GARLOCK ROAD ALTERNATIVE

Cultural Resources

Environmental Setting. The Garlock Road Alternative (GRA) is located on agriculture land, in Kern County, California. The alternative site is located in the western Mojave Desert approximately 1.2 miles south of the site of Garlock, a former railroad station situated in the eastern Fremont Valley approximately 22 miles northeast of California City. One-half mile to the southwest is the eastern edge of Koehn Dry Lake. The California desert has been inhabited for at least 8,000 to 12,000 years and perhaps as much as 16,000 years (Rosenthal et al. 2007, p.151). Prehistoric settlement was often centered around lakes, now the dry playas characteristic of the Mojave Desert and Great Basin. The lakes and the marsh environments along the lake shores supported abundant plant and animal species that provided food, fiber, medicine, tool materials, clothing, and ritual objects required for daily life (Schaefer and Laylander 2007). In the immediate vicinity of the Garlock Alternative, archaeological remains at Koehn Dry Lake, and further southwest at Cantil have revealed significant habitation during the late Holocene (Sutton et al. 2007).

From 8,000 to 6,000 years before present, climatic change caused the lakes to dry, and food gathering and land use patterns began that continued into the historic period, including the use of a greater variety of habitats, plants, and animals (Sutton et al. 2007). The bow and arrow may have appeared around 2,000 years ago as shown by a shift in projectile point form and size, and the arrival of bow-and-arrow technology is thought to be reflected by the late prehistoric introduction of the Desert Side-Notched and Cottonwood Triangular points found through the California desert (Sutton et al. 2007). Evidence from CA-KER-875 at Koehn suggests that the late prehistoric was marked by gradual desiccation as reflected in the prehistoric use of juniper as fuel at Koehn Lake, a tree that is longer present in the immediate region (Sutton et al. 2007, p.241).

The first documented exploration of the Mojave Desert by nonindigenous people occurred in 1770s by Francisco Garces, a Spanish Franciscan priest looking for a route from Arizona to Northern California. Much of the history of this region occurred through its use as a corridor, one used by fur trappers and caravans. California was annexed in 1848, the same year that gold was discovered, leading to an influx of prospectors. Roads were established to transport goods, people, livestock, food, and ore between the Mojave Desert and Los Angeles, and the western Mojave Desert began to have a large mining industry.

Railroad surveys began in 1853; the San Pedro, Los Angeles, and Salt Lake Line, predecessor to the Union Pacific through the Mojave Desert, was completed in 1905, and the Tonopah and Tidewater finished its line from Ludlow to Beatty, Nevada, in

1907. In 1914, a road was completed to parallel the tracks of the Atlantic & Pacific Railroad, which was the precursor to U.S. 66 (National Trails Highway).

Military bases were established in the desert in association to World War II, including Naval Air Weapons Station – China Lake and Fort Irwin.

Evidence from aerial photographs indicate that the entire GRA has been under irrigated cultivation for some time. The area lacks characteristic desert scrub of areas less subject to disturbance. In addition, the presence of radial irrigation systems suggests agricultural use after circa 1960. The radial irrigation method was invented and developed in Nebraska during the late 1940s. Until the late 1950s the method was largely restricted to the upper Midwest (http://en.wikipedia.org/wiki/Irrigation#Center_pivot_irrigation).

A records search for the GRA was conducted on January 15, 2010 by staff at the Southern San Joaquin Valley Information Center of the California Historical Resources Information System. The records search was carried out at the request of AECOM of San Diego, California. The research included a one-mile buffer surrounding the GRA site. The record search reveals that the region around the GRA is primarily unsurveyed and recorded archaeological remains are infrequent. A summary of the records search results was prepared by AECOM staff in February 2010.

The records search identified three prior studies within or adjoining the GRA and five previously recorded sites with one mile. The reports include Wilke (1983), Ridgeway and Garfinkel (1984) and Richards (2003). Sites in the GRA search area include P-15-191 (a bedrock milling station and trail), P-15-882 (temporary camp site), P-15-3366 (Mojave-Owenyo Southern Pacific line), P-15-12174 (milling stone scatter), and P-15-13303 (CA-KER-7499H, an historic dump). All recorded resources are located north or west of the GRA. Surveyed land within the buffer area is too limited to estimate site density. Two linear surveys are mapped to the north and east, one of which located an historic can dump (P-15-13303) adjacent to the northeastern corner of the GRA (Ridgeway and Garfinkel 1983).

During research in preparation of the present document, historic maps of the project region were consulted and one potential historical resource in the western portion of the GRA was identified. The 1915 edition of the United States Geological Survey *Searles Lake* 1:250,000 scale one-degree quadrangle appears to locate Garlock west and south of the present site. A location presently mapped as “Old Garlock” by the National Geospatial Intelligence Agency, is cited from the Saltdale 1:50,000 USGS quadrangle dated 1947 (United States Geological Survey 2010). The modern site of Garlock is 3.2 miles northeast of the location of “Old Garlock.” This historical change suggests that there may be a potential for historical archaeological resources within the northwest portion of the GRA site.

The available information on the occurrence of both prehistoric and historic archaeological sites is too scant to estimate probabilities for encountering resources within the GRA site. Satellite imagery accessed via Google Earth suggests that one or

more ancient beach lines may have traversed what is now the southwestern portion of the GRA. These lines, if they are indeed shore lines from ancient beaches may indicate a potential for prehistoric sites with the GRA area.

On Sunday, February 28th a windshield survey of the GRA was made by personnel of PAR Environmental Services, Inc. The visit found that access to the GRA is limited with poor roads and limited visual access. The GRA presently exhibits at least four and possibly seven structures. These appear to be mostly modern structures, but, based upon satellite imagery available on Google Earth, one older structure may be present at the location of Old Garlock in the northwest corner of the GRA.

Environmental Impacts. The construction and operation of a solar facility on the site of the Garlock Road alternative would appear to have the potential to affect the site of Old Garlock, and possibly one historic archaeological site (CA-KER-7499H), an historic can dump that may extend into the GRA area. Vertical disturbances may extend as much as four meters (13 feet).

