

# Mohave Ground Squirrel Live-Trapping Survey Juniper Solar Project, San Bernardino County, California

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## Introduction

This report provides the results of a protocol survey for the State-threatened Mohave ground squirrel (MGS, *Xerospermophilus mohavensis*) carried out in 2023. The project site is approximately 83 acres northwest of unincorporated Hinkley in Bernardino County. Harper Dry Lake is approximately 1.5 to 2.5 miles northeast and north of the site. Figure 1 shows the site on the Lockhart and Twelve Gauge Lake 7.5' USGS topographic maps (T11N, R4W, SW<sup>1/4</sup> Section 32). Figure 2 shows the site on an aerial photo. The UTM coordinates of the approximate center of the site are 11S 470464, 3873062. Site photos are found in Appendix 1.

The proposed project would construct two 4-megawatt solar photovoltaic power generating systems arranged in north to south arrays across the project site. The systems would store electrical production in long-duration batteries, located next to the solar arrays on less than 1 acre of the site. Interior perimeter all-weather unpaved roads would provide access to the system. Security fencing would be installed along the perimeter of the project site.

## Background on the Mojave Ground Squirrel

The MGS is a small ground squirrel (approximately 9 inches long) that inhabits the Mojave Desert, in parts of Inyo, Kern, Los Angeles and San Bernardino counties. The historical range of the MGS covered approximately 5 million acres from Palmdale in the south to Owens Lake in the north, and from the eastern edge of the Sierra Nevada to the Mojave River Valley (Gustafson 1993, CDFW 2019).

MGS occur in a range of open desert habitats, most commonly in creosote scrub but also in Joshua tree woodland, desert saltbush scrub, desert sink scrub, desert greasewood scrub, and shadscale scrub (Gustafson, 1993). MGS typically occur in areas with open vegetative cover and small bushes (< 0.6 meter [2 feet] in height) spaced approximately 6 to 9 meters (20 to 30 feet) apart. MGS consume leaves, forbs, shrubs, and grasses of several species and genera, including creosote (*Larrea tridentata*), winter fat (*Krascheninnikovia lanata*), spiny hop-sage (*Grayia spinosa*), saltbush (*Atriplex* spp.), golden linanthus (*Linanthus aureus*), Mediterranean grass (*Schismus arabicus*), box thorn (*Lycium* spp.), and several other plant species (Best 1995). Winter fat, spiny hop-sage, and saltbush are thought to make up approximately 60% of the species' shrub diet, indicating that these are important food sources when forbs are unavailable. It has been suggested that habitats where winter fat and hop-sage are absent may be suboptimal for MGS (Desert Managers MGS Working Group, no date).

MGS dig burrows in sandy and gravelly soils on flat to moderately sloping terrain. The burrows are used to avoid predators and high temperatures, and for aestivating during winter months. MGS are active only during the spring-summer months and spend most of the year (approximately seven months) below ground.

