6.8 PALEONTOLOGY

The Canyon Power Plant (CPP) will consist of a nominal 200-megawatt (MW) simple-cycle plant, using four natural gas-fired General Electric LM 6000PC Sprint combustion turbines and associated infrastructure. The project site is located at 3071 East Miraloma Avenue, in a City of Anaheim (COA)-designated industrial zone.

The CPP and associated construction laydown areas will be located on approximately 10 acres of disturbed land located at 3071 East Miraloma Avenue. Main access to the CPP site will be at the southeast corner of the project site from East Miraloma Avenue. A second gated entrance will be accessible via East Miraloma Avenue with a third gate off the alley to the east of the site. (Total land disturbance will be approximately 10 acres.)

The existing CPP site is predominantly paved (concrete and asphalt). Principal land use for the site was food catering for a fleet of approximately 75 to 100 trucks, formerly operated by Orange County Food Service. Onsite structures include a kitchen/warehouse building, maintenance garage (9 service bays), truck wash facility (5 bays), two ice manufacturing buildings, several storage sheds, and an outdoor truck repair shop which includes storage lockers and petroleum products, all of which will be demolished as a part of the CPP project.

The following activities are not part of the CPP project:

- Three residential houses along East Miraloma Avenue have recently been removed and are not a part of this Application for Certification (AFC). The COA Risk Manager and Fire Department determined that the residential units posed security and fire risks, and therefore they were removed. A letter from the COA Risk Manager to the Public Utilities Department is included in Appendix Q.
- Soil remediation activities associated with Phase I, Phase II, and Supplemental Phase II reports. The COA, now as owner of the property, has determined that it will conduct any soil remediation activities to limit its environmental liability for future uses of the site. These activities will occur regardless of whether the CPP project obtains a CEC license.
- Installation of a temporary, 8-foot-high security fence around the perimeter of the entire 10-acre site.
- General maintenance activities including site cleanup and trash removal.

The project will include the construction and/or installation of the following components:

- **Proposed CPP site.** In addition to the four natural gas-fired GE LM 6000PC Sprint gas turbines, the plant will include generator step-up transformers (GSUs), a 69 kilovolt (kV) switchyard, onsite fuel gas compressors, a gas pressure control and metering station, a packaged chilled water system for combustion turbine engine (CTG) power augmentation

with associated heating ventilation and air conditioning (HVAC)-type four-cell cooling tower, selective catalytic reduction system (SCR) emission control systems, and other associated plant infrastructure.

- **Gas pipeline.** Natural gas will be provided via a new 3,240-foot-long, 12-inch, and 350 pounds per square inch gauge (psig) gas line owned and maintained by SoCal Gas Company (SCGC), which will be connected to new onsite fuel gas compressors that will be part of the CPP facility. From the CPP site, this new pipeline will run approximately 580 feet east in East Miraloma Avenue to Kraemer Boulevard, then north 2,660 feet in Kraemer Boulevard to East Orangethorpe Avenue to connect into SCGCs transmission line L-1218 in East Orangethorpe Avenue. (Total land disturbance will be 0.219 acre.)
- **Process water.** Process water for the project will be recycled water supplied from the Orange County groundwater replenishment system (GWRS) via a new 2,185-foot-long, 14-inch pipeline utilizing a new offsite booster pump station. The water pipeline will run east of the site on the north side of East Miraloma Avenue for 1,850 feet to the new pumping station located north of the curb in the COA-owned easement of East Miraloma Avenue, then north 210 feet in new easement from the Orange County Water District (OCWD), then 125 feet easterly in new easement to the GWRS line on the western side of the Carbon Canyon Diversion Channel. There, it will connect to the 60-inch-diameter GWRS recycled water line at an existing 36-inch stub up. (Total land disturbance for both line and pumping station will be 0.246 acre.)
- **Electrical interconnection.** Underground 69 kV cables will connect from GSUs to the onsite switchyard, which will use gas-insulated switchgear (GIS). There will be four new underground 69 kV circuits leaving the site. Two will proceed underneath and to the south side of East Miraloma Avenue approximately 100 feet to rise up and connect to the existing 69 kV overhead Vermont-Yorba lines via two new transition structures. The second two 69 kV underground circuits will proceed eastward approximately 4,000 feet in East Miraloma Avenue, turn south on Miller, then proceed approximately 3,000 feet to connect to the Dowling-Yorba 69 kV line at East La Palma Avenue. (Total land disturbance for both sets of cables will be 0.489 acre.)
- **Communications.** Fiber optic cable will run in a common trench with the approximately 7,000-foot 69 kV electric cables, where it will tie into existing underground fiber optic cable for the supervisory control and data acquisition (SCADA) system.

6.8.1 Paleontological Resources

Paleontological resources (fossils) are the remains or traces of prehistoric animals and plants. Fossils are important scientific and educational resources because of their use in: 1) documenting the presence and evolutionary history of particular groups of now extinct organisms, 2) reconstructing the environments in which these organisms lived,

3) determining the relative ages of the strata in which they occur, and 4) determining the geologic events that resulted in the deposition of the sediments in which they were buried.

This section of the AFC summarizes the potential environmental impacts on paleontological resources that could result from construction of the Canyon Power Plant (CPP). Section 6.8.1 describes the existing environment that could be affected by the proposed project. Section 6.8.2 describes the potential impacts on paleontological resources resulting from construction and operation of the proposed project. The potential cumulative impacts to paleontological resources are discussed in Section 6.8.3. Proposed mitigation measures to reduce potential adverse impacts to paleontological resources are discussed in Section 6.8.4. Section 6.8.5 lists the federal, state, and local laws, ordinances, regulations, and standards (LORS) and the professional standards that protect paleontological resources. The involved agencies and agency contacts are provided in Section 6.8.5.4. Section 6.8.5.5 discusses the status of permits required and permit schedule. Finally, Section 6.8.6 lists the references used in preparing this document.