The potential to affect prehistoric resources by constructing the GRA is indeterminate. Because of the history of agricultural use of the entire GRA there is little potential for intact prehistoric or historic surface manifestations. As noted previously satellite imagery indicates that 100-percent of the GRA has been subjected to surface alterations related to agricultural operations. Typical agricultural tilling patterns and implements affect soil profiles to depths of four to 12 inches (10 to 30 cm). Deeper plowing and ripping, to break up hardpan formations for example, may extend to depths of four feet or more. The location of the alternative makes it possible that buried resources associated with Middle and Late Holocene high-shore lines of Koehn Lake may be present, particularly in the southern and western portions of the area. Geoarchaeological studies conducted for the Beacon Solar Energy project 12 to13 miles southwest of the GRA found Holocene period archaeological materials at depths of up to nearly four meters in some landforms. The investigators found that in general site accumulation tended to correlate with surfaces that reflect climatically stable, well watered periods with extended pooling periods on the playas (Young 2009).

One historical property, the site of Old Garlock may be present within the GRA, however without access to the location, this cannot be verified. The resolution of this issue would require further study.

Built environment, besides Old Garlock, includes several structures around the GRA quarters for ranch staff and shelters for hay or other ranch products. These appear less than 50 years of age.

Comparison to Proposed Project. The development of a solar facility on the site of the GRA would most likely have cultural resource impacts of less extent than the preferred site, based upon the available survey data. The extensive surface disturbance suggests that additional effects to archaeological resources may be limited. The lack of proximity to other known properties implies that visual impacts may also be limited.

In contrast, the proposed RSPP has no built environment issues. However, the RSPP's ground surface has not been subjected to agricultural use. Isolated resources and archaeological sites identified within the RSPP retain spatial patterning, material culture attributes and relative contextual data. As such, the resource base at RSPP allows for interpretation regarding general patterns of prehistoric and historic land use in the area through time and across the landscape and contains significant resources that appear to be lacking in the GRA.

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1.0 INTRODUCTION

Solar Millennium, LLC is proposing to construct a utility-scale solar thermal electric power generating facility named the Ridgecrest Solar Power Project (Proposed Project). The Proposed Project will utilize solar parabolic trough technology to generate electricity and will have a nominal output of 250 megawatts consisting of a single power plant utilizing two solar fields. The Proposed Project will be located in the high northern Mojave Desert in northeastern Kern County, California about five miles northwest of the City of Ridgecrest, California. The Proposed Project right-of-way (ROW), for which a ROW grant has been sought from the Bureau of Land Management (BLM), will extend across approximately 3,920 acres of public land owned by the federal government. The Proposed Project facilities will occupy 1,440 acres of the 3,920-acre site, and there will be a total disturbance area (including areas outside the facility fence line) of approximately 1,738 acres (EDAW AECOM 2009).

HELIX Environmental Planning, Inc. (HELIX) conducted a biological reconnaissance for one alternative site to the Proposed Project site, the Garlock Road Alternative site. The purpose of the reconnaissance was to assess the Garlock Road Alternative site in order to compare the potential impacts to biological resources on the Proposed Project site to the potential impacts to biological resources on the Garlock Road Alternative site. The Garlock Road Alternative site is located in Kern County approximately 15.75 miles south-southwest of the city center of Ridgecrest, California. The Garlock Road Alternative site is in Fremont Valley, south of the intersection of Garlock Road and Redrock Randsburg Road, approximately 6.6 miles west of U.S. 395. The Garlock Road Alternative site is approximately 2,248 acres in size and is comprised entirely of privately held land. It is assumed that the entire Garlock Road Alternative site would be disturbed during development of the Ridgecrest Solar Power Project.

2.0 ENVIRONMENTAL SETTING

Ridgecrest is located in the Mojave Bioregion. The Mojave Bioregion is the western extension of a vast desert that covers southern Nevada, the southwestern tip of Utah, and 25 million acres of southern California -- one quarter of the state. The climate is hot and dry in summer. Winters are cool to cold, depending on the elevation, with occasional rainstorms that can quickly turn a gulch or dry lake into a flash flood zone (California Environmental Resources Evaluation System [CERES] 2010).

The landscape is mostly moderately high plateau with elevations averaging 2,000 to 3,000 feet and isolated peaks that exceed 6,000 and 7,000 feet. Though appearing barren and remote, the desert teems with biodiversity, and more than 90 percent is within three miles of a paved road or off-road vehicle track (CERES 2010).

Palm oases provide water for wildlife, as do many streams and springs. In prehistoric times, the bioregion contained great desert lakes, which have long since evaporated and seeped underground. This bioregion has the lowest elevation in North America, 282 feet below sea level in Death Valley National Park. The Mojave, Amargosa, and Colorado rivers are the largest rivers in this mostly arid bioregion (CERES 2010).

Common habitats of the Mojave Bioregion are desert wash, Mojave creosote bush scrub, desert saltbush scrub, Joshua tree scrub, alkali scrub, palm oasis, juniper-pinyon woodland, and some hardwood and conifer forests at higher elevations. Cottonwood-willow riparian forest is a rare habitat in this bioregion, as is alkali marsh and open sandy dunes.

Rare animals include the Mohave ground squirrel (*Spermophilus mohavensis*), prairie falcon (*Falco mexicanus*), Le Conte's thrasher (*Toxostoma lecontei*), Nelson's bighorn sheep (*Ovis canadensis nelsoni*), gray vireo (*Vireo vicinior*), desert tortoise (*Gopherus agassizii*), pale Townsend's big-eared bat (*Corynorhinus townsendii pallescens*), Amargosa vole (*Microtus californicus scirpensis*), Mohave tui chub (*Gila bicolor mohavensis*), and Cottonball Marsh pupfish (*Cyprinodon salinus milleri*; found only in Death Valley National Park). Parks and recreation areas that provide water are the home of snowy plover (*Charadrius alexandrinus nivosus*), least sandpiper (*Calidris minutilla*), killdeer (*Charadrius vociferous*), American white pelican (*Pelecanus erythrorhynchos*), and thousands of migratory wading shore birds, as well as various raptors, coyote (*Canis latrans*), American badger (*Taxidea taxus*), least Bell's vireo (*Vireo bellii pusillus*), and Canada goose (*Branta canadensis*).

Rare plants include white bear poppy (*Arctomecon merriamii*), Barstow woolly sunflower (*Eriophyllum mohavense*), alkali mariposa lily (*Calochortus striatus*), Red Rock poppy (*Eschscholzia minutiflora*), Mojave monkeyflower (*Mimulus mohavensis*), and Stephen's beardtongue (*Penstemon stephensii*; CERES 2010).