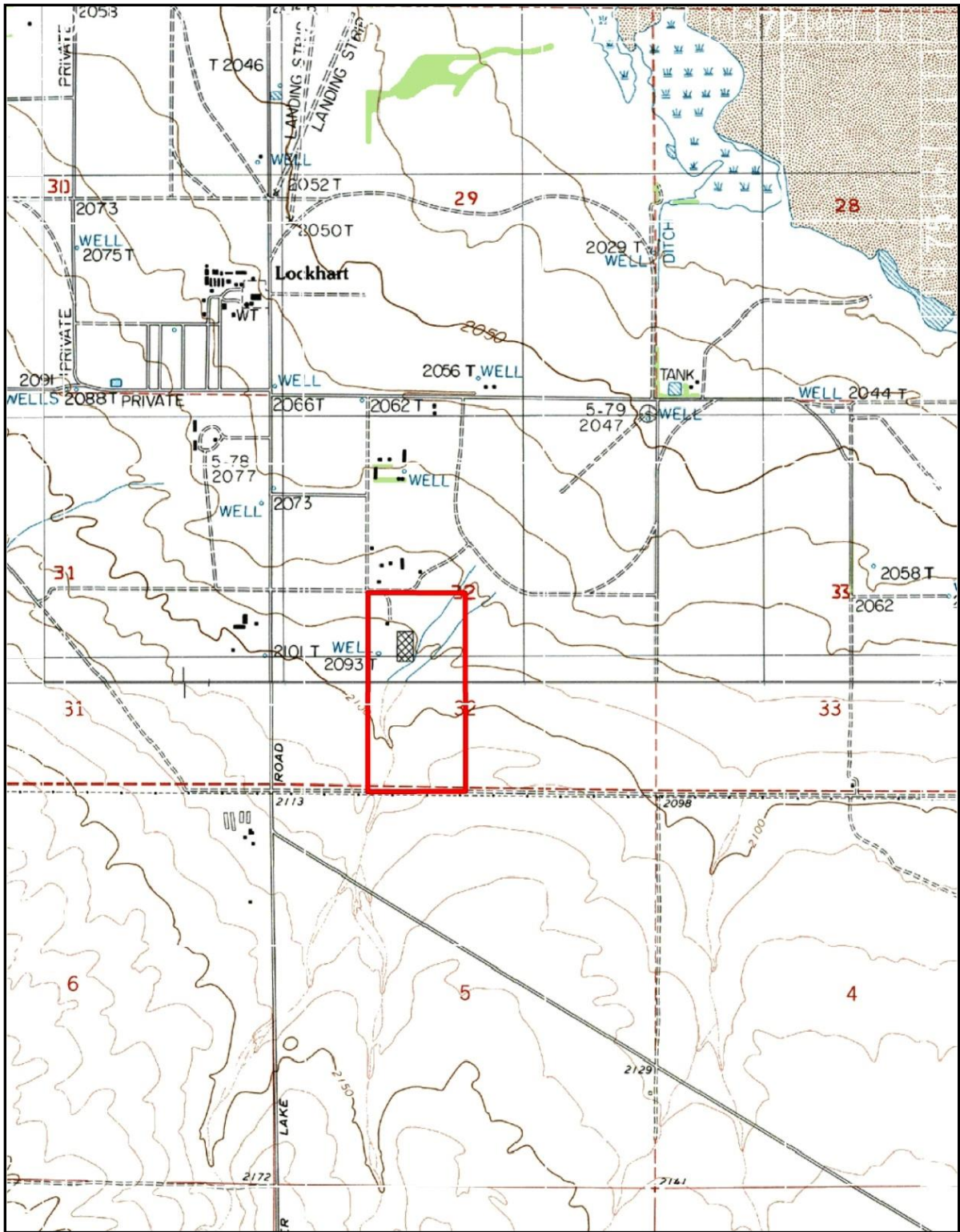


Figure 1. Project site on a USGS 7.5" topographic map.



Figure 2. Aerial photo of the project site (red rectangle), MGS trap grid (green square), and locations of wildlife camera stations (red circles).

### Site Description

The project site is flat (<1% slope to the north/northeast) with elevations from 2,090 to 2,210 feet above mean sea level. The soils on the site are Cajon sands, Cajon loamy sands, and Norob-Halloran complex (NRCS 2023). The plant communities and land covers on the site are allscale scrub, unvegetated wash, disturbed, and developed, shown in Figure 3 and described as follows:

Allscale scrub (77.69 acres). Allscale scrub is the dominant plant community on the project site. Shrub species associated with the allscale scrub alliance occurring within the project site include cheesebush (*Ambrosia salsola*), Anderson's boxthorn (*Lycium andersonii*), peach thorn (*Lycium cooperi*), and creosote bush (*Larrea tridentata*). Understory plants occurring within the project site include redstem stork's bill (*Erodium cicutarium*) and Mediterranean grass (*Schismus arabicus*). bristly fiddleneck (*Amsinkia tessellata*), gold nuggets (*Calochortus luteus*), and Baker's goldfields (*Lasthenia californica*);

Unvegetated wash (0.86 acres). The areas within the project site mapped as unvegetated wash are composed of a system of braided ephemeral channels carrying surface flows across the site from south to north;

Disturbed (3.86 acres). Disturbed habitat, located in the northern part of the site, consists of dirt roads and a previous residence;

Developed (0.56 acres). Urban/developed land occurs in the northern part of the site, which consists of a previous residence.

