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# 5.8 Paleontological Resources

This section presents the potential effects on paleontological resources (fossils) from the construction and operation of the MREC. Section 5.8.1 discusses the affected environment, including the resource inventory and its results. Section 5.8.2 presents the environmental analysis and impact assessment. Section 5.8.3 considers cumulative effects on paleontological resources, and 5.8.4 presents Mission Rock-proposed mitigation measures. Section 5.8.5 discusses applicable LORS. Section 5.8.6 lists involved agencies, Section 5.8.7 lists permits, and Section 5.8.8 provides the references consulted.

This section of the AFC meets all siting regulations of the CEC (2000, 2007) and conforms to the recommendations of the Society of Vertebrate Paleontology (SVP) (SVP, 2010) that address the assessment of and mitigating impacts on paleontological resources resulting from earth-moving activities. This paleontological resources inventory and impact assessment was prepared by James R. Verhoff, Staff Paleontologist with CH2M, and by Dr. W. Geoffrey Spaulding, CH2M's Paleontological Resources Specialist (PRS). This team has developed paleontological inventories, and paleontological monitoring and treatment plans, and implemented prescribed mitigation measures for a wide range of electrical generation and transportation projects in southern and central California.

## 5.8.1 Affected Environment

This section describes the affected environment for paleontological resources. It begins by describing the physiographic and geological context of the project area, and then continues by describing the nature and types of fossil resources that have been recorded in the area. It concludes by providing an assessment of the scientific importance of the fossils that may be encountered during the construction of this project.

### 5.8.1.1 Physiographic and Geologic Setting

The MREC site is located by geologists within a larger geological structure named in the Ventura Basin, one of several distinctive depositional basins along the western margin of Southern California. These basins hold sediments (mostly marine, but also terrestrial units) that record local transgressions and regressions of the Pacific Ocean. This is a process that has been on-going for at least 40 million years, but the sediments of the Ventura Basin are quite young, dating from the Pliocene to Recent (the last 5 million years) (Yeats and Rockwell, 1991). The MREC site itself lies within a predominantly east-west trending extension of the Ventura Basin, filled with sediments that comprise the floor of the Santa Clara River Valley. The southern edge of this valley is defined by the abrupt and steep hill-slopes the Oak Ridge Fault (Tan et al., 2004), while to the north the valley's edge is defined by more weathered, rounded hills (Yeats and Rockwell, 1991). In between lies a low-gradient alluvial fan complex, or bajada, that slopes gently southward to the southern margin of the valley where the river lies. Numerous smaller rivers and seasonal streams have cut arroyos (locally termed "barrancas") into this fan as they flow south from the northern hills to the Santa Clara River (Gutierrez, et al., 2008). While the position of the Santa Clara River is constrained to the actual "crease" of the Oak Ridge Fault in the MREC site area, the location of its mouth at the Pacific Ocean, 8.6 miles to the west-southwest, appears to have migrated through time (Yeats and Rockwell, 1991).

The geological history of this region is complex, owing to intense tectonic deformation associated with the San Andreas Fault and the rotation of the Transverse Ranges; this deformation continues to present (Yeats and Rockwell, 1991). The Ventura Basin began as a deep-sea depositional basin as early as 4 to 5 million years ago, and its oldest sediments consist of relatively deep-sea marine turbidites and mudstones unconformably overlying Tertiary beds (Yeats and Rockwell, 1991). The Pico Formation is recognized as the start of the shallowing of this basin, as it represents the start of conditions where sedimentation rates were greater than subsidence rates in the offshore basin (Harden, 1998). The

sediment in the valleys records a relative shallowing of sea level through time, through the combined effects of tectonic uplift and infilling of the basin by sediment, until the middle Pleistocene when there was a hiatus in deposition (termed the intra-Pleistocene unconformity in the Santa Clara Valley; Yeats and Rockwell, 1991). Deposition began again in the Pleistocene and continues to the present, in off-shore portions of the basin and along the down-warped "seam" of the Oak Ridge Fault, which forms the southern margin of the Santa Clara Valley (Yeats and Rockwell, 1991). The age of the Quaternary sediments in the Ventura Basin is well-constrained by vertebrate remains, microvertebrate remains (small mammal bones and teeth), magneto-stratigraphy, and radiometric dating of distinctive ash beds (Yeats and Rockwell, 1991). Calculated sedimentation rates within the basin are quite high; up to 7,300 meters (approximately 24,000 feet) of sediment have been deposited in the last 4 million years (Harden, 1998).

#### 5.8.1.2 Physiographic and Geologic Setting

**Resource Inventory Methods**

To develop a baseline paleontological resources inventory of the MREC site area and surrounding lands published and available unpublished geological and paleontological literature was reviewed. Sources included geological maps, satellite photography, technical and scientific reports, and electronic databases. The potential paleontological productivity of stratigraphic units that may be affected by project implementation was then initially developed through a paleontological resources records search. For this project, a paleontological resources records review was conducted using the online database maintained by the University of California Museum of Paleontology at Berkeley (UCMP).