3.0 METHODS AND LIMITATIONS

As preparation for the field reconnaissance, HELIX reviewed these documents, references, and databases: Ridgecrest Solar Power Project Application for Certification (AECOM 2009), Ridgecrest Solar Power Project Biological Resources Technical Report (EDAW AECOM 2009), STATSGO soils data (Soil Survey Staff, Natural Resources Conservation Service, U.S. Department of Agriculture [Soil Survey Staff] 2009), West Mojave Plan (BLM 2005), critical habitat mapping from the U.S. Fish and Wildlife Service, and California Natural Diversity Database (CNDDB; California Department of Fish and Game [CDFG] 2009) records.

HELIX biologists Deborah Leonard, Jasmine Watts, Jason Kurnow, and Kimberly Davis conducted the field reconnaissance of the Proposed Project site on 29 December 2009. On 30 December 2009, they conducted additional field work at the Garlock Road Alternative site to make site-specific comparisons between the biological resources on the Proposed Project site and those that HELIX observed on the Garlock Road Alternative site.

The reconnaissance included comparing and photographing representative samples of vegetation communities throughout the Proposed Project site and on the Garlock Road Alternative site. Vegetation community types and plant and animal species (or sign) observed were noted, as well as potential U.S. Army Corps of Engineers (ACOE) and/or CDFG jurisdictional features.

Since the Proposed Project site is entirely federally held, there were no access restrictions, and the reconnaissance was made by driving existing roads and surveying on foot where there were no roads. Since all of the Garlock Road Alternative site is privately held, access was restricted to the entire site. Therefore, HELIX viewed the Garlock Road Alternative site with binoculars from

vantage points around it where legal access could be made and conducted aerial photograph interpretation where the site could not be visually observed from a distance.

The potential for special status species occur on the Garlock Road Alternative site was determined using a habitat-based analysis, by referring to the special status species observed or with potential to occur on the Proposed Project site, and by consulting the CNDDB. Detailed vegetation mapping, delineation of potential ACOE/CDFG jurisdictional features, and focused surveys for special status plant and animal species were outside the scope of services provided by HELIX.

While detailed vegetation mapping was not conducted for the Garlock Road Alternative site, vegetation polygons were sketched based on what could be seen from public access points in the field as well as aerial photograph interpretation. These polygons were then digitized using a Geographic Information System (GIS), thereby providing a rough estimate of the total acreage for each vegetation community on the Garlock Road Alternative site. This mapping and the acreages derived from it are extremely preliminary (reconnaissance level) and should be used only to provide a generalized understanding of the amount and types of vegetation present. A full vegetation mapping effort would be required to provide more accurate figures.

4.0 RESULTS

Land Use, Elevation, Topography, and Soils

Proposed Project Site. The Proposed Project disturbance area is designated as BLM Multiple Use Class (MUC) "Limited" or "Unclassified." MUC "Limited" lands are "managed to provide for generally lower-intensity, carefully controlled multiple use of resources, while ensuring that sensitive values are not significantly diminished." Historic and current uses of the Proposed Project site (approved and unapproved) include grazing allotments, off-road vehicle use, target practice, and trash dumping. Elevation on the Proposed Project site ranges from approximately 2,580 to 2,890 feet above mean sea level. Topography on the Proposed Project site is relatively flat and slopes gently downward in a northwest direction. The majority of the Proposed Project site is underlain by alluvium and alluvial fan deposits that consist of unconsolidated moderately to well-sorted gravel, sand, silt, and clay. An outcrop of a basement complex of undifferentiated plutonic, hypabyssal, and metamorphic rocks occur in the eastern portion of the site (AECOM 2009).

Garlock Road Alternative Site. The Garlock Road Alternative site consists almost exclusively of historic agricultural operations and fallow agricultural fields and is surrounded largely by undisturbed, native vegetation communities. Elevation on the Garlock Road Alternative site ranges from approximately 1,960 to 2,200 feet above mean sea level. The Garlock Road Alternative site occurs in the bottom Fremont Valley and slopes gently to the southwest toward Koehn Lake. These soil series are mapped for the Garlock Road Alternative site: Rosamond, Gila, and Cajon (Soil Survey Staff 2009). The Rosamond series consists of deep, well drained soils that formed in material weathered mainly from granitic alluvium. The Gila series consists of very deep, well drained soils formed in stratified alluvium. The Cajon series consists of very deep, somewhat excessively drained soils that formed in sandy alluvium from dominantly granitic rocks (Soil Survey Staff 2009).

Jurisdictional Areas

Proposed Project Site. Two habitats on the Proposed Project site are considered waters of the state under the jurisdiction of the CDFG: Mojave desert wash scrub and unvegetated, ephemeral dry wash (see Photos 1 and 2 below).

Photo 1: Mojave Desert Wash Scrub on Proposed Project Site

Photo 2: Unvegetated, Ephemeral Dry Wash on Proposed Project Site

Garlock Road Alternative Site. No potential jurisdictional areas were observed on the Garlock Road Alternative site, and none are suspected based on aerial photograph and U.S. Geological Survey topographic map interpretation. It was noted that there is a wash along the northern border of the site as well as a wash that skirts the northwestern-most corner of the Garlock Road Alternative site that may be waters of the U.S. under the jurisdiction of the ACOE since they may have connection to Koehn Lake. Where the wash was directly observed by HELIX, it was unvegetated so it may not be waters of the state under the jurisdiction of the CDFG. A focused delineation would be necessary to confirm jurisdiction.

Wildlife Use

Proposed Project Site. Seventy-seven animal species were observed or detected during surveys of the 9,312-acre Biological Resources Survey Area (BRSA) for the Proposed Project (EDAW AECOM 2009). Common animal species observed or detected on the Proposed Project by EDAW AECOM and HELIX include species typical of the vegetation communities/habitats on the site such as side-blotched lizard (*Uta stansburiana*), greater roadrunner (*Geococcyx californianus*), horned lark (*Eremophila alpestris*), black-throated sparrow (*Amphispiza bilineata*), rock wren (*Salpinctes obsoletus*), common raven (*Corvus corax*), red-tailed hawk (*Buteo jamaicensis*), black-tailed jackrabbit (*Lepus californicus*), kangaroo rat (*Dipodomys* spp.), desert kit fox (*Vulpes macrotis arsipus*), and coyote. Additionally, scat from wild burro (*Equus asinus*) was found throughout the Proposed Project site.