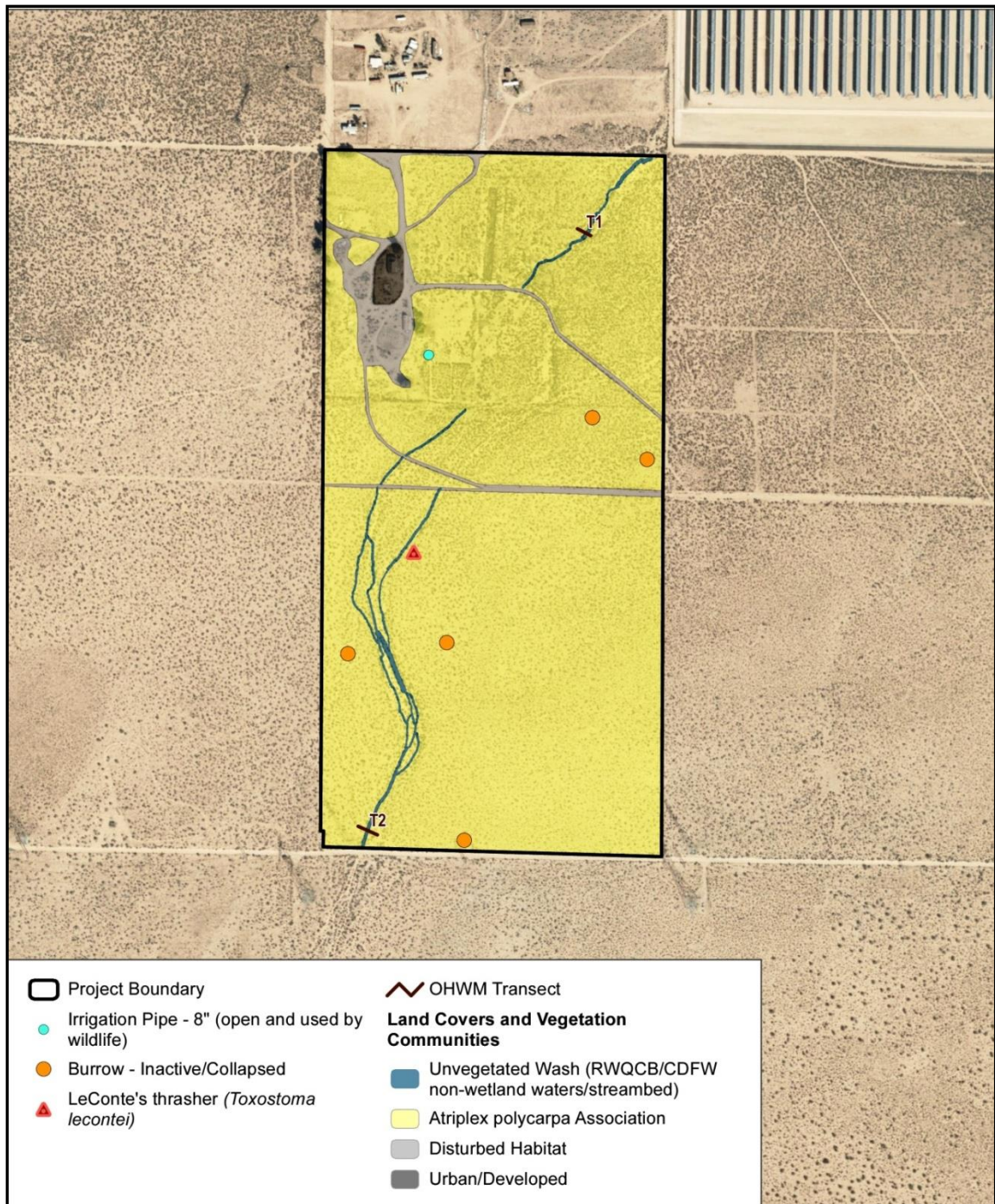


Figure 3. Plant communities and land covers on the project site

## Methods

A single 100-trap grid was established in the southern part of the approximately 83-acre site, where the habitat is saltbush scrub and an ephemeral wash without human-related disturbance. The northern part of the site contains a rural residence covering approximately 13 acres dating to prior to 1985 (the earliest aerial image available in Google Earth), and still evident on the 2022 aerial image shown in Figure 2.

