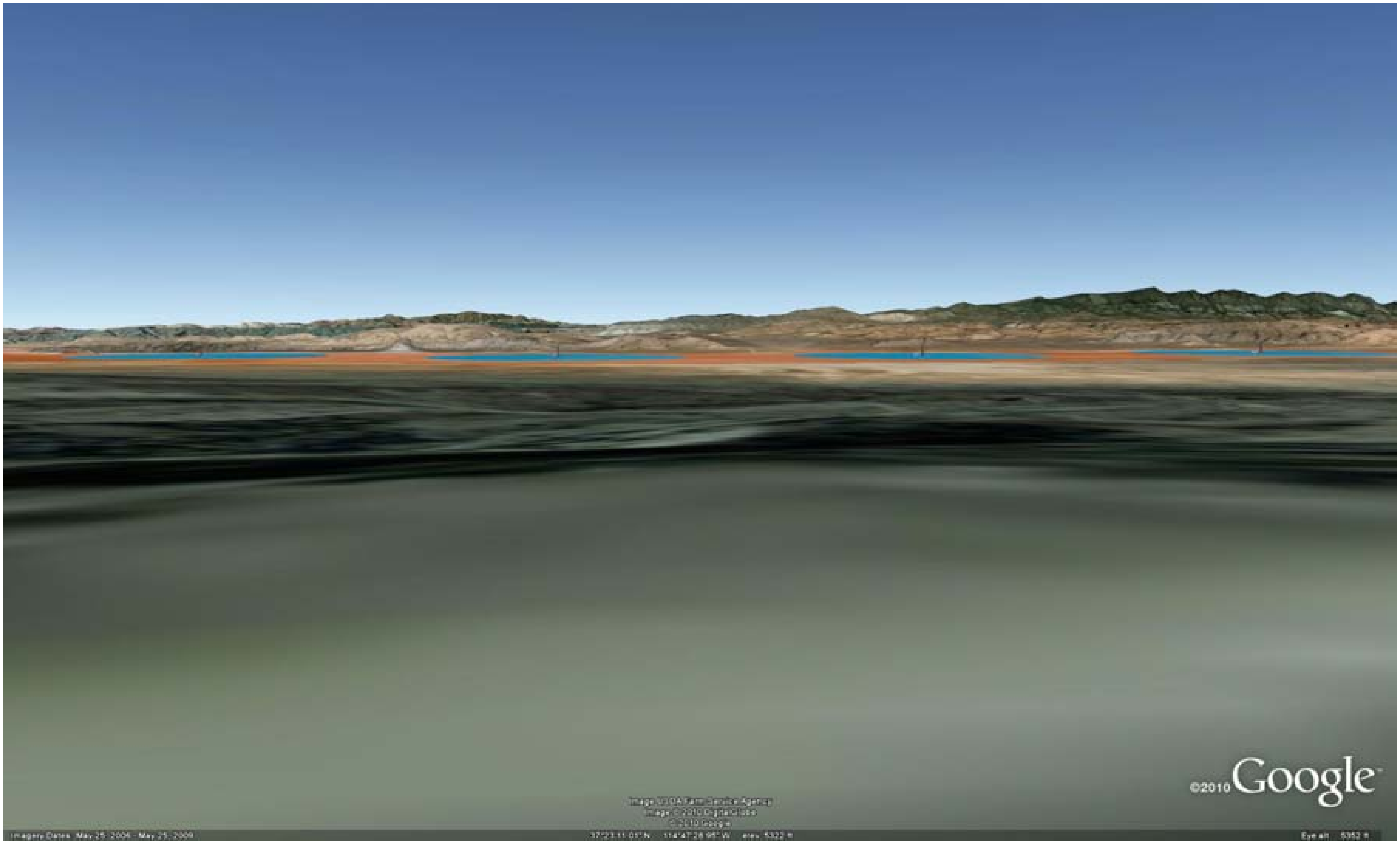

FIGURE 11.2.14.2-8 Google Earth Visualization of the Proposed Delamar Valley SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from Road within the North Delamar SRMA

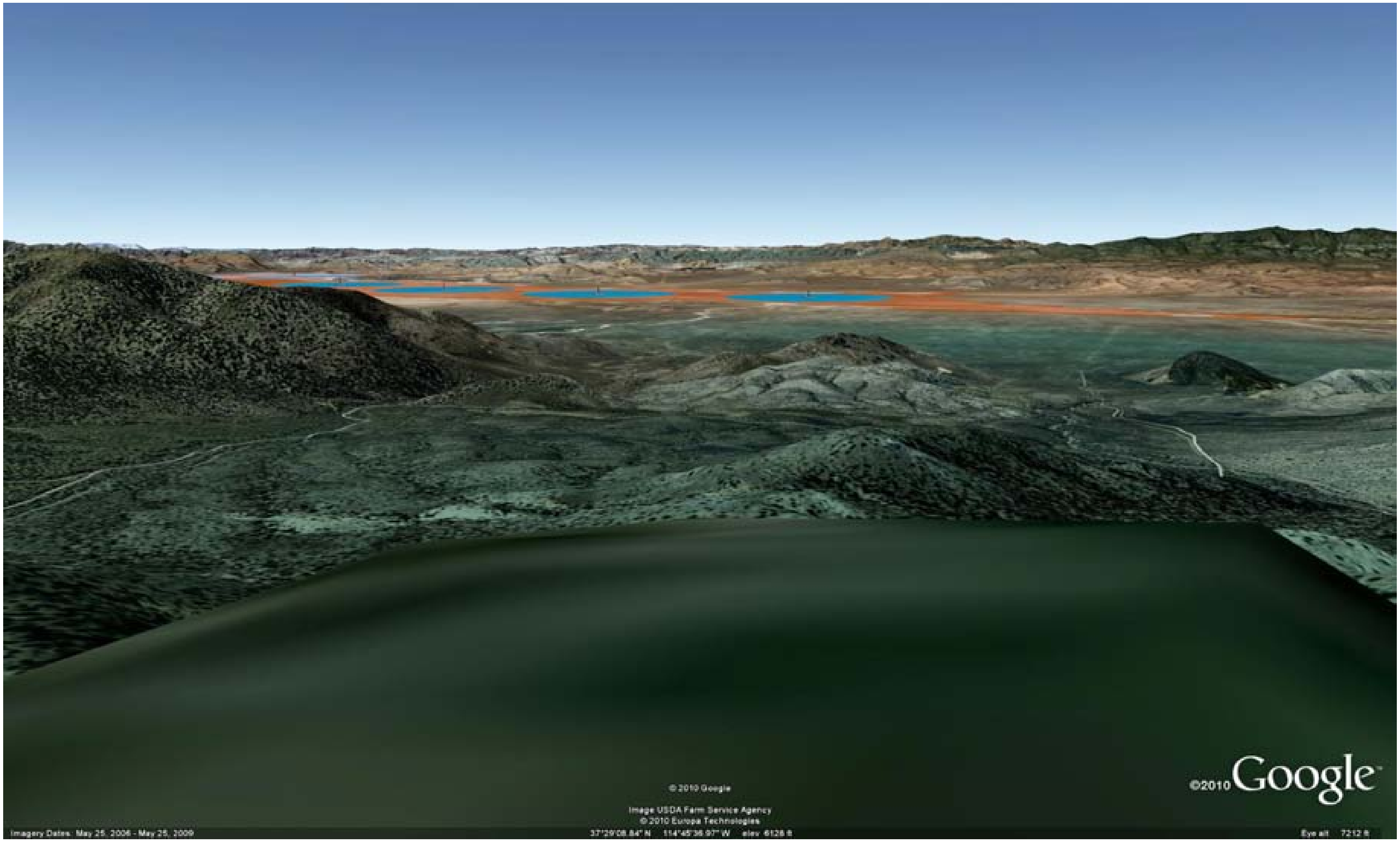

FIGURE 11.2.14.2-9 Google Earth Visualization of the Proposed Delamar Valley SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from an Unnamed Peak within the Northern Portion of the North Delamar SRMA

Taller solar facility components, such as transmission towers, cooling towers, STG components, and plumes (if present) would likely be visible, and if so, could contrast with the strongly horizontal and regular geometry of the collector/reflector arrays. The receivers of operating power towers within the SEZ would be visible as very bright light sources against the backdrop of the valley floor during the day and, if sufficiently tall, would have navigation warning lights at night that could be conspicuous from this location. Under the 80% development scenario analyzed in this PEIS, strong levels of visual contrast would be expected at this location.

In general, visual contrasts associated with solar facilities within the SEZ would depend on viewer location within the SRMA, the numbers, types, sizes and locations of solar facilities in the SEZ, and other project- and site-specific factors. Under the 80% development scenario analyzed in the PEIS, where there were unobstructed views, contrasts would be expected to be strong for many viewpoints within the western portion of the SEZ, with contrasts not diminishing substantially until the viewpoints were far enough east in the SRMA that intervening mountains screened large portions of the SEZ from view.

- *Pahranagat*—The 298,567-acre (1,208.26-km^2) Pahranagat SRMA is located approximately 2.7 mi (4.4 km) west of the SEZ at the point of closest approach, and some areas within the eastern and southeastern portion of the SRMA are within the SEZ viewshed. The primary recreational values for Pahrangat SRMA include heritage tourism and motorized recreation (BLM 2007d).

  As shown in Figure 11.2.14.2-2, approximately 52,619 acres (212.94 km^2), or 18% of the SRMA, are within the 650-ft (198.1-m) viewshed of the SEZ, and 11,970 acres (48.441 km^2), 4% of the SRMA, are within the 24.6-ft (7.5-m) viewshed. The portions of the SRMA within the viewshed extend from the point of closest approach to within 24 mi (39 km) of the SEZ. Within the SRMA, visibility of solar facilities within the SEZ would be primarily from the eastern slopes of the South Pahroc Range, but with some visibility from the western slopes of the southern end of the South Pahroc Range, as well as the highest elevations in the Hiko, East Pahranagat and Pahranagat Ranges further to the west.

Figures 11.2.14.2-6 and 11.2.14.2-7 (see above under South Pahroc Range WA impact discussion) are Google Earth visualizations of the SEZ as seen from two viewpoints in the eastern portion of the SRMA. As discussed above, because of the short distance to the SEZ and the relatively high vertical angles of view from these elevated viewpoints, strong visual contrasts would be expected for portions of the SRMA with open views close to the SEZ. Lower contrast levels would be expected for viewpoints farther north in the SRMA, because the views would be oblique to the long north-south axis of the SEZ; and substantially lower contrast levels would be expected for viewpoints much farther west in the SRMA in the Hiko and especially the East Pahranagat and Pahranagat Ranges.

Scenic Highways

- *U.S. 93*—U.S. 93 is a nationally designated scenic byway that runs within 8.4 mi (13.5 km) north of the SEZ. It is 149 mi (240 km) long, with some of the highlights located between Caliente and Crystal Springs, Nevada. Approximately 8.8 mi (14.2 km) are within the 650-ft (198.1-m) viewshed of the SEZ, and 2.6 mi (4.2 km) of the byway are within the 24.6-ft (7.5-m) viewshed.

  For travelers approaching the SEZ from Caliente, north of the SEZ, the tops of sufficiently tall power tower receivers located in the northern portion of the SEZ would come into view about 20 mi (32 km) west of Caliente, and about 8.8 mi (14.2 km) from the SEZ. After the first appearance of power tower receiver lights, lower height facilities might become visible about 1 minute later and could remain in view for several minutes as travelers moved westward. Clear views would be interrupted periodically by low hills and rises between the highway and the SEZ, and eventually only the tops of power towers would be visible; they would disappear when westbound travelers reached Pahroc Summit Pass, 11 mi (17 km) northwest of nearest point in the SEZ, and approximately 29 mi (47 km) west of Caliente.

  Eastbound travelers on U.S. 93 would have a similar visual experience to westbound travelers, but might first see power tower receivers within the SEZ as they passed just east of Pahroc Summit Pass, about 14 mi (23 km) east of the intersection of U.S. 93 with State Route 375 south of Hiko. Similarly to westbound travelers, eastbound travelers might see lower height solar facilities within the SEZ briefly, then power tower receiver lights only, before leaving the SEZ viewshed about 13 mi (21 km) west of Caliente, and about 9 mi (14 km) north of the SEZ.

  Within the SEZ viewshed, U.S. 93 is slightly elevated with respect to the northern portion of the SEZ, and the angle of view between the highway and the SEZ is very low. Because U.S. 93 travelers would be looking down the relatively narrow north–south axis of the SEZ, the SEZ would occupy a very small portion of the horizontal field of view, with weak visual contrasts expected for travelers on U.S. 93.

- *Silver State Trail*—The Silver State Trail is a congressionally and BLM-designated scenic byway that passes within about 10 mi (16 km) of the SEZ. About 13 mi (21 km) of the byway are within the SEZ 650-ft (198.1-m) viewshed, and about 4 mi are within the 24.6 (7.5 m) viewshed.

The elevation of the Silver State Trail within the SEZ viewshed is generally between 400-600 ft (120-180 m) higher than the SEZ, and at 10 mi (16 km) or greater distance, the vertical angle of view from the trail to the SEZ is very low. Furthermore, the view from the trail to the SEZ is parallel to the SEZ's long and very narrow north-south axis, so that the SEZ would occupy a very small portion of the horizontal field of view as seen from the trail.

Because of the relatively long distance to the SEZ, the vertical angle of view would be low, and solar facilities within the SEZ would be seen edge-on, which would reduce their apparent size, conceal their strong regular geometry, and cause them to appear to repeat the strong line of the horizon, all of which would tend to reduce associated visual contrasts. Taller solar facility components, such as transmission towers, could be visible, but some ancillary facilities might not be noticed by casual observers.

If power towers were located in the visible portions of the SEZ, when operating, they would likely appear as points of light under the southern horizon, against a backdrop of the valley floor. At night, if more than 200 ft (61 m) tall, power towers would have navigation warning lights that could potentially be visible from this location in the WA, and could be prominent in the dark night skies of this remote area.

Because of the small apparent size of the SEZ and the low angle of view from the trail to the SEZ, under the 80% development scenario analyzed in this PEIS, weak levels of visual contrast would be expected from solar development within the SEZ, as seen from the Silver State Trail.

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. Note that in addition to the resource types and specific resources analyzed in this PEIS, future site-specific NEPA analyses would include state and local parks, recreation areas, other sensitive visual resources, and communities close enough to the proposed project to be affected by visual impacts.

In addition to impacts associated with the solar energy facilities themselves, sensitive visual resources could be affected by facilities that would be built and operated in conjunction with the solar facilities. With respect to visual impacts, the most important associated facilities would be access roads and transmission lines, the precise location of which cannot be determined until a specific solar energy project is proposed. There is currently a 69-kV transmission line within the proposed SEZ, so construction and operation of a transmission line outside the proposed SEZ would not be required; however, transmission lines to connect facilities to the existing line would be required. For this analysis, the impacts of construction and operation of transmission lines outside of the SEZ were not assessed, based on the assumption 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. Note that, depending on project- and site-specific conditions, visual impacts associated with access roads, and particularly transmission lines, could be large. Detailed information about visual impacts associated with transmission lines is presented in Section 5.7.1. A detailed, site-specific NEPA analysis would be required to determine visibility and associated impacts precisely for any future solar projects, based on more precise knowledge of facility location and characteristics.

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.

11.2.14.2.3 Summary of Visual Resource Impacts for the Proposed Delamar Valley SEZ

Under the 80% development scenario analyzed in the PEIS, the SEZ would contain multiple solar facilities utilizing differing solar technologies, as well as a variety of roads and ancillary facilities. The array of facilities could create a visually complex landscape that would contrast strongly with the strongly horizontal, relatively uncluttered, and generally natural appearing landscape of the flat valley in which the SEZ is located. Large visual impacts on the SEZ and surrounding lands within the SEZ viewshed would be associated with solar energy development due to major modification of the character of the existing landscape. There is the potential for additional impacts from construction and operation of transmission lines and access roads within the SEZ.

The SEZ is in an area of low scenic quality, with some cultural disturbances already present. Local 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.

Utility-scale solar energy development within the proposed Delamar Valley SEZ is likely to result in strong visual contrasts for views from some locations within the Delamar Mountains and South Pahrac Range WAs, and the Pahranagat and North Delamar SRMAs. Minimal to weak visual contrasts would be expected for other highly sensitive visual resource areas within 25 mi (40 km) of the SEZ.

11.2.14.3 SEZ-Specific Design Features and Design Features Effectiveness

The presence and operation of large-scale solar energy facilities and equipment would introduce major visual changes into non-industrialized landscapes and could create strong visual contrasts in line, form, color, and texture that could not easily be substantially mitigated. Implementation of programmatic design features intended to reduce visual impacts (described in Appendix A, Section A.2.2) would be expected to reduce visual impacts associated with utility-scale solar energy development within the SEZ; however, the degree of effectiveness of these design features could be assessed only at the site- and project-specific level. Given the large scale, reflective surfaces, 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.

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, some SEZ-specific design features can be identified for the proposed Delamar Valley SEZ at this time, as follows:

- Within the SEZ, in areas visible from and within 3 mi (4.8 km) of the boundary of the Delamar Mountains WA, visual impacts associated with solar energy project operation should be consistent with VRM Class II management objectives (see Table 12.2.14.3-1), as experienced from KOPs (to be determined by the BLM) within the WA, and in areas visible from between 3 and 5 mi (4.8 and 8 km), visual impacts should be consistent with VRM Class III management objectives. The VRM Class II consistency mitigation would affect approximately 2,080 acres (8.417 km^2) within the western portion of the SEZ. The VRM Class III consistency mitigation would affect approximately 5,485 additional acres (22.2 km^2).

- Within the SEZ, in areas visible from between 3 and 5 mi (4.8 and 8 km) of the boundary of the South Pahroc Range WA, visual impacts associated with solar energy project operation should be consistent with VRM Class III management objectives, as experienced from KOPs (to be determined by the BLM) within the WA. The VRM Class III consistency mitigation would affect approximately 4,921 acres (19.9 km^2).

Because of the overlap in areas affected by the design features specified above, the total acreage affected by the design features is approximately 10,821 acres (43.79 km^2), or 65% of the total SEZ acreage. The acreage affected by VRM Class II consistency mitigation is 2,080 acres (8.417 km^2), or 13% of the total SEZ acreage. The acreage affected by VRM Class III consistency mitigation is 8,741 acres (35.37 km^2), or 53% of the total SEZ acreage. The areas subject to SEZ-specific design features requiring consistency with VRM Class II and Class III management objectives are shown in Figure 11.2.14.3-1.

TABLE 11.2.14.3-1 VRM Class Objectives

Class I	The objective of this class is to preserve the existing character of the landscape. This class provides for natural ecological changes; however, it does not preclude very limited management activity. The level of change to the characteristic landscape should be very low and must not attract attention.
Class II	The objective to this class is to retain the existing character of the landscape. The level of change to the characteristic landscape should be low. Management activities may be seen, but should not attract the attention of the casual observer. Any changes must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape.
Class III	The objective of this class is to partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should both dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.
Class IV	The objective of this class is to provide for management activities which require major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high. These management activities may dominate the view and be the major focus of viewer attention. However, every attempt should be made to minimize the impact of these activities through careful location, minimal disturbance, and repeating the basic elements.

Source: BLM (1986b).

Application of the SEZ-specific design features above would substantially reduce visual impacts associated with solar energy development within the SEZ, as well as on sensitive visual resource areas outside the SEZ but within the SEZ viewshed.

Application of the distance-based design feature to restrict allowable visual impacts associated with solar energy project operations within 5 mi (8 km) of the Delamar Mountains WA would substantially reduce potential visual impacts on the WA by limiting impacts within the BLM-defined foreground of the viewshed of this area, where potential visual impacts would be greatest. This design feature would also reduce impacts on the South Pahroc Range WA, the Pahranagat SRMA, and the North Delamar SRMA.

Application of the distance-based design feature to restrict allowable visual impacts associated with solar energy project operations between 3 and 5 mi (4.8 and 8 km) of the South Pahroc Range WA would substantially reduce potential visual impacts on the WA by limiting impacts within the BLM-defined foreground of the viewshed of this area, where potential visual impacts would be greatest. This design feature would also reduce impacts on the South Delamar Mountains WA, the Pahranagat SRMA, and the North Delamar SRMA.

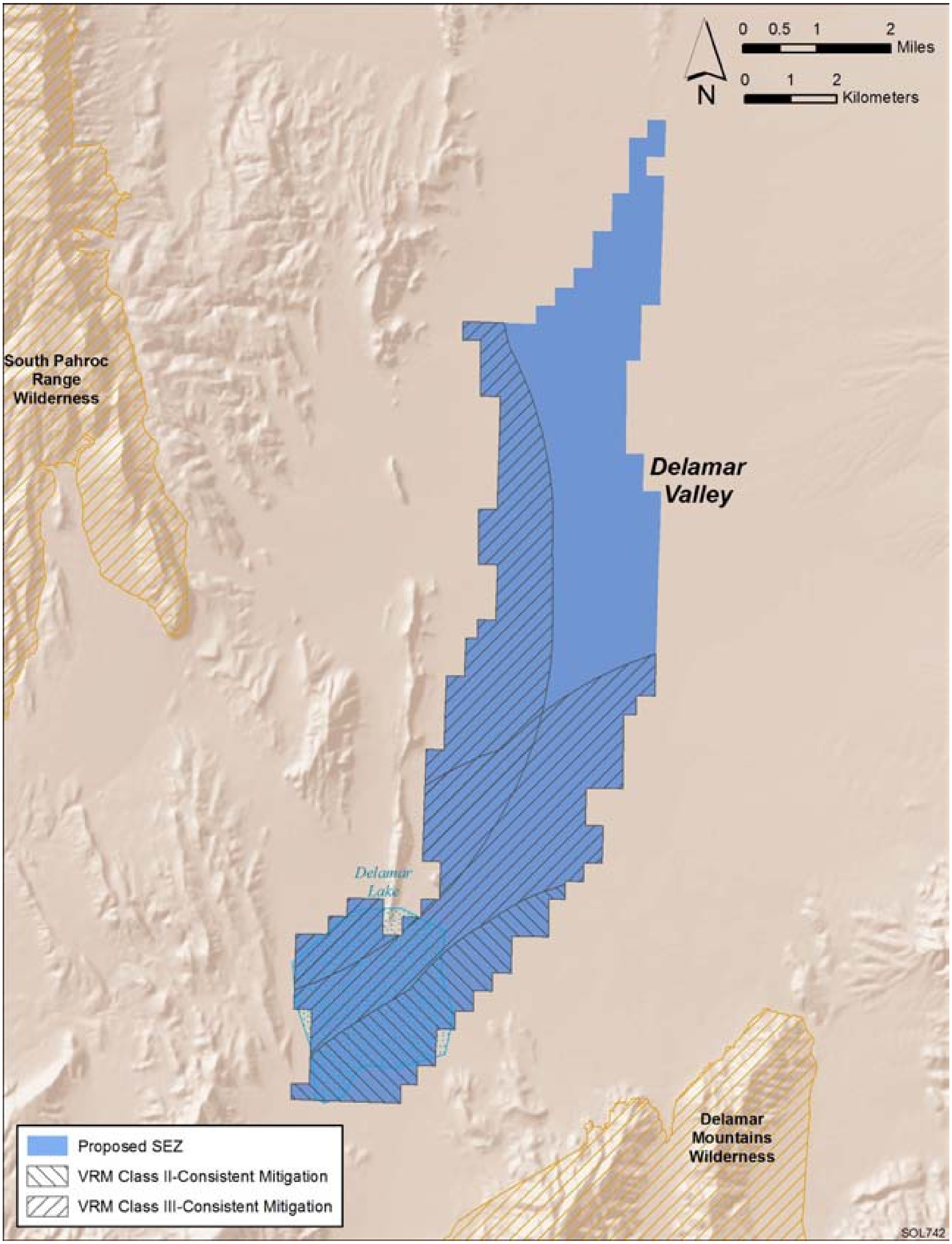

FIGURE 11.2.14.3-1 Areas within the Proposed Delamar Valley SEZ Affected by SEZ-Specific Distance-Based Visual Impact Design Features

11.2.15 Acoustic Environment

11.2.15.1 Affected Environment

The proposed Delamar Valley SEZ is located in southeastern Nevada, in the south central portion of Lincoln County. Neither the State of Nevada nor Lincoln County has established quantitative noise-limit regulations.

U.S. 93 runs east–west as close as about 8 mi (13 km) to the north of the proposed Delamar Valley SEZ and runs north–south as close as about 8 mi (13 km) to the west. State Route 317 runs north–south as close as 16 mi (26 km) to the east of the SEZ. There are numerous dirt roads that cross the SEZ or that access livestock facilities in the area. The nearest railroad runs about 16 mi (26 km) to the east of the SEZ. Nearby airports include Alamo Landing Field in Alamo and Lincoln County Airport in Panaca, which are located about 12 mi (19 km) west and 32 mi (51 km) northeast of the SEZ, respectively. No industrial activities other than grazing are located around the SEZ. Large-scale irrigated agricultural lands are situated in small agricultural towns along the Pahranagat Valley, which runs as close as about 8 mi (13 km) to the west of the SEZ, and at nearby towns such as Caliente and Panaca, which are more than 19 mi (31 km) northeast of the SEZ boundary. No sensitive receptors (e.g., residences, hospitals, schools, or nursing homes) exist around the proposed Delamar Valley SEZ. The nearest human receptors are located along U.S. 93, about 9 mi (14 km) west-southwest of the SEZ. Nearby population centers with schools include Alamo, about 11 mi (18 km) west of the SEZ; Caliente, about 22 mi (35 km) northeast of the SEZ; and Panaca, about 33 mi (53 km) northeast of the SEZ. Accordingly, noise sources around the SEZ include road traffic, aircraft flyover, and cattle grazing. Other noise sources are associated with current land use for various recreational activities around the SEZ, including OHV use, racing, setting off pyrotechnics, and model rocket launching. The proposed Delamar Valley SEZ is isolated and undeveloped; its overall character is considered wilderness to rural. To date, no environmental noise survey has been conducted around the SEZ. On the basis of the population density, the day-night average noise level (L_{dn} or DNL) is estimated to be 18 dBA for Lincoln County, well below the level typical of a rural area in the range of 33 to 47 dBA L_{dn} (Eldred 1982; Miller 2002).[11]

11.2.15.2 Impacts

Potential noise impacts associated with solar projects in the Delamar Valley SEZ would occur during all phases of the projects. During the construction phase, potential noise impacts associated with operation of heavy equipment on the nearest residences (about 9 mi [14 km] to the west-southwest of the SEZ) would be anticipated to be minimal due to considerable separation distances. During the operations phase, potential noise impacts on the nearest residences would be anticipated to be minimal as well. However, if the Delamar Valley SEZ

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

were fully developed, potential noise impacts on residences along the roads would likely be due to commuter, visitor, support, and delivery vehicular traffic to and from the SEZ. 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 proposed Delamar Valley SEZ are presented in this section. Any such impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2, and through the application of any additional SEZ-specific design features (see Section 11.2.15.3 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

11.2.15.2.1 Construction

The proposed Delamar Valley SEZ has a relatively flat terrain; thus, minimal site preparation activities would be required, and associated noise levels would be lower than those during general construction (e.g., erecting building structures and installing equipment, piping, and electrical).

