

Appendix I

Paleontological Resources



PALO VERDE MESA SOLAR PROJECT,
PALEONTOLOGICAL RESOURCES REPORT,
Riverside County, California

by

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The undersigned certifies that the attached report is a true and accurate description of the results of a paleontological assessment described herein.

A handwritten signature in blue ink, appearing to read 'John A. Minch', is written over a light blue horizontal line.

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TABLE OF CONTENTS

	PAGE
EXECUTIVE SUMMARY	i
INTRODUCTION	1
METHODOLOGY OF LITERATURE AND RECORDS SEARCH	5
RESULTS OF LITERATURE AND RECORDS SEARCH	5
GEOLOGY/BIOSTRATIGRAPHY	6
DESCRIPTION OF MAP UNITS WITHIN PROJECT SITE	7
PALEONTOLOGIC RESOURCES ON THE PROJECT SITE	8
REGIONAL PALEONTOLOGICAL RESOURCES OF SITE UNITS	8
SENSITIVITY AND SIGNIFICANCE OF POTENTIAL PALEONTOLOGICAL RESOURCES OF SITE UNITS	11
IMPACTS TO POTENTIAL PALEONTOLOGICAL RESOURCES.	12
CONCLUSIONS AND RECOMMENDATIONS FOR MITIGATION MEASURES	12
ANALYSIS OF ENVIRONMENTAL IMPACTS	15
REFERENCES	16

FIGURES

Figure 1. Regional Location Map.	2
Figure 2. Study area	3
Figure 3. Geologic Map of project area. (Stone, 2006).	4

TABLES

Table 1.	11
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EXECUTIVE SUMMARY

This Paleontological Resources Report documents the findings of a paleontological study conducted by John Minch and Associates, Inc. for the Palo Verde Mesa Solar Project (Project). The Project is located in the Palo Verde Mesa area of eastern Riverside County, California, approximately 5 miles west of Blythe, California. The Project consists of construction and operation of a 486 megawatt (MW) photovoltaic (PV) solar power plant and an approximately 14.7-mile 230 kilovolt (kV) transmission line to occupy 3,400 acres.

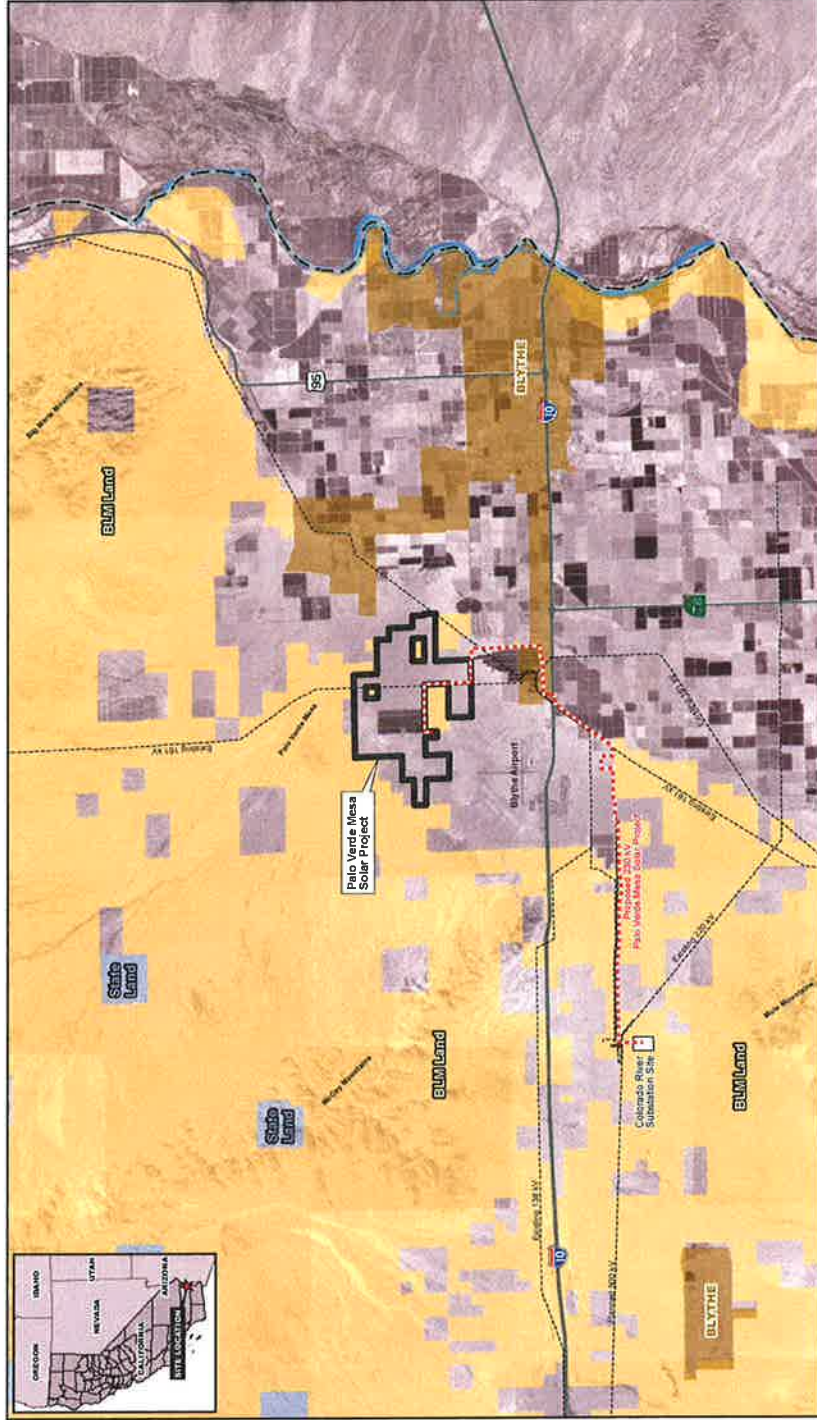
The study included: a literature review, review of the adjacent Blythe Mesa Solar Project and the McCoy Solar Energy Project, review of records searches at the San Bernardino County Museum (SBCM), Los Angeles County Museum (LACM), and databases from the University of California Berkeley Museum of Paleontology (UCMP). This investigation was performed in order to: 1) evaluate existing paleontological resources, 2) determine potential impacts to paleontological resources that would result from the proposed project, and 3) to determine appropriate mitigation measures necessary to minimize anticipated adverse impacts, if any, to paleontological resources resulting from construction of the project.