A paleontological resources field survey was then conducted to confirm the distribution of fossiliferous units on the ground, and to refine the understanding of the paleontological productivity of those units. This survey, conducted on October 6, 2015, focused on those portions of the right-of-way where native sediment is exposed at, or present near, the surface. This included the foot-slopes and hills on the northern margin of the valley where the transmission line corridor is proposed. Reconnaissance-level survey of the remainder of the project right-of-way in the Santa Clara River Valley, including the generation station site, was also conducted. These latter areas are occupied by younger Quaternary alluvium, with only Holocene sediments of low paleontological sensitivity expected at or near the surface. The ground surface of the Santa Clara River Valley in the MREC vicinity is also largely obscured by residential, light industry, and agricultural development.

**Resource Inventory Results**

The MREC site area is characterized by two strikingly different geologies: the valley of the Santa Clara River, and the foot-slopes and the hills bordering the valley to the north.

**Geological Units in the Valley**

The MREC lies on the relatively flat plain of the Santa Clara River Valley bottom, not far north of the current course of the river. This area is currently used as a storage area for recreational vehicles, and a layer of disturbed sediment and fill covers the entire area proposed for the generation station. Below this fill lies Holocene-age stream terrace deposits associated with the Santa Clara River (Tan et al., 2004). These sediments are chiefly point bar and overbank deposits associated with previous stream channels of the river.

Two offsite linear components of the MREC cross the Santa Clara River Valley. In addition to the Holocene stream terrace deposits, these offsite components also cross alluvial fan deposits derived from the nearby hills to the north, and associated with the numerous streams flowing south/southeast from the northern margin of the valley, running essentially perpendicular to the river they join. These alluvial fans dominate the valley, forming a more or less continuous sheet of very fine grained alluvium derived from the soft marine sediments that comprise the hills to the north (see below). These deposits range in

age from later[1] Pleistocene to Holocene (Tan et al., 2004). The sediments were deposited as debris flows, highly concentrated mud flows, and braided stream deposits (Tan et al., 2004). Pleistocene deposits originated in a similar manner to their Holocene counterparts in the valley, but some have been subsequently eroded to such a degree that their original surfaces are no longer present (Tan et al., 2004).

Holocene overbank deposits are found on the valley margin at the apex of these fans, at the mouths of the valleys issuing from the rugged hills to the north (Tan et al., 2004). These are recognized as fluvial, rather than alluvial, deposits by the presence of scour marks and channels (Tan et al., 2004).

**Geological Units in the Hills**

Only the proposed generator tie-line corridor crosses the hills to the north of the Santa Clara River Valley. This component of the project will include construction of conductor support structures, with excavation of pads and footings, as well stringing facilities. Existing access roads to the proposed tower pad localities will need to be extended short distances. These hills crossed by the proposed generator tie-line corridor (Figure 5.8-1), are composed of poorly consolidated marine sediments of Pleistocene age (younger than 2.6 million years). The sediments represent near-shore as well as relatively shallow, off-shore environments. The nomenclature of these geological formations has been revised multiple times (Grant and Gale, 1931; Dibblee, 1992; Winterer and Durham, 1962); for the purposes of this report, the system proposed by Gutierrez and others (2008) is adopted.

Originally, most of the marine sediments in this area were assigned to the Pico Formation, and nonmarine sediments to the Saugus Formation (Winterer and Durham, 1962). More detailed classification schemes have been employed since then, while the Pico Formation is retained as the basal marine unit present in the region, although not within the paleontological area of potential effect of this project. The Pico Formation is a marine sedimentary unit, consisting of predominantly turbidites as well as near-shore sands and gravels.

Two additional marine sedimentary units stratigraphically overly the Pico Formation, and both of these are within the paleontological resources area of potential effect: The Santa Barbara and Las Posas Formations. The former was once included as part of the Pico Formation, but is now recognized as a different and younger formation. The Santa Barbara Formation consists of near-shore marine sediments once deposited at the margin of the Pacific Ocean. The lithology of the formation ranges from massive gray to blueish gray claystone (Dibblee, 1992, terms this unit the Mudpit Claystone Member), to poorly consolidated, massive, light brown to brown silts and sandy silts. It occasionally includes fragments of older formations (Tan et al., 2004). In the generator tie-line corridor right-of-way, the clayey member appears missing and the marine sediments mapped as the Santa Barbara Formation are tan to brownish-grey silts and sandy silts. These sediments are fossiliferous, primarily producing shallow-marine and near-shore mollusks (Winterer and Durham, 1962). Many of the bivalves in these assemblages are paired (Winterer and Durham, 1962), indicating little if any transportation of these shells.

Stratigraphically, the Las Posas Formation lies immediately above the Santa Barbara Formation, and it represents yet nearer-shore marine environments; sediments deposited in a regressive marine setting as the sea continued to shallow. Originally it was included in the Fernando Formation, defined as all sediments between the upper Modelo and lower Saugus formations (Winterer and Durham, 1962). It has also been attributed to the Saugus Formation, and was included by some authors in the “lower San Pedro series” or “San Pedro Formation” (Grant and Gale, 1931). More recent geologic mapping (Dibblee, 1992; Gutierrez et al., 2008) has separated the Las Posas Formation into a distinct geologic unit. The sediments themselves are weakly indurated light brown to yellowish-brown sands

[1] The marine sediments that comprise the hills to the north are also Pleistocene in age, but evidently much older than the sediments of the valley.

(Dibblee, 1992) and sandy silts, with occasional gravels (CDOC, 2003), which often include marine shells and shell fragments (Grant and Gale, 1931).