This paleontological resources inventory and impact assessment was prepared by Dr. Lanny H. Fisk, PhD, PG, a California licensed Professional Geologist (PG) and Senior Paleontologist, and by Stephen J. Blakely, Field Paleontologist, both with PaleoResource Consultants (PRC). It meets all requirements of the California Energy Commission (CEC, 2007) and the standard measures for mitigating adverse construction-related environmental impacts on significant paleontological resources established by the Society of Vertebrate Paleontology (SVP, 1995, 1996; see Appendices E1 and E2).

6.8.1.1 Affected Environment

6.8.1.1.1 Geographic Location. The proposed project is located in the Los Angeles Basin in northern Orange County, California (Figures 6.8-1 and 6.8-2) within Townships (T) 3-4 South (S), Range (R) 9 West (W). The proposed project is located north of East Miraloma Avenue, and near to the intersection of Kraemer Boulevard and East Miraloma Avenue with its center at approximately latitude 33° 51’ 30” N and longitude 117° 51’ 44” W. An additional proposed pumping station is located approximately 0.33 miles west-northwest of the primary location at approximately latitude 33° 51’ 35” N and longitude 117° 51’ 19” W. The project would impact Section 6 within T3S, R9W and Sections 30 and 31 within T4S, R9W on the Orange United States Geological Survey (USGS) 7.5 minute quadrangle. The topographic relief at the site is low, with elevations ranging from approximately 210 to 220 feet (~64 to ~67 meters).

The Los Angeles Basin, which is within the Peninsular Ranges Geomorphic Province, is bounded by the Santa Monica Mountains and the Elysian, Repetto, and Puente Hills to the north, the Santa Ana Mountains to the east, and the San Joaquin Hills to the southeast (Figure 6.8-1). The project site is near the northern extent of the northwest-oriented Peninsular

Ranges Physiographic Province, which is south of the Transverse Ranges, and between the Colorado Desert Physiographic Province and the Pacific Ocean. Within the Peninsular Ranges, primary features including ranges, basins, and faults are generally oriented northwest, parallel with the coastline (Morton and Miller, 2006). Accessible roads to the project area include East Miraloma Avenue and Kraemer Boulevard. The site is northeast of the junction of California State Route (SR) 91 and SR57.

6.8.1.1.2 Regional Geologic Setting. The general geology of the project vicinity and the Los Angeles Basin area has been described in some detail by Yerkes et al. (1965), Morton et al. (1979), Schoellhamer et al. (1981), Schwartz and Colburn (1989), Greenwood (1997), Petersen et al. (1997), Brooks and Simmons (1998), McCulloh and Beyer (2004), Morton (2004), Langenheim et al. (2006), Morton and Miller (2006), and Bilodeau et al. (2007). Surficial geologic mapping in the project vicinity has been provided at a scale of 1:750,000 by Jennings et al. (1977); at a scale of 1:500,000 by Jenkins (1938); at a scale of 1:250,000 by Rogers (1965); at a scale of 1:150,000 by Petersen et al. (1997); at a scale of 1:100,000 by Greenwood and Morton (1991), Morton (2004), and Morton and Miller (2006); and at a scale of 1:24,000 by Dibblee (2001a, 2001b) and the California Division of Mines and Geology (DMG) (1998). The information in these geologic maps and published and unpublished reports form the basis of the following discussion. Individual maps and publications are incorporated into this report and referenced where appropriate. The aspects of geology pertinent to this report are the types, distribution, and age of sediments immediately underlying the project area and their probability of producing fossils during project construction. The site-specific geology in the vicinity of the project is discussed separately below.

The Los Angeles Basin is a subsiding depositional basin with a surficial expression of a lowland coastal plain. The Basin is of primarily Neogene age, with as much as 30,000 feet (9,100 meters) of sediment accumulation in some areas (Yerkes et al., 1965).

Yerkes et al. (1965) provided a compilation of previous geological surveys in the Los Angeles Basin and thoroughly described the geology of that region. In this work, Yerkes et al. (1965) divided the Los Angeles Basin into a series of subdivisions or “structural blocks” separated by major zones of “faulting or flexure in the basement rocks.” The CPP site is situated in the eastern portion of the Central Block as described by Yerkes et al. (1965). Basement rocks are exposed primarily in the Santa Ana Mountains and are composed of metamorphosed sedimentary rocks of Jurassic age, and of volcanic and plutonic igneous rocks of primarily Cretaceous age. The superjacent rocks in the Central Block are Mesozoic and Cenozoic marine and nonmarine sedimentary rocks.

The CPP site is located within the floodplain of the Santa Ana River on alluvial deposits derived from the Santa Ana Mountains, in the northeastern portion of the Los Angeles Basin. The apex of this large alluvial fan is to the east of the project site, where the river drainage

leaves the confines of the upland valleys. Sedimentary deposits composing this fan are derived from Cenozoic and Mesozoic sedimentary rocks, as well as from Mesozoic igneous rocks.

6.8.1.1.3 Resource Inventory Methods. To develop a baseline paleontological resource inventory of the project and surrounding area and to assess the potential paleontological productivity of each stratigraphic unit present, the published as well as available unpublished geological and paleontological literature was reviewed, and stratigraphic and paleontologic inventories were compiled, synthesized, and evaluated (see below). These methods are consistent with CEC (2007) and SVP (1995) guidelines for assessing the importance of paleontological resources in areas of potential environmental effect.