The majority of the project site is underlain by Pleistocene alluvium of the Palo Verde Mesa. Other units exposed on the site include Alluvial Deposits of the McCoy Wash Area (Pliocene to Pleistocene), Alluvial-fan and Alluvial-Valley Deposits (Pleistocene to Holocene), Alluvium of Modern Washes (Holocene), and Eolian Sand (Holocene). The Pleistocene units on site have a high potential to contain significant paleontological resources. The Holocene units on site have a low potential to contain significant paleontological resources. No recorded fossil localities are known from the project site. It is recommended that a qualified vertebrate paleontologist be retained to develop a Paleontological Resources Monitoring and Mitigation Plan (PRMMP) to mitigate any impacts to significant nonrenewable paleontological resources.

INTRODUCTION

At the request of Power Engineers, Inc., John Minch and Associates, Inc. [JMA] has undertaken the preparation of a Paleontological Resources Report for the proposed Palo Verde Mesa Solar Project, Riverside County, California (Figure 1). The purpose of this Study is to identify the potential paleontological resource impacts associated with the proposed Palo Verde Mesa Solar Project (Project) on 3,400 acres in eastern Riverside County (County). This study has been prepared in conformance with the California Environmental Quality Act (CEQA) Guidelines (Guidelines) that implement CEQA and the County's implementation procedures for CEQA. The Paleontological resources study was performed in order to: (1) evaluate existing paleontological resources of the site and surrounding area, (2) determine if the proposed Project poses any significant adverse impact to existing paleontological resources, and (3) to outline appropriate mitigation measures (if any) in order to minimize adverse impacts to the paleontological resources. This study was conducted in accordance with the professional guidelines established by the Society of Vertebrate Paleontology (SVP) (1995) and requirements set forth by the County of Riverside.

The Project consists of two major components: (1) a solar facility that would occupy 3,250 acres total and (2) a 230 kV transmission line within a 100-foot-wide right-of-way (150 acres). The Project site is located in the Palo Verde Mesa area of eastern Riverside County, approximately 5 miles west of Blythe, north and south of Interstate 10 and west of State Route 89 and Highway 95 (Figure 1). Figure 2 illustrates the location of the Project within the U.S. Geological Survey Map topographic quadrangles. The solar facility site is located within the McCoy Wash quadrangle. The 230 kV transmission line is within the McCoy Wash quadrangle, Ripley and Roosevelt Mine quadrangles. The solar facility site occupies part of the broad and relatively flat Palo Verde Mesa bounded to the east by a low 30 to 50 foot bluff that descends to the Palo Verde Valley.