The Saugus Formation records the transition from shallow marine to subaerial, or terrestrial depositional environments. While in some areas this allows the formation to be divided into a lower marine and upper terrestrial member (Winterer and Durham, 1962), for the purposes of this analysis this formation includes only the terrestrial sediments, including fluvial and estuarine habitats. The terrestrial sediments of the Saugus Formation consist of lenticular beds of light-gray and brown weakly consolidated sandstone and conglomerate with lenses of reddish-brown siltstone (mudstone of Winterer and Durham, 1962). Terrestrial vertebrate fossils have been found in this portion of the formation, including equid (*Pliohippus*) teeth (Winterer and Durham, 1962).

**Results of the Records Search**

A search of the UCMP database on September 29, 2015, queried fossil site records within the potentially impacted formations. The results can be used as a general guide to the paleontological potential (the likelihood of yielding scientifically significant fossils) of the sediments in the vicinity of the project, with allowance for the nature of the data. In particular, the complex history of the geologic names complicated this search, as historic locality records often retain their original stratigraphic designations despite later revisions to the nomenclature. Fortunately, the UCMP is sensitive to these issues, and many of the records indicate the history of the formation name.

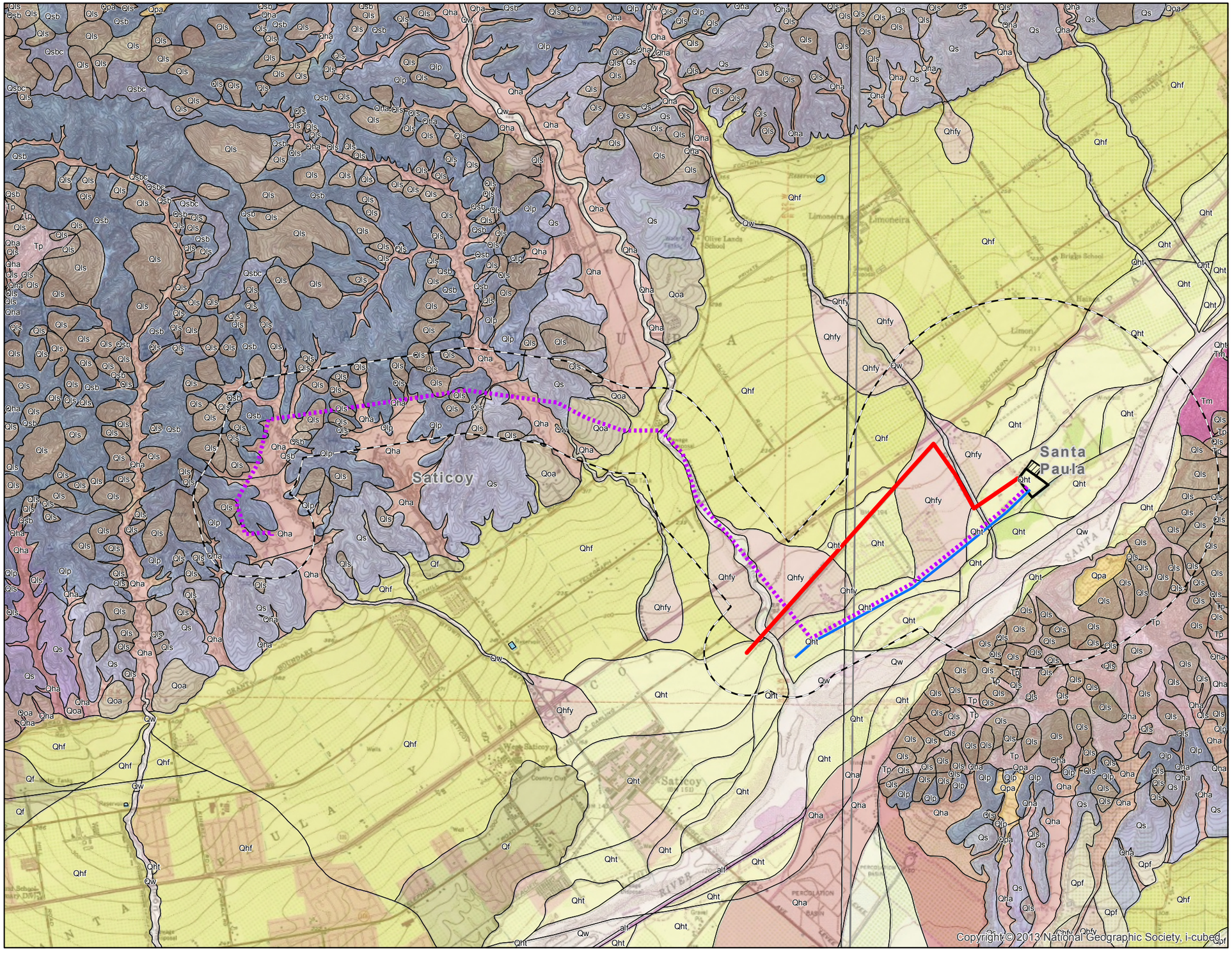
Queries of the UCMP database for the Santa Barbara Formation yielded 159 fossil localities attributed to this formation, 157 directly attributed to the formation and 2 attributed to the Santa Barbara member of the Pico Formation (UCMP, 2015). One locality was also attributed to the Mudpit Member of the Pico Formation (UCMP, 2015). The majority of these localities consist of microfossil collections, which are not considered scientifically significant due to the abundance of microfossils in the geologic record. The invertebrate fossils from this formation consist of gastropods and bivalves (UCMP, 2015).