Geologic maps and reports covering the bedrock and surficial geology of the project vicinity were reviewed to determine the exposed and subsurface rock units, to assess the potential paleontological productivity of each rock unit, and to delineate their respective areal distribution in the project area. Museum records searches were conducted at the University of California Museum of Paleontology (UCMP) at Berkeley and at the Natural History Museum of Los Angeles County (LACM) in order to determine whether any of the stratigraphic units found within the project vicinity had previously yielded significant paleontological resources. In addition, aerial photographs of the area were examined to aid in determining the areal distribution of distinctive sediment and soil types. No subsurface exploration was conducted for this assessment.

A field survey, which included visual inspection of exposures of potentially fossiliferous strata in the project area, was conducted to document the presence of sediments suitable for containing fossil remains and the presence of any previously unrecorded fossil sites. The field survey for this assessment was conducted on 17-19 October 2007 by Stephen J. Blakely, Field Paleontologist with PRC. During the field survey, stratigraphy was observed in local man-made excavations at construction sites, groundwater recharge basins, irrigation ditch banks, and stream channels. Exposed sediments up to approximately fifty feet (~15 meters) were observed in locations in the vicinity of the proposed project location (Figure 6.8-3).

6.8.1.2 Paleontological Resource Assessment Criteria

The SVP (1995), in common with other environmental disciplines such as archaeology and biology (specifically in regard to listed species), considers any fossil specimen significant unless demonstrated otherwise, and protected by environmental statutes. This position is held because fossils are uncommon and only rarely will a fossil locality yield a statistically significant number of specimens representing the same species. In fact, vertebrate fossils are so uncommon that, in most cases, each fossil specimen found will provide additional important information about the characteristics or distribution of the species it represents.

A stratigraphic unit (such as a formation, member, or bed) known to contain significant fossils is considered to be "sensitive" to adverse impacts if there is a high probability that earth-moving or ground-disturbing activities in that rock unit will either disturb or destroy fossil remains. This definition of sensitivity differs fundamentally from that for archaeological resources:

> *"It is extremely important to distinguish between archaeological and paleontological (fossil) resource sites when defining the sensitivity of rock units. The boundaries of archaeological sites define the areal extent of the resource. Paleontologic sites, however, indicate that the containing sedimentary rock unit or formation is fossiliferous. The limits of the entire rock formation, both areal and stratigraphic, therefore define the scope of the paleontologic potential in each case*" (SVP, 1995).

This distinction between archaeological and paleontological sites is important. Most archaeological sites have a surface expression that allows for their geographic location. Fossils, on the other hand, are an integral component of the rock unit below the ground surface; therefore, they are not observable unless exposed by erosion or human activity. Thus, a paleontologist cannot know either the quality or quantity of fossils present before the rock unit is exposed as a result of natural erosion processes or earth-moving activities. The paleontologist can only make conclusions on sensitivity to impact based upon what fossils have been found in the rock unit in the past, along with a judgment on whether or not the depositional environment of the sediments that compose the rock unit was likely to result in the burial and preservation of fossils.

Fossils are seldom uniformly distributed within a rock unit. Most of a rock unit may lack fossils, but at other locations within the same rock unit concentrations of fossils may exist. Even within a fossiliferous portion of the rock unit, fossils may occur in local concentrations. For example, Shipman (1977, 1981) excavated a fossiliferous site using a three-dimensional grid and removed blocks of matrix of a consistent size. The site chosen was known prior to excavation to be richly fossiliferous, yet only 17 percent of the blocks actually contained fossils. These studies demonstrate the physical basis for the difficulty in predicting the location and quantity of fossils in advance of project-related ground disturbance.

Since it is unfortunately not possible to determine where fossils are located without actually disturbing a rock unit, monitoring of excavations by an experienced paleontologist during construction increases the probability that fossils will be discovered and preserved. Preconstruction mitigation measures such as surface prospecting and collecting will not prevent adverse impacts on fossils because many sites will be unknown in advance due to an absence of fossils at the surface.

The non-uniform distribution of fossils within a rock unit is essentially universal and many paleontological resource assessment and mitigation reports conducted in support of

environmental impact documents and mitigation plan summary reports document similar findings (see for instance Lander, 1989, 1993; Reynolds, 1987, 1990; Spencer, 1990; Fisk et al., 1994; and references cited therein). In fact, most fossil sites recorded in reports of impact mitigation (where construction monitoring has been implemented) had no previous surface expression. Because the presence or location of fossils within a rock unit cannot be known without exposure resulting from erosion or excavation, under SVP (1995) standard guidelines, an entire rock unit is assigned the same level of sensitivity based on recorded fossil occurrences.

Using SVP (1995) criteria, the paleontological importance or sensitivity (high, low, or undetermined) of each rock unit exposed in a project site or surrounding area is the measure most amenable to assessing the significance of paleontological resources because the areal distribution of each rock unit can be delineated on a topographic or geologic map. The paleontological sensitivity of a stratigraphic unit reflects: 1) its potential paleontological productivity (and sensitivity), and 2) the scientific significance of the fossils it has produced. This method of paleontological resources assessment is the most appropriate because discrete levels of paleontological importance can be delineated on a topographic or geologic map.

The potential paleontological productivity of a stratigraphic unit exposed in a project area is based on the abundance/densities of fossil specimens and/or previously recorded fossil sites in exposures of the unit in and near a project site. The underlying assumption of this assessment method is that exposures of a stratigraphic unit in a project site are most likely to yield fossil remains both in quantity and density similar to those previously recorded from that stratigraphic unit in and near the project site.