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 being used. Typically, the power block area is located in the center of the solar facility, at a distance of more than 0.5 mi (0.8 km) from the facility boundary. Noise levels from construction of the solar array would be lower than 95 dBA. When geometric spreading and ground effects are considered, 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 distances somewhat shorter than 1.2 mi (1.9 km). If a 10-hour daytime work schedule is considered, the EPA guideline level of 55 dBA L_{dn} for residential areas (EPA 1974) would occur at about 1,200 ft (370 m) from the power block area, which would be well within the facility boundary. For construction activities occurring near the southern SEZ boundary, estimated noise levels at the nearest residences would be about 17 dBA, which is well below a typical daytime mean rural background level of 40 dBA. In addition, an estimated 40-dBA L_{dn}[12] at these residences (i.e., no contribution from construction activities) is well below the EPA guidance of 55 dBA L_{dn} for residential areas.

It is assumed that a maximum of two projects would be developed at any one time for SEZs greater than 10,000 acres (40.47 km^2) but less than 30,000 acres (121.4 km^2), such as the Delamar Valley SEZ. If two projects were to be built in the southern portion of the SEZ near the

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12 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.

nearest residences, noise levels would be about 3 dBA higher than the above-mentioned values. These levels would be still well below the typical daytime mean rural background level, and thus their contribution to the existing L_{dn} would be minimal.

In addition, noise levels are estimated at the specially designated areas within 5-mi (8-km) range from the Delamar Valley SEZ, which is the farthest distance that noise, except extremely loud noise, can be discernable. There are two specially designated areas within the range where noise might be an issue: Delamar Mountains WA, which is located as close as about 2 mi (3 km) south of the SEZ; and South Pahroc Range WA, which is located about 4 mi (6 km) northwest of the SEZ. For construction activities occurring near the SEZ boundary close to the specially designated areas, noise levels are estimated to be about 35 and 28 dBA at the boundaries of the Delamar Mountains WA and South Pahroc Range WA, respectively, which are lower than the typical daytime mean rural background level of 40 dBA. As discussed in Section 5.10.2, sound levels above 90 dB are likely to adversely affect wildlife (Manci et al. 1988). Thus, construction noise from the SEZ is not likely to adversely affect nearby specially designated areas.

Depending on the soil conditions, pile driving might be required for installation of solar dish engines. However, the pile drivers used, such as vibratory or sonic drivers, would be relatively small and quiet rather than the impulsive impact pile drivers frequently seen at large-scale construction sites. Potential impacts on the nearest residences would be anticipated to be negligible, considering the distance to the nearest residences (about 9 mi [14 km] from the SEZ boundary).

It is assumed that most construction activities would occur during the day, when noise is better tolerated than at night because of the masking effects of background noise. In addition, construction activities for a utility-scale facility are temporary in nature (typically a few years). Construction within the proposed Delamar Valley SEZ would cause negligible unavoidable but localized short-term noise impacts on neighboring communities, even when construction activities would occur near the southern SEZ boundary, close to the nearest 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 located in close proximity. Therefore, no adverse vibration impacts are anticipated from construction activities, including 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 negligible component of construction impacts and would be temporary in nature.

11.2.15.2.2 Operations

Noise sources common to all or most types of solar technologies include equipment motion from solar tracking, maintenance and repair activities (e.g., washing mirrors or replacing broken mirrors) at the solar array area, commuter/visitor/support/delivery traffic within and around the solar facility, and control/administrative buildings, warehouses, and other auxiliary buildings/structures. Diesel-fired emergency power generators and fire-water pump engines would be additional sources of noise, but their operations would be limited to several hours per month (for preventive maintenance testing).

With respect to the main solar energy technologies, noise-generating activities in the PV solar array area would be minimal, related mainly to solar tracking, if used. On the other hand, dish engine technology, which employs collector and converter devices in a single unit, generally has the strongest noise sources.

For the parabolic trough and power tower technologies, most noise sources during operations would be in 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 southern SEZ boundary, the predicted noise level would be about 23 dBA at the nearest residences, located about 9 mi (14 km) from the SEZ boundary, which is much lower than typical daytime mean rural background level of 40 dBA. If TES were not used (i.e., if the operation were limited to daytime, 12 hours only[13]), the EPA guideline level of 55 dBA (as L_{dn} for residential areas) would occur at about 1,370 ft (420 m) from the power block area and thus would not be exceeded outside of the proposed SEZ boundary. At the nearest residences, about 40 dBA L_{dn} (i.e., no contribution from facility operation) would be estimated, which is well below the EPA guideline of 55 dBA L_{dn} for residential areas. As for construction, if two parabolic trough and/or power tower facilities were operating around the nearest residences, combined noise levels would be about 3 dBA higher than the above-mentioned values. These levels are still well below the typical daytime mean rural background level of 40 dBA, and their contribution to existing L_{dn} level would be minimal. However, day-night average noise levels higher than those estimated above using simple noise modeling would be anticipated if TES were used during nighttime hours, as explained below and in Section 4.13.1.

On a calm, clear night typical of the proposed Delamar Valley SEZ setting, the air temperature would likely increase with height (temperature inversion) because of strong

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

radiative cooling. Such a temperature profile tends to focus noise downward toward the ground. There would be little, if any, shadow zone[14] within 1 or 2 mi (1.6 or 3 km) of the noise source in the presence of a strong temperature inversion (Beranek 1988). In particular, such conditions add to the effect of noise being more discernable during nighttime hours, when the background noise levels are the lowest. To estimate the day-night average noise level (L_{dn}), 6-hour nighttime generation with TES is assumed after 12-hour daytime generation. For nighttime hours under temperature inversion, 10 dB is added to noise levels estimated from the uniform atmosphere (see Section 4.13.1). On the basis of these assumptions, the estimated nighttime noise level at the nearest residence (about 9 mi [14 km] from the SEZ boundary) would be 33 dBA, which is slightly higher than the typical nighttime mean rural background level of 30 dBA. However, noise level would be much lower than this value if considering an air absorption algorithm among other attenuation mechanisms. The day-night average noise level is estimated to be about 41 dBA L_{dn}, which is well below the EPA guideline of 55 dBA L_{dn} for residential areas. The assumptions are conservative in terms of operating hours, and no credit was given to other attenuation mechanisms, so it is likely that noise levels would be lower than 41 dBA L_{dn} at the nearest residences, even if TES were used at a solar facility. In consequence, operating parabolic trough or power tower facilities using TES and located near the southern SEZ boundary could result in minimal adverse noise impacts on the nearest residences, depending on background noise levels and meteorological conditions.

Associated with operation of solar facilities located near the southern SEZ boundary and using TES, the estimated daytime level of 37 dBA at the boundary of the Delamar Mountains WA is lower than the typical daytime mean rural background level of 40 dBA, while the estimated nighttime level of 47 dBA is much higher than the typical nighttime mean rural background level of 30 dBA. For a facility near the west-central SEZ boundary, daytime and nighttime noise levels at the Big Dune ACEC are estimated to be 31 and 41 dBA, respectively. As discussed in Section 5.10.2, sound levels above 90 dB are likely to adversely affect wildlife (Manci et al. 1988). Thus, operation noise from the SEZ is not likely to adversely affect the nearby specially designated areas.

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 does not require a power block. A single, large solar dish engine has relatively low noise levels, but a solar facility might employ tens of thousands of dish engines, which would cause high noise levels around such a facility. For example, the proposed 750-MW SES Solar Two dish engine facility in California would employ as many as 30,000 dish engines (SES Solar Two, LLC 2008). At the proposed Delamar Valley SEZ, on the basis of the assumption of dish engine facilities of up to 1,471 MW total capacity (covering 80% of the total area, or 13,242 acres [53.6 km^2]), up to 58,850 25-kW dish engines could be employed. For a large dish engine facility, about a thousand 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.

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14 A shadow zone is defined as the region in which direct sound does not penetrate because of upward diffraction.

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 mean rural daytime environment) within 330 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, for example, about 50 dBA at 1.0 mi (1.6 km) and 47 dBA at 2 mi (3 km) from the boundary of the squarely-shaped dish engine solar field, both of which are higher than typical daytime mean rural background level of 40 dBA. However, these levels would occur at somewhat shorter distance than the aforementioned distances, considering noise attenuation by atmospheric absorption and temperature lapse during daytime hours. To estimate noise levels at the nearest residences, it was assumed dish engines were placed all over the Delamar Valley SEZ at intervals of 98 ft (30 m). Under these assumptions, the estimated noise level at the nearest residences, about a 9-mi (14-km) distance from the SEZ boundary, would be about 34 dBA, which is below the typical daytime mean rural background level of 40 dBA. Assuming 12-hour daytime operation, the estimated 41 dBA L_{dn} at these residences is well below the EPA guideline of 55 dBA L_{dn} for residential areas. Considering other noise attenuation mechanisms, noise levels at the nearest residences would be lower than estimated values in the above and thus potential impacts on nearby residences would be anticipated to be minimal.

For dish engines placed all over the SEZ, estimated noise levels would be about 44 and 43 dBA at the boundaries of the Delamar Mountains WA and South Pahroc Range WA, respectively, which are a little higher than the typical daytime mean rural background level of 40 dBA. However, dish engine noise from the SEZ is not likely to adversely affect wildlife at the nearby specially designated areas (Manci et al. 1988).

During operations, no major ground-vibrating equipment would be used. In addition, no sensitive structures are located close enough to the proposed Delamar Valley SEZ to experience physical damage. Therefore, during operation of any solar facility, potential vibration impacts on surrounding communities and vibration-sensitive structures would be negligible.

Transformer-generated humming noise and switchyard impulsive noises would be generated during the operation of solar facilities. These noise sources would be located near the power block area, typically near the center of a solar facility. Noise from these sources would generally be limited within the facility boundary and not be heard at the nearest residence, assuming a 9.5-mi (15-km) distance (at least 0.5 mi [0.8 km] to the facility boundary and 9 mi [14 km] to the nearest residences). Accordingly, potential impacts of these noise sources on the nearest residences would be negligible.

For impacts from transmission line corona discharge noise during rainfall events (discussed in Section 5.13.1.5), the noise level at 50 ft (15 m) and 300 ft (91 m) from the center of 230-kV transmission line towers would be about 39 and 31 dBA (Lee et al. 1996), respectively, typical of daytime and nighttime mean background noise levels in rural environments. Corona noise includes high-frequency components, considered to be more annoying than low-frequency environmental noise. However, corona noise would not likely cause impacts unless a residence was located close to it (e.g., within 500 ft [152 m] of a 230-kV transmission line). The proposed Delamar Valley SEZ is located in an arid desert environment, and incidents of corona discharge are infrequent. Therefore, potential impacts on nearby residences from corona noise along transmission lines within the SEZ would be negligible.

11.2.15.2.3 Decommissioning/Reclamation

Decommissioning/reclamation requires many of the same procedures and much of the same equipment used in traditional construction. Decommissioning/reclamation would include dismantling of solar facilities and support facilities such as buildings/structures and mechanical/electrical installations, disposal of debris, grading, and revegetation as needed. Activities for decommissioning would be similar to those for construction but more limited. Potential noise impacts on surrounding communities would be correspondingly lower than those for construction activities. Decommissioning activities would be of short duration, and their potential impacts would be minimal and temporary in nature. The same mitigation measures adopted during the construction phase could also be implemented during the decommissioning phase.

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

11.2.15.3 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. Due to the considerable separation distances, activities within the proposed Delamar Valley SEZ during construction and operation would be anticipated to cause only minimal increases in noise levels at the nearest residences and specially designated areas. Accordingly, no SEZ-specific design features are required.

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11.2.16 Paleontological Resources

11.2.16.1 Affected Environment

The surface geology of the proposed Delamar Valley SEZ is composed predominantly of thick alluvial deposits (over 100 ft thick) ranging in age from Pliocene to Holocene, with playa deposits of similar age in the southern portion of the SEZ. The total acreage of the alluvial deposits within the SEZ is 7,894 acres (32 km^2) or nearly 73% of the SEZ; there are 2,992 acres (12 km^2) of playa deposits that constitute 27% of the SEZ. In the absence of a PFYC map for Nevada, a preliminary classification of PFYC Class 3b is assumed for the playa deposits. Class 3b indicates that the potential for the occurrence of significant fossil materials is unknown and needs to be investigated further (see Section 4.8 for a discussion of the PFYC system). A preliminary classification of PFYC Class 2 is assumed for the young Quaternary alluvial deposits, similar to that assumed for the proposed Amargosa Valley SEZ (Section 11.1.16). Class 2 indicates that the potential for the occurrence of significant fossil material is low.

11.2.16.2 Impacts

Few, if any, impacts on significant paleontological resources are likely to occur in 73% of the proposed Delamar Valley SEZ. However, a more detailed look at the geological deposits of the SEZ is needed to determine whether a paleontological survey is warranted. If the geological deposits are determined to be as described above and are classified as PFYC Class 2, further assessment of paleontological resources in most of the SEZ is not likely to be necessary. Important resources could exist; if identified, they would need to be managed on a case-by-case basis. The potential for impacts on significant paleontological resources in the remaining 27% of the SEZ is unknown. A more detailed investigation of the playa deposits is needed prior to project approval. A paleontological survey will likely be needed following consultation with the BLM. The appropriate course of action would be determined as established in BLM IM2008-009 (BLM 2007e) and IM2009-011 (BLM 2008c). Section 5.14 discusses the types of impacts that could occur on any significant paleontological resources found to be present within the Delamar Valley SEZ. Impacts will be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2.

Indirect impacts on paleontological resources outside of the SEZ, such as those that could occur through looting or vandalism, are unknown but unlikely because any such resources would be below the surface and not readily accessed. Programmatic design features for controlling water runoff and sedimentation would prevent erosion-related impacts on buried deposits outside of the SEZ.

Approximately 8 mi (13 km) of access road is anticipated to connect to U.S. 93 to the north of the SEZ, resulting in approximately 58 acres (0.23 km^2) of disturbance in areas predominantly composed of alluvial sediments (preliminarily classified as PFYC Class 2). Direct impacts during construction are not anticipated in PFYC Class 2 areas, and new areas of high paleontological potential are not likely to be made more accessible as a result of this new access pathway. Although it is assumed elsewhere in this document that 8 mi (13 km) of access road is anticipated to connect to U.S. 93 in the southwest portion of the SEZ, this alternative route would cross a portion of the Hiko Range in an area of increased elevation and rock outcrops. The amount of disturbance is essentially the same (58 acres [0.23 km^2]), but the disturbance would occur in both alluvial sediments (PFYC Class 2) and areas of residual deposits in igneous and metamorphic rocks (volcanics are typically classified as PFYC Class 2 areas). Direct impacts during construction are not anticipated in PFYC Class 2 areas. No new transmission lines are currently anticipated for the proposed Delamar Valley SEZ. Impacts on paleontological resources related to the creation of new corridors not assessed in this PEIS would be evaluated at the project-specific level if new road or transmission construction or line upgrades are to occur.

A programmatic design feature requiring a stop work order in the event of an inadvertent discovery of paleontological resources would reduce impacts by preserving some information and allowing excavation of the resource, if warranted. Depending on the significance of the find, it could also result in some modification to the project footprint. Since the SEZ is located in an area partially classified as PFYC Class 3b, a stipulation would be included in permitting documents to alert solar energy developers of the possibility of a delay if paleontological resources were uncovered during surface-disturbing activities.

11.2.16.3 SEZ-Specific Design Features and Design Feature Effectiveness

Impacts would be minimized through the implementation of required programmatic design features, including a stop-work stipulation in the event that paleontological resources are encountered during construction, as described in Appendix A, Section A.2.2.

If the geological deposits are determined to be as described above and are classified as PFYC Class 2, mitigation of paleontological resources within 73% of the proposed Delamar Valley SEZ and the access road corridor is not likely to be necessary. The need for and the nature of any SEZ-specific design features for the remaining 27% of the SEZ would depend on the results of future paleontological investigations.

11.2.17 Cultural Resources

11.2.17.1 Affected Environment

11.2.17.1.1 Prehistory

The proposed Delamar Valley SEZ is located in the Great Basin region. The earliest known use of the area was likely during the Paleoindian Period, sometime between 12,000 and 10,000 years B.P. Surface finds of Paleoindian fluted projectile points, the hallmark of the Clovis culture, have been found in the area, but no sites with any stratigraphic context have been excavated. The Clovis culture is characterized by the aforementioned fluted projectile point and a hunting and gathering subsistence economy that followed migrating herds of Pleistocene mega fauna. The ambiguity of Paleoindian occupation in the Great Basin has given rise to the assumption that the people of this time period may have been inclined to subsist off of the lake and marsh habitats provided by the ancient Pleistocene pluvial lakes that occupied large portions of the Great Basin; consequently, these sites are difficult to find because they have been buried by the ebb and flow of the pluvial lakes. The cultural material associated with the pluvial lake habitations is referred to as the Western Pluvial Lakes Tradition. It is likely that these people did not rely entirely on the marshland habitats, but were nomadic hunters and gatherers who relied on both wetland resources and resources located away from the pluvial lakes. The archaeological assemblage associated with this cultural tradition is characterized by stemmed projectile points, leaf-shaped bifaces, scrapers, crescents, and in some cases ground stone tools for milling plant material. Often, projectile points and tools were made from locally procured obsidian, sources of which are not far from the proposed Delamar Valley SEZ; South Pahroc is just 5 mi (8 km) to the northwest of the SEZ, and Kane Springs Wash and Meadow Valley Wash are about 15 mi (24 km) to the southeast. Exploiting these sources of obsidian and collecting raw materials for tool manufacture were a part of a larger resource exploitation system in which groups moved in seasonal rounds to take advantage of resources in different localities (Haarklau et al. 2005; Fowler and Madsen 1986; Hockett et al. 2008).

The Archaic Period in the region began with the recession of most of the pluvial lakes in the area around about 8,000 to 6,000 B.P. and extended until about 4,000 B.P. Archaic period groups likely still congregated around marsh areas but also utilized the vast system of caves that can be found in the mountains of the Great Basin. The settlement system in some areas was likely based around a central base camp, with temporary extractive camps located on the margins of the territory to exploit resources that were not in the immediate vicinity of the base camp. Some of the key Archaic Period sites in the area near the proposed Delamar Valley SEZ are Stuart Rockshelter in the lower Meadow Valley Wash area, and Etna Cave, Conway Shelter, and O'Malley Shelter in the upper portions of the Meadow Valley Wash area, just northeast of the proposed Delamar Valley SEZ. The Lake Lahontan Basin, the site of a large Pleistocene pluvial lake that was located northeast of the proposed Delamar Valley SEZ, was also a place where several early Archaic period sites have been documented; the Archaic archaeological assemblage from these sites maintains some cultural continuity with the previous period, consisting of large notched points, leaf-shaped bifaces, scrapers, drills, gravers, and manos and metates (Fowler and Madsen 1986; Neusius and Gross 2007).

The Middle Archaic Period, from 4,000 to 1,500 B.P., saw the climatic shift known as the Little Pluvial, a wetter and cooler climate that caused some of the pluvial lakes to fill back up. The cultural material of this time period is similar to the Early Archaic, with an increased concentration of milling stones and mortars and pestles, and the appearance of normally perishable items that become well preserved in the arid Great Basin climate, such as wicker baskets, split-twig figurines, duck decoys, and woven sandals (Neusius and Gross 2007).

In the vicinity of the proposed Delamar Valley SEZ, the Late Archaic Period began around 1,500 B.P. and extended until about 800 B.P. This period saw major technological shifts, evidenced by smaller projectile points that were more useful because groups began using bow-and-arrow technology instead of atlatl and dart technology, and changes in subsistence techniques, particularly in the use of horticulture. In some areas, the Formative Era began around 1,500 B.P., and the proposed Delamar Valley SEZ is situated in an area that borders both the Formative Fremont and Virgin Anasazi cultures. In areas where these Formative cultures were not present, the Late Archaic lifeways persisted. The Fremont culture was located in most of Utah, north of the Colorado, Escalante, and Virgin Rivers, and in portions of eastern Nevada and western Colorado. The culture is characterized by the use of horticulture and hunting and gathering subsistence practices, distinctive gray-ware pottery, rod-and-bundle basketry, anthropomorphic rock art, and leather moccasins. The Virgin Anasazi culture was an extension of the Puebloan groups from the American Southwest into the Great Basin region. These groups brought with them the knowledge of horticulture, which they utilized on the floodplains of the river valleys they inhabited. Pueblo Grande de Nevada, located south of the proposed Delamar Valley SEZ near Overton, Nevada, is a prime example of the extensive settlements of the Virgin Anasazi culture in the vicinity of the SEZ. Characteristic of this period are gray-ware ceramics (sometimes decorated), rock art and intaglios, bedrock milling features, and turquoise mining. Both the Fremont and Virgin Anasazi groups had left the region by about 800 to 1,000 B.P., at which time Numic-speaking groups migrated into the region; however, the exact timing of these events are unclear and are a subject for further research in the region. These Numic-speaking people were the antecedents of the Southern Paiute, and the archaeological assemblage associated with this time period consists of Desert series projectile points, brown-ware ceramics, unshaped manos and millingstones, incised stones, mortars and pestles, and shell beads. The expression of a Numic period is questioned by contemporary Native American groups in the region because they see themselves as being descents of the Anasazi, having occupied the area since the beginning of time, and do not perceive of a disconnect between Virgin Anasazi and Numic periods (Fowler and Madsen 1986).

11.2.17.1.2 Ethnohistory

The proposed Delamar Valley SEZ is located within the traditional use area of the Southern Paiute. Southern Paiute groups tended to be wide ranging and often shared resources. The SEZ lies between the core areas of the Panaca and Pahranagat Bands (Kelly 1934; Kelly and Fowler 1986). The Pahranagat Band was centered on the Pahrangat Valley just to the west of

Delamar Valley, but Pahranagat people are reported to have lived at the southern end of the Delamar Valley. The Panaca Band was centered in Meadow Valley, about 34 mi (55 km) to the northeast. Delamar Valley and its surroundings appear to be more important to Pahranagat descendants than Panaca descendants (Stoffle and Dobyns 1983). Close to the northwestern boundary of Southern Paiute territory, the area may also have been known to the Western Shoshone.

Southern Paiute

A more general account of the Southern Paiutes is given in Section 11.1.17.1.2. This section deals primarily with those Southern Paiutes associated with the Delamar Valley. The proposed Delamar Valley SEZ falls within *Paranayi*, the western subdivision of the Southern Paiute Nation (Stoffle et al. 1997). Situated in the Delamar Valley and on Delamar Flat, it is just under 9 mi (14 km) northeast of the springs, lakes, and wetlands of the Pahranagat Valley.

The Pahranagat Band was a relatively small division of the Southern Paiutes. Like other Southern Paiute bands, it was centered on a spring-fed ribbon oasis. In Pahranagat Valley, they planted crops along lake margins and practiced some irrigation. They were also known to burn plots and scatter seeds in the burnt areas. They supplemented their food supply by fishing and by hunting in the surrounding mountains and hills. Hunters appealed for supernatural aid using means including a special mountain sheep song (Kelly and Fowler 1986). The Panaca Band base camps planted crops in Meadow Valley near present-day Panaca and Pioche and harvested pine nuts in the surrounding hills (Stoffle and Dobyns 1983).

The arrival of Europeans in the New World initially had indirect, although serious, effects on the Southern Paiutes. The Southern Paiute bands suffered from the spread of Old World diseases and the depredations of the slave trade that supplied Spanish and Mexican markets. The development of mining in the 1860s brought Euro-Americans to this part of Nevada in earnest. Mining communities, and the farming communities to support them, sprang up. The newcomers deprived the Paiutes of their traditional water sources and reduced the game and other wild foods they depended on. As Euro-American settlements grew and traditional resources declined, the Southern Paiute were drawn into the new economy, often serving as transient wage labor (Kelly and Fowler 1986). The 1889 discovery of gold in the hills east of the valley resulted in the excavation of extensive mines and the founding of the town of Ferguson, later renamed Delamar, about 6 mi (9 km) east of the proposed SEZ (Paher 1970).

In 1865, an initial attempt by the U.S. government to settle the Southern Paiutes in northeastern Utah among their traditional enemies, the Utes, failed. The Moapa River Reservation was established in 1875, and many members of the Paharangat Band eventually found a home there. Members of the Panaca Band were more likely to settle among the Indian Peaks and Cedar Bands in Utah. The Utah reservations were terminated in 1954, but the bands were restored to a federal trust relationship in 1980 (Stoffle and Dobyns 1983; Kelly and Fowler 1986).

Western Shoshone

The Western Shoshone are ethnically similar Central Numic speakers who traditionally occupied the northwestern flank of Southern Paiute territory—stretching from eastern California through central Nevada into northwestern Utah and southern Idaho. They interacted peacefully with the Southern Paiutes, with whom they were on good terms and may have shared the resources of the Paharangat Valley and its environs (Thomas et al. 1986). For more information on the Western Shoshone see Section 11.1.17.1.2.

11.2.17.1.3 History

The Great Basin was one of the last areas of the continental United States to be fully explored. The harsh and rugged landscape deterred most European and American explorers until the late 18th century. The earliest documented European presence in the Great Basin region was the Dominguez-Escalante Expedition that began in July of 1776. Two Catholic priests, Fathers Francisco Atanasio Dominguez and Silvestre Velez de Escalante were looking for a route from the Spanish capital city of Santa Fe to the Spanish settlement of Monterey on the California coast. Due to poor weather the group did not end up completing their intended journey, but the maps and journals describing their travels and encounters would prove valuable to later explorers who traversed the area, such as Spanish/New Mexican traders and Anglo-American fur trappers traveling the Old Spanish Trail in the 1820s and 1830s (BLM 1976).