The 10x10 trap grid was established using 100 large Sherman live traps (3 x 3.75 x 12”) at 35-meter spacing. Cardboard tents shielded the traps from sunlight; traps were checked every four hours and closed when the air temperature reached 90°F measured at 6 inches above the ground in the shade. The survey was carried out in three sessions: March 16-20, May 6-10, and June 21-25, 2023. Traps were baited with rolled oats and bird seed mixed with peanut butter. Due to mild weather conditions over the three survey sessions, traps were mostly left opened after dusk to sample nocturnal rodents.

Camera stations were established to supplement the live-trapping surveys in accordance with CDFW recommendations, with the objective of documenting use by ground squirrels known to occur in the region, including MGS and three common species: the Antelope ground squirrel (*Ammospermophilus leucurus*), round-tailed ground squirrel (*Xerospermophilus tereticaudus*), and California ground squirrel (*Otospermophilus beecheyi*). The camera stations were set up inside the trapping grid and operated in accordance with recommendations of Delaney et al (2017). Five cameras<sup>1</sup> in each grid were operated from dawn to dusk for the three 5-day sessions. The locations of the grid and camera stations are shown in Figure 2. The live-trapping and camera surveys totaled 1,500 live-trap days and 75 camera trap days, respectively.

## Results

The weather conditions during the surveys are summarized in Appendix 2. Appendix 3 contains the MGS Survey and Trapping Forms for the grid. No MGS or round-tailed ground squirrels (RTGS, *Xerospermophilus tereticaudus*) were captured during the survey and none were observed or heard on site or in the adjoining areas. 65 antelope ground squirrels (AGS, *Ammospermophilus leucurus*) were captured in the second and third sessions of the survey. Table 3 summarizes the ground squirrel captures and the captures of nocturnal rodents. The nocturnal trapping yielded three common small mammals: Merriam’s kangaroo rat (*Dipodomys merriami*), little pocket mouse (*Perognathus longimembris*), and desert pocket mouse (*Chaetodipus penicillatus*).

	Species*			
	AGS	MKR	LPM	DPM
Session 1	0	1	1	2
Session 2	19 (0)**	7	14 (0)	0
Session 3	46 (21)	6	19 (8)	21(11)
<b>Subtotals</b>	<b>65 (21)</b>	<b>14</b>	<b>37 (8)</b>	<b>22 (11)</b>
* AGS, Antelope ground squirrel ( <i>Ammospermophilus leucurus</i> ) MKR, Merriam's kangaroo rat ( <i>Dipodomys merriami</i> ) LPM, little pocket mouse ( <i>Perognathus longimembris</i> ) DPM, desert pocket mouse ( <i>Chaetodipus penicillatus</i> ) ** total captures with number of juveniles/subadults in ()				

The trapping results show an increase of AGS captures from none in session 1 to a total of sixty five captures in sessions 2 and 3. Individuals were not marked, therefore the captures numbers include new

<sup>1</sup> Browning Dark Ops HD Pro X Trail cameras

captures and recaptures. Each of the rodent species had from one to three litters in 2023. The survey results show the recovery of AGS and the three nocturnal rodents after the winter and spring rains of 2022 and 2023 that ended the years-long drought in the region.

## Discussion

The project site is located in the south-central part of MGS's historical range. The CNDDDB contains MGS records at eight localities within five miles of the Project Site between 1988 and 2014 (CNDDDB; CDFW 2023). Most of these records are from saltbush and creosote bush scrub habitats on flat, sandy, friable soils; one visual record is from an alfalfa field, and one of the live-capture records is from an ecotone of alfalfa field and saltbush scrub. Figure 4 shows their locations relative to the project site. The nearest MGS occurrence records in the CNDDDB are as follows (listed at increasing distance from the project site):