Under CEQA Guidelines section 15064.5 (a) (2), public agencies must treat all historical and cultural resources as significant unless the preponderance of evidence demonstrates that they are not historically or culturally significant. An individual fossil specimen is considered scientifically important if it is:

- Identifiable
- Complete
- Well preserved
- Age diagnostic
- Useful in paleoenvironmental reconstruction
- A type or topotypic specimen
- 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

All identifiable land mammal fossils are considered scientifically important because of their potential use in providing relative age determinations and paleoenvironmental reconstructions for the sediments in which they occur. Moreover, vertebrate remains are comparatively rare in the fossil record. Although fossil plants are usually considered of lesser importance because they are less helpful in age determination, they are actually more sensitive indicators of their environment (Miller et al., 1971) and as sedentary organisms, are more valuable than mobile animals for paleoenvironmental reconstructions. For marine sediments, invertebrate and marine algal fossils, including microfossils, are scientifically important for the same reasons that land mammal and/or land plant fossils are valuable in terrestrial deposits. The value or importance of different fossil groups varies depending on the age and depositional environment of the stratigraphic unit that contains the fossils.

The following tasks were completed to establish the paleontological importance and sensitivity of each stratigraphic unit exposed in or near the project site:

- The potential paleontological productivity of each rock unit was assessed based on previously recorded and newly documented fossil sites it contains at and/or near the project site.
- The scientific importance of fossil remains recorded from a stratigraphic unit exposed at and/or near the project site was assessed.
- The paleontological importance of a rock unit was assessed, based on its documented and/or potential fossil content in the area surrounding the project site.

6.8.1.2.1 Categories of Sensitivity. In its standard guidelines for assessment and mitigation of adverse impacts to paleontological resources, the SVP (1995) established three categories of sensitivity for paleontological resources: high, low, and undetermined.

High Sensitivity. Stratigraphic units in which fossils have been previously found have a high potential to produce additional fossils and are therefore considered to be highly sensitive. In the significance criteria of the SVP (1995), all vertebrate fossils are categorized as having significant scientific value and all stratigraphic units in which vertebrate fossils have previously been found have high sensitivity. In areas of high sensitivity, full-time monitoring is recommended during any project-related ground disturbance.

Low Sensitivity. Stratigraphic units that are not sedimentary in origin or that have not been known to produce fossils in the past are considered to have low sensitivity. Monitoring is usually not recommended nor needed during excavation in a stratigraphic unit with low sensitivity.

***Undetermined Sensitivity*.** Stratigraphic units that have not had any previous paleontological resource surveys or any fossil finds are considered to have undetermined sensitivity. After reconnaissance surveys, observation of artificial exposures (e.g., road cuts) and natural exposures (e.g., stream banks), and possible subsurface testing (e.g., augering or trenching), an experienced, professional paleontologist can often determine whether the stratigraphic unit should be categorized as having high or low sensitivity.

6.8.1.3 Resource Inventory Results

6.8.1.3.1 Stratigraphic Inventory. Regional geologic mapping in the vicinity of the proposed project has been provided by Jennings et al. (1977; 1:750,000), Jenkins (1938; 1:500,000), and Rogers (1965; 1:250,000). Larger scale mapping of the project site as been provided by Petersen et al. (1997; 1:150,000), Greenwood and Morton (1991; 1:100,000), Morton (2004; 1:100,000), Morton and Miller (2006; 1:100,000), California DMG (1998; 1:24,000), and Dibblee (2001a, 2001b; 1:24,000).

6.8.1.3.2 Project Geology. Based upon the available geologic literature, recent geologic maps, and field observations, only one stratigraphic unit will be potentially impacted during project construction activities. This unit, Quaternary alluvium, is described below.

***Quaternary Alluvium*.** Quaternary alluvium is composed primarily of fluvial sands and gravels reworked from older formations and transported from the topographically high adjacent areas of the Santa Ana Mountains. In addition to the sands and gravels, there are less abundant silts and clays. In the immediate vicinity of the project site, the alluvium is composed of clast sizes ranging up to approximately five inches (~12.7 cm) in diameter. The sand grains are generally sub-angular, while the larger lithic clasts are generally rounded. More than fifty feet (~15 meters) of stratigraphic thickness of Quaternary deposits exist at the project site (Morton et al., 1979; MACTEC, 2007; personal observations). Age determination of these deposits is difficult due to the fact that there has been continuous deposition at this site since late Tertiary or Pleistocene time, and recent deposits are not easily separated from upper Pleistocene strata (Yerkes et al., 1965). Sediments similar to those found at the proposed project site and located within 1 mile of the site have been recently mapped as Older Surficial Sediments, indicating a Pleistocene age (Dibblee, 2001b).

6.8.1.3.3 Paleontological Resource Inventory. An inventory of known paleontological resources previously discovered in the vicinity of the proposed project is presented below and the paleontological importance of these resources is assessed. The literature review and UCMP and LACM archival search conducted for this inventory documented no previously recorded fossil sites within the actual project site. However, sediments of the Quaternary alluvium have yielded fossilized remains of extinct species of continental vertebrates and other types of organisms at previously recorded fossil sites in the region (Lundelius et al.,

1983; Jefferson, 1991a; Jefferson, 1991b; McLeod, 2007; LACM records; UCMP records). One such fossil locality is located approximately two miles south of the project site.