Excluding records attributed to the Santa Barbara Formation or member, the UCMP records include 82 locations for the Pico Formation (UCMP, 2015). As with the Santa Barbara Formation, the majority of the fossil sites were invertebrate and microfossil remains. Three Miocene localities were also attributed to this Formation (UCMP, 2015). These include cetacean fossils, as well as unidentified bird remains (UCMP, 2015). None of the vertebrate fossil sites are within or near the MREC area.

Queries of the UCMP database (2015) for the Saugus Formation yielded 22 localities. Of these, two have yielded microfossils and the rest have produced invertebrate fossils (UCMP, 2015). As with the Santa Barbara Formation, the invertebrates collected from the Saugus Formation are limited to mollusks, and include gastropods and bivalves (UCMP, 2015).

Queries of the UCMP database (2015) for the Las Posas Formation produced four results. One of these sites has produced only invertebrates, while three have produced vertebrate remains (UCMP, 2015). The vertebrate remains are limited to unidentifiable mammal bone fragments and, in one locality, remains of the extinct horse *Equus occidentalis* (UCMP, 2015).

The UCMP database (2015) has yielded 59 records from the Fernando Formation. Where the location information is available, these finds are far from the MREC site, which likely reflects the fact that the Fernando Formation has not been used to describe the fossiliferous units within the project area for nearly a century (Grant and Gale, 1931). No record attributed to the Fernando Formation in the UCMP database is attributed to the Las Posas member (UCMP, 2015).




VICINITY MAP


LEGEND

- Project Site
- Laydown Area
- Natural Gas Pipeline Route
- Generator Tie-Line
- Process Water Supply Line
- USGS 24k Topo Map Boundaries

| | |
|---|---|
| Qw | Wash deposits within major river channels (Holocene, historic) |
| Qhfy | Alluvial fan deposits (latest Holocene) |
| Qha | Alluvial deposits (Holocene) |
| Qha1 | Alluvial deposits (Holocene) |
| Qha2 | Alluvial deposits (Holocene) |
| Qht | Stream terrace deposits (Holocene) |
| Qhf | Alluvial fan deposits (Holocene) |
| Qf | Alluvial fan deposits (late Pleistocene to Holocene) |
| Qpf | Undivided fan deposits (Pleistocene) |
| Qpa | Undivided alluvial deposits (Pleistocene) |
| Qoa | Alluvial deposits (early to middle Pleistocene) |
| Qls | Landslide deposits (Holocene to Pleistocene) |
| Qs | Saugus Formation (Pleistocene) |
| Qsbc | Santa Barbara Formation, conglomerate |
| Qlp | Las Posas Formation (Pleistocene) |
| Qsb | Santa Barbara Formation (Pleistocene) |
| Tp | Undivided Pico Formation (Pliocene) |
| Tm | Modelo Formation (Miocene) |
| alf | Artificial levee fill |
| water | Water |

USGS Geologic Map of the Santa Paula, Saticoy 7.5' Quadrangle, Ventura County, California

N

0 1,500 3,000
Feet

**Figure 5.8-1**
**Paleontological Resources Study Area**
Mission Rock Energy Center
*Ventura County, California*

Geologic names such as “overbank deposits” and “Quaternary alluvial fans” do not lend themselves to database searches. A query of the UCMP database (2015) for Quaternary fossil localities within Ventura County produced 218 results. Many of these are in named Quaternary deposits, such as the Las Posas Formation, and the overwhelming majority of the rest are located along the Pacific Coast or on offshore islands. The remainder generally lack locality data (UCMP, 2015). One vertebrate fossil site, which has produced mammoth fossils, was found in the City of Ventura, in unnamed Rancholabrean (Late Pleistocene) sediments (UCMP, 2015). One invertebrate fossil site, in Recent (Holocene) sediment, is also located in the City of Ventura (UCMP, 2015). No localities that include geographic information were identified near the project area.

**Results of the Field Survey**

The paleontological resources field survey of October 6, 2015 focused on segments of the MREC right-of-way where the results of the reviews, discussed above, indicated the presence of sediments with high paleontological sensitivity. This is essentially the mountainous terrain north of the Santa Clara River Valley where the generator tie-line right-of-way crosses outcrops of the Pleistocene age Santa Barbara, Las Posas, and Saugus formations. The older Quaternary-age sediments comprising the toe-slopes of these low mountains were also subject to pedestrian survey because they were exposed by agricultural activities that appear to have brought deeper sediments to the surface. Younger, Quaternary age alluvium comprising the Santa Clara River Valley itself was subject to reconnaissance survey only due to the lack of surface exposures, and absence of stratigraphic profiles in the area. The valley itself hosts extensive agricultural, light industrial, and business development. Where not developed, the land in the valley is overgrown. The arroyos (named *barrancas* in this region), which are cut into the alluvial fans extending from the bordering hills to the river, are entirely overgrown with vegetation and therefore offer no stratigraphic profiles for examination.