Garlock Road Alternative Site. Since access to the Garlock Road Alternative site was restricted, observation of wildlife or wildlife sign on the site was extremely limited. However, rodent burrows were observed as well as coyote scat, common raven, and house finch (*Carpodacus mexicanus*). Because the majority of the Garlock Road Alternative site has been disturbed by past agricultural operations, wildlife use of the site for foraging, sheltering, breeding, or dispersal is anticipated to be less than in surrounding native habitats. However, the Garlock Road Alternative site does occur in the center of Fremont Valley, and wildlife may cross the site to travel between the mountains to the north and south or between the upper elevations in the valley to the east to Koehn Lake to the west.

Vegetation Communities

Proposed Project Site. The Proposed Project disturbance area consists of approximately 1,738 acres, of which only Brown Road and U.S. 395 (total of 0.5 acre) are developed (EDAW AECOM 2009; Table 1). The remainder of the Proposed Project disturbance area supports native

vegetation communities including Mojave creosote bush scrub (see Photo 3 below); Mojave Desert wash scrub (see Photo 1 above); and unvegetated, ephemeral dry wash (see Photo 2 above).

Photo 3: Mojave Creosote Bush Scrub on Proposed Project Site

Table 1
VEGETATION COMMUNITY ACREAGES*

Vegetation Community	Proposed Project Disturbance Area	Garlock Road Alternative Site
Unvegetated, ephemeral dry wash	8.0	0.0
Mojave creosote bush scrub	1,721	0.0
Mojave desert wash scrub	8.0	0.0
Desert saltbush scrub (including disturbed)	0.0	354.8
Disturbed stabilized desert dunes	0.0	571.9
Disturbed habitat	0.0	1,317.5
Developed	0.5	3.8
TOTAL	1,738.0	2,248.0

*Acreages for the Proposed Project disturbance area (EDAW AECOM 2009) have been rounded. Acreages are approximate for the Garlock Road Alternative site (see Section 3.0, *Methods and Limitations* in this report). It is assumed herein, that all of the vegetation on the Garlock Road Alternative site would be impacted.

Garlock Road Alternative Site. Based on the field reconnaissance and interpretation of aerial photography, it appears that there are five vegetation communities on the Garlock Road Alternative site: disturbed habitat, disturbed desert saltbush scrub, disturbed stabilized desert dunes, desert saltbush scrub, and developed (Table 1).

Disturbed habitat occurs in the central and western portions of the Garlock Road Alternative site. Areas of disturbed habitat appear to have been subjected to the most intensive agricultural practices on the site. Disturbed habitat supports species such as mustard (*Sisymbrium* sp.), thistle (*Salsola* sp.), Mediterranean grass (*Schismus* sp.), and filaree (*Erodium* sp.). See Photo 4 below.

Photo 4: Disturbed Habitat (right), Developed (left) on Garlock Road Alternative Site

Disturbed desert saltbush scrub occurs on the Garlock Road Alternative site supports desert saltbush (*Atriplex polycarpa*) but also has substantial cover of plant species such as filaree, Mediterranean grass, mustard, and thistle. It also supports some scalebroom (*Lepidospartum squamatum*). See Photo 5 below.

Photo 5: Disturbed Desert Saltbush Scrub on Garlock Road Alternative Site

Disturbed stabilized desert dunes occur in the eastern portion of the Garlock Road Alternative site. Some old farming equipment was observed, and the vegetative cover is comprised primarily of annual, herbaceous plant species such as Mediterranean grass and filaree with a few, scattered thistle and desert saltbush. See Photo 6 below.

Photo 6: Disturbed Stabilized Desert Dunes on Garlock Road Alternative Site

Desert saltbush scrub occurs in the northeastern portion of the Garlock Road Alternative site. This community is dominated by desert saltbush and also supports some thistle, Mediterranean grass, and filaree. See Photo 7 below.

Photo 7: Desert Saltbush Scrub on Garlock Road Alternative Site (in background)

Developed occurs near the central portion of the Garlock Road Alternative site and consists of abandoned buildings. See Photo 4 above.

Special Status Species

Proposed Project Site. No state or federally listed plant species or non-listed, special status plant species were found on the Proposed Project site, although the state listed threatened Mohave ground squirrel (*Spermophilus mohavensis*) is assumed to be present (EDAW AECOM 2009). The following six special status animal species were observed on the Proposed Project site: desert tortoise (state a federally listed threatened), western burrowing owl (*Athene cunicularia hypugaea*; CDFG Species of Special Concern), loggerhead shrike (*Lanius ludovicianus*; CDFG Species of Special Concern), Le Conte's thrasher (*Toxostoma lecontei*; CDFG Species of Special Concern, BLM Sensitive), American badger (*Taxidea taxus*; CDFG Species of Special Concern), and desert kit fox (California Code of Regulations Protected Fur-bearing Mammal). See Appendix A for more information.

Garlock Road Alternative Site. Special status species observations have been reported to the CNDDB within five miles of the Garlock Road Alternative site (Table 2). These CNDDB records include two non-listed, special status plant species; three listed animal species; and two non-listed, special status animal species.

Table 2

California Natural Diversity Database Records for Special Status Species Within Five Miles of the Garlock Road Alternative Site

Common Name ***Scientific Name***	**Status** **State/Fed/CNPS/BLM**	**Records Within 5 Miles of Garlock Road Alternative Site***
Red Rock poppy *Eschscholzia minutiflora* ssp. *twisselmannii*	--/--/List 1B.2/S	Reported in seven locations in the mountains north and northwest of the site at distances from approximately 0.8 mile to 4.8 miles from the site.
Charlotte's phacelia *Phacelia nashiana*	--/--/List 1B.2/S, WEMO	Reported in six locations in the mountains north and northwest of the site at distances from approximately 1.4 miles to 4.1 miles from the site.