***Quaternary Alluvium*.** No fossil localities have previously been reported from Quaternary alluvium at the project site. However, significant vertebrate fossils have been reported from sediments within ten feet of the ground surface beneath deposits mapped as Quaternary alluvium in several areas of Orange County. One fossil locality located in similar sediments not far from the project site has produced vertebrate fossils of horse (*Equus*) at a depth of 8 to10 feet below the surface (McLeod, 2007; LACM records; see Figure 6.8-4). There have also been fossils reported from Quaternary alluvium from numerous other localities within Orange County (Lundelius et al., 1983; Jefferson, 1991a, 1991b; McLeod, 2007; UCMP records). During the field survey for this assessment, no fossils were seen at the surface in the exposed poorly consolidated Quaternary alluvium. However, the depositional environment of these sediments appears to be conducive to burial and preservation specifically of large vertebrate and plant remains.

Fossils occurring in Quaternary alluvium are valuable to the scientific community as they provide information about climatic conditions in the not too distant past. The occurrence of large and small mammals is well documented from these and older subsurface deposits and with further observation of earth-moving activities and prospecting for fossils, more specimens could be unearthed.

Since fossil vertebrates have been previously reported from Quaternary alluvium within Orange County, vertebrate fossils have been reported in similar deposits not far from the project site, and since depositional conditions observed in exposures in the vicinity of the project appear to be favorable for the preservation of fossils, the Quaternary alluvium is judged to have high sensitivity based on SVP (1995) criteria. There is a high probability of adverse impacts on paleontological resources resulting from project excavations in Quaternary alluvium.

6.8.1.3.4 Summary. Although no fossils are known to directly underlie the proposed project, the presence of fossil sites in sediments of the Quaternary alluvium elsewhere suggests that there is a potential for additional similar fossil remains to be uncovered by excavations in this stratigraphic unit during project construction. Under SVP (1995) criteria, the Quaternary alluvium that would be impacted by this project has a high sensitivity for producing additional paleontological resources.

Identifiable fossil remains salvaged from Quaternary alluvium during project construction could be scientifically important and significant. Identifiable fossil remains discovered during project construction could represent new taxa or new fossil records for the area, for the State of California, for the Quaternary, or for this stratigraphic unit. They could also represent geographic or temporal range extensions. Moreover, discovered fossil remains

could make it possible to more accurately determine the age, paleoclimate, and depositional environment of the sediments from which they are salvaged. Finally, fossil remains salvaged during project construction could provide a more comprehensive documentation of the diversity of animal and plant life that once existed in Orange County and could result in a more accurate reconstruction of the geologic and paleobiologic history of the Northern Peninsular Ranges and the Los Angeles Basin.

6.8.2 Environmental Consequences

Potential impacts on paleontological resources resulting from construction of the proposed CPP can be divided into construction-related impacts and operation-related impacts. The potential environmental effects from construction and operation of the project on paleontological resources are presented in the following subsections.

6.8.2.1 Potential Impacts from Project Construction

Construction-related impacts to paleontological resources primarily involve terrain modifications (excavations and drainage diversion measures). Paleontological resources, including an undetermined number of fossil remains and unrecorded fossil sites, associated specimen data and corresponding geologic and geographic site data, and the fossil-bearing strata, could be adversely affected by (i.e., would be sensitive to) ground disturbance and earth moving associated with construction of the project. Direct impacts could result from vegetation clearing, grading of roads and the generating facility site, trenching, augering for foundations for electrical towers or poles, and any other earth-moving activity that disturbed or buried previously undisturbed fossiliferous sediments, making those sediments and their paleontologic resources unavailable for future scientific investigation.

Clearing, grading, and deeper excavations at the project site could result in significant adverse impacts to paleontological resources. In addition, the construction of supporting facilities, such as temporary construction offices, laydown areas, and parking areas, have the potential to cause adverse impacts to significant paleontological resources, if they also will involve new ground disturbance. Thus, any project-related ground disturbance could have adverse impacts on significant paleontological resources. However, with a properly designed and implemented mitigation program, these impacts could be reduced to less than significant.

6.8.2.2 Potential Impacts from Project Operation

No impacts on paleontological resources are expected to occur from the continuing operation of the project or any of its related facilities.

6.8.3 Cumulative Impacts

If paleontological finds were to be encountered during project construction, the potential for cumulative impacts would exist. Mitigation measures would be implemented to salvage such resources and reduce cumulative impacts to a level that is less than significant. The mitigation measures proposed in Section 6.8.4 would effectively preserve the value to science of any significant fossils uncovered during project-related excavations.

6.8.4 Mitigation Measures

This section describes proposed mitigation measures that would be implemented to reduce potential adverse impacts to significant paleontological resources resulting from project construction. Mitigation measures are necessary because of potential adverse impacts of project construction on significant paleontological resources within the Quaternary alluvium. The proposed paleontological resource impact mitigation program would reduce to an insignificant level the direct, indirect, and cumulative adverse environmental impacts on paleontological resources that could result from project construction. The mitigation measures proposed below are consistent with SVP standard guidelines for mitigating adverse construction-related impacts on paleontological resources (SVP, 1995, 1996).

Prior to construction, a qualified paleontologist should be retained to both design a monitoring and mitigation program and implement the program during all project-related ground disturbances. The paleontological resource monitoring and mitigation program should include:

- Preconstruction coordination
- Construction monitoring
- Emergency discovery procedures
- Sampling and data recovery, if needed
- Preparation, identification, and analysis of the significance of fossil specimens salvaged, if any
- Museum storage of any specimens and data recovered
- Reporting

Prior to the start of construction, the paleontologist should conduct a field survey of exposures of sensitive stratigraphic units that will be disturbed and any fossils discovered should be salvaged. Earth-moving construction activities should be monitored wherever these activities will disturb previously undisturbed sediment. Monitoring will not need to be conducted in areas where sediments have been previously disturbed or in areas where exposed sediments will be buried, but not otherwise disturbed.