Further exploration of the Great Basin occurred in 1826 with fur-trapping expeditions, one conducted by Peter Ogden of the Hudson Bay Company, and the other by Jedediah Smith of the Rocky Mountain Fur Company. Both men were seeking new beaver fields; Ogden took a more northerly route through Elko, Pershing, and Humbolt Counties, and Smith entered near the proposed Delamar Valley SEZ at Mesquite and traveled into California. When Smith entered California he was detained by Mexican authorities and ordered to go back the way he came; however, he decided instead to travel farther north in California and cut across central Nevada, further exploring the Nevada region. Fur trapping never became a lucrative enterprise in Nevada; however, these trailblazers paved the way for later explorers and mappers, such as John C. Frémont. Frémont was a member of the Topographical Engineers, and was commissioned to map and report on the Great Basin area in 1843 and 1844. The results of his work gained wide circulation and were of great importance in understanding the topography of the Great Basin, both for official use and by those moving westward to seek new homes and fortunes (Elliott 1973).

Nevada and the larger Great Basin region provided a corridor of travel for those seeking to emigrate west. Several heavily traveled trails crossed the region, although none were particularly close to the proposed Delamar Valley SEZ. The Old Spanish Trail was an evolving trail system generally established in the early 19th century, but it tended to follow earlier established paths used by earlier explorers and Native Americans. The 2,700 mi (4,345 km) network of trails passes through six states, beginning in Santa Fe, New Mexico, and ending in Los Angeles, California. The closest portion of the congressionally designated Old Spanish National Historic Trail to the proposed SEZ is where it follows the Virgin River, about 50 mi

(80 km) to the southeast. Mormons also frequently used the Old Spanish Trail in emigrating farther west to Nevada, Arizona, and California, and the trail is often referred to as the Old Spanish Trail/Mormon Road. Another notable trail that crossed Nevada was the California Trail, a trail that followed portions of the notable Oregon Trail farther east of Nevada, then broke off from that trail and continued through the northern portion of Nevada along the Humbolt River until it reached California. The Pony Express Trail, a mail route that connected Saint Joseph, Missouri, to Sacramento, California, entered Nevada northeast of Ely and exited just south of Lake Tahoe (von Till Warren 1980).

With the ratification of the Treaty of Guadalupe Hidalgo in 1848 closing out the Mexican-American War, the area came under American control. In 1847, the first American settlers arrived in the Great Basin, among them Mormon immigrants under the leadership of Brigham Young, who settled in the Valley of the Great Salt Lake in Utah. They sought to bring the entire Great Basin under their control, establishing an independent State of Deseret. From its center in Salt Lake City, the church sent out colonists to establish agricultural communities in surrounding valleys and missions to acquire natural resources such as minerals and timber. Relying on irrigation to support their farms, the Mormons often settled in the same places the Fremont and Virgin Anasazi had centuries before. The result was a scattering of planned agricultural communities from northern Arizona to southern Idaho and parts of Wyoming, Nevada, and southern California. Mormon settlements near the proposed Delamar Valley SEZ were located at Crystal Springs, about 18 mi (29 km) to the northwest of the SEZ, and Clover Valley, about 28 mi (45 km) to the east of the SEZ (Paher 1970; Fehner and Gosling 2000).

Nevada's nickname is the "Silver State;" it is so named for the Comstock Lode strike in 1859 in Virginia City, about 400 mi (643 km) north of the proposed Delamar Valley SEZ. This was the first major silver discovery in the United States, and with the news of the strike hopeful prospectors flocked to the area in an effort to capitalize on the possible wealth under the surface of the earth. The discovery of the Comstock Lode led to the creation of Virginia City and other nearby towns that served the population influx. The population increase due to mining was so dramatic that in 1850 there were less than a dozen non-native persons in the state of Nevada; by 1860 there were 6,857, and by 1875 an estimated 75,000 people had settled within the boundaries of the Nevada territory. The Comstock Lode strike is important to the history of Nevada not just because of the population growth and significant amount of money that was consequently brought to the area, but also because of several technological innovations that were created and employed in the mines, including the use of square-set timbering. This technique kept loose soil from collapsing on miners, a concept that was eventually employed around the world in other mines (Paher 1970).

Mining for valuable deposits occurred in all regions of the state of Nevada, including in the vicinity of the proposed Delamar Valley SEZ. The closest mining district to the proposed SEZ was the Delamar Mine. Gold was initially discovered by farmers from Pahranagat in 1890 and 1891, leading to the formation of the Ferguson District in 1892. It is surmised that Native Americans may have been mining for the gold over a dozen years prior to the whites. Captain John C. De Lamar of Montana purchased the principal claim, renamed it Delamar and stepped up the development of the mine. During the years 1895 to 1900 the Delamar Mine was the most prosperous mine in Nevada, as most of the state was in a mining decline. The Delamar mining camp was known as “the maker of widows” due to the high frequency of deaths caused by silicosis, a lung disease brought about by the inhalation of high amounts of silica dust or “Delamar dust.” A small cemetery associated with the mine overlooks the Delamar Valley within 5 mi (8 km) of the SEZ. Despite the prevalence of the disease, people continued to work this rich mine until the late 1920s and early 1930s. The Pioche Mine was one of the most notorious mining districts in Lincoln County. Located in the Highland Range, to the northeast of the Delamar Valley SEZ, Pioche was a violent Wild West town that was also one of the most prosperous districts in the county. Other nearby mines included the Highland Mine and the Bristol Mine, both to the north of the SEZ, and Hiko to the west of the SEZ (Paher 1970).

The construction of railroads in Nevada was often directly related to mining activities in the state. It was necessary to construct intrastate rail lines to move ore from mines to mills; the Pioche to Bullionville Railroad was the closest line to the proposed Delamar Valley SEZ, but interstate railroads were also critical to the development of the economy. The San Pedro–Los Angeles–Salt Lake Railroad was constructed in 1905, connecting two of the most populous cities in the American West, Salt Lake City and Los Angeles. This still-used rail line is located to the east of the proposed Delamar Valley SEZ, as it passes through Caliente through the Meadow Valley Wash on its way to Las Vegas. The infamous Transcontinental Railroad was constructed between 1863 and 1869, connecting Sacramento, California, and Omaha, Nebraska, passing through the Nevada towns of Reno, Wadsworth, Winnemucca, Battle Mountain, Elko, and Wells, and changing the manner in which people traversed the United States.

Nevada’s desert-mountain landscape has made it a prime region for use by the U.S. military for several decades. Beginning in October 1940, President Franklin D. Roosevelt established the Las Vegas Bombing and Gunnery Range, a 3.5-million-acre (14,000-km^2) parcel of land northwest of Las Vegas, near Indian Springs, Nevada. The main purpose of the range was to serve as air-to-air gunnery practice, but at the end of WWII the gunnery range was closed. It was reopened at the start of the Cold War in 1948, recommissioned as the Las Vegas Air Force Base, and later renamed Nellis Air Force Base in 1950 (Fehner and Gosling 2000).

Prior to dropping the atomic bomb on the Japanese cities of Nagasaki and Hiroshima, the only testing of nuclear weapons on U.S. soil was at the Trinity site, near Los Alamos Laboratory in Alamogordo, New Mexico. Tests of nuclear weapons had been conducted at the newly acquired Marshall Islands in the Pacific, but due to logistical constraints, financial expenditures, and security reasons, a test site for nuclear weapons was needed in a more convenient region. Project Nutmeg commenced in 1948 as a study to determine the feasibility and necessity of a test site in the continental U.S. It was determined that due to public relations issues, radiological safety, and security issues a continental test site should only be pursued in the event of a national emergency. In 1949, that emergency occurred when the Soviet Union conducted their first test of a nuclear weapon and the Korean War started in the summer of 1950. Five initial test sites were proposed: Alamogordo/White Sands Missile Range in New Mexico, Camp LeJeune in North Carolina, the Las Vegas–Tonopah Bombing and Gunnery Range in Nevada, a site in central Nevada near Eureka, and Utah’s Dugway Proving Ground/Wendover Bombing Range. Several factors were considered when making the final decision, including fallout patterns, prevailing winds and predictability of weather, terrain, downwind populations, security, and public awareness and relations, with the Las Vegas–Tonopah Bombing and Gunnery Range being chosen as the NTS by President Truman in December 1950.

Covering 1,375 mi^2 (2213 km^2), the NTS is a part of the Las Vegas–Tonopah Bombing and Gunnery Range; it stretches from Mercury, Nevada, in the southeast to Pahute Mesa in the northwest. The first set of nuclear tests was conducted in January 1951; originally named FAUST (First American Drop United States Test) and later renamed Ranger, these bombs were detonated over Frenchman Flat, an area about 45 mi (72 km) southwest of the proposed Delamar Valley SEZ. Tests were also later conducted at Yucca Flat, an area located northwest of Frenchman Flat, in an effort to minimize the effect of the blasts on the population of Las Vegas, which reported some disturbances (non-radiological in nature) from the series of tests conducted at Frenchman Flat. Tests were also conducted at Jackass Flats, to the west of the proposed Delamar Valley SEZ, and Pahute Mesa, located to the north and west of the proposed Delamar Valley SEZ. Nuclear tests were conducted in an effort to test new weapons concepts, proof-test existing weapons, test the impact of nuclear weapons on manmade structures and the physical environment, and conduct experimental testing in search of possible peaceful uses, specifically the Pluto ramjet, Plowshare, and Rover rocket programs. The Pluto ramjet project was funded by the Air Force to design a system that could propel a vehicle at supersonic speeds and low altitudes, while the Rover rocket was a design for a nuclear-powered rocket for space travel. The Plowshare project was an attempt to show that nuclear weapons could be effective in moving large amounts of earth for canal and harbor construction. None of these three projects resulted in any sustained results in terms of the goals they were seeking, but they were important in their contribution to the overall work done at the NTS. In the fall of 1958, President Dwight Eisenhower declared a moratorium on nuclear testing, with the Soviet Union following suit until 1961 when testing resumed on both behalves. However, this testing was performed mostly underground at the NTS, with most atmospheric tests being conducted in the Pacific. The last atmospheric test at the NTS was on July 17, 1962, with the Limited Test Ban Treaty signed by the U.S. and Soviet Union on August 5, 1963, ending nuclear testing in the atmosphere, ocean, and space. The last underground nuclear detonation at the NTS was on September 23, 1992, after which Congress declared a moratorium on nuclear testing. In 1996, a Comprehensive Test Ban Treaty was proposed by an international organization, but it has yet to be ratified by the U.S. Senate; however, nuclear tests have not been conducted since. In total, 1,021 of the 1,149 nuclear detonations performed by the U.S. during the Cold War were conducted at the NTS (Fehner and Gosling 2000).

Within the proposed Delamar SEZ are a landing strip and two drop zones used by Nellis Air Force Base and the DoD, an area encompassing about 2,590 acres (10 km^2). The 15,000-ft (4,600-m) long landing strip is located in the southern portion of the SEZ on the dry lake bed; the drop zones are located on the southeast and northwest sides of the dry lake. Through use permits obtained from the BLM, the United States Air Force conducted loading and takeoff operations, refueling exercises, reloading exercises, and search-and-rescue training support exercises in periodic increments from the 1960s through the 1980s. Edwards Air Force Base also used the airstrip for an emergency landing strip for the X-15 aircraft flight test program (Scott 1994).

11.2.17.1.4 Traditional Cultural Properties—Landscape

The Southern Paiutes have traditionally taken a holistic view of the world, in which the sacred and profane are inextricably intertwined. According to their traditions, they were created in their traditional use territory and have a divine right to the land along with a responsibility to manage and protect it. Landscapes as a whole are often culturally important. An adverse effect on one part diminishes the rest (Stoffle 2001). From a Southern Paiute perspective, landscapes include places of power. Among the most important such places are sources of water; peaks, mountains, and elevated features; caves; distinctive rock formations; and panels of rock art. Places of power are important to the religious beliefs of the Southern Paiute. They may be sought out for individual vision quests or healing and may likewise be associated with culturally important plant and animal species. The view from such a point of power or the ability to see from one important place to another can be an important element of its integrity (Stoffle and Zedeño 2001b). Landscapes as a whole are tied together by a network of culturally important trails (Stoffle and Dobyns 1983; Stoffle and Zedeño 2001a).

The proposed Delamar Valley SEZ is situated close to the Paharangat Valley ribbon oasis, which includes lakes and spring-fed wetlands. It was an area of traditional Southern Paiute base camps and gardens. Located less than 10 mi (16 km) from Paharangat Valley, the southern end of Delamar Valley was likewise the site of Paharangat base camps (Stoffle and Dobyns 1983). These are reflected in the rock art panels and rock shelters located on the eastern face of a rocky ridge along the western boundary of proposed SEZ. Caves, rock art panels, and former dwelling places are all culturally significant features for the Southern Paiutes.

The southern end of the proposed SEZ appears to be at the center of a culturally important landscape. A potential access road linking the SEZ to U.S. 93, which follows the Pahranagat Valley, would pass through this area. In the past, Pahranagat descendents from the Moapa River Reservation identified the southern Pahranagat Valley and the Delamar Mountains as places of greatest concern. They ranked Kane Springs Wash, located just east of the Delamar Mountains, Delamar Dry Lake, and the historic town of Delamar as only slightly less important (Stoffle and Dobyns 1983).

11.2.17.1.5 Cultural Surveys and Known Archaeological and Historical Resources

In the proposed Delamar Valley SEZ, 9 surveys have been conducted within the boundaries of the SEZ, covering approximately 3.4% of the SEZ, and 17 additional surveys have been conducted within 5 mi (8 km) of the SEZ. Of the nine surveys conducted within the boundaries of the SEZ, five have been linear surveys, and the other four were block surveys. A total of eight sites have been documented in the proposed Delamar Valley SEZ, six prehistoric sites and two historic sites. Another 47 sites have been documented within 5 mi (8 km) of the proposed SEZ; of these, 39 are prehistoric, and 8 are historic (de DuFour 2009).

The Delamar Valley SEZ has the potential to yield significant cultural resources, especially prehistoric sites in the areas around the dry lake at the south end of the SEZ, as well as in alluvial fans located on the outer portions of the SEZ and within a 5 mi (8 km) radius

(Drews and Ingbar 2004). Around the dry lake bed in the SEZ is a site that has significant potential for eligibility for inclusion on the NRHP. This site is a small lithic scatter of obsidian flakes and projectile points, possible metate fragments, and fire-cracked rock, with the possibility of subsurface deposits. Another potentially eligible site is located on an alluvial fan in the eastern portion of the SEZ. This site is also a lithic scatter of obsidian flakes, likely dating to the Archaic period, and its potential subsurface deposits could provide information about Archaic settlement patterns. The other prehistoric sites in the Delamar SEZ are isolated projectile points (Rose Spring and Archaic points), grinding stone fragments, and dispersed lithic scatters. Two historic sites, one an isolated bottle, the other an historic telegraph line, are likely not eligible for inclusion on the NRHP; the telegraph line connected Delamar Mine to Bullfrog Mine, but has been previously vandalized and may not retain sufficient integrity. The Delamar Mine itself is within 6 mi (10 km) of the SEZ, and its associated cemetery is within 5 mi (8 km) overlooking the valley and the northern section of the SEZ from the northeast in the Delamar Mountains. Numerous rock art sites are in close proximity to the western edge of the SEZ boundary, and artifacts were noted in the western portion of the SEZ during an initial visit to the valley.

The BLM has designated several locations within relatively close proximity to the proposed Delamar Valley SEZ as ACECs because of their significant cultural value. The Pahroc Rock Art ACEC is located about 10 mi (16 km) to the north of the proposed Delamar Valley SEZ, at the south end of the North Pahroc Range. The Shooting Gallery ACEC is located about 15 mi (24 km) to the west of the SEZ, just west of Alamo. The name “Shooting Gallery” was applied to the district because there is evidence that prehistoric people created hunting blinds and a system of channels made of rocks to corral and hunt large game. The Mount Irish ACEC is located about 30 mi (48 km) to the northwest of the proposed Delamar SEZ, near Hiko, and is noted for its rock art and prehistoric camp sites. There are several other areas that contain culturally sensitive material and meet the criteria for ACEC designation, but in the interest of protecting the resources the BLM has not designated other ACECs, since it is presumed that ACEC designation could bring unwanted attention to the sites, including increased potential for vandalism.

National Register of Historic Places

Two sites within the proposed Delamar Valley SEZ have the potential to be eligible for inclusion in the NRHP, as mentioned above, and are associated with the dry lake area and alluvial fan areas. Within 5 mi (8 km) of the SEZ are 10 sites that exhibit potential significance for inclusion in the NRHP. These sites, eight of which are rock shelters, are all prehistoric in nature. All of the potentially eligible sites within the 5-mi (8-km) buffer are located to the west of the SEZ in the South Pahroc Range and surrounding area; most also consist of petroglyphs and/or pictographs. Several of the sites have diagnostic pottery; two of the sites contain Paiute ceramics, two others contain both Fremont and Paiute style ceramics, and one of those two sites could possibly contain Virgin Anasazi ceramic sherds. The other two sites include the largest single concentration of patterned-body anthropomorphs and peanut-bodied anthropomorphs (also referred to as Pahranagat Man) and a hunting camp and chipping station.

In addition, nine other properties are listed in the NRHP within Lincoln County. Three of these properties are prehistoric sites: the White River Narrows Archaeological District, located about 30 mi (48 km) northwest of the proposed SEZ; the Black Canyon Petroglyph Site in the Pahranagat National Wildlife Refuge, south of Alamo, about 7 mi (11 km) southwest of the Delamar Valley SEZ; and the Panaca Summit Archaeological District, about 40 mi (64 km) northwest of the SEZ. The other properties listed in the NRHP in Lincoln County are historic sites near the towns of Caliente and Pioche, both located to the northeast of the SEZ.

11.2.17.2 Impacts

Direct impacts on significant cultural resources could occur in the proposed Delamar Valley SEZ; however, further investigation is needed at the project-specific level. A cultural resource survey of the entire area of potential effect, including consultation with affected Native American Tribes, would first need to be conducted to identify archaeological sites, historic structures and features, and traditional cultural properties, and an evaluation would need to follow to determine whether any are eligible for listing in the NRHP as historic properties. The Delamar Valley SEZ has a high potential for containing prehistoric sites, especially in the dry lake area at the southern end of the SEZ; a potential for historic sites also exists. The largest potential for direct impacts on significant cultural values is in the dry lake area and the alluvial fans, located on the southern and outer portions of the SEZ. At least two of the sites recorded in these portions of the SEZ have been determined to be potentially eligible for listing in the NRHP. The history of the landing strip should also be investigated further. Section 5.15 discusses the types of impacts that could occur on any significant cultural resources found to be present in the Delamar Valley SEZ. Impacts will 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.

Indirect impacts on cultural resources outside of the SEZ boundary, such as through looting or vandalism, are possible in the rock shelter and petroglyph sites immediately west of the SEZ and also to the east toward the old mining town of Delamar. Visual impacts on traditional cultural properties identified either in the Pahroc Range or in the Delamar Mountains would occur. Subsurface sites would likely not be impacted because programmatic design features for controlling water runoff and sedimentation would prevent erosion-related impacts on buried deposits outside of the SEZ.

Approximately 8 mi (13 km) of access road is anticipated to connect to U.S. 93 to the north of the SEZ, resulting in approximately 58 acres (0.23 km^2) of disturbance. Impacts on cultural resources are possible in areas related to the access ROW, since new areas of potential cultural significance could be directly impacted by construction or opened to increased access from road use. Indirect impacts, such as vandalism or theft, could occur if significant resources are located in close proximity to the ROW. Programmatic design features assume that the necessary surveys, evaluations, and consultation will occur for the ROW, as with the project footprint within the SEZ. In this particular area, a couple of small surveys have been conducted that traverse the potential corridor. One site, a lithic scatter, has been recorded. The site consists of metate fragment and a stone tool fragment (either a projectile point or a blade fragment) and was not evaluated for eligibility for listing in the NRHP (de DuFour 2009). Although it is assumed elsewhere in this document that 8 mi (13 km) of access road is assumed to connect to U.S. 93 to the southwest of the SEZ, this alternative route could result in a greater potential for impacts on cultural resources. The amount of disturbance is essentially the same (58 acres [0.23 km^2]), but the disturbance would occur in an area of higher elevation, higher cultural sensitivity, and increased potential for rock shelters and rock art. No surveys have been previously conducted in the vicinity of this potential corridor (de DuFour 2009). No needs for new transmission have currently been identified, assuming existing lines would be used; therefore, no additional areas of cultural concern would be made accessible as a result of transmission development within the proposed Delamar Valley SEZ. However, impacts on cultural resources related to the creation of new corridors not assessed in this PEIS would be evaluated at the project-specific level if new road or transmission construction or line upgrades are to occur.

11.2.17.3 SEZ-Specific Design Features and Design Feature Effectiveness

Programmatic design features to mitigate adverse effects on significant cultural resources, such as avoidance of significant sites and features, cultural awareness training for the workforce, and measures for addressing possible looting/vandalism issues through formalized agreement documents, are provided in Appendix A, Section A.2.2.

SEZ-specific design features would be determined in consultation with the Nevada SHPO and affected Tribes and would depend on the results of future investigations.

- Avoidance of significant resources clustered in specific areas, such as those in the vicinity of the dry lake, is recommended.

Impacts on the viewsheds of areas of traditional cultural importance either in the west side of the Delamar Mountains to the east or the east side of the Pahroc Range to the west, if they are identified as such by the affected Tribes, would not be fully mitigable other than through avoidance of the valley. However, some mitigation options for visual impacts are provided in Section 11.2.14.

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11.2.18 Native American Concerns

Native Americans share many environmental and socioeconomic concerns with other ethnic groups. This section focuses on concerns that are specific to Native Americans or to which Native Americans bring a distinct perspective. For a discussion of issues of possible Native American concern shared with the population as a whole, several sections in this PEIS should be consulted. General topics of concern are addressed in Section 4.16. Specifically for the proposed Delamar Valley SEZ, Section 11.2.17 discusses archaeological sites, structures, landscapes, and traditional cultural properties; Section 11.2.8 discusses mineral resources; Section 11.2.9.1.3 discusses water rights and water use; Section 11.2.10 discusses plant species; Section 11.2.11 discusses wildlife species, including wildlife migration patterns; Section 11.2.13 discusses air quality; Section 11.2.14 discusses visual resources; Sections 11.2.19 and 11.2.20 discuss socioeconomics and environmental justice, respectively; and issues of human health and safety are discussed in Section 5.21.

11.2.18.1 Affected Environment

The proposed Delamar Valley SEZ falls within the Tribal traditional use area generally attributed to the Southern Paiute (Kelly and Fowler 1986), although the Paiutes often shared resources with the Western Shoshone, and the Western Shoshone may have been familiar with this border region. All federally recognized Tribes with Southern Paiute or Western Shoshone roots have been contacted and provided an opportunity to comment or consult regarding this PEIS. They are listed in Table 11.2.18.1-1. Details of government-to-government consultation efforts are presented in Chapter 14; a listing of all federally recognized Tribes contacted for this PEIS is found in Appendix K.

11.2.18.1.1 Territorial Boundaries

Southern Paiutes

The traditional territory of the Southern Paiutes lies mainly in the Mojave Desert, stretching from California to the Colorado Plateau. It generally follows the right bank of the Colorado River (heading downstream), including its tributary streams and canyons in southern Nevada and Utah, including most of Clark and Lincoln Counties in Nevada and extending as far north as Beaver County in Utah (Kelly and Fowler 1986). This area has been judicially recognized as the traditional use area of the Southern Paiute by the Indian Claims Commission (Clemmer and Stewart 1986; Royster 2008).

Western Shoshone

The Western Shoshone traditionally occupied a swath of the central Great Basin stretching from Death Valley in California through central Nevada and northwestern Utah to

TABLE 11.2.18.1-1 Federally Recognized Tribes with Traditional Ties to the Proposed Delamar Valley SEZ

Tribe	Location	State
Chemehuevi Indian Tribe	Havasu Lake	California
Colorado River Indian Tribes	Parker	Arizona
Confederated Tribes of the Goshute Reservation	Ibapah	Utah
Duckwater Shoshone Tribe	Duckwater	Nevada
Ely Shoshone Tribe	Ely	Nevada
Kaibab Paiute Tribe	Fredonia	Arizona
Las Vegas Paiute Tribe	Las Vegas	Nevada
Moapa Band of Paiutes	Moapa	Nevada
Pahrump Paiute Tribe	Pahrump	Nevada
Paiute Indian Tribe of Utah	Cedar City	Utah
Cedar Band	Cedar City	Utah
Indian Peak Band	Cedar City	Utah
Kanosh Band	Kanosh	Utah
Koosharem Band	Cedar City	Utah
Shivwits Band	Ivins	Utah
San Juan Southern Paiute Tribe	Tuba City	Arizona
Skull Valley Band of Goshute Indians	Grantsville	Utah

southeastern Idaho (Thomas et al. 1986). The proposed Delamar Valley SEZ lies within the northern margins of Southern Paiute territory in an area of shared use (Stoffle and Dobyns 1983).

11.2.18.1.2 Plant Resources

Native Americans continue to make use of a wide range of indigenous plants for food, medicine, construction materials, and other uses. The vegetation present at the proposed Delamar Valley SEZ is described in Section 11.2.10. The cover types present at the proposed SEZ are mostly in the Inter-Mountain Basins series. Mixed Salt Desert Scrub predominates. There is a substantial area of Playa in the southern end of the proposed SEZ and areas of Greasewood Flat, Semi-Desert Shrub Steppe, and Mojave Mid-elevation Desert Scrub (USGS 2005a). The proposed SEZ is sparsely vegetated. As shown in Table 11.2.18.1-2, the proposed SEZ is likely to contain some plants used by Native Americans for food and/or medicinal purposes (Stoffle et al. 1999; Stoffle and Dobyns 1983). Project-specific analyses will be needed to determine their presence at any proposed building site.