Legend

- Proposed 230 kV Palo Verde Mesa Solar Project
- Existing 138-161 kV Line
- Highway
- State Boundary
- Colorado River
- City of Blythe
- California State Land
- Bureau of Land Management

REGIONAL AREA

PALO VERDE MESA SOLAR PROJECT

Scale: 1:150,000

0 1 2 3 4 Miles

Source: National Aerial Imagery Program (NAIP), 2010

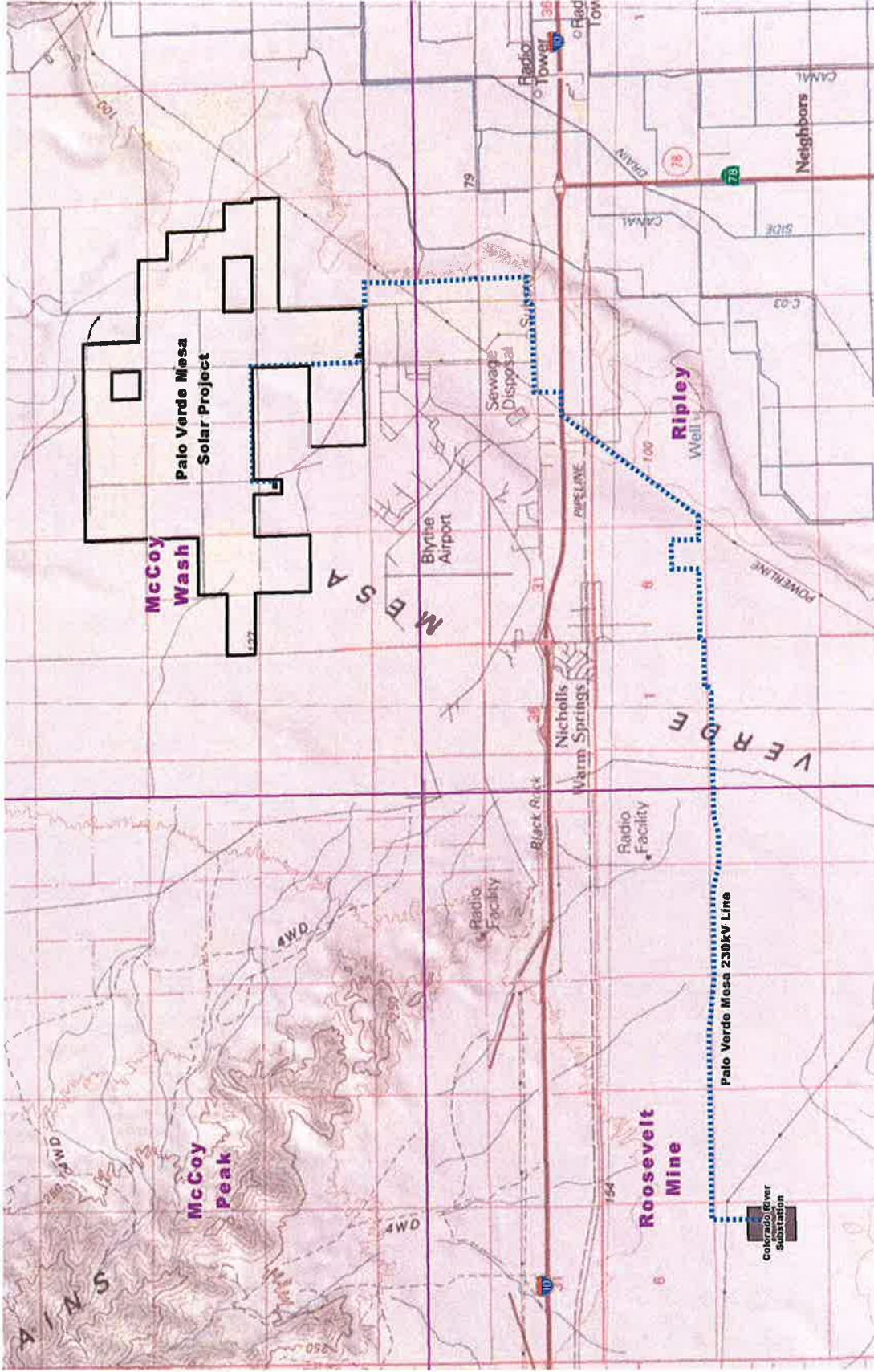


Figure 2. - Study Area plotted on U.S. Geological Survey Topographic Quadrangles

GEOLOGY/BIOSTRATIGRAPHY

The geology of the Blythe area has been described by Stone (2006) at a scale of 1:100,000. This 2006 map was modified from Stone (1990) which was compiled primarily from Hamilton (1964, 1984), Tosdal (1988), Stone and Pelka (1989), and Ballard (1990).

Surficial deposits of Pliocene to Holocene age form the land surface in the project area. Most of these alluvial-fan and alluvial-valley deposits are composed of alluvium either derived from local mountain ranges or transported into the area by the Colorado River. They are divided based primarily on their surface morphology and their appearance on aerial photographs.

It is important to note that there is a complex inter-relationship between these units, Erosion of the existing landscape was producing alluvial fans [gravel aprons] around high areas while the Colorado River was intermittently eroding and depositing gravel and sand over the area. Uplift of parts of the area changed these relationships and left parts of the older deposits exposed. Without age dates or definitive fossils the ages of these units [beyond being very young] are not closely defined.

As illustrated on Figure 3, the majority of the Project site is underlain by Alluvial Deposits of the Palo Verde Mesa (Qpv) (Pleistocene). Other units exposed on the site include: 1) minor exposures of Alluvium of Modern Washes (Qw) (Holocene) within two washes in the eastern portion of the site, 2) minor exposures of Alluvial-fan and Alluvial-Valley Deposits (Qa₆) (Holocene) underlie a small area in the western portion of the site, and 3) Alluvial Deposits of the McCoy Wash Area (Pliocene to Pleistocene) (QTmw) underlie a small area in the northern portion of the site. The