Table 2

(Continued)

Common Name *Scientific Name*	Status State/Fed/CNPS/BLM	Records Within 5 Miles of Garlock Road Alternative Site*
Desert tortoise *Gopherus agassizii*	ST/FT/--/WEMO	CNDDB record is for a 1,700 square mile area (that includes the site) from Fremont Valley south to the vicinity of Adelanto, west to State Route 14, east to the Calico Mountains, and Western Mojave Desert at elevations from 2,000 to greater than 4,000 feet.
Western snowy plover *Charadrius alexandrinus nivosus*	SSC/FT/--/--	Reported around Koehn Lake approximately 1.4 miles southeast of the site.
Prairie falcon *Falco mexicanus*	Formerly SSC but no longer is of special status.	Reported in six locations north and west of the site, including in the northern portion of the site.
Loggerhead shrike *Lanius ludovicianus*	SSC/--/--/WEMO	Reported in one location approximately 1.5 miles west of the site.
Le Conte's thrasher *Toxostoma lecontei*	SSC/--/--/S, WEMO	Reported in two locations: one approximately 0.5 mile north of the site and one approximately one mile west of the site.
Mohave ground squirrel *Spermophilus mohavensis*	ST/--/--/WEMO	Reported in three locations approximately 1.2 miles, 3.4 miles, and 3.75 miles east of the site.

*Source: CDFG 2009.

Status Codes:

Federal FE - Federally listed endangered: species in danger of extinction throughout a significant portion of its range
FT - Federally listed threatened: species likely to become endangered within the foreseeable future

State SE - State listed endangered
ST = State listed threatened
SSC = Species of special concern

California Native Plant Society

List 1B - Rare, threatened, or endangered in California and elsewhere
List 2 - Rare, threatened, or endangered in California but more common elsewhere
List 3 - Plants which need more information
List 4 - Limited distribution – a watch list
0.1 - Seriously threatened in California (high degree/immediacy of threat)
0.2 - Fairly threatened in California (moderate degree/immediacy of threat)
0.3 - Not very threatened in California (low degree/immediacy of threats or no current threats known)

BLM **S =** Sensitive
BLM Manual § 6840 defines sensitive species as "…those species that are (1) under status review by the FWS/NMFS; or (2) whose numbers are declining so rapidly that federal listing may become necessary, or (3) with typically small and widely dispersed populations; or (4) those inhabiting ecological refugia or other specialized or unique habitats." www.blm.gov/ca/pdfs/pa_pdfs/biology_pdfs/SensitiveAnimals.pdf

WEMO Special-status species considered in analysis of the West Mojave Plan (BLM 2005)

Since the Garlock Road Alternative site has been disturbed by past agricultural operations, the potential for special status plant species to occur there is low (see Appendix A). In addition to the species reported to the CNDDB within five miles of the Garlock Road Alternative site, there are other special status species that have been observed on the Proposed Project site or have been reported to the CNDDB within five miles of the Proposed Project site that may have potential to occur on the Garlock Road Alternative site. A list of all species with their potential to occur (or presence) on the Proposed Project site and the Garlock Road Alternative site is provided as Appendix A.

Based on the reconnaissance and CNDDB records, the Garlock Road Alternative site has the potential to support all of the animal species that are present on the Proposed Project site except Le Conte's thrasher because the habitat is not appropriate for the species (see Appendix A). The overall potential for desert tortoise is expected to be low because in some areas the substrate may be too sandy to support burrowing (e.g., disturbed stabilized desert dunes) and/or the vegetation has been too altered to provide necessary forage and shelter (e.g., disturbed habitat). It is expected, based on review of aerial photography, that the latter is probably the case in portions of the site that could not be viewed due to access restrictions. It should be noted, however, that Mojave creosote bush scrub surrounds the eastern and northern portions of the Garlock Road Alternative site, and based on aerial photograph review, surrounds the southern portion of the site as well. This Mojave creosote bush scrub habitat is appropriate for the desert tortoise, and desert saltbush scrub (including disturbed) on the Garlock Road Alternative site are adjacent to this habitat.

West Mojave Plan and Critical Habitat

Proposed Project Site. The Proposed Project disturbance area is located entirely within the West Mojave Plan (WEMO) area and is designated as BLM Multiple Use Class (MUC) "Limited" or "Unclassified." MUC "Limited" lands are "managed to provide for generally lower-intensity, carefully controlled multiple use of resources, while ensuring that sensitive values are not significantly diminished." Historic and current uses of the Proposed Project site

(approved and unapproved) include grazing allotments, off-road vehicle use, target practice, and trash dumping. The portion of the Proposed Project disturbance area south of Brown Road overlaps with approximately 844 acres of Mohave Ground Squirrel Conservation Area. The disturbance area does not occur within any other WEMO Conservation Areas or Areas of Critical Environmental Concern (ACECs) including designated Desert Tortoise Desert Wildlife Management Areas (DWMAs). The closest Desert Tortoise DWMA is the Fremont-Kramer DWMA approximately seven miles southeast of the Biological Resources Survey Area (BRSA) for the Proposed Project (EDAW AECOM 2009).

Garlock Road Alternative Site. The Garlock Road Alternative site is privately held land, so it is not managed by the BLM. Historic use of the property includes agricultural activities. Currently the property appears abandoned. While some maps appear to show that the Garlock Road Alternative site is within WEMO Mohave Ground Squirrel Conservation Area, it is suspected that this is a mapping error due to the scale of the maps, and that it is only the BLM land surrounding the site that should be included. The Garlock Road Alternative site, as privately held land, does not occur within any ACEC including designated Desert Tortoise DWMA, although an ACEC and the Fremont-Kramer (Desert Tortoise) DWMA are immediately south and west of the site. Critical habitat for the desert tortoise does not occur on the Garlock Road Alternative site but does occur immediately adjacent to the southwest corner of the site and also occurs approximately 0.7 mile south and 0.5 mile east and north of the site.

5.0 ALTERNATIVE COMPARISON SUMMARY

Table 3 provides a summarized comparison of the biological resources on the Proposed Project site and the Garlock Road Alternative site.