11.2.18.1.3 Other Resources

Southern Paiutes with ties to the area of the proposed SEZ rate springs as one of the most important resources in their cultural landscape. Water is an essential prerequisite for life in the arid areas of the Great Basin. As a result, water holds a key place in the religion of native

TABLE 11.2.18.1-2 Plant Species Important to Native Americans Observed or Likely To Be Present in the Proposed Delamar Valley SEZ

Common Name	Scientific Name	Status
Food		
Buckhorn Cholla	*Cylindropuntia acanthocarpa*	Possible
Buckwheat	*Eriogonum inflatum*	Observed
Cholla Cactus	*Cylindropuntia* spp.	Observed
Dropseed	*Sporobolus* spp.	Possible
Greasewood	*Sarcobatus vermiculatus*	Likely
Indian Rice Grass	*Oryzopsis hymenoides*	Observed
Iodine Bush	*Allenrolfea occidentalis*	Possible
Juniper	*Juniperus* spp.	Possible
Muhly	*Muhlenbergis porteri*	Possible
Wolfberry	*Lycium andersonii*	Possible
Yucca	*Yucca* spp.	Observed
Medicine		
Greasewood	*Sacarbatus vermiculatus*	Likely
Mormon Tea	*Ephedra* spp.	Observed
Sagebrush	*Artemesia tridentate*	Possible
Saltbush	*Atriplex* spp.	Observed

Sources: Field visit; USGS (2005a); Stoffle and Dobyns (1983); Stoffle et al. (1999).

cultures. Great Basin cultures consider all water sacred and purifying. Springs are often associated with powerful beings, and hot springs in particular figure in Southern Paiute creation stories. Water sources are often associated with rock art. Water sources are seen as connected, so damage to one damages all (Fowler 1991; Stoffle and Zedeño 2001a). There are springs located to the west of the proposed SEZ. Tribes are also sensitive regarding the use of scarce local water supplies for the benefit of far distant communities and recommend that the determination of adequate water supplies should be a primary consideration in determining whether a site is suitable for the development of a utility-scale solar energy facility (Moose 2009).

Wildlife likely to be found in the proposed Delamar Valley SEZ is described in Section 11.2.11. Mountain sheep, deer, and rabbit are the animals of concern most often mentioned by Native Americans with local ties (Stoffle and Dobyns 1983). The proposed SEZ provides suitable habitat for mule deer (*Odocoileus hemionus*), black-tailed jackrabbit (*Lepus californicus*), and desert cottontail (*Sylvilagus audubonii*). The mountains on either side of the valley provide suitable habitat for mountain sheep (*Ovis canadensis*), which may sometimes be present on the valley floor. Other animals traditionally important to the Southern Paiute include lizards, which are likely to occur in the proposed SEZ, and the golden eagle (*Aquila chrysaetosi*). The proposed SEZ falls within the range of the wide-ranging eagle (USGS 2005b). Animals important to affected Native American tribes likely to be found within the proposed SEZ are listed in Table 11.2.18.1-3.

Other natural resources traditionally important to Native Americans include salt, clay for pottery, and naturally occurring mineral pigments for the decoration and protection of the skin (Stoffle and Dobyns 1983). Of these, clay beds are possible in the dry lake within the proposed SEZ (see Section 11.2.7).

11.2.18.2 Impacts

In the past, when energy projects have been proposed, Great Basin Native Americans have expressed concern over project impacts on a variety of resources. They tend to take a holistic view of their traditional homeland. For them, cultural and natural features are inextricably bound together. Effects on one part have ripple effects on the whole. Western distinctions between the sacred and the secular have no meaning in their traditional worldview (Stoffle and Dobyns 1983). While no comments specific to the proposed Delamar Valley SEZ have been received from Native American Tribes to date, the Paiute Indian Tribe of Utah has asked to be kept informed of PEIS developments. When commenting on past projects in the Delamar Valley, the Southern Paiute have expressed concern over adverse effects on a wide range of resources. Geophysical features and physical cultural remains are discussed in Section 11.2.17.1.4. Such features are often seen as important because they are the location of or have ready access to a range of plant, animal, and mineral resources (Stoffle et al. 1997). Resources considered important include food plants, medicinal plants, plants used in basketry, and plants used in construction; large game animals, small game animals, and birds; and sources of clay, salt, and pigments (Stoffle and Dobyns 1983). Those likely to be found within the proposed Delamar Valley SEZ are discussed in Section 11.2.18.1.2.

The southern end of Delamar Valley has been identified as an area where the Paharangat Band of Southern Paiutes resided. In this area, there is likely a cultural landscape important to the Southern Paiute that would include the rockshelters and petroglyphs panels just beyond the western boundary of the proposed SEZ, the Delamar Lake playa, Delamar Mountains, the historic town of Delamar, and Kane Spring Wash. Associated with these features are plants and animals of traditional cultural importance. Although the proposed SEZ is sparsely vegetated, its proximity to a traditionally settled area suggests that the area was used historically by the Southern Paiute. An access road approaching the southern end of the proposed SEZ from the west is more likely to affect this potential cultural landscape than routes that follow Delamar Valley northward from the SEZ to U.S. 93. Any construction of solar energy facilities has the potential to disturb this landscape and its viewshed. Consultation with the affected Tribes should be undertaken to determine the aspects of the culturally important features that render them significant.

As consultation with the Tribes continues and project-specific analyses are undertaken, it is possible that there will be Native American concerns expressed over potential visual and other effects on specific resources and any culturally important landscapes within or adjacent to the proposed SEZ. Since solar energy facilities cover large tracts of land, even taking into account

TABLE 11.2.18.1-3 Animal Species used by Native Americans as Food whose Range Includes the Proposed Delamar Valley SEZ

Common Name	Scientific Name	Status
Mammals		
Badger	*Taxidea taxus*	All year
Black-tailed jackrabbit	*Lepus californicus*	All year
Bobcat	*Lynx rufus*	All year
Coyote	*Canis latrans*	All year
Cottontails	*Silvilagus* spp.	All year
Woodrats	*Neotoma* spp.	All year
Gray fox	*Urocyon cinereoargenteus*	All year
Kangaroo rats	*Dipodomys* spp.	All year
Kit fox	*Vulpes macotis*	All year
Mule deer	*Odocoileus hemionus*	All year
Pocket gopher	*Thomomys bottae*	All year
Pocket mice	*Perognathus* spp.	All year
Porcupine	*Erethizon dorsatum*	All year
Pronghorn	*Antilocapra americana*	All year
Red fox	*Vulpes vulpes*	All year
Rock squirrel	*Spermophilus variegatus*	All year
White-tailed antelope squirrel	*Ammospermophilus leucurus*	All year
White-tailed jackrabbit	*Lepus townsendii*	All year
Birds		
Burrowing owl	*Athene cunicular*	Summer
Common raven	*Corvus corax*	All year
Golden eagle	*Aquila chrysaetos*	All year
Great horned owl	*Bubo virginianus*	All year
Mourning Dove	*Callipepla gambelii*	All year
Northern mockingbird	*Mimus polyglottos*	All year
Sage grouse	*Centrocercus urophasianus*	All year
Sandhill crane	*Grus Canadensis*	Spring/fall
Swainson's hawk	*Buteo swainsoni*	Summer
Reptiles		
Desert horned-lizard	*Phrynosoma platyrhinos*	All year
Desert tortoise	*Gopherus agassizii*	Possible
Large lizards	Various species	All year

Sources: Field visit; USGS (2005b); Fowler (1986).

the implementation of programmatic design features, it is unlikely that avoidance of all resources important to Native Americans would be possible.

Implementation of programmatic design features, as discussed in Appendix A, Section A.2.2, should eliminate impacts on Tribes' water rights and the potential for groundwater contamination issues.

11.2.18.3 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 resources, and tribally important plant and animal species are provided in Appendix A, Section A.2.2. Mitigation of impacts on archaeological sites and traditional cultural properties is discussed in Section 11.2.17.3, in addition to programmatic design features for historic properties discussed in Appendix A, Section A.2.2.

The need for and nature of SEZ-specific design features addressing issues of potential concern would be determined during government-to-government consultation with the affected Tribes listed in Table 11.2.18.1-1.

11.2.19 Socioeconomics

11.2.19.1 Affected Environment

This section describes current socioeconomic conditions and local community services within the ROI surrounding the proposed Delamar Valley SEZ. The ROI is a three-county area comprising Clark and Lincoln Counties in Nevada and Iron County in Utah. It encompasses the area in which workers are expected to spend most of their salaries and in which a portion of site purchases and non-payroll expenditures from the construction, operation, and decommissioning phases of the proposed SEZ facility are expected to take place.

11.2.19.1.1 ROI Employment

In 2008, employment in the ROI stood at 944,909 (Table 11.2.19.1-1). Over the period 1999 to 2008, the annual average employment growth rate was higher in Lincoln County (5.1%) than in Iron County (3.4%) and Clark County (3.2%). At 3.2%, growth rates in the ROI as a whole were higher than the average rate for Nevada (2.7%).

In the ROI in 2006, the services sector provided the highest percentage of employment at 59.3%, followed by wholesale and retail trade at 14.9% and construction (11.7%) (Table 11.2.19.1-2). Within the three counties in the ROI, the distribution of employment across

TABLE 11.2.19.1-1 ROI Employment in the Proposed Delamar Valley SEZ

Location	1999	2008	Average Annual Growth Rate, 1999–2008 (%)
Clark County, Nevada	675,693	922,878	3.2
Lincoln County, Nevada	1,114	1,731	5.1
Iron County, Utah	14,571	20,300	3.4
ROI	691,582	944,909	3.2
Nevada	978,969	1,282,012	2.7
Utah	1,080,441	1,336,556	2.1

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

TABLE 11.2.19.1-2 ROI Employment in the Proposed Delamar Valley SEZ by Sector, 2006

	Clark County		Lincoln County		Iron County		ROI	
Industry	Employment	% of Total	Employment	% of Total	Employment	% of Total	Employment	% of Total
Agriculture[a]	213	0.0	130	16.1	934	7.0	1,277	0.1
Mining	522	0.1	38	4.7	10	0.1	570	0.1
Construction	100,817	11.6	60	7.4	1,829	13.8	102,706	11.7
Manufacturing	25,268	2.9	0	0.0	1,732	13.1	27,000	3.1
Transportation and public utilities	38,529	4.4	70	8.7	363	2.7	38,962	4.4
Wholesale and retail trade	128,498	14.8	309	38.3	2,650	20.0	131,407	14.9
Finance, insurance, and real estate	56,347	6.5	24	3.0	646	4.9	57,044	6.5
Services	516,056	59.6	343	42.6	5,068	38.2	521,500	59.3
Other	105	0.0	0	0.0	10	0.1	115	0.0
Total	866,093		806		13,250		880,149	

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

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

sectors is different from that of the ROI as a whole, with employment in services (59.6%) higher in Clark County than in the ROI as a whole, while employment in wholesale and retail trade (14.8%), and agriculture (0.0%) were lower than in other counties in the ROI.

11.2.19.1.2 ROI Unemployment

The average rate in Lincoln County over the period over the period 1999 to 2008 was 5.2%, slightly higher than the rate in Clark County (5.0%), and higher than the rate for Iron County (Table 11.2.19.1-3). The average rate in the ROI over this period was 5.0%, the same as the average rate for Nevada. Unemployment rates for the first 11 months of 2009 contrast with rates for 2008 as a whole; in Clark County, the unemployment rate increased to 11.1%, while in Lincoln County the rate reached 8.0%, and it increased to 6.4% in Iron County. The average rates for the ROI (11.0%) and for Nevada as a whole (11.0%) were also higher during this period than the corresponding average rates for 2008.

11.2.19.1.3 ROI Urban Population

The population of the ROI in 2006 to 2008 was 57% urban. The largest city, Las Vegas, had an estimated 2008 population of 562,849; other large cities in Clark County include Henderson (253,693) and North Las Vegas (217,975) (Table 11.2.19.1-4). In addition, there are two smaller cities in the county, Mesquite (16,528) and Boulder City (14,954). There are a number of unincorporated urban areas in Clark County that are not included in the urban population, meaning that the percentage of the county population not living in urban areas is overstated. The largest urban area in Iron County, Cedar City, had an estimated 2008 population of 28,439; other urban areas in the county in include Enoch (5,076) and Parowan (2,606) (Table 11.2.19.1-4). In addition, there are three other urban areas in the county, Paragonah (477), Kanaraville (314) and Brian Head (126). Most of these cities and towns are less than 100 mi (160 km) from the site of the proposed SEZ.

Population growth rates in the ROI have varied over the period 2000 to 2008 (Table 11.2.19.1-4). North Las Vegas grew at an annual rate of 8.3% during this period, with higher than average growth also experienced in Mesquite (7.3%), Enoch (4.9%), and Henderson (4.7%). Las Vegas (2.1%), Brian Head (0.8%),,Caliente (0.7%) and others experienced a lower growth rate between 2000 and 2008, while Boulder City (0.0%), experienced a static growth rate during this period.

11.2.19.1.4 ROI Urban Income

Median household incomes vary across urban areas in the ROI. Of the four cities for which data are available for 2006 to 2008, Henderson ($67,886) and North Las Vegas ($60,506) had median incomes in 2006 to 2008 that were higher than the average for Nevada ($56,348) and Utah ($56,484), while median incomes in Las Vegas ($55,113) and Cedar City ($41,318) were slightly lower than both state averages (Table 11.2.19.1-4).

TABLE 11.2.19.1-3 ROI Unemployment Rates for the Proposed Delamar Valley SEZ (%)

Location	1999–2008	2008	2009[a]
Clark County, Nevada	5.0	6.6	11.1
Lincoln County, Nevada	5.2	5.4	8.0
Iron County, Utah	4.1	4.2	6.4
ROI	5.0	6.5	11.0
Nevada	5.0	6.7	11.0
Utah	4.1	3.4	5.2

[a] Rates for 2009 are the average for January through November.

Sources: U.S. Department of Labor (2009a–c).

TABLE 11.2.19.1-4 ROI Urban Population and Income for the Proposed Delamar Valley 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]
Boulder City, Nevada	14,966	14,954	0.0	65,049	NA[b]	NA
Brian Head, Utah	118	126	0.8	56,732	NA	NA
Caliente, Nevada	1,123	1,191	0.7	33,260	NA	NA
Cedar City, Nevada	20,527	28,439	4.2	41,719	41,318	–0.1
Enoch, Utaj	3,467	5,076	4.9	48,112	NA	NA
Henderson, Nevada	175,381	253,693	4.7	72,035	67,886	–0.7
Kanarraville, Utah	311	314	0.1	44,258	NA	NA
Las Vegas, Nevada	478,434	562,849	2.1	56,739	55,113	–0.3
Mesquite, Utah	9,389	16,528	7.3	52,005	NA	NA
North Las Vegas, Nevada	115,488	217,975	8.3	56,299	60,506	0.2
Paragonah, Utah	470	477	0.2	43,721	NA	NA
Parowan, Utah	2,565	2,606	0.2	41,749	NA	NA

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

[b] NA = data not available.

Sources: U.S. Bureau of the Census (2009b–d).

Growth rates between 1999 and 2006 to 2008 were small in North Las Vegas (0.2%), and negative in Henderson (–0.7%), Las Vegas (–0.3%), and Cedar City (–0.1%). The average median household income growth rate as a whole over this period was –0.2% for Nevada, and –0.5% in Utah.

11.2.19.1.5 ROI Population

Table 11.2.19.1-5 presents recent and projected populations in the ROI and for the two states as a whole. Population in the ROI stood at 1,927,930 in 2008, having grown at an average annual rate of 4.0% since 2000. Growth rates for ROI were higher than those in Nevada (3.4%) over the same period.

Both counties in the ROI experienced growth in population between 2000 and 2008; population in Clark County grew at an annual rate of 4.0%, while population grew by 3.4% in Iron County and 1.4% in Lincoln County. The ROI population is expected to increase to 2,782,449 by 2021 and to 2,865,746 by 2023.

11.2.19.1.6 ROI Income

Total personal income in the ROI stood at $75.2 billion in 2007 and has grown at an annual average rate of 4.9% over the period 1998 to 2007 (Table 11.2.19.1-6). Per-capita income also rose over the same period at a rate of 1.0%, increasing from $36,099 to $39,847. Per-capita incomes were higher in Clark County ($40,307) than in Lincoln County ($26,858) and Iron County ($21,922) in 2007. Growth rates in total personal income have been higher in Clark County than in Iron County and Lincoln County. Personal income growth rates in the ROI were

TABLE 11.2.19.1-5 ROI Population for the Proposed Delamar Valley SEZ

Location	2000	2008	Average Annual Growth Rate, 2000–2008 (%)	2021	2023
Clark County, Nevada	1,375,765	1,879,093	4.0	2,710,303	2,791,161
Lincoln County, Nevada	4,165	4,643	1.4	5,350	5,412
Iron County, Utah	33,779	44,194	3.4	66,796	69,173
ROI	1,413,709	1,927,930	4.0	2,782,449	2,865,746
Nevada	1,998,257	2,615,772	3.4	3,675,890	3,779,745
Utah	2,233,169	2,727,343	2.5	3,546,228	3,666,248

Sources: U.S. Bureau of the Census (2009e,f); Nevada State Demographers Office (2008).

TABLE 11.2.19.1-6 ROI Personal Income for the Proposed Delamar Valley SEZ

Location	1998	2007	Average Annual Growth Rate, 1998–2007 (%)
Clark County, Nevada			
Total income[a]	45.7	74.1	5.0
Per-capita income	36,509	40,307	1.0
Lincoln County, Nevada			
Total income[a]	0.1	0.1	0.7
Per-capita income	24,711	24,121	-0.2
Iron County, Utah			
Total income[a]	0.7	0.9	3.5
Per-capita income	21,352	21,922	0.3
ROI			
Total income[a]	46.5	75.2	4.9
Per-capita income	36,099	39,847	1.0
Nevada			
Total income[a]	68.9	105.3	4.3
Per-capita income	37,188	41,022	1.0
Utah			
Total income[a]	61.9	82.4	2.9
Per-capita income	28,567	31,003	0.8

[a] Unless indicated otherwise, values are reported in $ billion 2008.

Sources: U.S. Department of Commerce (2009); U.S. Bureau of Census (2009e,f).

higher than the rate for Nevada (4.3%) and Utah (2.9%), but per-capita income growth rates in Clark County were the same as, while rates in Lincoln County and Iron County were lower than in Nevada as a whole (1.0%) and Utah (0.8%) as a whole.

Median household income in 2006 to 2008 varied from $41,173 in Lincoln County to $42,687 in Iron County and $56,954 in Clark County (U.S. Bureau of the Census 2009d).

11.2.19.1.7 ROI Housing

In 2007, more than 774,400 housing units were located in the three ROI counties, with about 97% of these located in Clark County (Table 11.2.19.1-7). Owner-occupied units compose approximately 60% of the occupied units in the three counties, with rental housing making up 40% of the total. Vacancy rates in 2007 were 29.3% in Lincoln County, 23.4% in Iron County, and 12.2% in Clark County; with an overall vacancy rate of 12.5% in the ROI, there were 97,010 vacant housing units in the ROI in 2007, of which 39,291 are estimated to be rental units that would be available to construction workers. There were 10,707 units in seasonal, recreational, or occasional use in the ROI at the time of the 2000 Census, with 1.5% of housing units in Clark County, 14.6% in Iron County, and 14.0% in Lincoln County used for seasonal or recreational purposes.

Housing stock in the ROI as a whole grew at an annual rate of 4.3% over the period 2000 to 2007, with 198,818 new units added to the existing housing stock (Table 11.2.19.1-7).

The median value of owner-occupied housing in 2000 to 2008 varied between $80,300 in Lincoln County, $112,000 in Iron County, and $139,500 in Clark County (U.S. Bureau of the Census 2009g).

11.2.19.1.8 ROI Local Government Organizations

The various local and county government organizations in the ROI are listed in Table 11.2.19.1-8. In addition, three Tribal governments are located in the ROI, with members of other Tribal groups located in the county, but whose Tribal governments are located in adjacent counties or states.

11.2.19.1.9 ROI Community and Social Services

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

Schools

In 2007, the three-county ROI had a total of 347 public and private elementary, middle, and high schools (NCES 2009). Table 11.2.19.1-9 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 Iron County schools (21.2) is higher than that in Clark County (19.0) and Lincoln County schools (13.3), while the level of service is much higher in Lincoln County (18.2) than elsewhere in the ROI, where there are fewer teachers per 1,000 population (Iron County 9.3, Clark County 8.7).

TABLE 11.2.19.1-7 ROI Housing Characteristics for the Proposed Delamar Valley SEZ

Parameter	2000	2007[a]
Clark County, Nevada		
Owner-occupied	302,834	393,453
Rental	209,419	268,572
Vacant units	47,546	92,144
Seasonal and recreational use	8,416	NA
Total units	559,799	754,169
Lincoln County, Nevada		
Owner-occupied	1,156	1,204
Rental	384	400
Vacant units	638	664
Seasonal and recreational use	305	NA
Total units	2,178	2,268
Iron County, Utah		
Owner-occupied	7,040	8,387
Rental	3,587	5,387
Vacant units	2,991	4,202
Seasonal and recreational use	1,986	NA
Total units	13,618	17,976
ROI		
Owner-occupied	311,030	403,044
Rental	213,390	274,359
Vacant units	51,175	97,010
Seasonal and recreational use	10,707	NA
Total units	575,595	774,413

[a] NA = data not available.

Sources: U.S. Bureau of the Census (2009h-j).

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TABLE 11.2.19.1-8 ROI Local Government Organizations and Social Institutions in the Proposed Delamar Valley SEZ

Governments	
City	
Boulder City, Nevada	Kanaraville, Utah
Brian Head, Utah	Las Vegas, Nevada
Caliente, Nevada	Mesquite, Utah
Cedar City, Nevada	North Las Vegas
Enoch, Utah	Paragonah, Utah
Henderson,. Nevada	Parowan, Utah
County	
Clark County, Nevada	Iron County, Utah
Lincoln County, Nevada	
Tribal	
Las Vegas Tribe of Paiute Indians of the Las Vegas Indian Colony, Nevada	
Moapa Band of Paiute Indians of the Moapa River Indian Reservation, Nevada	
Paiute Indian Tribe of Utah	

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

TABLE 11.2.19.1-9 ROI School District Data for the Proposed Delamar Valley SEZ, 2007

Location	Number of Students	Number of Teachers	Student-Teacher Ratio	Level of Service[a]
Clark County, Nevada	303,448	15,930	19.0	8.7
Lincoln County, Nevada	1,074	81	13.3	18.2
Iron County, Utah	8,522	402	21.2	9.3
ROI	313,044	16,413	19.1	8.7

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

Source: NCES (2009).

Health Care

The total number of physicians (4,220) and the number of physicians per 1,000 population (2.3) in Clark County is higher than in Iron County (55, 1.3) and in Lincoln County (2, 0.4) (Table 11.2.19.1-10).

Public Safety

Several state, county, and local police departments provide law enforcement in the ROI (Table 11.2.19.1-11). Lincoln County has 26 officers and would provide law enforcement services to the SEZ; there are 3,214 officers in Clark County and 31 officers in Iron County. Levels of service of police protection per 1,000 population are 5.8 in Lincoln County, 1.7 in Clark County, and 0.7 in Iron County. Currently, there are 1,000 professional firefighters in the ROI (Table 11.2.19.1-11).

11.2.19.1.10 ROI Social Structure and Social Change

Community social structures and other forms of social organization within the ROI are related to various factors, including historical development, major economic activities and sources of employment, income levels, race and ethnicity, and forms of local political organization. Although an analysis of the character of community social structures is beyond the scope of the current programmatic analysis, project-level NEPA analyses would include a description of ROI social structures, contributing factors, their uniqueness, and consequently, the susceptibility of local communities to various forms of social disruption and social change.

Various energy development studies have suggested that once the annual growth in population is between 5 and 15% in smaller rural communities, alcoholism, depression, suicide, social conflict, divorce, and delinquency would increase and levels of community satisfaction

TABLE 11.2.19.1-10 Physicians in the Proposed Delamar Valley SEZ ROI, 2007

Location	Number of Primary Care Physicians	Level of Service[a]
Clark County, Nevada	4,220	2.3
Lincoln County, Nevada	2	0.4
Iron County, Utah	55	1.3
ROI	4,277	2.3

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

Source: AMA (2009).

TABLE 11.2.19.1-11 Public Safety Employment in the Proposed Delamar Valley SEZ ROI

Location	Number of Police Officers[a]	Level of Service[b]	Number of Firefighters[c]	Level of Service
Clark County, Nevada	3,214	1.7	991	0.5
Lincoln County, Nevada	26	5.8	1	0.2
Iron County, Utah	31	0.7	8	0.2
ROI	3,271	1.7	1,000	0.5

[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).

would deteriorate (BLM 1980, 1983, 1996). Data on violent crime and property crime rates and on alcoholism and illicit drug use, mental health, and divorce, which might be used as indicators of social change, are presented in Tables 11.2.19.1-12 and 11.2.19-1.13, respectively.

There is some variation in the level of crime across the ROI, with higher rates of violent crime in Clark County (8.0 per 1,000 population) than in Lincoln County (1.3) and Iron County (1.2) (Table 11.2.19.1-12). Property-related crime rates are also higher in Clark County (34.5) than in Iron County (23.7) and Lincoln County (7.3); overall crime rates in Clark County (42.5) were higher than in Iron County (24.9) and Lincoln County (8.6).

Other measures of social change—alcoholism, illicit drug use, and mental health—are not available at the county level and thus are presented for the SAHMSA region in which the ROI is located. There is slight variation across the two regions in which the three counties are located; rates for alcoholism and mental health are slightly higher in the region in which Clark County is located (Table 11.2.19.1-13).

11.2.19.1.11 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 11.2.5.

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

TABLE 11.2.19.1-12 County and ROI Crime Rates for the Proposed Delamar Valley SEZ[a]

	Violent Crime[b]		Property Crime[c]		All Crime	
	Offenses	Rate	Offenses	Rate	Offenses	Rate
Clark County, Nevada	15,505	8.0	66,905	34.5	82,410	42.5
Lincoln County, Nevada	6	1.3	34	7.3	40	8.6
Iron County, Utah	56	1.2	1,085	23.7	1,141	24.9
ROI	15,567	8.1	68,024	35.3	83,591	43.4

[a] Rates are the number of crimes per 1,000 population.

[b] Violent crime includes murder and non-negligent manslaughter, forcible rape, robbery, and aggravated assault.

[c] Property crime includes burglary, larceny, theft, motor vehicle theft, and arson.

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

TABLE 11.2.19.1-13 Alcoholism, Drug Use, Mental Health, and Divorce in the Proposed Delamar Valley SEZ ROI[a]

Geographic Area	Alcoholism	Illicit Drug Use	Mental Health[b]	Divorce[c]
Nevada Clark	8.2	2.7	10.5	–[d]
Nevada Rural (includes Lincoln County)	8.0	2.7	9.5	–
Utah Southwest Region (includes Iron County)	5.6	2.5	11.3	–
Nevada				6.5
Utah				3.6

[a] Data for alcoholism and drug use represent percentage of the population over 12 years of age with dependence on 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 2007.

