

**APPENDIX F-2**  
**PALEONTOLOGICAL RESOURCES TECHNICAL MEMORANDUM**

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**Administrative Draft**

# Technical Memorandum

**Date:** July 3, 2108

**To:** Aarty Joshi, Senior Manager, Environmental Permitting  
NRG Renewables

**From:** Derrick Coleman, Geomorphologist  
Jenna Farrell, Archaeologist  
Tetra Tech, Inc.

**Re:** Records Search and Overview of Potential Paleontological Resources Related to the Daggett Solar Power Facility Project, San Bernardino County, California

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## Introduction

The purpose of this memorandum is to present the results of a records search for paleontological resources identified in the proposed Daggett Solar Power Facility Project (Project) area. The Project is a proposal to construct and operate a utility-scale, solar photovoltaic, electricity generation and energy storage facility that would produce up to 650 megawatts of power with up to 450 megawatts of battery storage capacity on approximately 3,500 acres of land. The Project would use existing electrical transmission infrastructure adjacent to the existing Coolwater Generating Station, a recently retired natural gas-fired power plant, to deliver renewable energy to the electric grid.

The Project site is flat and is generally bounded by the town of Daggett approximately 0.5 mile to the west; the Mojave River, Yermo, and Interstate 15 to the north; Barstow-Daggett Airport, Route 66, and Interstate 40 to the south; and Newberry Springs and Mojave Valley to the east. It is shown on four USGS 7.5-minute topographic quadrangles in California: *Yermo*, *Minneola*, *Harvard Hill*, and *Newberry Springs*. Figure 1 shows the Project location.

## Records Review

A paleontology records review<sup>1</sup> was conducted by Samuel A. McLeod, Ph.D., Vertebrate Paleontology, of documentation relevant to the Project site and general area in the Natural History Museum of Los Angeles County (see Appendix A). A request to the San Bernardino Museum for a paleontological records search was also made; however, due to staff constraints no results have been received to date (Appendix B). However, San Bernardino staff have the results from the Los Angeles County records search and Ian Gilbert, San Bernardino County's Curator of Earth Sciences, has stated in an email that the information should be adequate.

The records search did not identify any vertebrate fossil find localities within the Project site. The nearest fossil locality occurring in alluvial deposits associated with the Mojave River is about 35-40 miles east northeast. The records review summary stated that the types of fossils found generally occur in "older" Quaternary alluvium rather than the younger Quaternary alluvium found on the Project site.

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<sup>1</sup> Letter from Samuel A. McLeod, Ph.D., Natural History Museum of Los Angeles County, dated 18 June 2018; re: Paleontological resources for the proposed Daggett Solar Project, east of Daggett, San Bernardino County, project area.

**Site Geology**

The most recent geologic map covering the Project area<sup>2</sup> (Figure 2) shows the predominant alluvial deposits within the Project boundaries to be one of the younger Mojave River deposits (QywoMR), with an early Holocene to latest Pleistocene age, or modified lands (ml). The modified lands category generally covers either property developed for the Barstow-Daggett Airport or for irrigated agriculture; and, therefore already disturbed.

Intermediate age (Qia) or older age (Qoa, and QToa) alluvial fan deposits are not found within the Project boundaries, but are located within about one mile south of the Project boundary. This suggests these units could be found underlying the young Mojave River wash sediments mapped within the Project boundaries. The depth at which they might be encountered is likely to increase from the southern to the northern portions of the Project site. There is a significant area of young wind-blown (aeolian) deposits (Qyed) or young mixed eolian/alluvial deposits (Qyea/QywoMR) to the east of the Project site, but only a small area of these deposits intersect with the Project.

The local geologic units mapped in the vicinity of the Project are listed by age in Table 1. Descriptions of these geologic units are provided below.