majority of the 230 kV transmission line is underlain by Alluvial Deposits of the Palo Verde Mesa (Qpv) (Pleistocene). Other units exposed on the transmission line include: 1) minor exposures of Alluvium of Modern Washes (Qw) (Holocene) within one wash, 2) exposures of Alluvium of Modern Washes (Qa₆) (Holocene) and 3) Eolian Sand (Qs) (Holocene). These geologic units and their relationships are discussed in the following section.

DESCRIPTION OF MAP UNITS WITHIN PROJECT SITE (oldest to youngest)

QTmw - Alluvial deposits of the McCoy Wash area (possibly Pliocene to Pleistocene) - Ancestral Colorado River alluvial deposits of rounded river gravel and minor locally derived gravel form several broad hills standing 15 to 25 m above Palo Verde Mesa in the southeast side of the McCoy Mountains. Hillside exposures show that the surface gravels are underlain by brown, well-consolidated calcareous or gypsiferous sandstone. Stratigraphic relations of QTmw with adjacent deposits of Palo Verde Mesa (Qpv) are unclear. Metzger and others (1973, p. G22) considered deposits mapped as QTmw as of presumed Pliocene and Pleistocene age

Qpv - Alluvial deposits of Palo Verde Mesa (Pleistocene) - Unconsolidated to weakly consolidated deposits of sand, pebbly sand, silt, and clay that are locally well exposed along the scarp of Palo Verde Mesa, which bounds the flood plain of the Colorado River. Scarp exposures, typically about 20 to 30 m thick, show an upper, slope-forming unit of tan to light-gray, sandy and pebbly alluvium and a lower, cliff-forming unit of light-reddish-brown, interbedded fine-grained sand, silt, and clay. The upper unit extends westward from the top of the scarp to form the surface of Palo Verde Mesa, which is composed of unconsolidated sand and pebbly sand containing a mixture of local and river pebbles generally less than 4 cm in diameter. The subtle rather arbitrary contact between units Qpv and Qa₆ is placed at the western limit of river pebbles present at the surface of Palo Verde Mesa. This contact approximately coincides with the slight break in slope that marks the distal margins of alluvial fans and valleys extending from the mountains to the west.