Table 3

Alternative Comparison for Biological Resources*

Biological Resource	Proposed Project Site Disturbance Area	Garlock Road Alternative Site
Vegetation Communities	Vegetative cover in the disturbance area is approximately 99 percent native Communities present include Mojave creosote bush scrub; Mojave Desert wash scrub; unvegetated, ephemeral dry wash; and developed	Vegetative cover on site is approximately 41 percent native (and mostly disturbed) Communities present include disturbed habitat, disturbed desert saltbush scrub, disturbed stabilized desert dunes, desert saltbush scrub, and developed
Jurisdictional Areas	Waters of the state: Mojave Desert wash scrub and unvegetated, ephemeral dry wash There are no waters of the U.S. in the disturbance area	No potential jurisdictional areas were observed on the alternative site, and none are suspected based on aerial photograph and U.S. Geological Survey topographic map interpretation.
Special Status Plants Observed (including CNDDB records)	None	None
Potential for Other Special Status Plants	Low to moderate throughout the site	Low throughout the site
Special Status Animals Observed (including CNDDB records)	Desert tortoise (ST, FT*), western burrowing owl (SSC), loggerhead shrike (SSC), Le Conte's thrasher (SSC), and desert kit fox (Protected Fur-bearing Animal per California Code of Regulations 460)	Desert tortoise (see Table 2 and Appendix A)

Table 3
(Continued)

Biological Resource	Proposed Project Site Disturbance Area	Garlock Road Alternative Site
Potential for Other Special Status Animals	Low to high Mohave ground squirrel (ST) is assumed to be present	Desert tortoise—low (in desert saltbush scrub) Northern harrier (*Circus cyaneus*; SSC)—moderate to forage throughout the site Western burrowing owl—moderate throughout the site Loggerhead shrike—moderate to forage throughout the site Le Conte's thrasher—low (in desert saltbush scrub) Desert kit fox—moderate throughout the site Mohave ground squirrel—not expected; habitat not present Pallid bat (*Antrozous pallidus*; SSC, S)—moderate (may roost in abandoned buildings and forage on site)
Critical Habitat	None	None
Level of Site Disturbance	Low throughout the entire approximately 1,738-acre disturbance area	Low in desert saltbush scrub (approximately 355 acres) Moderate in disturbed stabilized desert dunes (approximately 572 acres) High on remainder (approximately 1,321 acres) of the approximately 2,248-acre site

*See following Table 2 for an explanation of status codes used in Table 3. Refer to Appendix A for a complete listing of species with potential to occur.

6.0 CONSTRUCTION IMPACTS

Proposed Project Site. According to the Ridgecrest Solar Power Project Biological Resources Technical Report (EDAW AECOM 2009), the Proposed Project would directly impact a total of approximately 1,738 acres. The impacts would include those to approximately 8.0 acres each of Mojave Desert wash scrub and unvegetated, ephemeral dry wash (both of which may be waters

of the state), as well as approximately 1,721 acres of Mojave creosote bush scrub and 0.5 acre of develop (EDAW AECOM 2009).

No special status plant species occur in the Proposed Project site disturbance area, so there would be no impacts to these types of species.

Site grading and installation of project facilities would directly and permanently impact approximately 1,738 acres of occupied desert tortoise habitat within which 40 individual desert tortoise ("a large population;" EDAW AECOM 2009) and more than 200 desert tortoise burrows were observed in 2009 (EDAW AECOM 2009). Additionally, the Mohave ground squirrel is assumed to be present, and approximately 1,725 acres of suitable habitat for the species (including 844 acres of Mohave Ground Squirrel Conservation Area) occurs in the disturbance area (EDAW AECOM 2009) that would be directly and permanently impacted.

The Proposed Project would also directly impact non-listed, special status animal species including the western burrowing owl (two nesting pairs, four individuals, and 1,738 acres of foraging habitat), loggerhead shrike (loss of foraging habitat), Le Conte's thrasher (loss of creosote bush habitat for foraging and possibly nesting), and desert kit fox (loss of 75 burrows/burrow complexes and 1,738 acres of foraging habitat), as well as migratory birds (habitat destruction, death, injury, nest disturbance) throughout the entire 1,738-acre Proposed Project disturbance area (EDAW AECOM 2009).

Garlock Road Alternative Site. It is expected that the entire Garlock Road Alternative site and all of its vegetation communities would be permanently lost as a result of site grading and installation of project facilities, potentially affecting special status animal species (see Table 3 and Appendix A).

Few impacts to special status animal species would be expected on the Garlock Road Alternative site because it has been impacted by past agricultural activities and is mostly disturbed (see Table 3). However, some special status animal species have moderate potential to occur on the site including western burrowing owl, northern harrier, loggerhead shrike, desert kit fox, and pallid bat. The Garlock Road Alternative site could provide foraging habitat for all of these species and breeding habitat for the western burrowing owl and desert kit fox, and all of the habitat would be directly and permanently impacted during construction.

With regard to the western burrowing owl, burrowing owl numbers have been markedly reduced in California for at least the past 60 years. Conversion of grasslands, other habitat destruction, and poisoning of ground squirrels, has contributed to the reduction in numbers in recent decades, which was noted in the 1940s and earlier. Within the past 20 years, however, and particularly within the past five years, the decline of the western burrowing owl in California appears to have greatly accelerated. Apparently, this has resulted because of habitat loss caused by increased residential and commercial development (California Public Utilities Commission 2008). *Aspen, this came from your Solar 2 alts writeup—please include reference at end for us.* Although the CNDDB does not show any record of the western burrowing owl within five miles of the Garlock Road Alternative site, it may occur on the Garlock Road Alternative site since appropriate habitat is present.

While the desert tortoise has been reported to the CNDDB within a 1,700 square mile area that includes the Garlock Road Alternative site, the potential for the tortoise to occur on the Garlock Road Alternative site is low, but the tortoise could occur immediately off site in surrounding Mojave creosote bush scrub habitat and desert tortoise critical habitat. The Proposed Project could have indirect impacts to off-site desert tortoise, for example, if invasive exotic plant species spread from the Garlock Road Alternative site into adjacent tortoise habitat thereby degrading its quality.

Finally, wildlife movement across the site, should it occur, would be affected if the Garlock Road Alternative site is developed and fenced. Wildlife would have to travel around the approximately 2,248-acre site to move through this portion of Fremont Valley, although there is presently native habitat surrounding the site that would allow for this movement.

Additional impacts to vegetation communities, and possibly special status species, would occur due to the construction of linear facilities (e.g., transmission lines) associated with a solar project on the Garlock Road Alternative site. Information regarding these linear facilities is not available, and estimating the types or extent of the potential impacts from such facilities is outside the scope of services provided by HELIX.

General Construction Impacts to Wildlife

Any wildlife residing on the Proposed Project or Garlock Road Alternative sites would potentially be displaced, injured, or killed during project construction activities. Animal species in the project area could fall into construction trenches, be crushed by construction vehicles or equipment, or be harmed by project personnel. In addition, construction activities may attract predators or crush animal burrows or nests.

Migratory/Special Status Bird Species Impacts

The Proposed Project and Garlock Road Alternative sites provide foraging, cover, and/or breeding habitat for migratory birds. Project construction could impact nesting birds in violation of the Migratory Bird Treaty Act.