**TABLE 1. MAPPED GEOLOGIC UNITS**  
*(In the Daggett Solar Project Area)*

Age	Deposit Type					
	Alluvial Fan	Mojave River	Eolian	Mixed (Eolian/ Alluvial)	Playa	Modified
Active	Qaa	QawMR	<b>Qae</b>		<b>Qap</b>	<b>ml</b>
Young	<b>Qya</b>	QywyMR <b>QywoMR</b>	<b>Qyed</b>	Qyea		
Intermediate	Qia					
Old	Qoa QToa					

Source: Phelps, et.al. (2012)  
 Bold text indicates unit found within Project boundaries.

<sup>2</sup> Phelps, G.A., Bedford, D.R., Lidke, D.J., Miller, D.M., and Schmidt, K.M., 2012, Preliminary surficial geologic map of the Newberry Springs 30' x 60' quadrangle, California: U.S. Geological Survey Open-File Report 2011-1044, pamphlet 68 p., 1 sheet, scale 1:100,000. (Available at <http://pubs.usgs.gov/of/2011/1044/>).

### **Active Age Deposits**

**Qaa Active alluvial fan deposits** (latest Holocene)—Poorly to moderately sorted fine sand to boulders deposited by ephemeral streams that actively receive or have received sediments within the last few years or decades. Typically, unconsolidated and uncemented, thus easily eroded. Surface undulates with rounded microtopography common to braided streams and pronounced bar and swale topography; incised channels are shallow or absent. Active fan channels originate from the mountain front, incised in the proximal fan and tending to diffuse in the distal fan; distinct from active washes (Qaw), which generally occur at the base of fans and trend parallel to the mountain front. Soil development is minimal but fine grained eolian sediment may be abundant, especially in distal piedmont areas. Surfaces are prone to flooding. Main proximal fan channels are sharply defined on aerial photographs as long, bright, sinuous features and grade down-fan into complex braided-channel networks. Vegetation typically reflects age of exposure, with recently active surfaces having sparse annuals, and older surfaces supporting a patchwork of shrubs such as creosote bush (*Larrea tridentata*) and white bursage (*Ambrosia dumosa*) on surfaces active only decadal.

**QawMR Active wash deposit** (latest Holocene)—Moderately to poorly sorted, fine sand to boulder gravel deposited by ephemeral streams that actively receive or have received sediments within the last few decades. Similar in character to unit Qaa but generally better sorted and stratified. Typically forms wider, longer, more gently sloping channels that drain small inter-fan valleys; thus, flows more frequently than alluvial fan channels. Deposits loose and unconsolidated, easily disturbed. No soil development. As much as several meters of active sediments commonly have accumulated within the past few decades. Appears on aerial photographs as long, bright, somewhat sinuous features trending perpendicular to the base of distal fans. Recently active surfaces contain sparse vegetation, commonly including Smoke Tree (*Dalea Spinosa*) and Mesquite (*Prosopis Pubescens*). Channels active at decadal intervals are moderately vegetated on surfaces or with desert senna (*Senna Armata*), cheesebush (*Hymenoclea salsola*), and catsclaw (*Acacia greggii var. arizonica*). Active wash deposits that drain the Mojave River are designated QawMR to indicate Mojave River sediment and fluvial system. The Mojave River subunit is distinguished by predominance of grus with admixture of fine pebbles of quartzite and volcanic rocks. Sandy deposits occupy the broad channel of the Mojave River and are interbedded with muddy sediments in bordering floodplain areas. Willows, cottonwoods, and other phreatophytes are common, especially where fault zones or shallow bedrock force groundwater nearly to the land surface.

**Qae Active eolian sand deposits** (latest Holocene)—Light to gray, pale-brown, moderately sorted to well-sorted fine to medium sand; moderately cross laminated, containing few clasts. Loose and subject to migration. Gently sloping topography; gradational contacts with neighboring units. No soil development. On aerial photography has high-albedo. Generally, lacks vegetation, but some undifferentiated units low (<0.5 m) shrub mounds.