Prior to the start of construction, construction personnel involved with earth-moving activities should be informed: that fossils may be discovered during excavating; that these fossils are protected by laws; on the appearance of common fossils, and; on proper notification procedures. This worker training should be prepared and presented by a qualified paleontologist.

Implementation of these mitigation measures will reduce the potentially significant adverse environmental impact of project-related ground disturbance and earth-moving on paleontological resources to an insignificant level by allowing for the salvage of fossil remains and associated specimen data and corresponding geologic and geographic site data that otherwise might be lost to earth-moving and to unauthorized fossil collecting.

With a well designed and implemented paleontological resource monitoring and mitigation plan, project construction could actually result in beneficial impacts on paleontological resources through the discovery of fossil remains that would not have been exposed without project construction and, therefore, would not have been available for study. The salvage of fossil remains as part of project construction could help answer important questions regarding the geographic distribution, stratigraphic position, and age of fossiliferous sediments in the project area.

6.8.5 LORS Compliance

Paleontological resources are classified as non-renewable scientific resources and are protected by several federal and state statutes (California Office of Historic Preservation, 1983; Marshall, 1976; West, 1991; Fisk and Spencer, 1994; Gastaldo, 1999), most notably by the 1906 Federal Antiquities Act and other subsequent federal legislation and policies and by the State of California's environmental regulations (CEQA, Section 15064.5). Professional standards for assessment and mitigation of adverse impacts on paleontological resources have been established by the SVP (1995, 1996). Design, construction, and operation of the proposed project, including ancillary facilities, will be conducted in accordance with LORS applicable to paleontological resources. Federal and State LORS applicable to paleontological resources are summarized in Table 6.8-1 and discussed briefly below, together with county and city requirements and SVP professional standards.

6.8.5.1 <u>Federal</u>

Federal legislative protection for paleontological resources stems from the Antiquities Act of 1906 (Public Law [P.L.] 59-209; 16 United States Code 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 land. The Antiquities Act of 1906 forbids disturbance of any object of antiquity on federal land without a permit issued by the responsible managing agency. This act also establishes criminal sanctions for unauthorized

TABLE 6.8-1
APPLICABLE LORS

Jurisdiction	LORS	Requirements	Conformance Section	Administering Agency	Agency Contact
Federal					
	Antiquities Act of 1906	Protects paleontological resources on federal lands	6.8.5.1		
	NEPA, 1969	Protects paleontological resources on federal lands	6.8.5.1	EPA	
State					
	CEQA	Protects paleontological resources on state lands	6.8.5.2		
	Public Resources Code Sections 5097.5/5097.9	Protects paleontological resources on state lands	6.8.5.2		
Local					
	Orange County General Plan	Protects paleontological resources on county lands	6.8.5.3		
	Anaheim General Plan	Protects paleontological resources on city lands	6.8.5.3		

appropriation or destruction of antiquities. The Federal Highways Act of 1958 clarified that the Antiquities Act applied to paleontological resources and authorized the use of funds appropriated under the Federal-Aid Highways Act of 1956 to be used for paleontological salvage in compliance with the Antiquities Act and any applicable state laws.

In addition to the Antiquities Act, other federal statutes protect fossils. The Historic Sites Act of 1935 (P.L. 74-292; 49 Stat. 666, 16 U.S.C. 461 *et seq.*) declares it national policy to preserve objects of historical significance for public use and gives the Secretary of the Interior broad powers to execute this policy, including criminal sanctions. The National Environmental Policy Act (NEPA) of 1969 (P.L. 91-190, 31 Stat. 852, 42 U.S.C. 4321-4327) requires that important natural aspects of our national heritage be considered in assessing the environmental consequences of any proposed project. The Federal Land Policy Management Act (FLPMA) of 1976 (P.L. 94-579; 90 Stat. 2743, U.S.C. 1701-1782) requires that public lands be managed in a manner that protects the quality of their scientific values. Paleontological resources are also afforded federal protection under 40 CFR 1508.27 as a subset of scientific resources. Federal protection for significant paleontological resources would apply to this project if any construction or other related project impacts occur on federally owned or managed lands.

6.8.5.2 State

The CEC environmental review process under the Warren-Alquist Act is considered functionally equivalent to that of the California Environmental Quality Act (CEQA; Public Resources Code Sections 15000 *et seq*.) with respect to paleontological resources. Guidelines for the Implementation of CEQA, as amended 7 September 2004 (Title 14, Chapter 3, California Code of Regulations: 15000 *et seq*.) define procedures, types of activities, persons, and public agencies required to comply with CEQA, and include as one of the questions to be answered in the Environmental Checklist (Section 15023, Appendix G, Section XIV, Part a) the following: "*Will the proposed project directly or indirectly destroy a unique paleontological resource or site?*"

Although neither CEQA nor the Guidelines define what is "*a unique paleontological resource or site*", CEQA section 21083.2 defines "*unique archaeological resources*" as "*…any archaeological artifact, object, or site about which it can be clearly demonstrated that, without merely adding to the current body of knowledge, there is a high probability that it meets any of the following criteria*:

1) *Contains information needed to answer important scientific research questions and that there is a demonstrable public interest in that information*.
2) *It has a special and particular quality such as being the oldest of its type or the best available example of its type*.
3) *Is directly associated with a scientifically recognized import prehistoric or historic event*."