[d] A dash indicates date not available.

Sources: SAMHSA (2009); CDC (2009).

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, with some activity occurring on private land (e.g., dude ranches, golf courses, bowling alleys, and movie theaters). Expenditures associated with recreational activities form an important part of the economy of the ROI. In 2007, 240,631 people were employed in the ROI in the various sectors identified as recreation, constituting 26.1% of total ROI employment (Table 11.2.19.1-14). Recreation spending also produced almost $9,455 million in income in the ROI in 2007. The primary sources of recreation-related employment were hotels and lodging places and eating and drinking places.

11.2.19.2 Impacts

The following analysis begins with a description of the common impacts of solar development, including common impacts on recreation and on social change. These impacts would occur regardless of the solar technology developed in the SEZ. The impacts of facilities employing various solar energy technologies are analyzed in detail in subsequent sections.

TABLE 11.2.19.1-14 Recreation Sector Activity in the Proposed Delamar Valley SEZ ROI, 2007

ROI	Employment	Income ($ million)
Amusement and recreation services	4,681	147.6
Automotive rental	2,909	118.3
Eating and drinking places	105,589	3,230.5
Hotels and lodging places	116,751	5,620.2
Museums and historic sites	285	17.8
Recreational vehicle parks and campsites	352	10.1
Scenic tours	5,448	221.7
Sporting goods retailers	4,436	88.4
Total ROI	240,631	9,454.7

Source: MIG, Inc. (2010).

11.2.19.2.1 Common Impacts

Construction and operation of a solar energy facility at the proposed Delamar Valley SEZ would produce direct and indirect economic impacts. Direct impacts would occur as a result of expenditures on wages and salaries, procurement of goods and services required for project construction and operation, and the collection of state sales and income taxes. Indirect impacts would occur as project wages and salaries, procurement expenditures, and tax revenues subsequently circulate through the economy of each state, thereby creating additional employment, income, and tax revenues. Facility construction and operation would also require in-migration of workers and their families into the ROI surrounding the site, which would affect population, rental housing, health service employment, and public safety employment. Socioeconomic impacts common to all utility-scale solar energy facilities are discussed in detail in Section 5.17. These impacts will be minimized through the implementation of programmatic design features described in Appendix A, Section A.2.2.

Recreation Impacts

Estimating the impact of solar facilities on recreation is problematic because it is not clear how solar development in the SEZ would affect recreational visitation and nonmarket values (i.e., the value of recreational resources for potential or future visits; see Section 5.17.1.2.3). While it is clear that some land in the ROI would no longer be accessible for recreation, the majority of popular recreational locations would be precluded from solar development. It is also possible that solar facilities in the ROI would be visible from popular recreation locations, and that construction workers residing temporarily in the ROI would occupy 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 5.17.1.1.4). While some degree of social disruption is likely to accompany large-scale in-migration during the boom phase, there is insufficient evidence to predict the extent to which specific communities are likely to be affected, which population groups within each community are likely to be most affected, and the extent to which social disruption is likely to persist beyond the end of the boom period (Smith et al. 2001). Accordingly, because of the lack of adequate social baseline data, it has been suggested that social disruption is likely to occur once an arbitrary population growth rate associated with solar energy development projects has been reached, with an annual rate of between 5 and 10% growth in population assumed to result in a breakdown in social structures, with a consequent increase in alcoholism, depression, suicide, social conflict, divorce, and delinquency, and deterioration in levels of community satisfaction (BLM 1980, 1983, 1996).

In overall terms, the in-migration of workers and their families into the ROI would represent an increase of 0.1% in regional population during construction of the trough technology, with smaller increases for the power tower, dish engine and PV technologies, and during the operation of each technology. While it is possible that some construction and operations workers will choose to locate in communities closer to the SEZ, because of the lack of available housing to accommodate all in-migrating workers and families in smaller rural communities in the ROI and insufficient range of housing choices to suit all solar occupations, many workers are likely to commute to the SEZ from larger communities elsewhere in the ROI, thereby reducing the potential impact of solar projects on social change. Regardless of the pace of population growth associated with the commercial development of solar resources and the likely residential location of in-migrating workers and families in communities some distance from the SEZ itself, the number of new residents from outside the ROI is likely to lead to some demographic and social change in small rural communities in the ROI. Communities hosting solar facilities 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 95 jobs, and $1.3 million in income in the ROI in 2007 (MIG, Inc. 2010). The construction and operation of solar facilities in the Delamar Valley SEZ could result in a decline in the amount of land available for livestock grazing, resulting in total (direct plus indirect) impacts of the loss of four jobs and $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 $1,036 annually on land dedicated to solar facilities in the SEZ.

Access Road Impacts

The impacts of construction of an access road connecting the Delamar Valley SEZ could include the addition of 169 jobs in the ROI (including direct and indirect impacts) in the peak year of construction (Table 11.2.19.2-1). Construction activities in the peak year would constitute less than 1% of total ROI employment. Access road construction would also produce $6.7 million in ROI income. Direct sales taxes would each be $0.2 million; direct income taxes in Utah would be less than $0.1 million.

Total operations (maintenance) employment 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 11.2.19.2-1) and would also produce less than $0.1 million in income. Direct sales taxes would be less than $0.1 million in the first year, with direct income taxes of less than $0.1 million.

TABLE 11.2.19.2-1 ROI Socioeconomic Impacts of an Access Road Connecting the Proposed Delamar Valley SEZ[a]

Parameter	Construction	Operations
Employment (no.)		
Direct	97	<1
Total	169	<1
Income[b]		
Total	6.7	<0.1
Direct state taxes[b]		
Sales	0.2	<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 8 mi (13 km) of access road is required for the Delamar Valley SEZ. Construction impacts are assessed for the peak year of construction. Although gravel surfacing might be used, the analysis assumes the access road will be paved.

[b] Unless indicated otherwise, values are reported in $ million 2008. There is currently no individual income tax in Nevada; data provided are for workers who would reside Utah.

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

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 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.

11.2.19.2.2 Technology-Specific Impacts

The economic impacts of solar energy development in the proposed SEZ were measured in terms of employment, income, state tax revenues (sales and income), population in-migration, housing, and community service employment (education, health, and public safety). More information on the data and methods used in the analysis are 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) would be required for solar trough technologies. Impacts of multiple facilities employing a given technology at each SEZ were assumed to be the same as impacts for a single facility with the same total capacity. Construction impacts were assessed for a representative peak year of construction, assumed to be 2021 for each technology. Construction impacts assumed that a maximum of two projects could be constructed within a given year, with a corresponding maximum land disturbance of up to 6,000 acres (24 km^2). For operations impacts, a representative first year of operations was assumed to be 2023 for trough and power tower and 2022 for the minimum facility size for dish engine and PV, and 2023 was assumed for the maximum facility size for these technologies. The years of construction and operations were selected as representative of the entire 20-year study period because they are the approximate midpoint; construction and operations could begin earlier.

Solar Trough

Construction. Total construction employment impacts in the ROI (including direct and indirect impacts) from the use of solar trough technologies would be up to 6,048 jobs (Table 11.2.19.2-2). Construction activities would constitute 0.4% of total ROI employment. A solar facility would also produce $369.5 million in income. Direct sales taxes would be $2.4 million; direct income taxes in Utah would be $0.2 million.

Given the scale of construction activities and the likelihood of local worker availability in the required occupational categories, construction of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 1,486 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility

TABLE 11.2.19.2-2 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed Delamar Valley SEZ with Trough Facilities[a]

Parameter	Maximum Annual Construction Impacts	Operations Impacts
Employment (no.)		
Direct	3,488	577
Total	6,048	890
Income[b]		
Total	369.5	33.6
Direct state taxes[b]		
Sales	2.4	0.3
Income	0.2	<0.1
BLM payments		
Acreage-related fee	NA	1.0
Capacity fee[d]	NA	17.4
In-migrants (no.)	1,486	74
Vacant housing[c] (no.)	743	66
Local community service employment		
Teachers (no.)	13	1
Physicians (no.)	3	0
Public safety (no.)	3	0

[a] Construction impacts are based on the development at the site in a single year; it was assumed that several facilities with a combined capacity of up to 1,200 MW (corresponding to 6,000 acres [24 km^2] of land disturbance) could be built. Operations impacts were based on full build-out of the site, producing a total output of 2,648 MW.

[b] Unless indicated otherwise, values are reported in $ million 2008. There is currently no individual income tax in Nevada; data provided are for workers who would reside Utah.

[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 2010h), 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.

construction on the number of vacant rental housing units would not be expected to be large, with 743 rental units expected to be occupied in the ROI. This occupancy rate would represent 1.3% 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 employment (education, health, and public safety). An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, 13 new teachers, 3 physicians, and 3 public safety employees (career firefighters and uniformed police officers) would be required in the ROI. These increases would represent 0.1% of total ROI employment expected in these occupations.

Operations. Total operations employment impacts in the ROI (including direct and indirect impacts) of a build-out using solar trough technologies would be 890 jobs (Table 11.2.19.2-2). Such a solar facility would also produce $33.6 million in income. Direct sales taxes would be $0.3 million; direct income taxes in Utah would be less than $0.1 million. Based on fees established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010h), acreage–related fees would be $1.0 million, and solar generating capacity fees, at least $17.4 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 74 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility operation on the number of vacant owner-occupied housing units would not be expected to be large, with 66 owner-occupied units expected to be occupied in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service (health, education, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the provision of these services in the ROI. Accordingly, one new teacher would be required in the ROI.

Power Tower

Construction. Total construction employment impacts in the ROI (including direct and indirect impacts) from the use of power tower technologies would be up to 2,409 jobs (Table 11.2.19.2-3). Construction activities would constitute 0.2 % of total ROI employment. Such a solar facility would also produce $147.2 million in income. Direct sales taxes would be $0.9 million; direct income taxes in Utah would be $0.1 million.

Given the scale of construction activities and the likelihood of local worker availability in the required occupational categories, construction of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with

TABLE 11.2.19.2-3 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed Delamar Valley SEZ with Power Tower Facilities[a]

Parameter	Maximum Annual Construction Impacts	Operations Impacts
Employment (no.)		
Direct	1,389	298
Total	2,409	405
Income[b]		
Total	147.2	14.0
Direct state taxes[b]		
Sales	0.9	<0.1
Income	0.1	<0.1
BLM payments		
Acreage-related fee	NA	1.0
Capacity fee[d]	NA	9.7
In-migrants (no.)	592	38
Vacant housing[c] (no.)	296	34
Local community service employment		
Teachers (no.)	5	0
Physicians (no.)	1	0
Public safety (no.)	1	0

[a] Construction impacts are based on the development at the site in a single year; it was assumed that several facilities with a combined capacity of up to 667 MW (corresponding to 6,000 acres [24 km^2] of land disturbance) could be built. Operations impacts were based on full build-out of the site, producing a total output of 1,471 MW.

[b] Unless indicated otherwise, values are reported in $ million 2008. There is currently no individual income tax in Nevada; data provided are for workers who would reside in Utah.

[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 2010h), 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.

592 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility construction on the number of vacant rental housing units would not be expected to be large, with 296 rental units expected to be occupied in the ROI. This occupancy rate would represent 0.5% 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, 5 new teachers, 1 physician, and 1 public safety employee would be required in the ROI. These increases would represent less than 0.1% of total ROI employment expected in these occupations.

Operations. Total operations employment impacts in the ROI (including direct and indirect impacts) of a build-out using power tower technologies would be 405 jobs (Table 11.2.19.2-3). Such a solar facility would also produce $14.0 million in income. Direct sales taxes would be less than $0.1 million; direct income taxes in Utah would be less than $0.1 million. Based on fees established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010h), acreage–related fees would be $1.0 million, and solar generating capacity fees, at least $9.7 million.

Given the likelihood of local worker availability in the required occupational categories, operation of a solar facility means that some in-migration of workers and their families from outside the ROI would be required, with 38 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility operation on the number of vacant owner-occupied housing units would not be expected to be large, with 34 owner-occupied units expected to be required in the ROI.

No new community service employment would be required to meet existing levels of service in the ROI.

Dish Engine

Construction. Total construction employment impacts in the ROI (including direct and indirect impacts) from the use of dish engine technologies would be up to 979 jobs (Table 11.2.19.2-4). Construction activities would constitute 0.1% of total ROI employment. Such a solar facility would also produce $59.8 million in income. Direct sales taxes would be $0.4 million; direct income taxes in Utah would be less than $0.1 million.

TABLE 11.2.19.2-4 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed Delamar Valley SEZ with Dish Engine Facilities[a]

Parameter	Maximum Annual Construction Impacts	Operations Impacts
Employment (no.)		
Direct	565	290
Total	979	394
Income[b]		
Total	59.8	13.6
Direct state taxes[b]		
Sales	0.4	<0.1
Income	<0.1	<0.1
BLM payments		
Acreage-related fee	NA	1.0
Capacity fee[d]	NA	9.7
In-migrants (no.)	241	37
Vacant housing[c] (no.)	120	33
Local community service employment		
Teachers (no.)	2	0
Physicians (no.)	1	0
Public safety (no.)	1	0

[a] Construction impacts are based on the development at the site in a single year; it was assumed that several facilities with a combined capacity of up to 667 MW (corresponding to 6,000 acres [24 km^2] of land disturbance) could be built. Operations impacts were based on full build-out of the site, producing a total output of 1,471 MW.

[b] Unless indicated otherwise, values are reported in $ million 2008. There is currently no individual income tax in Nevada; data provided are for workers that would reside in Utah.

[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 2010h), 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.

Given the scale of construction activities and the likelihood of local worker availability in the required occupational categories, construction of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 241 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility construction on the number of vacant rental housing units would not be expected to be large, with 120 rental units expected to be occupied in the ROI. This occupancy rate would represent 0.2% of the vacant rental units expected to be available in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service (education, health, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, two new teachers, one physician, and one public safety employee would be required in the ROI. These increases would represent less than 0.1% of total ROI employment expected in these occupations.

Operations. Total operations employment impacts in the ROI (including direct and indirect impacts) of a build-out using dish engine technologies would be 394 jobs (Table 11.2.19.2-4). Such a solar facility would also produce $13.6 million in income. Direct sales taxes would be less than $0.1 million; direct income taxes in Utah would be less than $0.1 million. Based on fees established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010h), acreage–related fees would be $1.0 million, and solar generating capacity fees, at least $9.7 million.

Given the likelihood of local worker availability in the required occupational categories, operation of a dish engine solar facility means that some in-migration of workers and their families from outside the ROI would be required, with 37 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility operation on the number of vacant owner-occupied housing units would not be expected to be large, with 33 owner-occupied units expected to be required in the ROI.

No new community service employment would be required to meet existing levels of service in the ROI.

Photovoltaic

Construction. Total construction employment impacts in the ROI (including direct and indirect impacts) from the use of PV technologies would be up to 457 jobs (Table 11.2.19.2-5). Construction activities would constitute less than 0.1 % of total ROI employment. Such solar

TABLE 11.2.19.2-5 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed Delamar Valley SEZ with PV Facilities[a]

Parameter	Maximum Annual Construction Impacts	Operations Impacts
Employment (no.)		
Direct	263	29
Total	457	39
Income[b]		
Total	27.9	1.4
Direct state taxes[b]		
Sales	0.2	<0.1
Income	<0.1	<0.1
BLM payments		
Acreage-related fee	NA	1.0
Capacity fee[d]	NA	7.7
In-migrants (no.)	112	4
Vacant housing[c] (no.)	56	3
Local community service employment		
Teachers (no.)	1	0
Physicians (no.)	0	0
Public safety (no.)	0	0

[a] Construction impacts are based on the development at the site in a single year; it was assumed that several facilities with a combined capacity of up to 667 MW (corresponding to 6,000 acres [24 km^2] of land disturbance) could be built. Operations impacts were based on full build-out of the site, producing a total output of 1,471 MW.

[b] Unless indicated otherwise, values are reported in $ million 2008. There is currently no individual income tax in Nevada; data provided are for workers who would reside in Utah.

[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 2010h) , assuming full build-out of the site.

development would also produce $27.9 million in income. Direct sales taxes would be $0.2 million; direct income taxes in Utah would be less than $0.1 million.

Given the scale of construction activities and the likelihood of local worker availability in the required occupational categories, construction of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 112 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility construction on the number of vacant rental housing units would not be expected to be large, with 56 rental units expected to be occupied in the ROI. This occupancy rate would represent 0.1% of the vacant rental units expected to be available in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service (education, health, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, one new teacher would be required in the ROI. This increase would represent less than 0.1% of total ROI employment expected in this occupation.

Operations. Total operations employment impacts in the ROI (including direct and indirect impacts) of a build-out using PV technologies would be 39 jobs (Table 11.2.19.2-5). Such a solar facility would also produce $1.4 million in income. Direct sales taxes would be less than $0.1 million; direct income taxes in Utah would be less than $0.1 million. Based on fees established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010h), acreage–related fees would be $1.0 million, and solar generating capacity fees, at least $7.7 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 four persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility operation on the number of vacant owner-occupied housing units would not be expected to be large, with three 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.

11.2.19.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features addressing socioeconomic impacts have been identified for the proposed Delamar Valley SEZ. Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program, would reduce the potential for socioeconomic impacts during all project phases.

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11.2.20 Environmental Justice

11.2.20.1 Affected Environment

Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," formally requires federal agencies to incorporate environmental justice as part of their missions (*Federal Register,* Volume 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 is conducted to determine whether construction and operation would produce impacts that are high and adverse; and (3) if impacts are high and adverse, a determination is made as to whether these impacts disproportionately affect minority and low-income populations.

Construction and operation of solar energy projects in the proposed SEZ could affect environmental justice if any adverse health and environmental impacts resulting from either phase of development are significantly high and if these impacts disproportionately affect minority and low-income populations. If the analysis determines that health and environmental impacts are not significant, there can be no disproportionate impacts on minority and low-income populations. In the event impacts are significant, disproportionality would be determined by comparing the proximity of any high and adverse impacts with the location of low-income and minority populations.

The analysis of environmental justice issues associated with the development of solar facilities considered impacts within the SEZ and 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 who 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.

This PEIS applies both criteria in using the Census data for census block groups, wherein consideration is given to the minority population that is both greater than 50% and 20 percentage points higher than in the state (the reference geographic unit).

- **Low-Income**. Individuals who fall below the poverty line. The poverty line takes into account family size and age of individuals in the family. In 1999, for example, the poverty line for a family of five with three children below the age of 18 was $19,882. For any given family below the poverty line, all family members are considered as being below the poverty line for the purposes of analysis (U.S. Bureau of the Census 2009l).

The data in Table 11.2.20.1-1 show the minority and low-income composition of the total population located in the proposed SEZ based on 2000 Census data and CEQ guidelines. Individuals identifying themselves as Hispanic or Latino are included in the table as a separate entry. However, because Hispanics can be of any race, this number also includes individuals identifying themselves as being part of one or more of the population groups listed in the table.

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 Nevada, 17.0% of the population is classified as minority, while 10.1% is classified as low-income. However, the number of minority individuals does not exceed 50% of the total population in the area, and the number of minority individuals does not exceed the state average by 20 percentage points or more; thus, in aggregate, there is no minority population in the SEZ area based on 2000 Census data and CEQ guidelines. The number of low-income individuals does not exceed the state average by 20 percentage points or more and does not exceed 50% of the total population in the area; thus, in aggregate, there are no low-income populations in the SEZ.

In the Utah portion of the 50-mi (80-km) radius, 9.3% of the population is classified as minority, while 17.0% is classified as low-income. The number of minority individuals does not exceed 50% of the total population in the area and the number of minority individuals does not exceed the state average by 20 percentage points or more; thus, in aggregate, there is no minority population in the SEZ area based on 2000 Census data and CEQ guidelines. The number of low-income individuals does not exceed the state average by 20 percentage points or more and does

TABLE 11.2.20.1-1 Minority and Low-Income Populations within the 50-mi (80-km) Radius Surrounding the Proposed Delamar Valley SEZ

Parameter	Nevada	Utah
Total population	12,838	5,101
White, non-Hispanic	10,659	4,625
Hispanic or Latino	1,353	242
Non-Hispanic or Latino minorities	826	234
One race	593	177
Black or African American	101	7
American Indian or Alaskan Native	393	149
Asian	51	11
Native Hawaiian or Other Pacific Islander	21	2
Some other race	27	8
Two or more races	233	57
Total minority	2,179	476
Low-income	1,295	865
Percentage minority	17.0	9.3
State percentage minority	17.2	15.9
Percentage low-income	10.1	17.0
State percentage low-income	10.5	9.4

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

not exceed 50% of the total population in the area; thus, in aggregate, there are no low-income populations in the SEZ.

Figures 11.2.20.1-1 and 11.2.20.1-2 show the locations of the low-income and minority population groups, respectively, within the 50-mi (80-km) radius around the boundary of the SEZ.

At the individual block group level there are low-income populations in one census block group, located in Iron County to the west of Cedar City, including the towns of Newcastle and Modena, which has a low-income population that is more than 20 percentage points higher than the state average. There are no other block groups exceeding the 20% threshold in the 50-mi (80-km) area, and there are no block groups with low-income or minority populations that exceed 50% of the total population in the block group, and the number of minority individuals does not exceed the state average by 20 percentage points or more at the individual block group level.

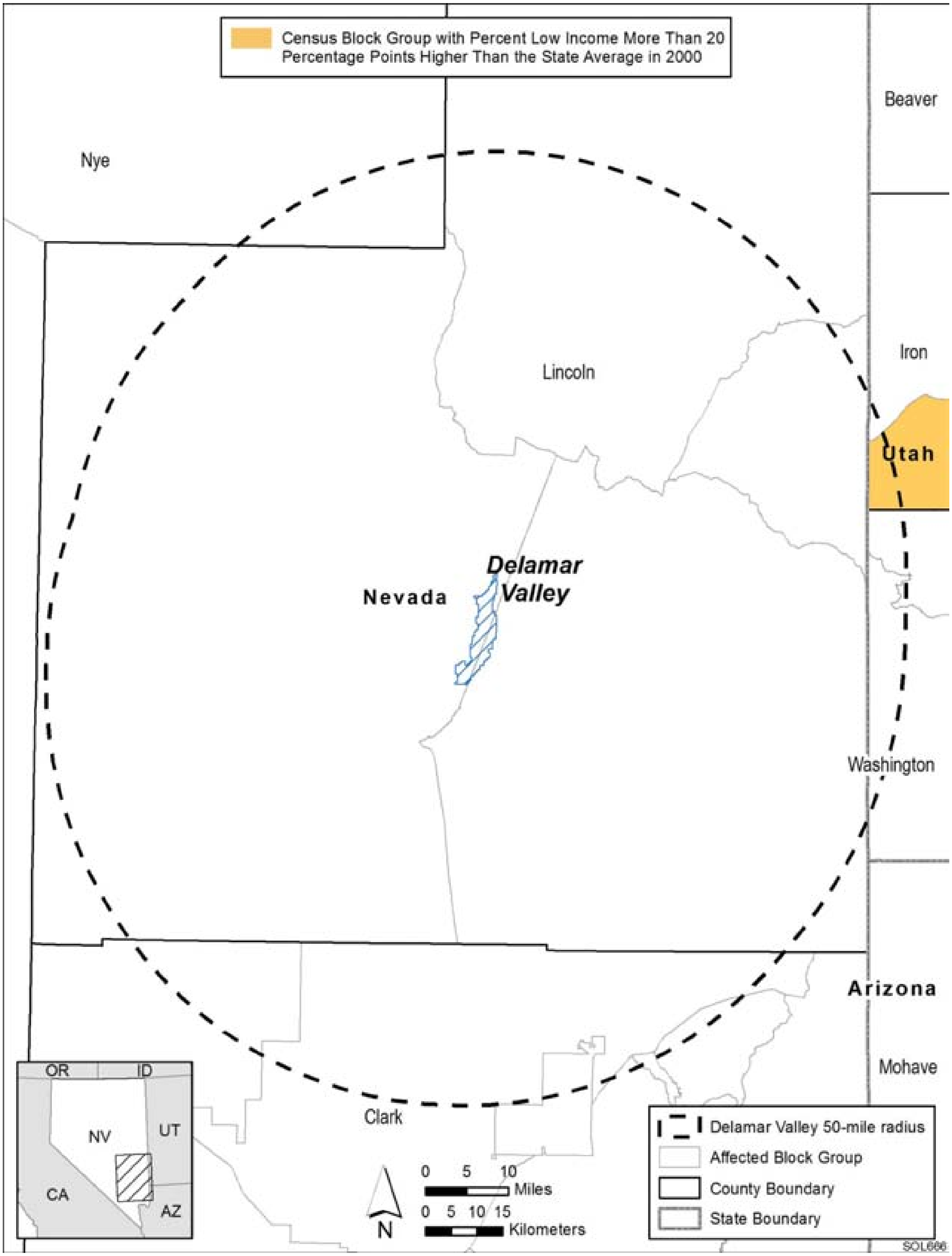

FIGURE 11.2.20.1-1 Low-Income Population Groups within the 50-mi (80-km) Radius Surrounding the Proposed Delamar Valley SEZ

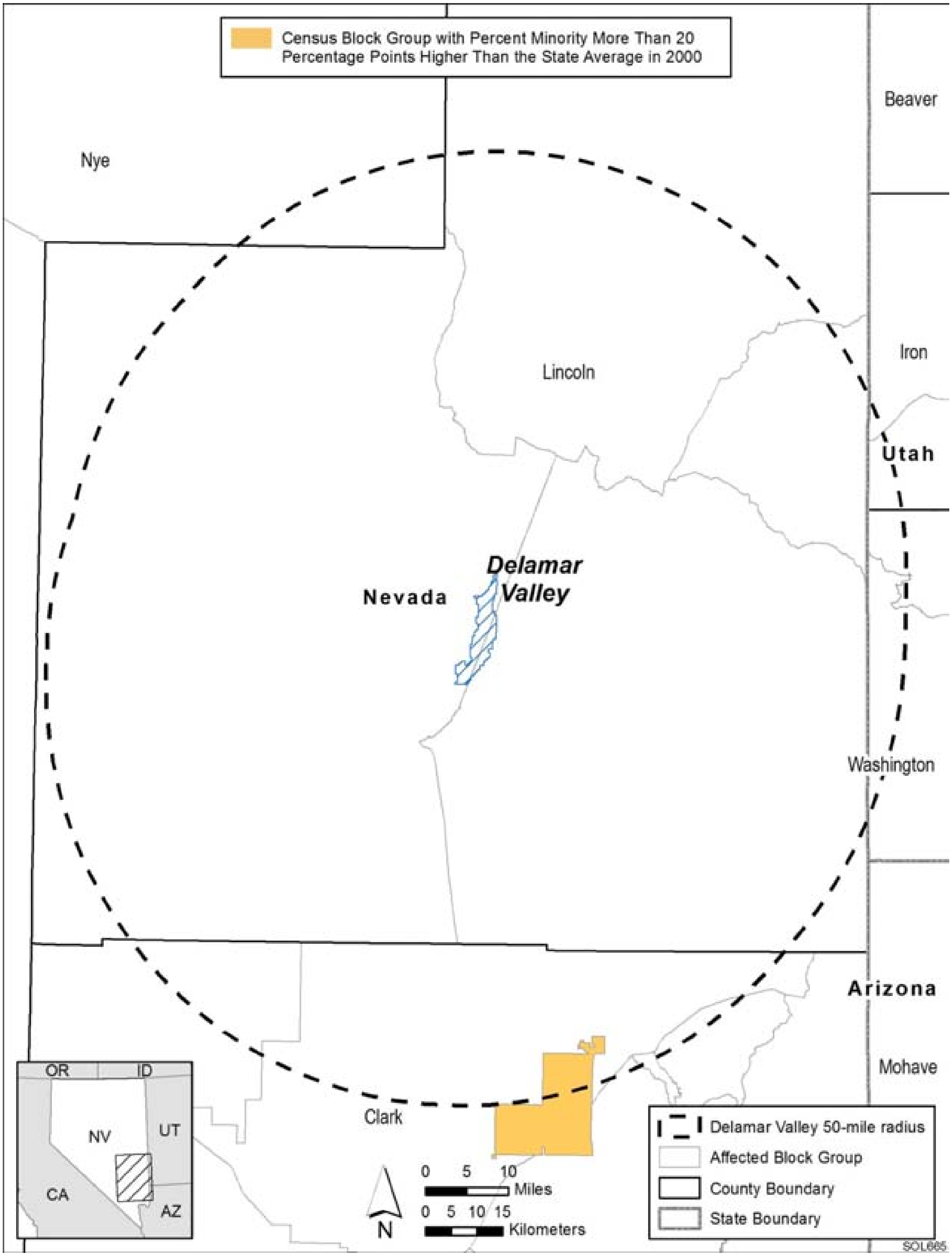

FIGURE 11.2.20.1-2 Minority Population Groups within the 50-mi (80-km) Radius Surrounding the Proposed Delamar Valley SEZ

A single block group with minority populations more than 20 percentage points higher than the state average is located to the northeast of Las Vegas, associated with the Moapa River Indian Reservation.