**Qap Active playa deposits** (latest Holocene)—Weakly bedded, poorly sorted, compact silt, clay, and sand; locally salt rich. Forms broad, extensive, very flat floors of ephemeral lakes and ponds that have received water and sediment from surrounding source areas within the past few decades. Deposits have undergone seasonal flooding and drying cycles, with associated sediment expansion and shrinkage; locally may also show displacive growth of salt crystals. Subject to eolian deposition and erosion. Thin to thick subhorizontal bedding. Mud-cracked; may have linear fissures or mounds that support vegetation.

### **Impacts Assessment**

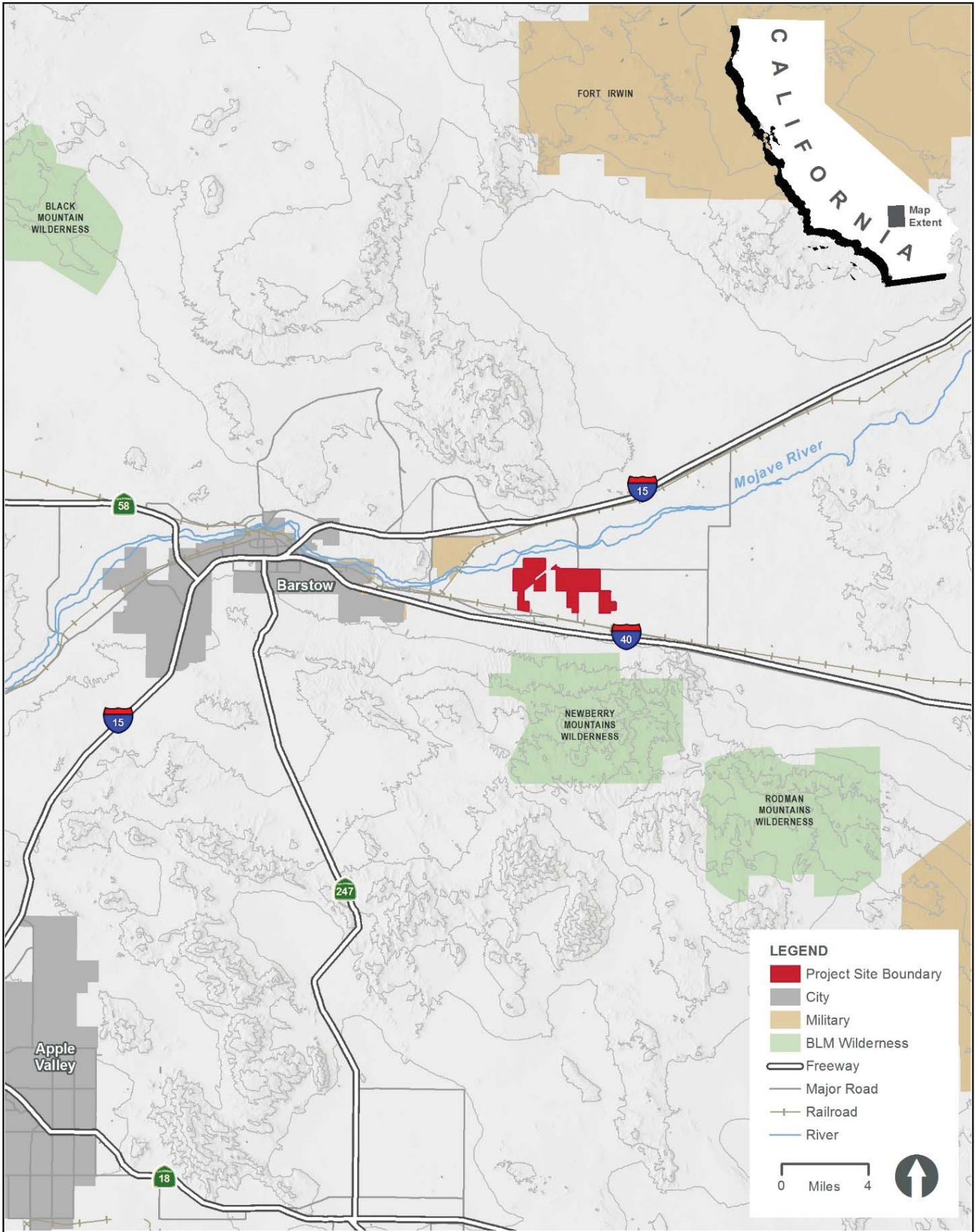
The geologic units on the Project site have limited potential for vertebrate fossil inclusion due to their youth and eolian depositional nature. The Project site is relatively flat and construction activities would consist of surface grading or shallow excavations in the uppermost few feet of the Holocene alluvium, active wash sediments, and wind-blown sand deposits. Given that Project-related excavation would be shallow, there is a low likelihood for encountering paleontological resources.