With only slight modification, this definition is equally applicable to recognizing "*a unique paleontological resource or site*." Additional guidance is provided in CEQA Guidelines section 15064.5(a)(3)(D), which indicates "*generally, a resource shall be considered historically significant if it has yielded, or may be likely to yield, information important in prehistory or history*."

Paleontological resources are considered to be significant if they:

- Provide important information on the evolutionary trends among organisms, relating living organisms to extinct organisms
- Provide important information regarding development of biological communities or interaction between botanical and zoological biota
- Demonstrate unusual circumstances in biotic history
- Are in short supply and in danger of being depleted or destroyed by the elements, vandalism, or commercial exploitation, and are not found in other geographic localities

CEQA Guidelines section XVII, part a, of the 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*?" Fossils are important examples of the major periods of California prehistory. To be in compliance with CEQA, environmental impact assessments, statements, and reports 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.

The CEQA lead agency having jurisdiction over a project is responsible to insure that paleontological resources are protected in compliance with CEQA and other applicable statutes. California Public Resources Code section 21081.6, entitled Mitigation Monitoring Compliance and Reporting, requires that the lead agency demonstrate project compliance with mitigation measures developed during the environmental impact review process.

Other state requirements for paleontological resources management are in Public Resources Code Chapter 1.7, Section 5097.5 (Stats., 1965, c. 1136, p. 2,792), entitled Archaeological, Paleontological, and Historical Sites. This statute defines any unauthorized disturbance or removal of a fossil site or fossil 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. This statute would apply to the CPP project because the project will be built on city-owned lands.

6.8.5.3 Local

California Planning and Zoning Law require each county and city jurisdiction to adopt a comprehensive, long-term general plan for its development. The general plan is a policy document designed to give long-range guidance to those making decisions affecting the future character of the planning area. It represents the official statement of the community's physical development as well as its environmental goals. The general plan also acts to clarify and articulate the relationship and intentions of local government to the rights and expectations of the general public, property owners, and prospective investors. Through its general plan, the local jurisdiction informs these groups of its goals, policies, and development standards; thereby, communicating what must be done to meet the objectives of the general plan. State planning law requires each jurisdiction to identify environmental resources and to prepare and implement policies which relate to the utilization and management of these resources. Recognizing the exceptional wealth of scientifically important fossiliferous deposits in Orange County, the Orange County Board of Supervisors passed Resolutions 77-866 in 1977 and BR 87-516 in 1987 that require all paleontological material from County-permitted projects to be donated to the County or its designee. All monitoring, salvaging, and identifying of collected items, as well as preparing reports on collections, must be carried out by qualified paleontological professionals. Paleontological

guidelines are fully described in a model curation program developed by California State University at Fullerton (Eisentraut and Cooper, 2002). Orange County paleontological mitigation requirements would only apply if county properties or county funds were involved in the CPP project.

Paleontological resources are also addressed in the Anaheim General Plan and Zoning Code Update of 2004. In the Environmental Impact Report for this update, Mitigation Measure 5.4-2 states, "*City staff shall require property owners/developers to provide studies to document the presence/absence of archaeological and/or paleontological resources for areas with documented or inferred resource presence. On properties where resources are identified, such studies shall provide a detailed mitigation plan, including a monitoring program and recovery and/or in situ preservation plan, based on the recommendations of a qualified specialist.*"

6.8.5.4 Agencies and Agency Contacts

No state or local agencies have specific jurisdiction over paleontological resources and therefore, no agencies were contacted.

6.8.5.5 Permits Required and Permitting Schedule

No state or local agency requires a paleontological collecting permit to allow for the salvage of fossil remains discovered as a result of construction-related earth moving on non-federal public or private land in a project site. No federally owned or managed lands will be impacted by this project.

6.8.5.6 Professional Standards

The SVP, a national scientific organization of professional vertebrate paleontologists, has established standard guidelines (SVP, 1995, 1996) that outline acceptable professional practices in the conduct of paleontological resource assessments and surveys, monitoring and mitigation, data and fossil salvage, sampling procedures, and specimen preparation, identification, analysis, and curation. Most practicing professional paleontologists in the nation adhere closely to the SVPs assessment, mitigation, and monitoring requirements as specifically spelled out in its standard guidelines. The SVPs standard guidelines were approved by a consensus of professional paleontologists and are the standard against which all paleontological monitoring and mitigation programs are judged. Many federal and California state regulatory agencies have either formally or informally adopted the SVPs "standard guidelines" for the mitigation of construction-related adverse impacts on paleontological resources as a measure of professional practice.

Briefly, SVP guidelines recommend that each project have literature and museum archival reviews, a field survey, and, if there is a high potential for disturbing significant fossils

during project construction, a mitigation plan that includes monitoring by a qualified paleontologist to salvage fossils encountered, identification of salvaged fossils, determination of their significance, and placement of curated fossil specimens into a permanent public museum collection (such as the designated California State repository for fossils, the UCMP at Berkeley).

6.8.6 References

Bilodeau, W.L., Bilodeau, S.W., Gath, E.M., Oborne, M., and Proctor, R.J. 2007. Geology of Los Angeles, California, United States of America: Environmental and Engineering Geoscience, vol. 13, no. 2, p. 99-160.

Brooks, D.R., and Simmons, E.V. 1998. Keeping ahead of the bulldozers – Orange County geology: 23 p. *in* Behl, R. J., April 3-10, 1998, field trip program, Cordilleran Section GSA Guidebook to field trip #1-#13 94th Annual Meeting, Cordilleran Section of the Geological Society of America.