- # 339. 0 trapped 6-10 April, 12-16 May & 17-21 Jun 2006. 1 female captured on 30 May 2007; 1 trapped 16 July 2007 (approximately 0.3 miles east of the project site);
- # 366. 1 juvenile observed running on 28 July 2011 (approximately 0.9 miles north of the project site);
- #156. One adult squirrel detected on 24 May 1988 (approximately 1 mile east of the project site);
- #188. One squirrel sighted on 18 Mar 1975; 4 captured in spring 1988; 1 detected between 2-11 May 1988 (approximately 1.4 miles northwest of the project site);
- # 484. 1 adult female, 3 juvenile males, and 5 juvenile females trapped a total of 30 times with recaptures, 5-9 May 2014 (approximately 1.94 miles south of the project site);
- # 485. 1 adult female, 3 juvenile females & 1 juvenile male caught and released 7-9 May 2014 (approximately 2.04 miles south of the project site). Tissue sample analysis confirmed that one of the juvenile females was a 2<sup>nd</sup> or 3<sup>rd</sup> generation MGS-RTGS (round-tailed ground squirrel) hybrid.
- # 224: Three adults detected on 24 May 1988 (approximately 2.4 miles northwest of the project site); and
- #221: Three squirrels detected 12-24 May, 1988, five squirrels detected from 2-11 May 1988 (approximately 3.7 miles northwest of the project site).

Leitner (2008, 2015, 2021) summarized the results from all MGS surveys across the species range over three time periods. The results from the project vicinity are as follows.

- In the 1998-2007 period, six live-trapping surveys yielded no MGS captures (Leitner 2008). The CNDDDB also contains an MGS record in 2007 (CNDDDB occurrence number 339 in Figure 4) that is approximately 0.3 miles east of the project site;
- In the 2008 to 2012 period, MGS live-trapping surveys recorded MGS from two sites in close proximity (occurrences 484 and 485), approximately two miles south of the project site. Occurrence 485 was later found to be a hybrid between MGS and RTGS. MGS were recorded on two camera stations approximately 3 miles west and 3.5 miles west/northwest of the project site, and one visual observation approximately 0.9 miles north/northeast of the project site (number 366 in Figure 4; Leitner 2015);
- In the 2013-2020 period, there were 14 regional (5-day) surveys and 9 camera surveys within 5 miles of the project site (Leitner 2021). 50 percent and 40 percent of the regional live-trapping and camera station surveys yielded MGS presence results, respectively.

MGS live-trapping surveys within five miles of the project site from 1998 to 2020 detected MGS at 13 sites, including at seven trap locations, five camera stations, and one visual observation location. Taken

together, the survey and CNDDDB occurrence data indicate that MGS occurs in the project vicinity in saltbush and creosote bush scrub habitats, but were not present at all locations with apparently suitable habitat. MGS distribution appears to be patchy in the Harper Lake region; its relatively low capture numbers since 2015 may be due to the drought conditions.

The allscale habitat that occurs on the project site is suitable for MGS. The four rodent species documented on the project site showed strong population growth during the protocol survey. No MGS were captured or observed on the project site despite the improved post-drought conditions, which indicates they were not present on the site at the time of the survey.