Qa₆ - Alluvial-fan and alluvial-valley deposits Unit 6 (Pleistocene to Holocene) - Angular to subangular gravel and sand derived from local mountain ranges. Mostly unconsolidated to weakly consolidated. Young alluvial-fan and alluvial-valley deposits are generally characterized by a lack of desert varnish and have local evidence of recent sediment transport. This unit consists mostly of sand, pebbly sand, and sandy pebble-gravel; forms gently sloping valley floors marginal to older, varnished alluvial-fan deposits.

Near the mountains, this unit includes relatively coarse, youthful, unvarnished gravel deposits of alluvial fans that grade downslope into the fine-grained deposits; some of these gravels form surfaces that may be inactive and equivalent to some deposits mapped elsewhere as Qa. Unit also includes deposits of many minor washes and channels (equivalent to Qw) too small to be mapped separately.

Qw - Alluvium of modern washes (Holocene) - Unconsolidated, angular to subangular gravel and sand derived from local mountain ranges. Boulder- and cobble-rich wash deposits proximal to mountain fronts grade downstream into pebbly and sandy distal deposits. Mapped areas include both large individual washes and closely spaced smaller washes. Wash deposits commonly grade laterally and downstream into young alluvial sand and gravel

Qs - Eolian sand (Holocene) - Unconsolidated sand dunes. Dunes are often partially stabilized by vegetation. Thin accumulations of eolian sand, not mapped separately, are present locally. The sand is derived from dry lake beds and the surrounding mountains. Dune formation has likely resulted from winds originating from the northwest (Brown 1923).

PALEONTOLOGIC RESOURCES ON THE PROJECT SITE

The review of the LACM, SBCM, and UCMP records, fossil lists, published and unpublished literature indicated that no known paleontologic resource localities are recorded from the study area.

REGIONAL PALEONTOLOGICAL RESOURCES OF SITE UNITS

Sedimentary geologic units within the Mojave Desert region are generally isolated and specific to local areas. Without datable ash beds or volcanic flows the age of the various units are generally determined by 1) relationships to other units, 2) their general appearance, and 3) by their relative degree of dissection. Due to active faulting and differential rates of erosion, units of differing ages often exhibit similar characteristics in different basins. This makes the correlation of units from area to area difficult and speculative. Thus, any fossil localities in Pleistocene sediments are indicative of the high paleontological sensitivity of any Pleistocene sedimentary unit.

The review of a SBCM records search results indicate that similar river alluvium in the Blythe area, Jefferson (1991); and elsewhere in the eastern Mojave, Agenbroad and others, (1992), Shaw (1981), in Arizona, and in Sonora, Mexico, Shaw, (1981); Croxen and others, (2007), has reliably and consistently yielded vertebrate fossil remains.

Alluvial Deposits of the McCoy Wash Area (QTmw) Pliocene to Pleistocene

Although no in fossil resources have been documented from this geologic unit within the Project area, it is considered highly likely to contain significant paleontological resources because of its age, subsurface lithologic composition, and proximity to the ancient Colorado River floodplain. Additionally, this unit is known to be equivalent in age to the nearby Arroyo Diablo Formation, which has a high paleontological resource potential. Therefore, under SVP (1995) criteria, this geologic unit is considered to have a **high paleontological sensitivity**.

Alluvial Deposits of Palo Verde Mesa (Qpv) Pleistocene

The Alluvial Deposits of the Palo Verde Mesa have been mapped as Qpv and dated as Pleistocene in age (1.2 Ma - 10,000 years B.P., Stone 2006). No fossil resources have been recorded from this geologic unit within the Project area. Numerous vertebrate localities have been reported from Older Pleistocene alluvial sediments elsewhere in southern California, Arizona, and Sonora, Mexico. These Older Pleistocene alluvial sediments have been reported to yield significant fossils of extinct animals from the Ice Age (Jefferson, 1991; Reynolds and Reynolds, 1991; Woodburne, 1991; Springer and Scott, 1994; Scott, 1997; Springer and others, 1998, 2007), as well as fossil plants (Reynolds and Reynolds, 1991; Anderson and others, 2002). Fossils vertebrates recovered from these Pleistocene sediments represent extinct taxa including mammoths, mastodons, ground sloths, dire wolves, short-faced bears, saber-toothed cats, large and small horses, large and small camels, and bison (Jefferson, 1991; Reynolds and Reynolds, 1991; Woodburne, 1991; Springer and Scott, 1994; Scott, 1997; Springer and others, 1998, 2007). Therefore, under SVP (1995) criteria, this geologic unit is considered to have a **high paleontological sensitivity**.