### **Mitigation Measures**

While encounters with paleontological resources during Project construction are not likely to be a concern within the Project boundaries, it is recommended as a precaution that paleontology be included in a worker education program to be developed and implemented for construction personnel. The purpose of the education would be to help construction personnel recognize subsurface evidence that “older” sediment has been encountered during an excavation, or that actual fossils may be present in subsurface materials that have been exposed.

## **FIGURES**

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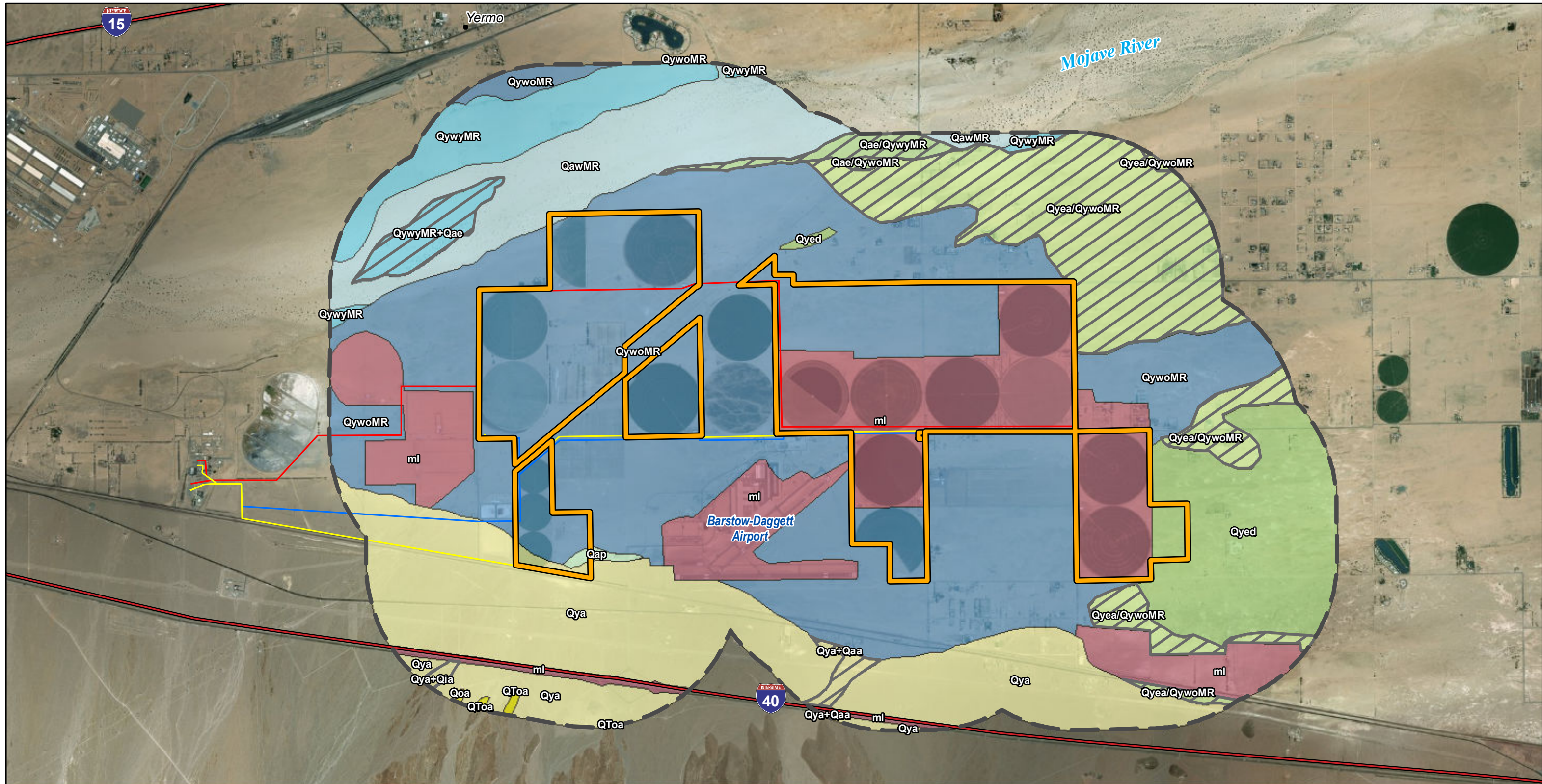
## Daggett Solar Power Facility