11.2.20.2 Impacts

Environmental justice concerns common to all utility-scale solar energy facilities are described in detail in Section 5.18. These impacts will be minimized through the implementation of the 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 facilities within the proposed Delamar Valley SEZ include noise and dust during the construction; noise and EMF effects associated with operations; 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 (Section 11.2.20.1) within the 50-mi (80-km) radius around the boundary of the SEZ; this means that any adverse impacts of solar projects could disproportionately affect minority populations. Because there are low-income populations within the 50-mi (80-km) radius, there could also be impacts on low-income populations.

11.2.20.3 SEZ-Specific Design Features and Design Feature Effectiveness

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

11.2.21 Transportation

The proposed Delamar Valley SEZ is accessible by road and rail. One U.S. highway serves the immediate area, and a major railroad is in the vicinity. A small airport with a dirt runway is nearby with major airport facilities farther away in Las Vegas. General transportation considerations and impacts are discussed in Sections 3.4 and 5.19, respectively.

11.2.21.1 Affected Environment

U.S. 93 runs north–south, approximately 8 to 14 mi (13 to 23 km) to the west of the proposed Delamar Valley SEZ and also east–west, approximately 8 mi (13 km) to the north of the SEZ, as shown in Figure 11.2.21.1-1. Approximately 16 to 21 mi (26 to 34 km) east of the SEZ, State Route 317 passes from the north to south, going south from Caliente to Elgin, an abandoned railroad town. The town of Alamo is west of the Delamar Valley SEZ on U.S. 93. The Las Vegas metropolitan area is approximately 90 mi (145 km) to the south of the SEZ along U.S. 93. Several local unimproved dirt roads cross the SEZ from U.S. 93. As listed in Table 11.2.21.1-1, U.S. 93 carries an average traffic volume of about 1,600 to 1,900 vehicles per day west of the SEZ and about 650 to 740 vehicles per day north of the SEZ (NV DOT 2010). State Route 317 carries less than 100 vehicles per day in the vicinity of the Delamar Valley SEZ (NV DOT 2010). OHV use in the SEZ and surrounding area has been designated as "Limited to travel on designated roads and trails" (BLM 2010c).

The UP Railroad serves the region. The main line passes through Las Vegas on its way between Los Angeles and Salt Lake City. The railroad passes west of the proposed Delamar Valley SEZ where it parallels State Route 317. The nearest rail access is in Caliente to the northeast of the SEZ.

The nearest public airport, owned by the BLM, is the Alamo Landing Field Airport. The airport is west of the SEZ off of U.S. 93 with two dirt runways, 2,500- and 5,000-ft (762- and 1,524-m) long, both in fair condition (FAA 2009) as listed in Table 11.2.21.1-2. The second closest public airport is the Lincoln County Airport, a small local airport about a 15-mi (24-km) drive to the north of Caliente in Panaca. The airport has one asphalt runway, 4,260-ft (1,408-m) long, in fair condition (FAA 2009). Alamo Landing Field Airport and Lincoln County Airport do not have any scheduled commercial passenger or freight service.

North Las Vegas Airport and McCarran International Airport provide the major public air services in the area. North Las Vegas Airport, a regional airport about a 95-mi (153-km) drive to the southwest of Alamo, does not have scheduled commercial passenger service but caters to smaller private and business aircraft (Clark County Department of Aviation 2010). In 2008, 22,643 and 23,950 passengers arrived at and departed from North Las Vegas Airport, respectively (BTS 2008). Farther to the south in Las Vegas, approximately a 102-mi (164-km) drive from Alamo, McCarran International Airport is served by all major U.S. airlines. In 2008, 20.43 million and 20.48 million passengers arrived at and departed from McCarran International Airport, respectively (BTS 2008). About 83.2 million lb (37.7 million kg) of freight departed and 117 million lb (53.2 million kg) arrived at McCarran in 2008 (BTS 2008).

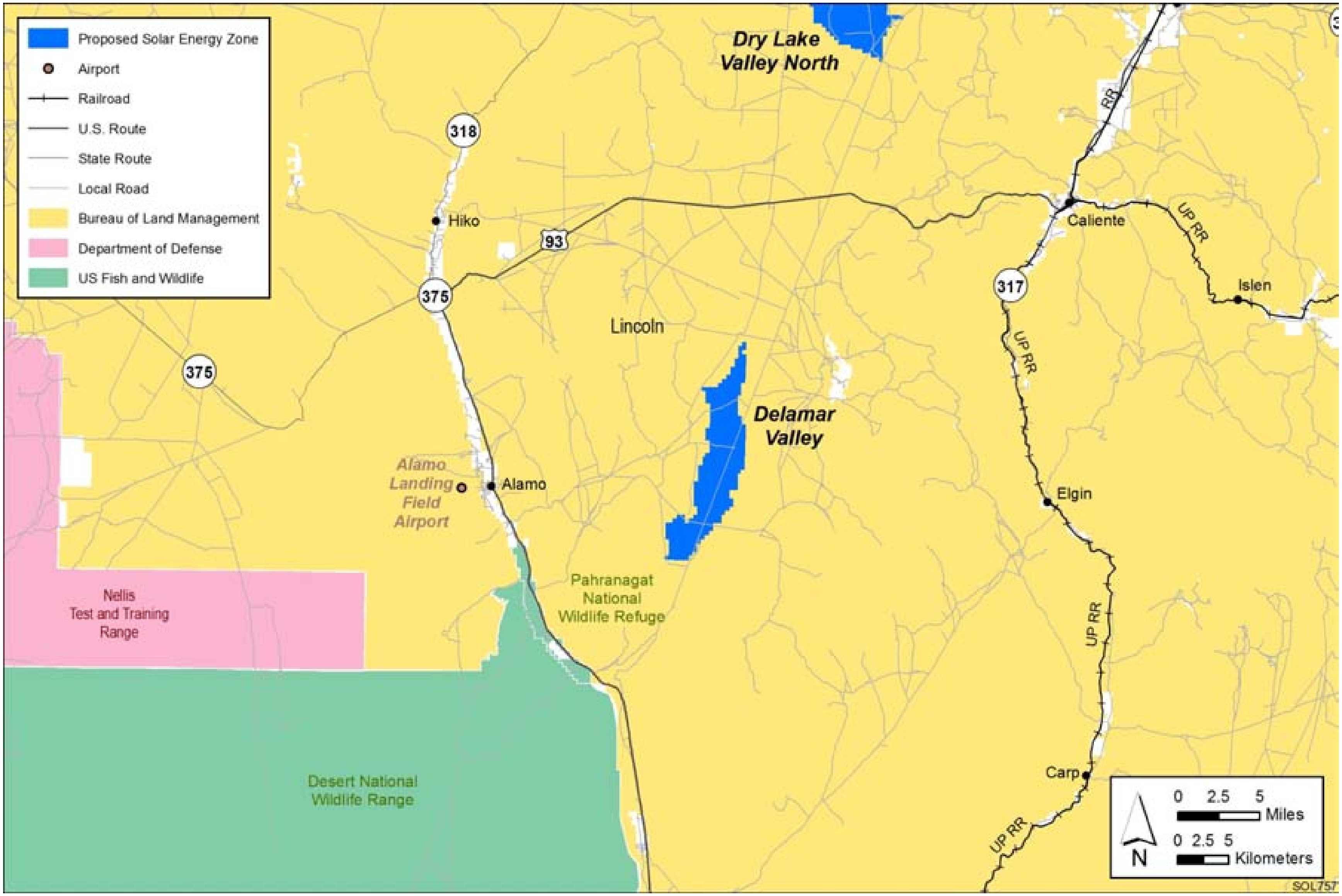

FIGURE 11.2.21.1-1 Local Transportation Network Serving the Proposed Delamar Valley SEZ

TABLE 11.2.21.1-1 AADT on Major Roads near the Proposed Delamar Valley SEZ for 2009

Road	General Direction	Location	AADT (vehicles)
U.S. 93	North–South	North of I-15 Junction (I-15 Exit 64)	2,300
		South of Alamo	1,900
		South of State Route 318	1,600
		North of State Route 375	650
		South of State Route 317 by Caliente	740
		North of Caliente	1,400
State Route 317	North–South	6 mi south of U.S. 93	80
		3 mi south of Elgin	30
State Route 318	North–South	West of junction with U.S. 93	1,100
		1.6 mi north of junction with State Route 375	1,200
State Route 375	East–West	West of junction with State Route 318	200

Source: NV DOT (2010).

Nellis Air Force Base, available only to military aircraft, lies closer to the proposed Delamar Valley SEZ than North Las Vegas Airport on the northwestern edge of the Las Vegas metropolitan area. Nellis Air Force Base is one of the largest fighter bases in the world and is involved in conducting advanced fighter training. Operations occur over the NTTR, which offers 4,700 mi^2 (12,173 km^2) of restricted land (U.S. Air Force 2010). Part of the eastern edge of the NTTR is approximately 18 mi (29 km) to the west–southwest of the southwestern portion of the SEZ.

11.2.21.2 Impacts

As discussed in Section 5.19, the primary transportation impacts are anticipated to be from commuting worker traffic. Single projects could involve up to 1,000 workers each day, with an additional 2,000 vehicle trips per day (maximum) or possibly 4,000 vehicle trips per day if two larger projects were to be developed at the same time. The volume of traffic on U.S. 93 to the west of the proposed Delamar Valley SEZ would represent an increase in traffic of about 100 or 200% for one or two projects, respectively, should all traffic access the SEZ in that area. Such traffic levels would also represent an increase of about 250 or 500% of the traffic currently encountered on the east–west portion of U.S. 93 to the north of the SEZ for one or two projects, respectively.

Because higher traffic volumes would be experienced during shift changes, traffic on U.S. 93 would experience minor slowdowns during these time periods in the area of exits in the vicinity of the SEZ where projects are located. Local road improvements would be necessary on

TABLE 11.2.21-2 Airports Open to the Public in the Vicinity of the Proposed Delamar Valley SEZ

			Runway 1[a]			Runway 2[a]		
Airport	Location	Owner/Operator	Length (ft [m])	Type	Condition	Length (ft [m])	Type	Condition
Alamo Landing Field	Directly east of the SEZ on U.S. 93	BLM	2,500 (762)	Dirt	Fair	5,000 (1,524)	Dirt	Fair
Lincoln County	Northeast of the SEZ in Panaca, a 70-mi (113-km) drive from Alamo	Lincoln County	4,620 (1,408)	Asphalt	Fair	NA[b]	NA	NA
North Las Vegas	Near I-15 in North Las Vegas, a 95-mi (34-km) drive from Alamo	Clark County	4,202 (1,281)	Asphalt	Good	5,000 (1,524)	NA	Good
			5,004 (1,525)	Asphalt	Good	NA	NA	NA
McCarran International	Off I-15 in Las Vegas, about 102 mi (164 km)	Clark County	8,985 (2,739)	Concrete	Good	9,775 (2,979)	Concrete	Good
			10,526 (3,208)	Asphalt	Good	14,510 (4,423)	Asphalt	Good
			6,196 (1,889)	Asphalt	Good	7,161 (2,183)	Asphalt	Good

a Source: FAA (2009).

b NA = not applicable.

any portion of U.S. 93 that might be developed so as not to overwhelm the local access roads near any site access point(s).

Solar development within the SEZ would affect public access along OHV routes designated open and available for public use. If there are any designated as open within the proposed SEZ, open routes crossing areas issued ROWs for solar facilities would be re-designated as closed (see Section 5.5.1 for more details on how routes coinciding with proposed solar facilities would be treated).

11.2.21.3 Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features have been identified related to impacts on transportation systems around the proposed Delamar Valley SEZ. The programmatic design features described 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 solar facilities within the SEZ, more specific access locations and local road improvements could be implemented

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11.2.22 Cumulative Impacts

The analysis presented in this section addresses the potential cumulative impacts in the vicinity of the proposed Delamar Valley SEZ in Lincoln County, Nevada. The CEQ guidelines for implementing NEPA define cumulative impacts as environmental impacts resulting from the incremental impacts of an action when added to other past, present, and reasonably foreseeable future actions (40 CFR 1508.7). The impacts of other actions are considered without regard to the agency (federal or nonfederal), organization, or person that undertakes them. The time frame of this cumulative impacts assessment could appropriately include activities that would occur up to 20 years in the future (the general time frame for PEIS analyses), but little or no information is available for projects that could occur further than 5 to 10 years in the future.

The land surrounding the Delamar Valley SEZ is undeveloped and no permanent residents live in the area. The nearest population center is the small community of Alamo about 9 mi (14 km) from the western boundary of the SEZ. The Pahranagat NWR and the Desert National Wildlife Range are located southwest of the SEZ. Two WAs are located near the Delamar Valley SEZ: the Delamar Mountains WA is located south of the SEZ, and the South Pahroc Range is northwest of the SEZ. Five other WAs are within 50 mi (80 km) of the SEZ. The BLM administers approximately 82% of the lands in the Ely District that contains the Delamar SEZ. In addition, the proposed Dry Lake Valley North SEZ is located about 20 mi (32 km) to the north, the proposed East Mormon Mountain SEZ is located about 40 mi (64 km) to the southeast, and the Dry Lake SEZ is located about 51 mi (82 km) to the south of the Delamar Valley SEZ, and for some resources, the geographic extents of impacts from multiple SEZs overlap.

The geographic extent of the cumulative impacts analysis for potentially affected resources near the Delamar Valley SEZ is identified in Section 11.2.22.1. An overview of ongoing and reasonably foreseeable future actions is presented in Section 11.2.22.2. General trends in population growth, energy demand, water availability, and climate change are discussed in Section 11.2.22.3. Cumulative impacts for each resource area are discussed in Section 11.2.22.4.

11.2.22.1 Geographic Extent of the Cumulative Impacts Analysis

The geographic extent of the cumulative impacts analysis for potentially affected resources evaluated near the Delamar Valley SEZ is provided in Table 11.2.22.1-1. These geographic areas define the boundaries encompassing potentially affected resources. Their extent may vary based on the nature of the resource being evaluated and the distance at which an impact may occur (thus, for example, the evaluation of air quality may have a greater regional extent of impact than visual resources). Most of the lands around the SEZ are administered by the BLM, the USFWS, or the DoD; there are also some Tribal lands at the Moapa River Reservation about 44 mi (70 km) south of the SEZ. The BLM administers approximately 78% of the lands within a 50-mi (80-km) radius of the SEZ.

TABLE 11.2.22.1-1 Geographic Extent of the Cumulative Impacts Analysis by Resource Area: Proposed Delamar Valley SEZ

Resource Area	Geographic Extent
Land Use	Central Lincoln County–Delamar Valley
Specially Designated Areas and Lands with Wilderness Characteristics	Central Lincoln County
Rangeland Resources	
Grazing	Central Lincoln County
Wild Horses and Burros	A 50-mi (80-km) radius from the center of the Delamar Valley SEZ
Recreation	Central Lincoln County
Military and Civilian Aviation	Central Lincoln County
Soil Resources	Areas within and adjacent to the Delamar Valley SEZ
Minerals	Central Lincoln County
Water Resources	
Surface Water	Jumbo Wash and another intermittent stream, several ephemeral washes, and the dry Delamar Lake
Groundwater	Delamar Valley, Pahranagat Valley, and Coyote Springs Valley groundwater basins, White River Groundwater Flow System
Air Quality and Climate	A 31-mi (50-km) radius from the center of the Delamar Valley SEZ
Vegetation, Wildlife, and Aquatic Biota, Special Status Species	A 50-mi (80-km) radius from the center of the Delamar Valley SEZ, including portions of Lincoln, Clark, and Nye Counties in Nevada, and Washington and Iron Counties in Utah
Visual Resources	Viewshed within a 25-mi (40-km) radius of the Delamar Valley SEZ
Acoustic Environment (noise)	Areas adjacent to the Delamar Valley SEZ
Paleontological Resources	Areas within and adjacent to the Delamar Valley SEZ
Cultural Resources	Areas within and adjacent to the Delamar Valley SEZ for archaeological sites; viewshed within a 25-mi (40-km) radius of the Delamar Valley SEZ for other properties, such as traditional cultural properties.
Native American Concerns	Delamar Valley and surrounding mountain ranges; viewshed within a 25-mi (40-km) radius of the Delamar Valley SEZ.
Socioeconomics	Lincoln and Clark Counties in Nevada, Iron County in Utah
Environmental Justice	Lincoln County
Transportation	U.S. 93; State Routes 317, 318, 375

11.2.22.2 Overview of Ongoing and Reasonably Foreseeable Future Actions

The future actions described below are those that are "reasonably foreseeable;" that is, they have already occurred, are ongoing, are funded for future implementation, or are included in firm near-term plans. Types of proposals with firm near-term plans are as follows:

- Proposals for which NEPA documents are in preparation or finalized;

- Proposals in a detailed design phase;

- Proposals listed in formal NOIs published in the *Federal Register* or state publications;

- Proposals for which enabling legislations has been passed; and

- Proposals that have been submitted to federal, state, or county regulators to begin a permitting process.

Projects in the bidding or research phase or that have been put on hold were not included in the cumulative impact analysis.

The ongoing and reasonably foreseeable future actions described below are grouped into two categories: (1) actions that relate to energy production and distribution, including potential solar energy projects under the proposed action (Section 11.2.22.2.1); and (2) other ongoing and reasonably foreseeable actions, including those related to mining and mineral processing, grazing management, transportation, recreation, water management, and conservation (Section 11.2.22.2.2). Together, these actions have the potential to affect human and environmental receptors within the geographic range of potential impacts over the next 20 years.

11.2.22.2.1 Energy Production and Distribution

On February 16, 2007, Governor Jim Gibbons signed an Executive Order to encourage the development of renewable energy resources in Nevada (Gibbons 2007a). The Executive Order requires all relevant state agencies to review their permitting processes to ensure the timely and expeditious permitting of renewable energy projects. On May 9, 2007, and June 12, 2008, the governor signed Executive Orders creating the Nevada Renewable Energy Transmission Access Advisory Committee Phase I and Phase II that will propose recommendations for improved access to the grid system for renewable energy industries (Gibbons 2007b, 2008). In May 28, 2009, the Nevada legislature passed a bill modifying the Renewable Energy Portfolio Standards (Nevada Senate 2009). The bill requires that 25% of the electricity sold to be produced by renewable energy sources by 2025.

No existing and only one foreseeable energy production facility are located within a 50-mi (80-km) radius from the center of the Delamar Valley SEZ. The 50-mi (80-km) area includes portions of Lincoln, Clark, and Nye Counties in Nevada, and Washington and Iron Counties in Utah. Reasonably foreseeable future actions related to energy distribution are identified in Table 11.2.22.2-1 and described in the following sections.

Renewable Energy Development

Renewable energy ROW applications on public land are considered in two categories, fast-track and regular-track applications. Fast-track applications, which apply principally to solar energy facilities, are those applications on public lands for which the environmental review and public participation process is under way and the applications could be approved by December 2010. A fast-track project would be considered foreseeable because the permitting and environmental review processes would be under way. There are no fast-track projects within 50 mi (80 km) of the proposed Delamar Valley SEZ. Regular-track proposals are considered potential future projects, but not necessarily foreseeable projects, since not all applications would be expected to be carried to completion. These proposals are considered together as a general level of interest in development of renewable energy in the region. In addition, foreseeable projects on private land are considered. One such project, the BrightSource Energy Solar Project, has been identified and is discussed below.

TABLE 11.2.22.2-1 Reasonably Foreseeable Future Actions Related to Energy Development and Distribution near the Proposed Delamar Valley SEZ

Description	Status	Resources Affected	Primary Impact Location
Renewable Energy Development			
BrightSource Coyote Springs Project; 960 MW, solar tower	Planning stage	Terrestrial habitats, wildlife, water, visual, cultural, socioeconomics	33 mi (53 km) south of the SEZ
Transmission and Distribution Systems			
Southwest Intertie Project	FONSI issued July 30, 2008 In-service in 2010	Disturbed areas, terrestrial habitats along transmission line ROW	Corridor passes through the SEZ
One Nevada Transmission Line Project	Draft Supplemental EIS Nov. 30, 2009	Disturbed areas, terrestrial habitats along transmission line ROW	Corridor passes through the SEZ
Zephyr and Chinook Transmission Line Project	Permit Applications in 2011/2012	Disturbed areas, terrestrial habitats along transmission line ROW	Corridor passes near or through the SEZ

BrightSource Energy Solar Project. BrightSource Energy is planning to build a 960 MW solar thermal powered facility on private land at the Coyote Springs Investment Development Project at the junction of US 93 and State Route 168. The facility will utilize the Luz Power Tower, which consists of thousands of mirrors that reflect sunlight onto a boiler filled with water sitting on top of a tower. The high temperature steam produced is piped to a conventional turbine that generates electricity. The station will utilize a dry-cooling system. The site, approximately 7,680 acres (31 km^2) in size, would be located 33 mi (53 km) south of the SEZ (BrightSource Energy 2009).

Pending Solar and Wind ROW Applications on BLM-Administered Lands. Applications for right-of-way grants that have been submitted to the BLM include two pending solar projects and one pending authorization for wind site testing that would be located within 50 mi (80 km) of the Delamar Valley SEZ (BLM 2010d). No applications for geothermal projects have been submitted. Table 11.2.22.2-2 lists these applications and Figure 11.2.22.2-1 shows their locations.

The likelihood of any of the regular-track application projects actually being developed is uncertain, but it is generally assumed to be less than that for fast-track applications. The number and type of projects listed in Table 11.2.22.2-2 are an indication of the level of interest in development of renewable energy in the region. Some number of these applications would be expected to result in actual projects. Thus, the cumulative impacts of these potential projects are analyzed in general for their potential aggregate effects.

Wind testing would involve some relatively minor activities that could have some environmental effects, mainly the erection of meteorological towers and monitoring of wind conditions. These towers may or may not employ guy wires and may be 200 ft (60 m) high.

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Energy Transmission and Distribution Projects

The following proposed transmission line projects, which would run through or near the proposed Delamar Valley SEZ, are considered reasonably foreseeable projects.

TABLE 11.2.22.2-2 Pending Renewable Energy Project ROW Applications on BLM-Administered Land within 50 mi (80 km) of the Proposed Delamar Valley SEZ[a,b]

Serial Number	Applicant	Application Received	Size (acres)[c]	MW	Technology	Status	Field Office
Solar Applications							
NVN-84467	Pacific Solar Investments Inc	Dec. 7, 2007	11,000	1,000	CSP/Trough	Pending	Las Vegas
NVN-86350	Solar Reserve LLC	Oct. 2, 2008	7,680	180	CSP/Tower	Pending	Caliente
Wind Applications							
NVN-87970	Pacific Wind Development	-[d]	-	-	Wind	Pending Wind Site Testing	Las Vegas

[a] Source: BLM (2009c).

[b] Information for pending solar and pending wind energy projects downloaded from *GeoCommunicator* (BLM and USFS 2010b).

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

[d] A dash indicates data not available.