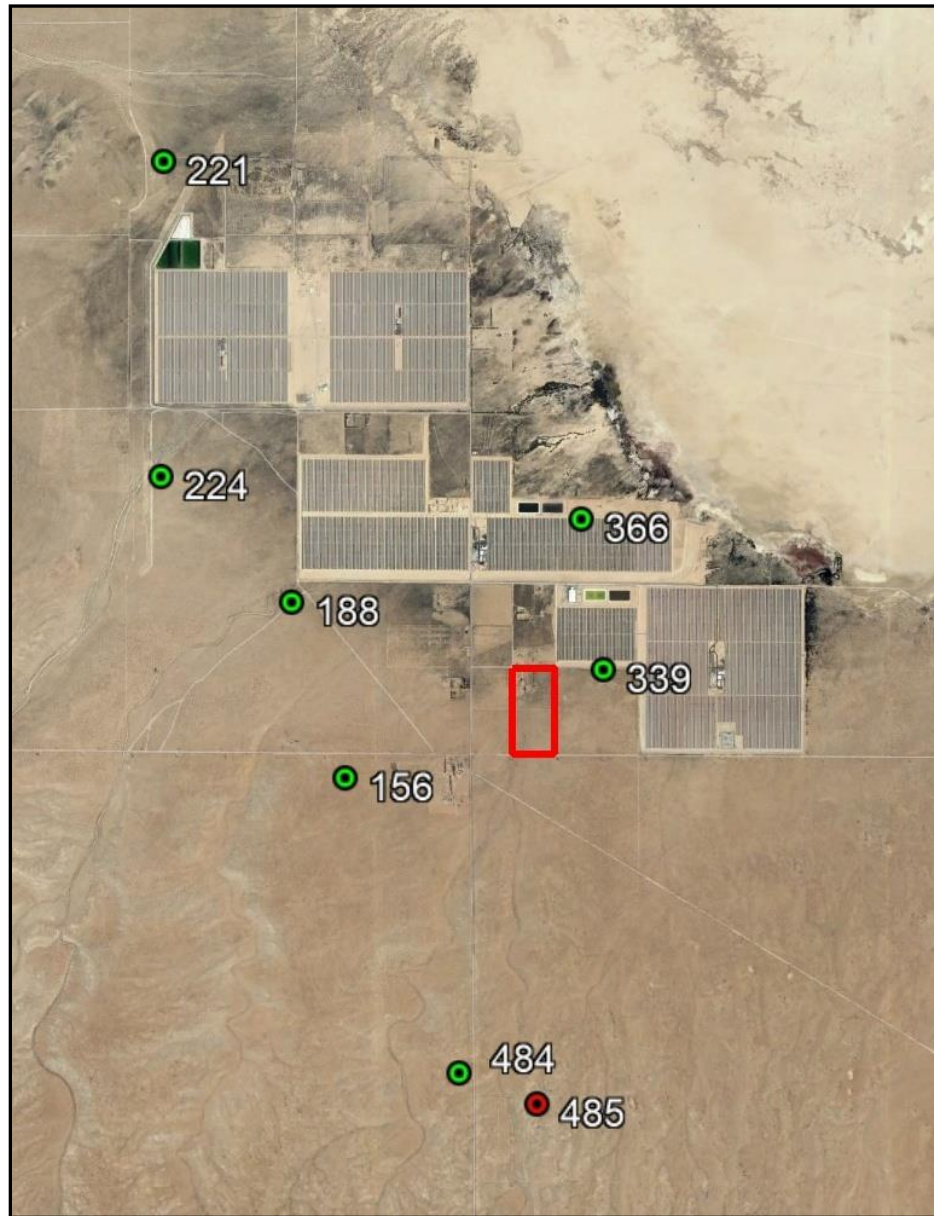


Figure 4. MGS occurrence localities in the vicinity of the project site (red rectangle) with occurrence numbers from the CNDDDB (in blue and red markers).

## Conclusion

The MGS surveys on the project site in 2023 included visual/aural surveys, live-trapping, and camera station surveys and yielded no MGS occurrences. Based on the negative results of the current surveys,

MGS are not likely to occur on the project site and are not expected to be impacted by the proposed project. According to the Mohave Ground Squirrel Survey Guidelines (CDFG 2010), “If a survey conducted according to these guidelines results in no capture or observation of the Mohave Ground Squirrel on a project site, this is not necessarily evidence that the Mohave Ground Squirrel does not exist on the site or that the site is not actual or potential habitat of the species. However, in the circumstance of such a negative result, the Department will stipulate that the project site harbors no Mohave Ground Squirrels. This stipulation will expire one year from the ending date of the last trapping on the project site conducted according these guidelines.” If the site is not developed prior to June 25, 2024 it may be necessary to repeat the Mohave ground squirrel survey.

## References

Best, T. L. 1995. *Spermophilus mohavensis*. Mammalian Species 509: 1–7.

California Department of Fish and Wildlife. 2023. California Natural Diversity Database, Element report for the Mohave ground squirrel. California Department of Fish and Game, Natural Heritage Division, Sacramento, California.

\_\_\_\_\_. 2019. A Conservation Strategy for the Mohave Ground Squirrel (*Xerospermophilus mohavensis*). California Department of Fish and Wildlife.  
<https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=171301&inline>

\_\_\_\_\_. 2010. Mohave Ground Squirrel Survey Guidelines. Unpublished guidelines produced by CDFG. Sacramento, California. 5 pp. <https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=83975>.

Desert Managers Mohave Ground Squirrel Working Group. no date. Draft conservation strategy for the Mohave ground squirrel. 27pp. [http://www.dmg.gov/documents/DFT\\_MGS\\_Consv\\_Strategy\\_DMG\\_101106.pdf](http://www.dmg.gov/documents/DFT_MGS_Consv_Strategy_DMG_101106.pdf)

Gustafson, J.R. 1993. A status review of the Mohave Ground Squirrel (*Spermophilus mohavensis*). California Department of Fish and Game. Nongame Bird and Mammals Report 93-9.