The results of the field survey confirmed the findings of the records search and literature review regarding the fossiliferous nature of the marine sedimentary units. Marine mollusk fossils were observed as common to abundant in all exposures of the Las Posas and Santa Barbara formations subject to examination. Excavations at pre-existing electrical transmission towers and along road cuts near the generator tie-line have exposed a range of well-preserved mollusks, mostly bivalves. Essentially all exposures of these two formations also contained greater or lesser amounts of broken shell. Some strata composed almost entirely of shell “hash” were observed, but not close to the MREC right-of-way.

In contrast, no fossil material was noted in any of the exposures of the Saugus Formation examined during this survey. However, the records review shows that fossils are less frequent in these terrestrial sediments, but not less important to understanding the paleontological record of the area. As only one out of the four tower pads sited on the Saugus Formation (Figure 5.8-1) could be accessed, it is possible that fossil material may yet be encountered in the Saugus Formation as well.

No indication of paleontological sensitivity could be found on disturbed exposures of older Quaternary alluvium, nor were any such indications located elsewhere during reconnaissance of the valley bottom. A map showing the paleontological sites located during this survey is included as Appendix 5.8A and filed separately under a request for confidentiality.

**Paleontological Sensitivity of the MREC Right-of-Way**

Paleontological sensitivity is the qualitative assessment made by a professional paleontologist taking into account the paleontological potential of the stratigraphic units present, the local geology and geomorphology, and any other local factors that may be germane. According to the SVP standard guidelines (2010), sensitivity comprises: the potential for yielding abundant or significant vertebrate fossils or for yielding a few significant fossils, large or small, vertebrate, invertebrate, or paleobotanical remains, and the importance of recovered evidence for new and significant taxonomic, phylogenetic, paleoecological, or stratigraphic data (Table 5.8-1).

Table 5.8-1 Paleontological Sensitivity Ratings Employed

| | Definition |
|---|---|
| High | Assigned to geological formations known to contain paleontological resources that include rare, well-preserved, and/or fossil materials important to on-going paleoclimatic, paleobiological and/or evolutionary studies. They have the potential to produce, or have produced vertebrate remains that are the particular research focus of many paleontologists, and can represent important educational resources. |
| Moderate | Stratigraphic units that have yielded fossils that are but moderately well preserved, are common elsewhere, and/or that are stratigraphically long ranging would be assigned a moderate rating. This evaluation also can be applied to strata that have an unproven but strong potential to yield fossil remains based on the stratigraphy and/or geomorphologic setting. Fossil assemblages from paleontologically moderately sensitive rock units may still retain scientific importance for their data potential. |
| Low | Sediment that is relatively recent, or that represents a high-energy subaerial depositional environment where fossils are unlikely to be preserved. A low abundance of invertebrate fossil remains, or reworked marine shell from other units, can occur but the paleontological sensitivity would remain low due to their lack of potential to serve as significant scientific or educational purposes. This evaluation also can be applied to strata that have been monitored and that have failed to yield scientifically significant fossil remains. |
| Marginal and Zero | Stratigraphic units with marginal potential include pyroclastic flows and soils that might preserve traces or casts of plants or animals. Most igneous rocks, however, have zero paleontological potential. Other stratigraphic units deposited subaerially in a high energy environment (such as alluvium) also may be assigned a marginal or zero sensitivity rating. Manmade fill is also considered to possess zero (no) paleontological potential. |

Fossil marine mollusk assemblages are common up and down the coast of California, which is well known to be a tectonically highly-active geological province. As a result of the tectonically driven uplift of marine sedimentary basins, the number of later Neogene (Plio-Pleistocene) molluscan assemblages in western California is likely in the many thousands. Therefore, marine invertebrate fossils are not generally considered scientifically significant individually; it is only in aggregate that they become significant. Individually, gastropods and bivalves are generally considered acceptable for hobby collection (BLM, 2009). Therefore, the paleontological sensitivity of the Las Posas and Santa Barbara formations is considered to be moderate. Moderate paleontological sensitivity also applies to the Saugus Formation which has the potential to yield scientifically significant fossil material.

The Older Quaternary alluvium of the foot-slopes on the margin of the valley possess low paleontological sensitivity; the subaerial deposition regime of alluvium usually precludes fossil preservation and no records have been found of fossil sites in similar settings. The Holocene alluvium that blankets the floor of the Santa Clara River Valley also possesses low paleontological sensitivity. However, terrace sets mapped within about one half-mile of the Santa Clara River suggests variability in fluvial depositional regimes over time. At depths greater than about 10 feet (3 meters) it is possible that older sediments within a half-mile of the river may contain fossil material and these deposits are therefore designated to be of moderate paleontological sensitivity at depth.

## 5.8.2 Environmental Analysis

The subsurface of the MREC area consists of Holocene alluvial deposits overlain by disturbed sediments and artificial fill. Offsite components of the project, including a transmission line and water line, cross chiefly Holocene alluvial fill in the valley floor, and Quaternary terrace deposits and the Santa Barbara, Las Posas, and Saugus formations in the hills north of the MREC area. The environmental effects on paleontological resources from construction and operation of the MREC are presented in the following sections.