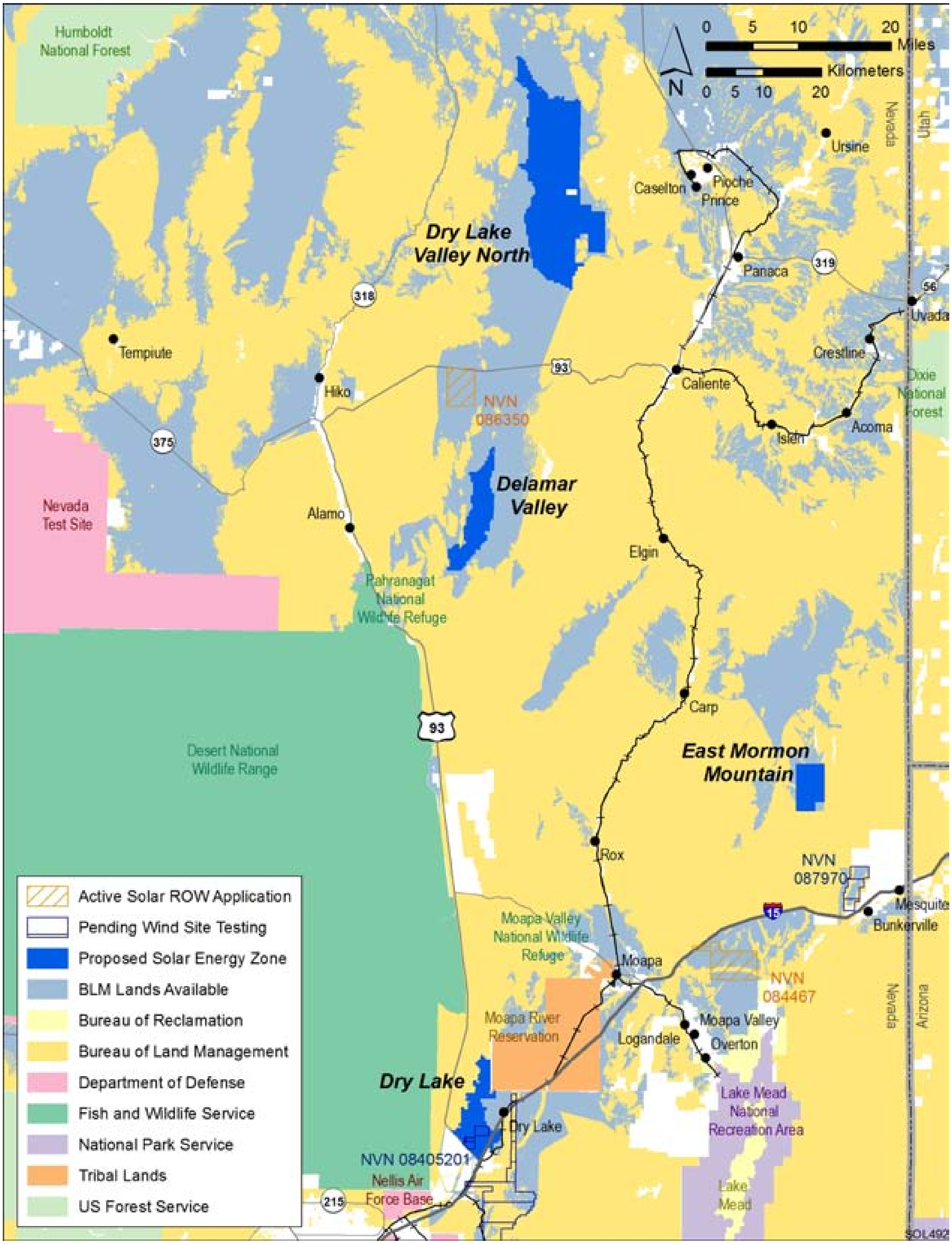

FIGURE 11.2.22.2-1 Locations of Renewable Energy Project ROW Applications on Public Land within a 50-mi (80-km) Radius of the Proposed Delamar Valley SEZ

Southwest Intertie Project (SWIP). The SWIP is a 520-mi (830-km) long single-circuit, overhead 500-kV transmission line project. The first phase, the Southern Portion, is a 264-mi (422-km) long transmission line that begins at the existing Harry Allen Substation located in Dry Lake, Nevada, and extends north to a proposed substation about 18 mi (29 km) northwest of Ely, Nevada. The transmission line will pass through the SEZ. It will consist of self-supporting, steel-lattice and steel-pole H-frame structures placed 1,200 to 1,500 ft (366 to 457 m) apart. The SWIP is expected to be completed in 2010. Construction could have potential impacts to the Mojave Desert Tortoise (BLM 2007a).

One Nevada Transmission Line Project. NV Energy proposes to construct and operate a 236-mi (382-km) long, 500-kV transmission line with fiber optic telecommunication and appurtenant facilities in White Pine, Nye, Lincoln, and Clark Counties. It will consist of self-supporting, steel-lattice and steel-pose H-frame structures, placed 900 to 1,600 ft (274 to 488 m) apart. The width of the right-of-way is 200 ft (61 m). The proposed action includes new substations outside the ROI of the Delamar Valley SEZ. The transmission line would be within the SWIP utility corridor that passes through the SEZ. Construction could have potential impacts to the Mojave Desert Tortoise (BLM 2009e).

Zephyr and Chinook Transmission Line Project. TransCanada is proposing to construct two 500-kV high-voltage direct current transmission lines. The Zephyr project would originate in southeastern Wyoming. The Chinook project would originate in south central Montana. Both would travel along the same corridor from northern Nevada, passing near or through the SEZ, and terminate in the El Dorado Valley south of Las Vegas. Construction is expected to be complete in 2015 or 2016 (TransCanada 2010).

11.2.22.2.2 Other Actions

Other major ongoing and foreseeable actions identified within 50 mi (80 km) of the proposed Delamar Valley SEZ are listed in Table 11.2.22.2-3 and described in the following subsections.

Arizona Nevada Tower Corporation (ANTC). ANTC has constructed seven cellular telephone signal relay towers in Lincoln County along the U.S. 93 corridor between Coyote Springs Valley and the town of Pioche. Four of the seven sites are 100-ft (30.5-m) square parcels. The remaining three are 50 ft × 100 ft (15.7 m × 30.5 m), 50 ft × 120 ft (15.7 m × 36.6 m) and 100 ft × 200 ft (30.5 m × 61.0 m). Utility corridors were extended to six of the sites to supply electricity. Solar cells are the primary source of power for the Alamo Peak site, with wind generation as the backup. The towers are steel lattice, three-sided and free standing, and each tower base is a 30-ft (9-m) square concrete slab. The towers at Alamo Peak and Highland Peak are 125 ft (38.1 m) high, and the other five are 195 ft (59.4 m) high (BLM 2007b).

TABLE 11.2.22.2-3 Other Major Actions near the Proposed Delamar Valley SEZ[a]

Description	Status	Resources Affected	Primary Impact Location
Arizona Nevada Tower Corporation Communication Sites	EA issued April 2007	Terrestrial habitats, wildlife, cultural resources	East, west ,and southwest of the SEZ
Patriot Communication Exercises in Lincoln County	DEA April 2008	Terrestrial habitats, wildlife, soils	North of the SEZ
Caliente Rail Realignment	FEIS June 2008	Terrestrial habitats, wildlife cultural resources	25 mi (40 km) north of the SEZ
Delamar Valley Groundwater Testing/Monitoring Wells	EA and FONSI issued Sept. 2009	Terrestrial habitats, wildlife cultural resources	Within the SEZ
Meadow Valley Gypsum Project	EA and FONSI issued 2008	Terrestrial habitats, wildlife, soils, socioeconomics	Southeast of the SEZ
Clark, Lincoln and White Pine Counties Groundwater Development Project	DEIS expected in March 2011	Terrestrial habitats, wildlife, groundwater	Within the SEZ
Lincoln County Land Act Groundwater Development and Utility ROW	FEIS issued May 2009	Terrestrial habitats, wildlife, groundwater	Southeast of the SEZ
Coyote Springs Investment Development Project	FEIS issued Sept. 2008, ROD issued Oct. 2008	Terrestrial habitats, wildlife, water, socioeconomics	20-33 mi (32-53 km) south of the SEZ
Kane Springs Groundwater Development Project	FEIS issued Feb. 2008	Terrestrial habitats, wildlife, groundwater	20 mi (32 km) south of the SEZ
Alamo Industrial Park and Community Expansion	Preliminary Design Report Jan. 2000. FEIS issued Jan. 2010.	Terrestrial habitats, wildlife, socioeconomics	10 mi (16 km) west of the SEZ
Meadow Valley Industrial Park	FEIS issued Jan. 2010	Terrestrial habitats, wildlife, socioeconomics	20 mi (32 km) northeast of the SEZ
NV Energy Microwave and Mobile Radio Project	Preliminary EA issued March 2010	Terrestrial habitats, wildlife cultural resources	Two of the sites 40 mi (64 km) west of SEZ, one site 50 mi (80 km) northwest of SEZ
U.S. 93 Corridor Wild Horse Gather	EA issued Dec. 28, 2009	Terrestrial habitats, wildlife	North of the SEZ
Silver King Herd Management Area Wild Horse Gather	Preliminary EA issued June 10, 2010	Terrestrial habitats, wildlife	North of the SEZ
Eagle Herd Management Area Wild Horse Gather	Preliminary EA issued Dec. 17, 2009	Terrestrial habitats, wildlife	Northeast of the SEZ
Ash Canyon Sagebrush Restoration and Fuels Reduction Project	Preliminary EA issued May 2010	Terrestrial habitats, wildlife	22 mi (35 km) northeast of the SEZ
Pioche/Caselton Wildland Urban Interface Project	Preliminary EA issued May 2010	Terrestrial habitats, wildlife	35 mi (57 km) northeast of the SEZ

[a] Projects in later stages of agency environmental review and project development.

Other Ongoing Actions

Patriot Communications Exercise in Lincoln County. The U.S. Air Force at Nellis Air Force Base has acquired a 15-year Communications Use Lease to support ground-based radar/communications exercises at fourteen 5.7-acre (0.023-km^2) sites. A maximum of five exercises would be conducted annually for a period of 15 years. Three of the sites are along U.S. 93 about 10 mi (16 km) north of the SEZ (BLM 2008d).

Other Foreseeable Actions

Caliente Rail Alignment. The DOE proposes to construct and operate a railroad for the shipment of spent nuclear fuel and high-level radioactive waste to the geologic repository at Yucca Mountain, Nevada. The rail line would begin near Caliente, Nevada, and extend north; then turn in a westerly direction, passing about 25 mi (40 km) north of the SEZ, to a location near the northwest corner of the NTTR; and then continue south–southwest to Yucca Mountain. The rail line would range in length from approximately 328 mi (528 km) to 336 mi (541 km), depending upon the exact location of the alignment and would be restricted to DOE shipments. Over a 50-year period, 9,500 casks containing spent nuclear fuel and high-level radioactive waste, and approximately 29,000 rail cars of other materials, including construction materials, would be shipped to the repository. An average of 17 one-way trains per week would travel along the rail line. Construction of support facilities—interchange yard, staging yard, maintenance-of-way facility, rail equipment maintenance yard, cask maintenance facility, and Nevada Rail Control Center and National Transportation Operation Center—would also be required. Construction would take 4 to 10 years and cost $2.57 billion. Construction activities would occur inside a 1000-ft (300-m) wide ROW for a total footprint of 40,600 acres (164 km^2) (DOE 2008).

Delamar Valley Groundwater Testing/Monitoring Wells. The Southern Nevada Water Authority (SNWA) intends to construct two to four groundwater wells within two 2.5-acre (0.010-km^2) (a 1.0-acre [0.004-km^2] long-term and a 1.5-acre [0.006-km^2] short-term) locations in the Delamar Valley. The dimensions for the long-term ROW would be 168 ft × 260 ft (51 m × 79 m), and the dimensions for the short-term ROW would be 330 ft × 330 ft (100 m × 100 m) for each site. Two 12-in. (0.30-m) and two 20-in. (0.51-m) wells would be drilled to between 2,200 and 2,400 ft (670 and 730 m) deep. Access to the well sites would be from both existing roads and a new 809-ft (247-m) long access road. Water generated during the tests would be discharged into the natural drainage network around the sites. At the completion of hydraulic testing, SNWA will continue to record data to establish baseline ranges of the groundwater levels in the area (BLM 2009f).

Meadow Valley Gypsum Project. The Meadow Valley Gypsum Project is proposing to mine gypsum on 21.2 acres (0.0858 km^2) of public land, about 35 mi (56 km) southeast of the

SEZ. A total of 46.7 acres (0.189 km^2) would be disturbed during the 10-year lifetime of the project. A 1.5-mi (2.5-km) access road and a 1.8-acre (0.0073-km^2) railroad siding would be constructed (BLM 2007c).

Clark, Lincoln and White Pine Counties Groundwater Development Project. The SNWA proposes a groundwater development project that would transport approximately 122,755 ac-ft/yr (151 million m^3/yr) of groundwater under existing water rights and applications from several hydrographic basins in eastern Nevada and western Utah. The proposed facilities include production wells, 306 mi (490 km) of buried water pipelines, 5 pumping stations, 6 regulating tanks, 3 pressure reducing stations, a buried storage reservoir, a water treatment facility, and about 323 mi (517 km) of 230 kV overhead power lines, 2 primary and 5 secondary substations. A portion of the project will be located in the Delamar Valley SEZ. The project would develop groundwater in the following amounts in two hydraulically connected valleys that would supply groundwater to the Delamar Valley SEZ: Dry Lake Valley (11,584 ac-ft/yr [14.3 million m^3/yr]) and Delamar Valley (2,493 ac-ft/yr [3.1 million m^3/yr]). In addition, an undetermined amount of water could be developed and transferred from Coyote Spring Valley, which is south of the SEZ and down-gradient of the other two basins (SNWA 2010).

Lincoln County Land Act (LCLA) Groundwater Development and Utility ROW. This project involves the construction of the infrastructure required to pump and convey groundwater resources in the Clover Valley and Tule Desert hydrographic areas. The project includes 75 mi (122 km) of collection and transmission pipeline, 30 wells, 5 storage tanks, water pipeline booster stations, transmission lines and substations, and a natural gas pipeline. A total of 240 acres (0.97 km^2) will be permanently disturbed, and 1,878 acres (7.6 km^2) temporarily disturbed. The closest approach to the SEZ is about 35 mi (58 km) east (USFWS 2009b).

Coyote Springs Investment (CSI) Development Project. CSI intends to develop a new town in southern Lincoln County at the junction of U.S. 93 and State Route 168. The town would be a master planned community on 21,454 acres (86.8 km^2) and would include residential, commercial and industrial land uses. Plans call for more than 111,000 residential dwelling units at a density of 5 units per acre. Also included in the community would be public buildings, hotels, resorts, casinos, commercial and light industrial areas, roads, bridges and a heliport. Utilities and other infrastructure would be developed to serve the town, including power facilities, sanitary sewer and wastewater treatment facilities, stormwater facilities, solid waste disposal transfer stations, and telecommunications facilities. Water supply treatment facilities, monitoring wells, production wells, storage facilities, and transmission and distribution facilities would also be built. Approximately 70,000 acre ft/yr (86 million m^3/yr) of water would be needed for the community at full build-out, which may occur over a period of about 40 years. Currently, CSI and its affiliates hold approximately 36,000 acre ft/yr (44.0 million m^3/yr) in certificated groundwater rights in various basins within Lincoln County. CSI currently owns the 21,454-acre development area and holds leases on an additional 7,548 acres (30.6 km^2) of BLM land in Lincoln County and 6,219 acres (25.2 km^2) of BLM land in Clark County within or next to the privately held land. These adjacent areas would be managed by BLM for the protection of federally-listed threatened or endangered species; activities would be limited to non-motorized recreation or scientific research. The north end of the development would lie about 20 mi (32 km) south of the SEZ (USFWS 2008).

Kane Springs Groundwater Development Project. The Lincoln County Water District (LCWD) proposes to construct infrastructure to pump and convey groundwater from the Kane Springs Valley Hydrographic Basin to its Service Territory in the Coyote Spring Valley in southern Lincoln County. Facilities would be located along or near the Kane Springs Road ROW, within a 2,640-foot wide utility corridor. A production well and monitoring well were constructed in 2005. Up to six additional production wells would be placed along an approximately 9.4-mi (15-km) long collection pipeline. Other infrastructure would include a 3.8-mi (6-km) long transmission pipeline and two water storage tanks. A 3-mi (5-km) long 138-kV electrical transmission line, 14 mi (22 km) of lower voltage lines, and a new substation would be built to supply power to the project. The Nevada State Engineer has appropriated 1,000 ac-ft/yr (1.2 million m3/yr) for the project, while full development would be dependent upon water demand and future water rights and could draw up to 5,000 ac-ft/yr (6 million m^3/yr) from the Kane Springs Valley Hydrographic Basin. The project would lie about 20 mi (32 km south of the SEZ (BLM 2008e).

Alamo Industrial Park and Community Expansion. The BLM is planning to transfer 4 parcels, consisting of 855 acres (3.46 km^2) to Lincoln County. Parcel A, consisting of approximately 217 acres (0.88 km^2) is intended to be used for light industrial use. It is assumed that the industrial park structures would require 117 acres (0.47 km^2) with parking, roads and support infrastructure on another 100 acres (0.40 km^2). The remaining parcels would be used for community expansion, and would be developed primarily for residential purposes. Housing units limited to about 3 units per acre (0.004 km^2) would be built over a 20-year period. The site, about 0.1 mi (0.16 km) southeast of the Town of Alamo along U.S. 93, is about 9 mi (14 km) west of the SEZ (Agra Infrastructure 2000) (BLM 2007f) (USFWS 2010d).

Meadow Valley Industrial Park. The BLM is planning to transfer a 103 acre (0.42 km^2) parcel to the City of Caliente, Nevada for the construction of the Meadow Valley Industrial Park. The site is located on a previously disturbed area used for agriculture and recreation at the intersection of U.S. 93 and State Route 317, about 20 mi (32 km) northeast of the SEZ. Improvements to the site would include construction of a rail spur, access roads, and water and sewer extensions (USFWS 2010d).

NV Energy Microwave and Mobile Radio Project. NV Energy is proposing to install a new microwave and radio communications network at thirteen sites. Two sites are located about 40 mi (64 km) north of the SEZ and one is located about 10 mi (16 km) south of the SEZ. The closest site is 0.6 acre (0.0024 km^2) but requires disturbance of 57 acres (0.23 km^2) of land for access and power line ROW. Each site would include a communication shelter, two or three propane tanks, and a generator. Two of the three sites closest to the SEZ would have an 80-ft (25-m) self-supporting lattice tower, and the other would have a 200-ft (60-m) tower (BLM 2010b).

U.S. Highway 93 Corridor Wild Horse Gather. The BLM Schell Field Office plans to gather and remove about 50 excess wild horses residing outside the wild horse herd management areas, which pose a safety hazard on U.S. 93 (BLM 2009g).

Silver King Herd Management Area Wild Horse Gather. The BLM Schell and Caliente Field Offices propose to gather and remove 445 excess wild horses from within and outside the Silver King Herd Management Area (HMA). The Silver King HMA is 606,000 acres (2,452 km^2) in size and is located 16 mi (26 km) north of Caliente, Nevada (BLM 2010e).

Eagle Herd Management Area Wild Horse Gather. The BLM Schell Field Office proposes to gather and remove 545 excess wild horses from within and outside the Eagle HMA. The Eagle HMA is 670,000 acres (2,710 km^2) in size and is located 20 mi (32 km) northeast of Caliente, Nevada (BLM 2009h).

Ash Canyon Sagebrush Restoration and Fuels Reduction Project. The BLM Caliente Field Office is proposing to conduct a sagebrush improvement and fuels reduction project adjacent to Ash Canyon, about 5 mi (8 km) southeast of Caliente, Nevada, and about 22 mi (35 km) northeast of the SEZ. The size of the project area is 870 acres (3.5 km^2). The goal is to reduce pinyon and juniper in order to achieve a desired state where sagebrush is present along with an understory of perennial species; to reduce risk of wild fires by reducing fuel loading; to restore the historic disturbance regime; and to improve the available habitat for resident wildlife (BLM 2010f).

Pioche/Caselton Wildland Urban Interface Project. The BLM is proposing to conduct a wildland urban interface project near Pioche and Caselton, Nevada about 35 mi (57 km) northeast of the SEZ. About 3,246 to 4,711 acres (13.1 to 19.1 km^2) is planned for treatment. The goal is to reduce the threat of wild fire to Pioche and Caselton through implementation of fuel reduction treatments; to reduce the risk of large, uncontrolled wild fires by reducing fuel loading; and to restore the historic disturbance regime within the project area. The treatment would include reduction of canopy cover and fuel continuity of single-leaf pinyon, Utah juniper, and shrub species to prevent crown fire potential (BLM 2010g).

Grazing

Grazing is a common use of lands in the vicinity of the proposed Delamar Valley SEZ. The management authority for grazing allotments on these lands rests with BLM's Caliente Field Office. 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 the current level of use will continue in the near term. A long-term reduction in federal authorized grazing use would affect the value of the private grazing lands.

Mining

The only active mining in the Ely District is at Bald Mountain Mine and Mooney Basin Mine more than 100 mi (162 km) from the SEZ. The proposed Meadow Valley Gypsum Project is discussed above in this section.

11.2.22.3 General Trends

General trends of population growth, energy demand, water availability, and climate change for the proposed Delamar Valley SEZ are presented in this section. Table 11.2.22.3-1 lists the relevant impacting factors for the trends.

TABLE 11.2.22.3-1 General Trends Relevant to the Proposed SEZs in Nevada

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

11.2.22.3.1 Population Growth

Over the period 2000 to 2008, the population grew by 1.4% in Lincoln County, by 4.0% in Clark County, and by 3.4% in Iron County, Utah, the ROI for the Delamar Valley SEZ (see Section 11.2.19.1.5). The population of the ROI in 2008 was 1,927,930. The growth rate for the state of Nevada as a whole was 3.4% and for Utah 2.5%.

11.2.22.3.2 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 seven SEZ areas in Nevada 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 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).

11.2.22.3.3 Water Availability

As described in Section 11.2.9.1, the perennial yield of the Delamar Valley groundwater basin is set at 2,550 ac-ft/yr (3.1 million m^3/yr) representing one-half of the natural recharge estimate used by the State Engineer in Ruling 5875 (NDWR 2008). Of the available 2,550 ac-ft/yr (3.1 million m^3/yr) in water rights, 7 ac-ft/yr (8,600 m^3/yr) is allocated for stock water and 2,493 ac-ft/yr (3.1 million m^3/yr) is allocated for municipal use (NDWR 2010a). The municipal water right allocation was granted to the SNWA by the State Engineer through Ruling 5875, with the remaining 50 ac-ft/yr (61,700 m^3/yr) of unallocated water rights in Delamar Valley being set aside for future water development (NDWR 2008).

In 2005, water withdrawals from surface waters and groundwater in Lincoln County were 57,100 ac-ft/yr (70 million m^3/yr), 11% of which came from surface waters and 89% from groundwater. The largest water use category was irrigation, at 55,100 ac-ft/yr (68 million m^3/yr). Public supply/domestic water uses accounted for 1,300 ac-ft/yr (1.6 million m^3/yr), with livestock and mining water uses on the order of 230 ac-ft/yr (280,000 m^3/yr) and 450 ac-ft/yr (560,000 m^3/yr), respectively (Kenny et al. 2009). However, within Delamar Valley there has been very little groundwater development, with less than 100 ac-ft/yr (123,000 m^3/yr) withdrawn for stock ponds (Eakin 1963).

11.2.22.3.4 Climate Change

Governor Jim Gibbons' Nevada Climate Change Advisory committee (NCCAC) conducted a study of climate change and its effects on Nevada (NCCAC 2008). The report summarized the present scientific understanding of climate change and its potential impacts on Nevada. A report on global climate change in the United States prepared by the U.S. Global Change Research Program (GCRP 2009) documents current temperature and precipitation conditions and historic trends. Excerpts of the conclusions from these reports indicate:

- Decreased precipitation will occur, with a greater percentage of that precipitation coming from rain, which will result in a greater likelihood of winter and spring flooding, and decreased stream flow in the summer.

- The average temperature in the Southwest has already increased by about 1.5ºF (0.8ºC) compared to a 1960 to 1979 baseline, and by the end of the century, the average annual temperature is projected to rise 4º to 10ºF (2.2º to 5.5ºC).

- Warming climate and related reduction in spring snowpack and soil moisture have increased the length of the wildfire season and intensity of forest fires.

- Later snow and less snow coverage in ski resort areas could force ski areas to shut down before the season would otherwise end.

- Much of the Southwest has experienced drought conditions since 1999. This represents the most severe drought in the last 110 years. Projections indicate an increasing probability of drought in the region.

- As temperatures rise, landscape will be altered as species shift their ranges northward and upward to cooler climates.

- Temperature increases, when combined with urban heat island effects for major cities such as Las Vegas, present significant stress to health, electricity and water supply.

- Increased minimum temperatures and warmer springs extend the range and lifetime of many pests that stress trees and crops, and lead to northward migration of weed species.

11.2.22.4 Cumulative Impacts on Resources

This section addresses potential cumulative impacts in the proposed Delamar Valley SEZ on the basis of the following assumptions: (1) because of the moderate size of the proposed SEZ (10,000 to 30,000 acres [40.5 to 121 km^2]), up to two projects could be constructed at a time, and (2) maximum total disturbance over 20 years would be about 13,242 acres (53.6 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. Since an existing 69-kV transmission line runs along and inside the southeastern boundary of the SEZ, no analysis of impacts has been conducted for the construction of a new transmission line outside of the SEZ that might be needed to connect solar facilities to the regional grid (see Section 11.2.1.2). Regarding site access, the nearest major road is U.S. 93, which lies about 8 mi (13 km) to both the north and west of the SEZ. It is assumed that an access road would be constructed to this road to support solar development in the SEZ.

Cumulative impacts that would result from the construction, operation, and decommissioning of solar energy development projects within the proposed SEZ when added to other past, present, and reasonably foreseeable future actions described in the previous section in each resource area are discussed below. At this stage of development, because of the uncertain nature of the future projects in terms of size, number, location within the proposed SEZ, 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.

11.2.22.4.1 Lands and Realty

The area covered by the proposed Delamar Valley SEZ is largely isolated and undeveloped. In general, the areas surrounding the SEZ are rural in nature. Existing dirt roads from separate access points on U.S. 93 provide access to the northern and southern portions of the SEZ. Numerous dirt/ranch roads provide access throughout the SEZ (Section 11.2.2.1).

Development of the SEZ for utility-scale solar energy production would establish a large industrial area that would exclude many existing and potential uses of the land, perhaps in perpetuity. Access to such areas by both the general public and much wildlife would be eliminated. Traditional uses of public lands would no longer be allowed. Utility-scale solar energy development would be a new and discordant land use in the area.