Leitner, P. 2015. Current status of the Mohave ground squirrel (*Xerospermophilus mohavensis*): A five-year update (2008–2012). Endangered Species Recovery Program, California State University, Stanislaus, One University Circle, Turlock, California 95382. Published in Western Wildlife 2: 9–22.

\_\_\_\_\_. 2008. Current status of the Mohave ground squirrel. Trans. West. Sect. Wildl. Soc. 44:11-29.

NRCS (Natural Resources Conservation Service). 2023. <http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx>



**Appendix 1. Site photos**



Photo 1. Southeastern part of grid, looking northwest



Photo 2. Northern part of grid, looking southeast



Photo 3. Southern part of grid, looking east



Photo 4. Western part of the grid along ephemeral wash, looking north

**Appendix 2. Weather Data for Juniper Mohave Ground Squirrel Trapping Grid**

Date	Temperature (F)				Cloud Cover (%)				Wind (mph)			
	Min	Time	Max	Time	Min	Time	Max	Time	Min	Time	Max	Time
3/16	50	0735	67	1500	5	0735	15*	1830	0	0735	5-7	1830
3/17	49	0715	65	1345	0	0715	20*	1730	0	0715	3-5	1345
3/18	48	0730	70	1330	0	0730	100	1715	3-6	0730	5-9	1330
3/19	49	0700	58	1430	30	1830	100	0700	1-2	0700	3-7	1115
3/20	47	0720	62	1530	75	1530	100	0720	2-5	0720	5-9	1200
5/6	47	0730	73	1500	7*	1030	100	1800	1-3	0730	4-12	1500
5/7	53	0715	79	1600	0	0715	0	1700	1-3	0715	4-12	1700
5/8	56	0700	81	1600	0	0700	0	1800	1-2	0700	5-15	1800
5/9	59	0710	79	1600	0	1000	65	1600	1-3	0710	4-12	1600
5/10	54	0700	80	1500	0	0700	0	1800	1-3	0700	4-8	1500
6/21	60	0700	83	1330	0	0700	0	1830	1-2	1330	2-4	0700
6/22	64	0700	84	1500	0	0700	0	1800	1-3	0700	5-12	1800
6/23	60	0700	86	1800	0	0700	0	1800	0	1200	2-4	0700
6/24	63	0710	90	1430	10*	0710	70	1200	0	1200	1	0710
6/25	63	0700	85	1400	0	0700	0	1800	2	0700	3-5	1400

### Appendix 3. Mohave Ground Squirrel (MGS) Survey and Trapping Form

Part I – Project Information							
Project Name: <u>Juniper Solar</u>				Township: <u>11N</u>			
Property Owner: <u>Private</u>				Range: <u>4W</u>			
Quad/Map Series: <u>Lockhart, Twelve Gauge Lake 7.5'</u>				Section: <u>32 SW<sup>1/4</sup></u>			
UTM Coordinates of grid corners (NAD 83, error <6m)							
NW Corner		NE Corner		SE Corner		SW Corner	
Easting	Northing	Easting	Northing	Easting	Northing	Easting	Northing
4703323	3872979	470638	3872979	470636	3872670	470322	3872668
Acreage of Project Site (or linear distance):						83 Acres	
Acreage of potential MGS habitat on site (or linear distance):						65 Acres	
Visual Surveys of potential MGS habitat conducted on:						March 16, 2023	
Visual Surveys conducted by:						Phil Brylski	
Total # of grids:						1 grid	
Session	Start Date	End Date	Trapping Conducted By:				
1	3/16/23	3/20/23	P. Brylski				
2	5/6/23	5/10/23	P. Brylski				
3	6/21/23	6/25/23	P. Brylski				
Part II – General Habitat Description							
Vegetation							
Dominant Perennials		cheesebush, Anderson's boxthorn					
Other Perennials		peach thorn, and creosote bush					
Dominant Annuals		redstem stork's bill, Mediterranean grass					
Other Annuals		bristly fiddleneck, gold nuggets, Baker's goldfields					
Land Forms ( <i>i.e.</i> , bajadas, washes): desert plain							
Soil Description: Cajon sands, Cajon loamy sands, and Norob-Halloran complex							
Elevation: 2,090 to 2,210				Slope		<1%	