#### 5.8.2.1 Paleontological Resource Significance Criteria

Guidelines for the implementation of CEQA (PRC Sections 15000 et seq.) include among the questions to be answered in the Environmental Checklist (Section 15023, Appendix G) the following: "Would the project directly or indirectly destroy a unique paleontological resource or site?" and "Does the project have the potential to …eliminate important examples of the major periods of California…pre-history?" These questions are answered in the affirmative based on the data and considerations provided above.

In its standard guidelines for assessment and mitigation of adverse impacts to paleontological resources, the SVP (1995) notes that an individual fossil specimen is considered scientifically important and significant if it meets the following criteria:

- Identifiable
- Complete
- Well preserved
- Age-diagnostic
- Useful in paleoenvironmental reconstruction
- A member of a rare species
- A species that is part of a diverse assemblage,
- A skeletal element different from, or a specimen more complete than, those now available for that species

For example, identifiable land mammal or terrestrial plant fossils are considered scientifically important because of their potential use in determining the age and paleoenvironment of the sediments in which they occur. Moreover, vertebrate and plant remains are comparatively rare in the fossil record. Fossil plants are particularly important in this regard and, as sessile (anchored in place) organisms, are actually more sensitive indicators of their paleoenvironment and, therefore more important than mobile mammals for paleoenvironmental reconstructions.

For marine and shoreline sediments, invertebrate mega-fossils (e.g., mollusks, cephalopods) are scientifically important for the same reasons that land mammal and/or land plant fossils are valuable in terrestrial deposits. Marine microfossils such as foraminifera or radiolaria are much more common, and consequently usually not considered for resource protection because of their relative abundance. The value or importance of different fossil groups varies depending on the age and depositional environment of the stratigraphic unit that contains the fossils, their abundance in the record, and their degree of preservation.

Using these criteria and the sensitivity ratings provided above, the significance of potentially adverse impacts of earth moving on the paleontological resources was assessed. Any unmitigated impact on a fossil site, or on a fossil-bearing rock unit of high or moderate sensitivity, would be considered significant.

#### 5.8.2.2 Paleontological Resource Impact Assessment

The significance of impacts of MREC-related activities on the paleontological resources of each stratigraphic unit found at the MREC site and along the linear appurtenances is presented in this section. All MREC components within the Santa Clara River Valley will impact Holocene sediments at shallow depth (within 10 feet of the surface). Excavations for foundations and other components of the power generation facility itself are will extend deeper than 10 feet, and may encounter older fluvial deposits. The generator tie-line will also affect Pliocene to Pleistocene marine and near-shore deposits.

**Holocene Sediment** - Construction-related excavations within the plow zone and at depth of less than 10 feet will not result in any adverse impacts on paleontological resources. Reworked and disturbed fossil material can be present in previously disturbed sediment or fill, but lack of stratigraphic context and likely mechanical damage would compromise all scientific values. This would apply to all excavations

within 10 feet of current ground surface within the Santa Clara River Valley, as well as any other developed areas (such as access roads) along the utility corridors. No impacts to paleontological resources will occur during excavations within these shallower sediments.

**Quaternary Stream Terrace Deposits and Deeper Alluvium** - Below the artificial fill and Holocene sediment at the project area within the valley are older alluvium and sediments associated with the Santa Clara River. While no fossils have been found in these sediments to date, the depositional environment makes preservation at depth of organic material likely. Such fossils could provide valuable information regarding the ongoing tectonic deformation of this valley, as well as local and regional response to climate shifts within the Holocene. Therefore, it is possible that the MREC could encounter significant paleontological resources within these sediments. If this occurs, implementation of the recommended mitigation measures will reduce the potential impacts to a level below significance.

**Santa Barbara Formation** - The Santa Barbara Formation has produced important marine invertebrate fossils (UCMP, 2015; Grant and Gale, 1931), and field survey has confirmed the presence of mollusk fossils within the generator tie-line right-of-way. Therefore, it is possible that the MREC could encounter significant paleontological resources within these sediments. If this occurs, implementation of the recommended mitigation measures will reduce the potential impacts to a level below significance.

**Las Posas Formation** - The Las Posas Formation has predominantly produced common marine invertebrate remains (UCMP, 2015). However, isolated mammal fossils have also been found (UCMP, 2015). It is therefore possible that the MREC could encounter significant paleontological resources within these sediments. If this occurs, implementation of the recommended mitigation measures will reduce the potential impacts to a level below significance.

**Saugus Formation** - Like the Santa Barbara and Las Posas formations, the Saugus Formation has produced common invertebrate fossils (UCMP, 2015; Grant and Gale, 1931). Equid teeth have also been found, however (Winterer and Durham, 1962). It is therefore possible that the MREC could encounter significant paleontological resources within these sediments. If this occurs, implementation of the recommended mitigation measures will reduce the potential impacts to a level below significance.

Because no excavations in paleontologically sensitive sediments are anticipated from the operation or the maintenance of the project, no impacts on paleontological resources are expected from the O&M of the MREC.

### 5.8.3 Cumulative Effects

Reasonably foreseeable projects within or near the project area and those permitted or in a permitting process but not constructed at this time do not involve major excavations in geological formations with a high potential for containing significant fossils. Although the MREC has some potential to encounter significant fossils during construction of the facility and linear appurtenances, mitigation measures proposed below will reduce potential impacts below the level of significance. The potential for impacts on paleontological resources of the MREC to combine with those of other projects to reach a cumulatively considerable impact is very low.