Alluvial Fan and Alluvial Valley Deposits (Qa₆) late Pleistocene? to Holocene

Holocene-age Unit 6, is mapped by Stone (2006) as Qa₆. Stone (2006) assigns this unit an age of 100 to 2,000 years B.P.

No fossil resources are known to exist within this geologic unit within the Project area. Fossil vertebrate localities have been recorded from similar deposits north of the Project area (McLeod 2011). Whereas Qa₆ is considered too young to contain fossilized material and is considered to have a **low paleontological sensitivity** at least at the surface, it overlies and is poorly distinguished from older units that are considered as having high potential for containing significant fossil resources, therefore, the **paleontological sensitivity increases to high paleontological sensitivity with depth.**

Quaternary Alluvium of Modern Washes (Qw) Holocene

Quaternary alluvium of modern washes, mapped as Qw, occur in the eastern portion of the site in the McCoy Wash. Modern wash sediments are dated as Recent (Holocene) in age. Holocene-aged sediments often contain the remains of modern organisms, however they are considered too young to contain significant paleontological resources. Therefore, these sediments are determined to have a **low paleontological sensitivity.**

However, paleontologically sensitive Pleistocene age alluvial and fluvial deposits may be encountered at depth. Thus, areas within the Project area mapped as Qw are considered to have a **paleontological sensitivity ranging from low to high, increasing with depth.**

Eolian Sand (Qs) Holocene

The active sand dune deposits are too young to contain fossilized remains. However, older sand dune deposits, frequently stabilized with vegetation, may contain scientifically vertebrate specimens (McLeod 2011). Therefore, sand dune deposits within the Project area are assigned a **low to high paleontological sensitivity, increasing with depth**

SENSITIVITY AND SIGNIFICANCE OF POTENTIAL PALEONTOLOGICAL RESOURCES OF SITE UNITS

Recent (Holocene) Alluvial and river deposits (Qw, Qs and much of Qa₆) Vs. Pleistocene Alluvial and river deposits (QTmw, Qpv, and locally Qa₆)

Recent (Holocene) Alluvial and river deposits (Qw, Qs and much of Qa₆)

Qw, Qs and much of Qa₆ are all grouped within the broad category of Holocene (Recent) alluvium and river deposits. Holocene Alluvium is less than 11,000 years and is not considered to contain paleontological resources and is generally assigned a **low paleontological sensitivity**. However; it is often difficult to distinguish Recent Alluvium from Pleistocene Alluvium (as in **Qa₆**) when deposition was continuous.

Pleistocene Alluvial and river deposits (QTmw, Qpv, and locally Qa₆)

QTmw, Qpv, and locally Qa₆ are all grouped within the broad category of Pleistocene alluvium and river deposits. Pleistocene Alluvium is more than 11,000 years and is considered to have a high potential to contain paleontological resources and is generally assigned a **high paleontological sensitivity**

Age	Geologic Unit	Map Symbol	Typical Fossil Types	Paleontological Resource Sensitivity
Holocene	Quaternary alluvium of modern washes	Qw	None	Low to high (increasing with depth)
Holocene	Quaternary eolian sand	Qs	None	Low to high (increasing with depth)
Holocene	Alluvial-fan and valley deposits	Qa ₆	None	Low to high (increasing with depth)
Pleistocene	Alluvial deposits of Palo Verde Mesa	Qpv	Terrestrial vertebrates	High
Pliocene to Pleistocene	Alluvial deposits of McCoy Wash area	QTmw	Terrestrial vertebrates	High

Table 1. Geologic Units in the Palo Verde Mesa Solar Project Area and their Paleontological Sensitivity Rating (*after Stone, 2006*)

Known sedimentary units of Pleistocene age underlie the majority of the area covered by the Project. These Pleistocene alluvial and river sediments of the area are considered to be of high paleontologic sensitivity and are known to contain significant fossils in other parts of southern California. There is a high potential for significant paleontological resources on the portion of the site underlain by Pleistocene Alluvium. (See Table 1)

IMPACTS TO POTENTIAL PALEONTOLOGICAL RESOURCES

Grading and excavation in conjunction with development will have high potential to adversely impact significant nonrenewable paleontologic resources that may be present within the boundaries of the project property, depending upon the lithology of the Pleistocene older alluvial sediments present.