Figure 1

Project Area

San Bernardino County, CA





**Daggett Solar Power Facility**

Figure 2  
Geologic Units  
San Bernardino County, CA



- 1-mile Buffer
- Project Boundary

**Gen-Tie Options**

- Santa Fe St
- SCE Pass Through
- Northern Option

Age	Geologic Units (Unconsolidated Sediment)					
	Alluvial Fan	Mojave River	Eolian	Mixed (Eolian/ Alluvial)	Playa	Modified
Active						
Young		 				
Intermediate						
Old	 					

**Combined Geologic Units**

## **APPENDICES**

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## Appendix A

Natural History Museum  
of Los Angeles County  
900 Exposition Boulevard  
Los Angeles, CA 90007

tel 213.763.DINO  
www.nhm.org



Vertebrate Paleontology Section  
Telephone: (213) 763-3325

e-mail: [smcleod@nhm.org](mailto:smcleod@nhm.org)

18 June 2018

Tetra Tech, Inc.  
2969 Prospect Park Drive, Suite 100  
Rancho Cordova, CA 95670

Attn: Jenna Farrell, Cultural Resources

re: Paleontological resources for the proposed Daggett Solar Project, east of Daggett, San Bernardino County, project area

Dear Jenna:

I have conducted a thorough search of our paleontology collection records for the locality and specimen data for the proposed Daggett Solar Project, east of Daggett, San Bernardino County, project area as outlined on the portions of the Yermo, Minneola, and Newberry Springs USGS topographic quadrangle maps that you sent to me via e-mail on 18 May 2018. We do not have any vertebrate fossil localities that lie directly within the proposed project area boundaries, but we do have localities somewhat nearby from the same sedimentary deposits that occur in the proposed project area, either at the surface or at depth.

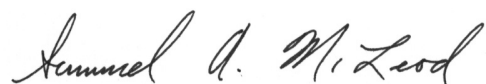
In the very eastern portions of the proposed project area there are surface deposits of younger Quaternary wind blown sands. Otherwise, surface deposits in the entire proposed project area consist of younger Quaternary Alluvium. In the very southwestern portion of the proposed project area these younger Quaternary Alluvium probably includes material from the Newberry Mountains adjacent to the south. Otherwise, the younger Quaternary Alluvium in the proposed project area is derived from Calico Mountains to the north, the Newberry Mountains to the south, and Elephant Mountain and other elevated terrain to the west, partly via the Mojave River that currently flows just north of the proposed project area. These younger Quaternary deposits typically do not contain significant vertebrate fossil in the uppermost layers, but older Quaternary deposits at varying depths may well contain significant fossil vertebrate remains.