### 5.8.4 Mitigation Measures

Even though there are so significant adverse paleontological impacts, the mitigation measures proposed below are in compliance with CEC environmental guidelines (CEC, 2000, 2007) and conform to SVP standard guidelines for mitigating adverse construction-related impacts on paleontological resources (SVP, 2010). Implementation of these mitigation measures will further assure that the potential impacts from project-related ground disturbance on paleontological resources will be insignificant.

#### 5.8.4.1 Project Paleontological Resources Specialist

Before the start of construction, Mission Rock will submit the name and resume of a qualified PRS to the CEC for review and approval. This individual will prepare the paleontological resources awareness module (PRAM) of the worker education program and be available during the course of ground-disturbing construction in case there is an unanticipated paleontological discovery. The name and contact information of the PRS will be provided to construction management personnel, the compliance manager, and the cultural resource monitors.

#### 5.8.4.2 Construction Personnel Education

Before working on the MREC site for the first time, all construction personnel (including supervisory personnel) involved in earth-moving activities will be provided with paleontological resources awareness training via the PRAM. They will be informed that fossils may be encountered, provided with information on the appearance of fossils, the role of paleontological monitors, and on proper notification procedures. This worker training will be presented by the PRS. Subsequent training may be conducted via video presentation and hard-copy training materials.

#### 5.8.4.3 Develop and Implement a Paleontological Resources Monitoring and Mitigation Plan

Before the start of construction, the MREC proponent will submit for review a Paleontological Resources Monitoring and Mitigation Plan (PRMMP). This plan will outline monitoring procedures and protocols to be followed in the event that paleontological resources are discovered. At minimum, the PRMMP will stipulate that when paleontological resources are encountered all work in the immediate area of the find will halt immediately and the paleontological resources monitor(s) will be notified. Construction will not resume in the area of the find until the PRS releases the area.

The PRMMP will also outline protocols to be followed during monitoring and in the case of discovery of paleontological resources, and reporting requirements. The PRMMP will stipulate that monitoring requirements are to be determined by the PRS, and will be based solely on their judgement of the paleontological sensitivity of the sediments disturbed by construction and the PRS's professional assessment regarding the on-going potential of impacts to this resource.

#### 5.8.4.4 Develop a Final Paleontological Resources Report

At the conclusion of the MREC construction, a final Paleontological Resources Report will be prepared. In the event that no paleontological resources are discovered this report will note the monitoring activities that occurred and that no fossils were discovered. In the event that fossils are discovered the nature of these fossils, tentative identifications (if possible), and the name of the repository they were deposited in will be identified as well. The report will be submitted to the CEC and Ventura County.

### 5.8.5 Laws, Ordinances, Regulations, and Standards

Paleontological resources are non-renewable scientific resources and are protected by several federal and state statutes (California Office of Historic Preservation, 1983; Marshall, 1976; Fisk and Spencer, 1994), most notably by the 1906 Federal Antiquities Act and other subsequent federal legislation and policies, and by State of California environmental regulations (CEQA, Section 15064.5). Professional standards for assessment and mitigation of adverse impacts on paleontological resources have been established by the SVP (2010). Design, construction, and operation of MREC will be conducted in accordance with all LORS applicable to paleontological resources. Federal, state, and local LORS applicable to paleontological resources are summarized in Table 5.8-2 and discussed briefly below, along with professional standards for paleontological resources assessment and impact mitigation.

Table 5.8-2 LORS Applicable to Paleontological Resources

| LORS | Applicability | AFC Reference | Project Conformity |
|---|---|---|---|
| Omnibus Public Land Management Act of 2009 (H.R. 146), Title 6, Subtitle D | Not applicable – Applies only to federal land managed by the Secretaries of the Interior and Agriculture | — | — |
| Antiquities Act of 1906 | Not applicable – No federal land involved, or federal entitlement required | — | — |
| National Environmental Policy Act of 1969 | Not applicable – No federal land involved, or federal entitlement required | — | — |
| CEQA, Appendix G | Applicable – Requires assessment of the potential to affect paleontological resources during earth-moving activities | Sections 5.8.2, 5.8.3, and 5.8.5 | Yes |
| PRC, Sections 5097.5/5097.9 | Not applicable – Applies to state-owned land | — | — |
| Ventura County General Plan 2015 | Applicable – Requires mitigation of affected resources | - | Yes |

### 5.8.5.1 Federal LORS

Federal protection for significant paleontological resources would apply to the MREC only if any construction or other related project impacts occur on federally owned or managed lands, or if a federal entitlement or other permit were required. On March 31, 2009, President Obama signed into law the Omnibus Public Land Management Act of 2009 (H.R. 146; OPLMA). Implementing regulations for this law have yet to be developed by the affected agencies. Title 6, Subtitle D of the OPLMA, *Paleontological Resources Preservation*, requires the secretaries of the Department of the Interior (exclusive of Indian trust lands) and the Department of Agriculture (insofar as U.S. Forest System lands are concerned) to "…manage and protect paleontological resources on Federal land using scientific principals and expertise… (and) develop appropriate plans for inventory, monitoring, and the scientific and educational use of paleontological resources…". The OPLMA further excludes casual collection from restrictions under the law, and then describes the requirements for permitting collection on federal lands, stipulations regarding their use in education, continued federal ownership of recovered paleontological resources, and standards for acceptable repositories of collected specimens and associated data (OPLMA, Sections 6303-6305). The OPLMA also provides for criminal and civil penalties for unauthorized removal of paleontological resources from federal land, and rewards for reporting the theft of fossils (Sections 6306-6309).