CONCLUSIONS AND RECOMMENDATIONS FOR MITIGATION MEASURES

Ground-disturbing activities in the site area may result in adverse impacts to significant paleontological resources unless proper mitigation measures are implemented. Implementation of proper mitigation measures can, however, reduce the impacts to the paleontological resources to below the level of significance.

1. A qualified vertebrate paleontologist shall prepare a Worker's Environmental Awareness Program (WEAP). The paleontological training program for workers shall address the potential to encounter paleontological resources in the field, the sensitivity and importance of these resources, and the legal obligations to preserve and protect such resources. The training program shall also include the set of reporting procedures that workers are to follow if paleontological resources are encountered during project activities. The training program shall be presented by a qualified paleontologist and may be combined with other training programs prepared for cultural and biological resources, hazardous materials, or any other areas of interest or concern.

2. A qualified vertebrate paleontologist shall be retained to develop a Paleontologic Resource Mitigation Monitoring Plan (PRMMP) to mitigate impacts and to guide the recovery of any significant nonrenewable paleontologic resources. This PMP shall be consistent with the provisions of the California Environmental Quality Act (Scott and Springer, 2003), as well as with regulations currently implemented by the County of Riverside and the proposed guidelines of the Society of Vertebrate Paleontology.
3. The qualified vertebrate paleontologist, who is a Registered Professional Geologist, should direct paleontologic monitoring, by a qualified paleontologic monitor, during excavations in areas underlain by geologic units identified as having a high paleontologic sensitivity and likely to contain paleontologic resources. Areas of specific concern include all previously undisturbed paleontologic sensitive sediments of the fossiliferous Pleistocene Palo Verde Mesa. The paleontologist shall oversee grading, trenching, and augering in fossil-bearing sediments with a significant Paleontologic Resource potential. All ground-disturbing activities in high Paleontologic Resource sensitivity areas shall be monitored on a full-time basis at the start of the project. All ground disturbances in areas determined to have low to high sensitivity at depths of 5 feet or greater shall also, initially, require monitoring on a full-time basis. If no significant fossils are being found, then, after an adequate amount of time, the frequency of monitoring may be adjusted at the discretion of the qualified paleontologist. No monitoring is required in areas determined to have a low Paleontologic Resource sensitivity.
4. Paleontologic monitors shall be equipped to salvage fossils as unearthed, to divert equipment to avoid construction delays, and to remove samples of sediments likely to contain the remains of small fossil invertebrates and vertebrates. Monitors shall be empowered to temporarily halt or divert equipment to allow removal of abundant or large specimens.
5. Preparation of recovered specimens to a point of identification and permanent

preservation, including washing of sediments to recover small invertebrates and vertebrates. Preparation and stabilization of all recovered fossils are essential in order to fully mitigate adverse impacts to the resources (Scott and others, 2004).

6. Identification and curation of specimens into an established, accredited museum repository with permanent retrievable paleontologic storage. These procedures are also essential steps in effective paleontologic mitigation (Scott and others, 2004) and CEQA compliance (Scott and Springer, 2003). The paleontologist should have a written repository agreement in hand prior to the initiation of mitigation activities. Mitigation of adverse impacts to significant paleontologic resources is not complete until such curation into an established museum repository has been fully completed and documented.
7. Preparation a paleontological resources monitoring report by the qualified paleontologist. The report will include findings with an appended itemized inventory of specimens. This report and inventory, when submitted to the appropriate Lead Agency along with confirmation of the curation of recovered specimens into an established, accredited museum repository, will signify completion of the program to mitigate impacts to paleontologic resources.

ANALYSIS OF ENVIRONMENTAL IMPACTS

Significant Impact Which Cannot be Avoided or Mitigated

(Section 15126(b) of CEQA Guidelines)

Not applicable; Impact on paleontological resources are considered significant but mitigable.

Significant Impact Which Can be Avoided or Mitigated

Development of the site may have an impact on paleontological resources that cannot be avoided. Impacts to these paleontological resources can however, be mitigated by implementation of all mitigation measures recommended above.

Cumulative Impacts

Impacts to paleontological resources at the site are considered to be non-Cumulative.

Residual Impacts After Mitigation (If Any)

There will be no Residual Impacts after Mitigation.

Alternatives Analysis

There is no need to consider alternatives to the project as impacts to the paleontological resources will be reduced to levels of insignificance if mitigation measures are employed.

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