Spread of Noxious Weeds

Construction of a solar project at the Proposed Project or Garlock Road Alternative sites could result in the introduction and/or dispersal of invasive or exotic weeds (to adjacent native habitats for the Garlock Road Alternative site). Permanent and temporary earth disturbance adjacent to native habitats increases the potential for exotic, invasive plant species to establish and/or disperse into native plant communities, which leads to community and habitat degradation. On the other hand, the removal of plant material from the Garlock Road Alternative site, if done properly, could positively impact adjacent native habitats because so much of the material that would be removed consists of invasive, exotic weeds (e.g., thistle and mustard).

Excessive Noise

Noise from construction activities on the Proposed Project and Garlock Road Alternative sites could temporarily discourage wildlife from foraging and nesting immediately adjacent to the project area. Many bird species rely on vocalization during the breeding season to attract a mate within their territory. Noise levels from certain construction activities could reduce the reproductive success of nesting birds.

7.0 OPERATIONAL IMPACTS

Operation of transmission lines associated with a solar project on the Proposed Project site or on the Garlock Road Alternative site could result in increased avian mortality due to collision with the new transmission lines. An increased incidence of accidental wildfire is also a possibility (although the potential is low) from downed transmission lines. Additionally, there would be the potential for edge effects to special status animal species in surrounding habitat areas from operational night lighting or noise. Furthermore, the desert tortoise could be subjected to increased predation from common ravens (that were observed during the reconnaissance), which may increase in numbers due to an increase in perching and nesting sites provided by project facilities.

8.0 CONCLUSION

Definitive conclusions about the amount of potential adverse impacts to biological resources in the absence of site-specific survey and project design information for the Garlock Road Alternative site cannot be made. However, development of a solar project at the Garlock Road Alternative site would impact fewer biological resources compared to the Proposed Project site because development of the Garlock Road Alternative site would occur primarily on disturbed habitat, whereas development of the Proposed Project site would occur entirely (minus 0.5 acre) on land supporting native vegetation communities.

Furthermore, while a number of special status plant and animal species have been reported to the CNDDB within five miles of the Garlock Road Alternative site, none were actually reported on the site. The only special status species with moderate (and not higher) potential to occur on the Garlock Road Alternative site are not listed species.

The Proposed Project site, on the other hand, is known to support five special status species, one of which, the desert tortoise ("a large population;" EDAW AECOM 2009), is state and federally listed, and another, the state listed Mohave ground squirrel, is assumed to be present. Therefore, development of a solar project on the Garlock Road Alternative site would have fewer impacts to biological resources than development of a solar project on the Proposed Project site.

9.0 REFERENCES

AECOM. 2009. Ridgecrest Solar Power Project Application for Certification. September.

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APPENDIX A
SPECIAL STATUS SPECIES POTENTIALLY OCCURRING ON THE GARLOCK ROAD ALTERNATIVE SITE AND THE PROPOSED RIDGECREST SOLAR POWER PROJECT SITE

Species	Status	Habitat	Potential to Occur or Presence On Site	
			Proposed Project Site (EDAW AECOM 2009)	**Garlock Road Alternative Site**
Plants				
Mojave tarplant (*Deinandra mohavensis*, syn *Hemizonia m.*)	SE California Native Plant Society (CNPS) List 1B.3 WEMO	Chaparral, riparian scrub on low sand bars, mostly in riparian areas or in ephemeral grasslands 2,500 – 4,800 feet.	Low	Not expected; habitat not present
Red Rock tarplant (*Deinandra arida*, syn. *Hemizonia a.*)	SR CNPS List 1B.2 WEMO	Mojave desert scrub where water has collected along ephemeral streams; clay soils 900 – 2,800 feet.	Low	Not expected; habitat not present
Alkali mariposa-lily (*Calochortus striatus*)	CNPS List 1B.2 BLM Sensitive WEMO	Chaparral, chenopod scrub, meadows and seeps 200 – 4,800 feet.	Not Expected	Not expected; habitat not present
Brown fox sedge (*Carex vulpinoidea*)	CNPS List 2.2	Marshes and swamps, riparian woodland 90 – 3,600 feet.	Not Expected	Not expected; habitat not present
Muir's tarplant (*Carlquistia muirii*) (syn. *Raillardopsis m.*)	CNPS List 1B.3 BLM Sensitive	Chaparral, montane coniferous forest in crevices of granite ledges and dry sandy soils 3,300 – 7,500 feet.	Not Expected	Not expected; habitat not present
Gilman's goldenbush *(Ericameria gilmanii)*	CNPS List 1B.3	Subalpine coniferous forest, montane coniferous forest, generally on limestone 6,300 – 10,200 feet.	Not Expected	Not expected; habitat not present
Hall's daisy (*Erigeron aequilifolius*)	CNPS List 1B.3 BLM Sensitive WEMO	Broadleafed upland forest, lower montane coniferous forest, pinyon and juniper woodland, upper montane coniferous forest, rocky, granitic soils 4,500 – 13,500 feet.	Not Expected	Not expected; habitat not present
Red Rock poppy (*Eschscholzia minutiflora* ssp. *twisselmannii*)	CNPS List 1B.2 BLM Sensitive	Mojave Desert scrub on volcanic tuff 2,000 – 6,120 feet.	Moderate	Not expected; habitat not present
Creamy blazing star (*Mentzelia tridentata*)	CNPS List 1B.3 BLM Sensitive	Mojave Desert scrub 2,100 – 3,500 feet.	Moderate	Low

Appendix A (cont.)
SPECIAL STATUS SPECIES POTENTIALLY OCCURRING ON THE GARLOCK ROAD ALTERNATIVE SITE AND THE PROPOSED RIDGECREST SOLAR POWER PROJECT SITE