Additional federal legislative protection for paleontological resources stems from the Antiquities Act of 1906 (PL 59-209; 16 USC 431 et seq.; 34 Stat. 225), which calls for protection of historic landmarks, historic and prehistoric structures, and other objects of historic or scientific interest on federal lands. In addition, the National Environmental Policy Act of 1969 (USC, section 4321 et seq.; 40 CFR, section 1502.25), as amended, requires analysis of potential environmental impacts to important historic, cultural, and natural aspects of our national heritage. Because no federally owned or managed lands will be affected by this project, and no federal entitlement or other permit is required, these statutes do not extend to paleontological resources (see Table 5.8-2).

### 5.8.5.2 State LORS

The CEC environmental review process under the Warren-Alquist Act is considered functionally equivalent to that of CEQA (PRC Sections 21000 et seq.). CEQA requires that public agencies and private interests identify the environmental consequences of their proposed projects on any object or site of

significance to the scientific annals of California (Division I, California PRC: 5020.1 [b]). The CEQA Guidelines (PRC Sections 15000 et seq.) define procedures, types of activities, persons, and public agencies required to comply with CEQA. Appendix G in Section 15023 provides an Environmental Checklist of questions that a lead agency should normally address if relevant to a project's environmental impacts. One of the questions to be answered in the Environmental Checklist (Section 15023, Appendix G, Section V, part c) is the following: "Would the project directly or indirectly destroy a unique paleontological resource or site…?"

The CEQA lead agency having jurisdiction over a project is responsible for ensuring that paleontological resources are protected in compliance with CEQA and other applicable statutes. The lead agency with the responsibility to ensure that fossils are protected during construction of the proposed MREC is the CEC. PRC Section 21081.6, entitled Mitigation Monitoring Compliance and Reporting, requires that the CEQA lead agency demonstrate project compliance with mitigation measures developed during the environmental impact review process.

Section XVII, part a, of the CEQA Environmental Checklist asks a second question equally applicable to paleontological resources: "Does the project have the potential to …eliminate important examples of the major periods of California history or pre-history?" To be in compliance with CEQA, impact assessments must answer both these questions in the Environmental Checklist. If the answer to either question is "yes" or "possibly," a mitigation and monitoring plan must be designed and implemented to protect significant paleontological resources. However, for the MREC the answer to these questions is "unlikely" if not "no," and therefore a mitigation and monitoring plan is not warranted for this project at this time.

Other state requirements for paleontological resource management are in California PRC Chapter 1.7, Section 5097.5/5097.9 (Stats. 1965, c. 1136, p. 2792), entitled Archaeological, Paleontological, and Historical Sites. This statute defines any unauthorized disturbance or removal of a fossil site or remains on public land as a misdemeanor and specifies that state agencies may undertake surveys, excavations, or other operations as necessary on state lands to preserve or record paleontological resources. PRC Section 5097.5/5097.9 does not apply to MREC because construction or other related project impacts will not occur on state-owned or managed lands and no state agency is intended to obtain ownership of project lands during the term of the project license (Table 5.8-2).

#### 5.8.5.3 Local LORS

As the MREC is entirely within unincorporated portions of Ventura County, only Ventura County LORS are applicable.

The Ventura County General Plan (Ventura County, 2015) requires that all discretionary developments be assessed for paleontological resources, and re-designed to avoid potential impacts where possible. Mitigation of impacts is required to follow the Guidelines of the State office of Historic Preservation and to be performed in consultation with professional paleontologists (Ventura County, 2015).

#### 5.8.5.4 Professional Standards

The SVP, an international organization of professional paleontologists, has established standard guidelines (SVP, 2010) that outline acceptable professional practices in the conduct of paleontological resource assessments and surveys, monitoring and mitigation, data and fossil recovery, sampling procedures, and specimen preparation, identification, analysis, and curation. Most practicing paleontologists in the nation follow the SVP's guidelines, and extend those to address other types of fossils of scientific significance, such as invertebrate fossils and paleobotanical specimens.

## 5.8.6 Agencies and Agency Contacts

There are no agencies having blanket jurisdiction over paleontological resources. The CEC has jurisdiction over paleontological resources for this project. The Ventura County General Plan 2015 (Ventura County, 2015) requires that mitigation be conducted in consultation with professional paleontologists. If encountered, scientifically significant fossil specimens and associated site records will be submitted to the UCMP (Table 5.8-3).

Table 5.8-3 Agency Contacts for Paleontological Resources

| Issue | Agency | Contact |
|---|---|---|
| Paleontological Resources Documentation and Specimen Repository | UCMP | Dr. Patricia Holroyd<br>Curator of Vertebrate Paleontology<br>1101 Valley Life Sciences Building<br>Berkeley, CA 94720-4780<br>(510) 642-3733 |

## 5.8.7 Permits and Permit Schedule

No state, county, or city agency requires a paleontological collecting permit to allow for the recovery of fossil remains discovered as a result of construction-related earth moving on this project site.

## 5.8.8 References

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