Our closest vertebrate fossil locality in alluvial deposits occurring around the Mojave River is LACM 1208, east-northeast of the proposed project area southwest of Crucero near the Mesquite Hills southwest of Soda Lake, that produced fossil specimens of camel, *Camelops*, and horse, *Equus conversidens*.

Shallow excavations in younger Quaternary Alluvium and Quaternary aeolian sands exposed throughout the proposed project area may not encounter any significant fossil vertebrate remains. Deeper excavations that extend down into older Quaternary deposits, however, may very well uncover significant vertebrate fossils. Any substantial excavations in the proposed project area, therefore, should be monitored closely to quickly and professionally recover any fossil remains discovered while not impeding development. Also, sediment samples should be collected and processed to determine the small fossil potential in the proposed project area. Any fossils recovered during mitigation should be deposited in an accredited and permanent scientific institution for the benefit of current and future generations.

This records search covers only the vertebrate paleontology records of the Natural History Museum of Los Angeles County. It is not intended to be a thorough paleontological survey of the proposed project area covering other institutional records, a literature survey, or any potential on-site survey.

Sincerely,

A handwritten signature in cursive script that reads "Samuel A. McLeod".

Samuel A. McLeod, Ph.D.  
Vertebrate Paleontology

enclosure: invoice

**From:** Gilbert, Ian [<mailto:ian.Gilbert@sbcm.sbcounty.gov>]  
**Sent:** Wednesday, June 13, 2018 8:58 AM  
**To:** Farrell, Jenna <[Jenna.Farrell@tetrattech.com](mailto:Jenna.Farrell@tetrattech.com)>  
**Subject:** RE: Paleontological Resources

Hello Jenna,

Thank you for reaching us with your question. First of all I would like to apologize for my late response, I have been on paternity leave for the last month and a half and was unable to set up an outgoing email/phone message before I left. I also tried to call your number but your voicemail does not seem to be set up.

As for your question, yes, you may use the NHMLA for your records search. I doubt that their localities are as extensive in the Inland Empire as ours, but their record search should suffice. In fact, at this point I have a backlog of record searches (due to my leave and an upcoming exhibit) and I would not be able to perform your request until early-to-mid July.

I do not see this backlog being an issue after July, so please feel free to contact the SBCM with future record searches.

I hope this answers your question.

Best,

**Ian Gilbert**  
Curator of Earth Sciences  
**San Bernardino County Museum**  
Phone: 909-798-8616  
Fax: 909-307-0539  
Email: [ijilbert@sbcm.sbcounty.gov](mailto:ijilbert@sbcm.sbcounty.gov)  
2024 Orange Tree Lane  
Redlands, CA, 92374

<image001.png>

*Our job is to create a county in which those who reside and invest can prosper and achieve well-being.*  
[www.SBCounty.gov](http://www.SBCounty.gov)

<image002.jpg> <image003.jpg>

**From:** Farrell, Jenna <[Jenna.Farrell@tetrattech.com](mailto:Jenna.Farrell@tetrattech.com)>  
**Sent:** Tuesday, June 5, 2018 2:14 PM  
**To:** Gilbert, Ian <[ian.Gilbert@sbcm.sbcounty.gov](mailto:ian.Gilbert@sbcm.sbcounty.gov)>  
**Subject:** Paleontological Resources

Hi Ian:

I have a question regarding a records check for paleontological Resources:

- There is a proposed project in San Bernardino County – does it make a difference if we do a Vertebrate Paleontological records check through the Vertebrate Paleontology Department at LACM Natural History versus your museum. I though the LACM did it for most counties in southern California and was not sure if we should have requested a records check with your museum.

Thanks,

Jenna

**Jenna Farrell | Cultural Resources Department**  
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