Species	Status	Habitat	Potential to Occur or Presence On Site	
			Proposed Project Site (EDAW AECOM 2009)	**Garlock Road Alternative Site**
Plants (cont.)				
Sweet-smelling monardella (*Monardella beneolens*)	CNPS List 1B.3 BLM Sensitive WEMO	Alpine boulder and rock field, subalpine coniferous forest, upper montane coniferous forest 7,500 – 10,500 feet.	Not Expected	Not expected; habitat not present
Charlotte's phacelia (*Phacelia nashiana*)	CNPS List 1B.2 BLM Sensitive WEMO	Joshua tree "woodland," Mojave desert scrub, pinyon and juniper woodland 1,800 – 6,600 feet.	Low	Not expected; habitat not present
Nine-mile Canyon phacelia (*Phacelia novenmillensis*)	CNPS List 1B.2 BLM Sensitive WEMO	Broadleafed upland forest, cismontane woodland, pinyon and juniper woodland, upper montane coniferous forest 4,935 – 7,920.	Not Expected	Not expected; habitat not present
Latimer's woodland-gilia (*Saltugilia latimeri*)	CNPS List 1B.2	Chaparral, Mojave Desert scrub, pinyon and juniper Woodland 1,200 – 5,700 feet.	Low	Low
Reptile				
Desert tortoise (*Gopherus agassizii*)	FT/ST WEMO	Various desert scrubs and desert washes up to about 5,000 feet, but not including playas.	Present	Low
Birds				
Northern harrier (*Circus cyaneus*)	SSC WEMO	Occurs in open sage scrub, desert scrub, grasslands, and agricultural fields during migration and in winter. Does not breed in the desert but is fairly common in winter and during periods of migration.	Moderate (nonbreeding)	Moderate
Western burrowing owl (*Athene cunicularia hypugaea*)	SSC BLM Sensitive WEMO	Found mainly in grassland and open scrub from the seashore to foothills. Also found in deserts and scrublands. Strongly associated with the burrows of ground squirrels or other fossorial mammals.	Present	Moderate
Loggerhead shrike *(Lanius ludovicianus)*	SSC WEMO	Occurs in semi-open country with utility posts, wires, and trees to perch on.	Present	Moderate

Appendix A (cont.)
SPECIAL STATUS SPECIES POTENTIALLY OCCURRING ON THE GARLOCK ROAD ALTERNATIVE SITE AND THE PROPOSED RIDGECREST SOLAR POWER PROJECT SITE

Species	Status	Habitat	Potential to Occur or Presence On Site	
			Proposed Project Site (EDAW AECOM 2009)	**Garlock Road Alternative Site**
Birds (cont.)				
Le Conte's thrasher (*Toxostoma lecontei*)	SSC BLM Sensitive WEMO	Open desert scrub, desert washes, and alluvial fans with sandy or alkaline soils. Where it occurs, silver cholla is the preferred nesting substrate.	Present	Low
Bendire's thrasher (*Toxostoma bendirei*)	SSC BLM Sensitive WEMO	Mojave Desert scrub with either *Yucca* spp., *Opuntia* spp., or other succulents present (England and Laudenslayer 1989 *in* EDAW AECOM 2009).	Not Expected	Not expected; habitat not present
Mammals				
Mohave ground squirrel (*Spermophilus mohavensis*)	ST WEMO	Mojave Desert scrub vegetation. High-quality habitat includes a diversity of shrub species, native herbaceous plants, and sandy or loamy soils that provide suitable substrate for burrow construction.	High—assumed present	Not expected; habitat not present
American badger (*Taxidea taxus*)	SSC	Coastal sage scrub, mixed chaparral, grassland, oak woodland, chamise chaparral, mixed conifer, pinyon-juniper, desert scrub, desert wash, montane meadow, open areas, and sandy soils.	Moderate	Low
Desert kit fox (*Vulpes macrotis arsipus*)	Calif. Code of Regulations PFM	This fossorial species is found in desert habitats of western states.	Present	Moderate
Nelson's bighorn sheep (*Ovis canadensis nelsoni*)	BLM Sensitive WEMO	Mountain slopes with sparse growth of trees above the desert floor in California. The species prefers open areas that are steep and rocky to avoid predators (Bleich et al. 1990 *in* EDAW AECOM 2009).	Not Expected	Not expected; habitat not present
Pallid bat (*Antrozous pallidus*)	SSC BLM Sensitive	This gregarious species usually roosts in small colonies in rock crevices and buildings but may nest in caves, mines, rock piles, and tree cavities.	Low	Moderate

***Status Codes:**

Federal FE = Federally listed endangered: species in danger of extinction throughout a significant portion of its range
FT = Federally listed threatened: species likely to become endangered within the foreseeable future

State SE = State listed endangered
ST = State listed threatened
SR = State listed rare
SSC = Species of special concern

California Native Plant Society (CNPS)
CNPS List 1B - Rare, threatened, or endangered in California and elsewhere
CNPS List 2 - Rare, threatened, or endangered in California but more common elsewhere
CNPS List 3 - Plants which need more information
CNPS List 4 - Limited distribution – a watch list
0.1 - Seriously threatened in California (high degree/immediacy of threat)
0.2 - Fairly threatened in California (moderate degree/immediacy of threat)
0.3 - Not very threatened in California (low degree/immediacy of threats or no current threats known)

California Code of Regulations
PFM = Protected Fur-bearing Mammal

BLM Sensitive
BLM Manual § 6840 defines sensitive species as "…those species that are (1) under status review by the FWS/NMFS; or (2) whose numbers are declining so rapidly that federal listing may become necessary, or (3) with typically small and widely dispersed populations; or (4) those inhabiting ecological refugia or other specialized or unique habitats." <www.blm.gov/ca/pdfs/pa_pdfs/biology_pdfs/SensitiveAnimals.pdf>

WEMO Special-status species considered in analysis of the West Mojave Plan (BLM 2005)

References

EDAW AECOM. 2009. Ridgecrest Solar Power Project Biological Resources Technical Report, Kern County, California. September.

Bureau of Land Management. 2005. Final Environmental Impact Report and Statement for the West Mojave Plan, A Habitat Conservation Plan and California Desert Conservation Area Plan Amendment Volume 1. Available at http://www.blm.gov/ca/pdfs/cdd_pdfs/wemo_pdfs/plan/wemo/Vol-1-Chapter1_Bookmarks.pdf. Accessed January 28, 2010.

Photo 1: Mojave Desert Wash Scrub on Proposed Project Site

Photo 2: Unvegetated, Ephemeral Dry Wash on Proposed Project Site

Photo 3: Mojave Creosote Bush Scrub on Proposed Project Site

Photo 4: Disturbed Habitat (right), Developed (left) on Garlock Road Alternative Site

Photo 5: Disturbed Desert Saltbush Scrub on Garlock Road Alternative Site

Photo 6: Disturbed Stabilized Desert Dunes on Garlock Road Alternative Site

Photo 7: Desert Saltbush Scrub on Garlock Road Alternative Site (in background)