As shown in Table 11.2.22.2-2 and Figure 11.2.22.2-1, there are two pending solar development applications and one pending wind site testing application within a 50-mi (80-km) radius of the proposed Delamar Valley SEZ. There are currently no solar applications within the SEZ. One solar application lies about 5 mi (8 km) northwest of the SEZ and the other lies about 50 mi (80 km) to the southeast, as does the lone wind application. In addition, the proposed Dry Lake Valley North SEZ is about 20 mi (32 km) to the north, but contains no solar applications. The small number of applications indicates only modest interest in renewable energy development within 50 mi (80 km) of the proposed SEZ, while no foreseeable renewable energy projects have been identified.

Several foreseeable projects of other types are of note within this distance, however, including proposed groundwater development and associated utility projects and proposed transmission line projects that would lie on or near the SEZ, and a planned community development on 43,000 acres (174 km^2) that would lie about 20 mi (32 km) south of the SEZ. Proposed projects are described in Section 11.2.22.2.2.

The development of utility-scale solar projects in the proposed Delamar Valley SEZ in combination with other ongoing, foreseeable and potential actions within the geographic extent of effects, nominally 50 mi (80 km), could have cumulative effects on land use in the vicinity of the proposed SEZ. While ongoing and foreseeable actions on or near the SEZ would permanently disturb relatively small amounts of land and the planned community development lies at a distance that would add little to impacts from the SEZ, identified actions could result in small cumulative impacts on land use through impacts on, for example, groundwater and visual resources, especially if the SEZ is fully developed with solar projects.

11.2.22.4.2 Specially Designated Areas and Lands with Wilderness Characteristics

There are 15 specially designated areas within 25 mi (40 km) of the proposed Delamar Valley SEZ in Nevada (Section 11.2.3.1). The potential exists for cumulative visual impacts on these areas from the construction of utility-scale solar energy facilities within the SEZ and the construction of transmission lines outside the SEZ. The exact nature of cumulative visual impacts on the users of these areas would depend on the specific solar technologies employed in the SEZ and the locations selected within the SEZ for solar facilities and outside the SEZ for transmission lines. Currently proposed solar and wind projects lie far enough away from the SEZ that sensitive areas would not likely be cumulatively affected by energy facilities within the geographic extent of effects. However, SEZ facilities and associated roads and transmission lines would add to the visual clutter of the area, including that from several proposed transmission lines and a proposed water pipeline project.

11.2.22.4.3 Rangeland Resources

The proposed Delamar Valley SEZ contains portions of two perennial grazing allotments (Section 11.2.4.1.1). If utility-scale solar facilities are constructed on the SEZ, those areas occupied by the solar projects would be excluded from grazing. The effects of other renewable energy projects within the geographic extent of effects, including pending solar and wind applications within 50 mi (80 km) of the SEZ that are ultimately developed, would not likely result in cumulative impacts on grazing due to the small number and distance of the proposed facilities from Delamar Valley. However, a number of groundwater development projects in the Delamar Valley basin and connected basins, described in Section 11.2.22.2.2, along with groundwater use by solar facilities in the SEZ, could result in a cumulative effect on the availability of groundwater for grazing. Other foreseeable projects that might affect these allotments, mainly proposed transmission lines and a water pipeline, would have minimal long-term effects on grazing.

A number of BLM HMAs and HAs occur within the 50-mi (80-km) SEZ region for the proposed Delamar Valley SEZ (Section 11.2.4.2.1), including one within the 5-mi (8-km) area of indirect effects. While such areas near the proposed SEZ contain wild horses, potential indirect impacts from development within the SEZ would be mitigated. Since foreseeable projects within this distance would have minimal effects on wild horses and burros, cumulative impacts are unlikely to could occur.

11.2.22.4.4 Recreation

Limited outdoor recreation (e.g., backcountry driving, OHV use, and some camping and hunting) occurs on or in the immediate vicinity of the SEZ. While there are no current solar applications within the proposed SEZ, construction of utility-scale solar projects on the SEZ would preclude recreational use of the affected lands for the duration of the projects. Road closures and access restrictions within the proposed SEZ would affect OHV use in particular. Foreseeable and potential actions, primarily transmission lines and a water pipeline, would also affect areas of low recreational use and would have minimal effects on current recreational activities. Thus, cumulative impacts on recreation within the geographic extent of effects are not expected.

11.2.22.4.5 Military and Civilian Aviation

The southwest portion of the proposed Delamar Valley SEZ is crossed by one MTR with a 100-ft (30-m) AGL operating limit, while the area is completely included within the NTTR. The military has expressed serious concern over possible solar energy facilities within the SEZ. Nellis Air Force Base has indicated that any facilities higher than 100 ft (30 m) may be incompatible with low-level aircraft use of the MTR, and the NTTR has indicated that structures higher than 50 ft (15 m) AGL may present unacceptable electromagnetic compatibility concerns for its test mission (Section 11.2.6.2). Potential solar facilities, proposed communication towers, and proposed new transmission lines outside the SEZ could present additional concerns for military aviation, depending on the eventual location of such facilities with respect to training routes, and thus, could result in cumulative impacts on military aviation. The closest civilian airports located in Alamo, Nevada, and Lincoln County, Nevada, 13 mi (21 km) northwest and 32 mi (51 km) northeast, respectively, are unlikely to be affected by facilities in the SEZ.

11.2.22.4.6 Soil Resources

Ground-disturbing activities (e.g., grading, excavating, and drilling) during the construction phase of a solar project, including the construction of any associated transmission line connections and new roads, would contribute to soil loss due to wind erosion. Road use during construction, operations, and decommissioning of the solar facilities would further contribute to soil loss. Programmatic design features would be employed to minimize erosion and loss. Residual soil losses with mitigations in place would be in addition to losses from construction of other potential renewable energy facilities, proposed transmission lines, proposed water lines, and recreational uses. Overall, the cumulative impacts on soil resources would be small, however, because of the small number of currently foreseeable projects within the geographic extent of effects. The small number of pending solar and wind applications in this area suggests that future impacts from renewable energy projects would increase minimally over that from any development in the SEZ.

Landscaping of solar energy facility areas in the SEZ could alter drainage patterns and lead to increased siltation of surface water streambeds, in addition to that from other foreseeable projects and other activities (e.g., OHV use, outside the SEZ). However, with the expected programmatic design features in place, cumulative impacts would be small.

11.2.22.4.7 Minerals (Fluids, Solids, and Geothermal Resources)

As discussed in Section 11.2.8, there are currently no active oil and gas leases within the proposed Delamar Valley SEZ, while there are no mining claims or proposals for geothermal energy development pending. Because of the generally low level of mineral production in the proposed SEZ and surrounding area and the expected low impact on mineral accessibility of other foreseeable actions within the geographic extent of effects, no cumulative impacts on mineral resources are expected.

11.2.22.4.8 Water Resources

Section 11.2.9.2 describes the water requirements for various technologies if they were to be employed on the proposed SEZ to develop utility-scale solar energy facilities. The amount of water needed during the peak construction year for all evaluated solar technologies would be 1,964 to 2,814 ac-ft (2.4 million to 3.5 million m^3). During operations, with full development of the SEZ over 80% of its available land area, the amount of water needed for all evaluated solar technologies would range from 76 to 39,762 ac-ft/yr (94,000 to 49 million m^3). The amount of water needed during decommissioning would be similar to or less than the amount used during construction. As discussed in Section 11.2.22.2.3, water withdrawals in 2005 from surface waters and groundwater in Lincoln County were 57,100 ac-ft/yr (70 million m^3/yr), of which 11% came from surface waters and 89% came from groundwater. The largest water use category was irrigation, at 55,100 ac-ft/yr (68 million m^3/yr). Therefore, cumulatively the additional water resources needed for solar facilities in the SEZ during operations would constitute from a relatively small (0.1%) to a very large (70%) increment (the ratio of the annual operations water requirement to the annual amount withdrawn in Lincoln County), depending on the solar technology used (PV technology at the low end and the wet-cooled parabolic trough technology at the high end). However, as discussed in Section 11.2.9.1.3, very little water is currently withdrawn from the Delamar Valley basin, roughly 100 ac-ft/yr. The annual yield of the basin is determined to be 2,550 ac-ft/yr (3.1 million m^3/yr), all but 50 ac-ft/yr (61,700 m^3/yr) of which is currently allocated,, with the vast majority allocated to the SNWA for municipal use. Thus, solar facilities on the SEZ would have the capacity to far exceed the available groundwater in the basin and even within in Lincoln County using wet cooling, while full development with dry-cooled solar trough technologies could exceed estimated basin yields (Section 11.2.9.2.2).

While solar development of the proposed SEZ with water-intensive technologies would likely be infeasible due to impacts on groundwater supplies and restrictions on water rights, excessive groundwater withdrawals could disrupt the existing groundwater flow pattern to the Pahranagat Valley and Coyote Springs Valley basins, which could adversely affect groundwater flow in the White River Groundwater Flow System, as well as the springs and wetlands within the Pahranagat NWR that support critical wildlife habitat (Section 11.2.9.2.4). Thus, a significant increase in withdrawals from development within the proposed SEZ could result in a major impact on groundwater and supported habitats in the Delamar Valley, while further cumulative impacts could occur when combined with other future uses in the region and from potential solar facilities in both the proposed Delamar Valley and in the proposed Dry Lake Valley North SEZ, located 20 mi (32 km) to the north. Other foreseeable, actions with groundwater demands within in the central portion of the White River groundwater flow system are described in Section 11.2.22.2.2 and include: (1) the proposed Coyote Springs Investment Development Project, a planned community located about 20 to 33 mi (32 to 53 km) south of the SEZ, which, at full build-out in approximately 40 years, would require an estimated 70,000 ac-ft/yr (86 million m^3/yr) of water, mainly from groundwater; (2) the Kane Springs Groundwater Development project, which could eventually draw 5,000 ac-ft/yr (6 million m^3/yr); (3) the Clark, Lincoln and White Pine Counties Groundwater Development Project, which could withdraw 14,000 ac-ft/yr (17.3 million m^3/yr) from the Dry Lake and Delamar Valley groundwater basins, and (4) the dry-cooled BrightSource Energy Solar Project, which would be located within the Coyote Springs Development Project and which currently has unknown groundwater needs.

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 19 to 148 ac-ft (23 to 183 thousand m^3) during the peak construction year and would range from less than 2 up to 37 ac-ft/yr (up to 46,000 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-cooling systems, there would also be from 418 to 752 ac-ft/yr (0.52 to 0.93 million m^3) of blowdown water from cooling towers. Blowdown water would need to be either treated on-site or sent to an off-site facility. Any on-site treatment of wastewater would have to ensure that treatment ponds are effectively lined in order to prevent any groundwater contamination. Thus, blowdown water would not contribute to cumulative effects on treatment systems or on groundwater.

11.2.22.4.9 Vegetation

The proposed Delamar Valley SEZ is located within the Tonopah Basin ecoregion, which primarily supports a sparse shadscale communities. The SEZ is located in a transition zone between the Great Basin and Mojave deserts, with Mojave desert-scrub communities and endemic species in the SEZ and adjacent areas. If utility-scale solar energy projects were to be constructed within the SEZ, all vegetation within the footprints of the facilities would likely be removed during land-clearing and land-grading operations. Full development of the SEZ over 80% of its area would result in moderate to large impacts on certain cover types

(Section 11.2.10.2.1). Wetlands associated with the Delamar Lake playa could be affected by project development, while intermittently flooded areas downgradient from solar projects or access roads could be affected by ground-disturbing activities. Alteration of surface drainage patterns or hydrology could adversely affect downstream dry wash communities. Wetland and riparian habitats outside of the SEZ that are supported by groundwater discharge, including the Pahranagat NWR, 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, in combination with that from other construction, agriculture, recreation, and transportation. The cumulative dust loading 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. Programmatic 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. While most of the cover types within the SEZ are relatively common in the greater SEZ region, several cover types are relatively uncommon, representing 1% or less of the land area within the region. Thus, other ongoing and reasonably foreseeable future actions would have a cumulative effect on them. Such effects could be moderate with full build-out of the SEZ, but would likely fall to small for foreseeable development due to the abundance of the primary species and the relatively small number of foreseeable actions within the geographic extent of effects. However, the proposed Coyote Springs Investment Development project, a proposed community development covering 43,000 acres (174 km^2) and located about 20 mi (32 km) south of the proposed SEZ (Section 11.2.22.2.2), could contribute to cumulative effects on some rare cover types if they are present in the development area. Nearer the SEZ, cumulative effects on wetland species could occur from water use, drainage modifications, and stream sedimentation from development in the region. The magnitude of such effects is difficult to predict at the current time.

11.2.22.4.10 Wildlife and Aquatic Biota

Wildlife species that could potentially be affected by the development of utility-scale solar energy facilities in the proposed SEZ include amphibians, reptiles, birds, and mammals. 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. In general, impacted species with broad distributions and a variety of habitats would be less affected than species with a narrowly defined habitat within a restricted area. The use of programmatic design features would reduce the severity of impacts on wildlife. These design features would include pre-disturbance biological surveys to identify key habitat areas used by wildlife, followed by avoidance or minimization of disturbance to those habitats.

As noted in Section 11.2.22.2, other ongoing, reasonably foreseeable and potential future actions within 50 mi (80 km), of the proposed SEZ include a groundwater transfer project, two pending solar applications, and one pending wind application (Figure 11.2.22.2-1). While impacts from full build-out over 80% of the proposed SEZ would result in small to moderate impacts on some amphibian, reptile, bird, and mammal species (Section 11.2.11), impacts from foreseeable development within the 50-mi (80-km) geographic extent of effects would be small.

Many of the wildlife species present within the proposed SEZ that could be affected by other actions have extensive available habitat within the region, while no foreseeable solar or wind projects have been firmly identified within the geographic extent of effects. The pending solar and wind applications in the region could contribute to small cumulative effects, however, as would the foreseeable groundwater transfer and transmission line projects. In addition, the proposed Coyote Springs Investment Development project located about 20 mi (32 km) south of the proposed SEZ could contribute to cumulative effects on some species due to its large size.

There are no surface waterbodies or perennial streams within the proposed Delamar Valley SEZ or within the 5-mi (8-km) area of indirect effects, while washes are typically dry and flow only after precipitation, and Delamar Lake and associated wetlands rarely contain water. Thus, no standing aquatic communities are likely to be present in the proposed SEZ. However, aquatic communities do exist within the 50-mi (80-km) geographic extent of effects, including Ash Spring and the Pahranagat NWR, which contain stream and wetland habitat critical for aquatic biota, including several protected endemic fish species (Section 11.2.11.2). However, potential contributions to cumulative impacts on aquatic biota and habitats resulting from groundwater drawdown or soil transport to surface streams from solar facilities within the SEZ and within the geographic extent of effects are difficult to quantify, but are expected to be low. There is little foreseeable development within the geographic extent of effects that would affect the same aquatic habitats potentially affected by the proposed SEZ, while available groundwater is already fully appropriated. The magnitude of any cumulative impacts on aquatic species that might occur will depend on the extent of eventual solar and other development in the region and on cooling technologies employed by solar facilities.

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

On the basis of recorded occurrences or suitable habitat, as many as 49 special status species could occur within the Delamar Valley SEZ or could be affected by groundwater use there. Of these species only the desert tortoise is known to occur within the affected area of the SEZ. The nearest recorded occurrences of desert tortoise are 5 mi (8 km) west of the SEZ, while designated critical habitat occurs approximately 9 mi (14 km) south of the SEZ. In addition, there are 16 groundwater-dependent species or species with habitats that may be affected in the White River Valley regional groundwater system from withdrawals in the Delamar Valley. Numerous additional species that occur on or in the vicinity of the SEZ are listed as threatened or endangered by the state of Nevada or Utah or listed as a sensitive species by the BLM (Section 11.2.12.1). Design Features to be used to reduce or eliminate the potential for effects on these species from the construction and operation of utility-scale solar energy facilities in the SEZs and related projects (e.g., access roads and transmission line connections) outside the SEZ include avoidance of habitat and minimization of erosion, sedimentation, and dust deposition. Ongoing effects on special status species include those from roads, transmission lines, and recreational activities in the area. However, the amount of foreseeable development within the geographic extent of effects is low, including mainly one potential solar and one potential wind project, a groundwater transfer pipeline, and several transmission line projects. Cumulative impacts on protected species, including the desert tortoise, are possible but are expected to be relatively low. Actual impacts would depend on the number, location, and cooling technologies of projects that are actually built. Projects would employ mitigation measures to limit effects.

11.2.22.4.12 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 nearby projects outside the proposed SEZ 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.

Because the area proposed for the SEZ is rural and undeveloped land, there are no significant industrial sources of air emissions in the area. The only type of air pollutant of concern is dust generated by winds. Because the number of other foreseeable and potential actions that could produce fugitive dust emissions is small, while such projects are unlikely to overlap in both time and affected area, cumulative air quality effects due to dust emissions during any overlapping construction periods would be small.

Over the long term and across the region, the development of solar energy may have beneficial cumulative impacts on the air quality and atmospheric values 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 11.2.13.2.2, air emissions from operating solar energy facilities are relatively minor, while the displacement of criteria air pollutants, VOCs, TAPs, and GHG emissions currently produced from fossil fuels could be significant. For example, if the Delamar Valley SEZ were fully developed (80% of its acreage) with solar facilities, the quantity of pollutants avoided could be as large as 12% of all emissions from the current electric power systems in Nevada.

11.2.22.4.13 Visual Resources

The proposed Delamar Valley SEZ is located in the central portion of the broad and flat Delamar Valley. The valley is bounded by mountain ranges to the east, southeast and west, with open views to the north. (Section 11.2.14.1). The area is sparsely inhabited, remote, and rural in character.

The VRI values for the SEZ and immediate surroundings are VRI Class IV, indicating low relative visual values. Currently, there is a low level of cultural disturbance, including from unpaved roads, transmission lines, fences, and corrals. Delamar Lake is used for various recreational uses, including OHV driving and racing. Grazing occurs outside of the dry lake bed.

Construction of utility-scale solar facilities on the SEZ and associated transmission lines outside the SEZ would significantly alter the natural scenic quality of the area. 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. Potential impacts would include night sky pollution, including increased skyglow, light spillage, and glare. Other potential solar and wind projects and related roads and transmission lines outside the proposed SEZ would cumulatively affect the visual resources in the area.

Visual impacts resulting from solar energy development within the SEZ would be in addition to impacts caused by other potential projects in the area. There is currently only one solar facility ROW application nearby, about 5 mi (8 km) northwest of the SEZ, and one other solar and one wind site testing application, each about 50 mi (80 km) southeast of the SEZ on public lands (Figure 11.2.22.2-1). In addition, several new transmission projects and a groundwater transfer pipeline project represent foreseeable development that would pass through or near the proposed SEZ as discussed in Section 11.2.22.2. While the contribution to cumulative impacts in the area of these potential projects would depend on the location of facilities that are actually built, it may be concluded that the general visual character of the landscape within this distance could be altered from what is currently rural desert by the presence of solar facilities, transmission lines, and other new infrastructure. Because of the topography of the region, such developments, located in basin flats, would be visible at great distances from surrounding mountains, which include sensitive viewsheds. Given the small number of current proposals, it is unlikely that two or more facilities would be viewable from a single location. However, facilities would be located near major roads and thus would be viewable by motorists, who would also be viewing transmission lines, towns, and other infrastructure, as well as the road system itself.

As facilities are added, several projects might become visible from one location, or in succession, as viewers move through the landscape, as by driving on local roads. In general, the new projects would not be expected to be consistent in terms of their 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. Considering the above in light of the fact that only potential solar and wind projects have been identified, small cumulative visual impacts could occur within the geographic extent of effects from future solar, wind, and other existing and future developments.

11.2.22.4.14 Acoustic Environment

The areas around the proposed Delamar Valley SEZ are relatively quiet. The existing noise sources around the SEZ include road traffic, aircraft flyover, and cattle grazing. Other noise sources are associated with current land use around the SEZ, including outdoor recreation and OHV use. The construction of solar energy facilities could increase the noise levels periodically for up to 3 years per facility, but there would be little or no noise during operation of solar facilities, except from solar dish engine facilities and from parabolic trough or power tower facilities using TES, which could also minimally affect nearby residences due to considerable separation distances.

Other ongoing and reasonably foreseeable and potential future activities in the general vicinity of the SEZs are described in Section 11.2.22.2. Because proposed projects and nearest residents are relatively far from the SEZ with respect to noise impacts and the area is sparsely populated, cumulative noise effects during the construction or operation of solar facilities are unlikely.

11.2.22.4.15 Paleontological Resources

The proposed Delamar Valley SEZ has low potential for the occurrence of significant fossil material in 73% of its area, mainly alluvial deposits, and unknown potential in about 27% of its area, mainly playa deposits (Section 11.2.16.1). While impacts on significant paleontological resources are unlikely to occur in most of the SEZ, the specific sites selected for future projects would be investigated to determine whether a paleontological survey is needed. Any paleontological resources encountered would be mitigated to the extent possible. No significant cumulative impacts on paleontological resources are expected.

11.2.22.4.16 Cultural Resources

The Delamar Valley is rich in cultural history, and the area covered by the proposed Delamar Valley SEZ has the potential to contain significant cultural resources. At least 9 surveys have been conducted within the boundaries of the SEZ, and 17 additional surveys have been conducted within 5 mi (8 km) of the SEZ, resulting in the recording of 8 sites within SEZ and at least 47 sites located within 5 mi (8 km) of the SEZ (Section 11.2.17.1). Areas with potential for significant sites within the proposed SEZ include areas around the dry lake, at the south end of the SEZ, as well as in alluvial fans located on the outer portions of the SEZ and within a 5-mi (8-km) radius. 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 occurring in the region. However, the amount of potential and foreseeable development is low, including one potential solar project, a proposed groundwater transfer pipeline, and several proposed transmission line projects within the 25-mi (40-km) geographic extent of effects (Section 11.2.22.2). While any future solar projects would disturb large areas, the specific sites selected for future projects would be surveyed; historic properties encountered would be avoided or mitigated to the extent possible. Through ongoing consultation with the Nevada SHPO and appropriate Native American governments, it is likely that most adverse effects on significant resources in the region could be mitigated to some degree. It is unlikely that any sites recorded in the SEZ would be of such individual significance that, if properly mitigated, development would cumulatively cause an irretrievable loss of information about a significant resource type, but this would depend on the results of the future surveys and evaluations. An increase in vandalism on cultural sites could result from additional development in the area, however, particularly if there are multiple solar projects on the SEZ.

11.2.22.4.17 Native American Concerns

Major Native American concerns in arid portions of the Great Basin include water, culturally important plant and animal resources, and culturally important landscapes. The development of utility-scale solar energy facilities within the SEZ in combination with the foreseeable development in the surrounding area could cumulatively contribute to effects on these resources. Development of the SEZ would result in the removal of plant species from the footprint of the facility during construction. This would include some plants of cultural importance. However, the primary species that would be affected are abundant in the region, thus the cumulative effect would likely be small. Likewise, habitat for important species, such as the black-tailed jackrabbit, would be reduced; however, extensive habitat is available in the area, reducing the cumulative effect. The cultural importance of the mountains surrounding the SEZ is as yet undetermined. If culturally important, the view from these features can be an important part of their cultural integrity. The degree of impact on these resources of development at specific locations must be determined in consultation with the Native American Tribes whose traditional use area includes the proposed SEZ. In general, Tribes prefer that development occur on previously disturbed land and this SEZ is largely undeveloped.

Government-to-government consultation is under way with federally recognized Native American Tribes with possible traditional ties to the Delamar Valley area. All federally recognized Tribes with Southern Paiute or Western Shoshone roots have been contacted and provided an opportunity to comment or consult regarding this PEIS. To date, no specific concerns have been raised to the BLM regarding the proposed Delamar Valley SEZ. However, the Paiute Indian Tribe of Utah has asked to be kept informed of PEIS developments. When commenting on past projects in the Delamar Valley, the Southern Paiute have expressed concern over adverse effects of energy projects on a wide range of resources (Section 11.2.18.2). Continued discussion with the area Tribes through government-to-government consultation is necessary to determine the extent to which cumulative effects of solar energy development in the Delamar Valley can be addressed.

11.2.22.4.18 Socioeconomics

Solar energy development projects in the proposed Delamar Valley 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 (including the transmission lines) could range from about 260 to 3,500 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 460 (solar PV) to as high as 6,000 (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-year or more 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, including the proposed groundwater transfer pipeline, and several proposed transmission line projects. The number of workers needed at the solar facilities would be in the range of 30 to 600 with approximately 40 to 900 total jobs created in the region, assuming full build-out of the SEZ (Section 11.2.19.2.2). 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.

11.2.22.4.19 Environmental Justice

Any impacts from solar development could have cumulative impacts on minority and low-income populations within 50 mi (80 km) of the proposed SEZ in combination with other development in the area. Such impacts could be both positive, such as from increased economic activity, and negative, such as from visual impacts, noise, and exposure to fugitive dust. Actual impacts would depend on where low-income populations are located relative to solar and other proposed facilities and on the geographic range of effects. Overall, effects from facilities within the SEZ are expected to be small, while other foreseeable and potential actions would not likely combine with effects from the SEZ on minority and low-income populations. If needed, mitigation measures can be employed to reduce the impacts on these populations in the vicinity of the SEZ. Thus, it is not expected that the proposed Delamar Valley SEZ would contribute to cumulative impacts on minority and low-income populations.

11.2.22.4.20 Transportation

U.S. 93 lies about 8 mi (13 km) to the west and a equal distance to the north of the proposed Delamar Valley SEZ. The closest commercial airport is Lincoln County Airport at Panaca, about 35 mi (56 km) to the northeast of the SEZ. The Union Pacific railroad serves the region. During construction of utility-scale solar energy facilities, there could be up to 1,000 workers commuting to the construction site at the SEZ, which could increase the AADT on these roads by 2,000 vehicle trips for each facility under construction. With as many as two facilities assumed under construction at the same time, traffic on U.S. 93 could experience slowdowns in the area of the SEZ (Section 11.2.21.2). This increase in highway traffic from construction workers could likewise have moderate cumulative impacts in combination with existing traffic levels and increases from additional future projects in the area, including from construction in the proposed Dry Lake Valley North SEZ located 20 mi (32 km) to the north, should construction schedules overlap. Local road improvements may be necessary on portions of U.S. 93 near the proposed Delamar Valley SEZ. Any impacts during construction activities would be temporary. The impacts can also be mitigated to some degree by staggered work schedules and ride-sharing programs. Traffic increases during operation would be relatively small because of the low number of workers needed to operate the solar facilities and would have little contribution to cumulative impacts.

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11.2.23 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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