California Division of Mines and Geology. 1997. Seismic hazard evaluation of the Orange 7.5-minute quadrangle, Los Angeles County, California: California Division of Mines and Geology Open-File Report 97-19, scale 1:24,000.

California Energy Commission. 2007. Rules of practice and procedure and power plant site certification regulations, April 2007.

California State Historic Preservation Office. 1983. Summary of state/federal laws protecting cultural resources: California State Historic Preservation Office, Sacramento, CA, 4 p.

Dibblee, T.W. 2001a. Geologic map of the Whittier and Prado Dam quadrangles (eastern Puente Hills), Los Angeles and Orange counties, California: Dibblee Geological Foundation Map DF-74, scale 1:24,000.

2001b. Geologic map of the Yorba Linda and La Habra quadrangles (western Puente Hills), Los Angeles, Orange, San Bernardino, and Riverside counties, California: Dibblee Geological Foundation Map DF-75, scale 1:24,000.

Eisentraut, P.J., and Cooper, J.D. 2002. Development of a model curation program for Orange County's archaeological and paleontological collections – Final Report: Submitted to the County of Orange.

Fisk, L.H., Spencer, L.A., and Whistler, D.P. 1994. Paleontologic resource impact mitigation on the PGT-PG&E Pipeline Expansion Project, Volume II: PG&E Section, California: unpublished report prepared for the Federal Energy Regulatory Commission, California

Public Utilities Commission, Pacific Gas and Electric Company, and Bechtel Corporation by Paleo Environmental Associates, Inc., Altadena, CA, 123 p.

Fisk, L.H., and Spencer, L.A. 1994. Highway construction projects have legal mandates requiring protection of paleontologic resources (fossils): p. 213-225, *in* S. F. Burns (editor), Proceedings of the 45th Highway Geology Symposium, Portland, OR, 258 p.

Gastaldo, R.A. 1999. International laws: collecting, transporting and ownership of fossils – USA: p. 330-338 *in* T. P. Jones and N. P. Rowe (editors), Fossil plants and spores, The Geological Society, London, England, 396 p.

Greenwood, R.B. 1997. Liquefaction zones in the Orange 7.5-minute quadrangle, Orange County, California: p. 3-17 *in* Seismic hazard zone report for the Orange 7.5-minute quadrangle, Orange County, California, California Division of Mines and Geology Seismic Hazard Zone Report 001, 45 p.

Greenwood, R.B., and Morton, D.M. 1991. Geologic map of the Santa Ana 1:100,000 Quadrangle, California: California Division of Mines and Geology Open-File Report 91-17, scale 1:100,000.

Jefferson, G.T. 1991a. A catalogue of late Quaternary vertebrates from California: Part One, nonmarine lower vertebrate and avian taxa: Natural History Museum of Los Angeles County, Technical Report., no. 5, 60 p.

1991b. A catalogue of late Quaternary vertebrates from California: Part Two, mammals: Natural History Museum of Los Angeles County, Technical Report., no. 7, 129 p.

Jennings, C.W., Strand, R.G., Rogers, T.H., Boylan, R.T., Moar, R.R., and Switzer, R.A. 1977. Geologic map of California: California Division of Mines and Geology, Geologic Data Map 2, scale 1:750,000.

Jenkins, O.P. 1938. Geologic map of California: California Division of Mines and Geology, Sacramento, CA, scale 1:500,000.

Lander, E.B. 1989. Interim paleontological resource technical report, Eastside Reservoir Project Study – Phase 1, Riverside County, California: unpublished report prepared for Metropolitan Water District of Southern California by Paleo Environmental Associates, Inc., Altadena, CA, 20 p.

1993. Paleontologic/cultural resource impact mitigation program final report: unpublished report prepared for Midway Sunset Cogeneration Company, Mojave Natural Gas Pipeline, and Kern County, California by Paleo Environmental Associates, Inc., Altadena, CA, 57 p.

Langenheim, V.E., Hildenbrand, T.G., Jachens, R.C., Campbell, R.H., and Yerkes, R.F., 2006, Aeromagnetic map with geology of the Los Angeles 30' x 60' quadrangle, southern California: U.S. Geological Survey Scientific Investigations Map 2950, scale 1:100,000, 17 p.

Lundelius, E.L., Graham, R.W., Anderson, E., Guilday, J., Holman, A., Steadman, D.W., and Webb, S.D. 1983. Terrestrial vertebrate faunas: p. 311-353 *in* Wright, H. E., and Porter, S. C. (editors), Late-Quaternary environments of the United States, Volume 1 – The Late Pleistocene, 407 p.

MACTEC. 2007. Report of geotechnical investigation, proposed city of Anaheim 200 MW peaking power plant: unpublished report prepared for PB Americas, Inc. by MACTEC Engineering and Consulting, Inc., Los Angeles, California, 142 p.

Marshall, L.G. 1976. Paleontological salvage and federal legislation: Journal of Paleontology, vol. 50, p. 346-348.

McCulloh, T.H., and Beyer, L.A. 2004. Mid-Tertiary isopach and lithofacies maps for the Los Angeles region, California – templates for palinspastic reconstruction to 17.4 Ma: U. S. Geological Survey Professional Paper 1690, 32 p.

McLeod, S.A. 2007. Los Angeles County Museum paleontology collection records search, Anaheim Municipal Power Station site: unpublished report prepared for PaleoResource Consultants by the Natural History Museum of Los Angeles County, Los Angeles, CA, 2 p.

Miller, R.E., Green, J.H., and Davis, G.H. 1971. Geology of the compacting deposits in the Los Banos – Kettleman City subsidence area, California. Mechanics of aquifer systems: U. S. Geological Survey Professional Paper 497-E, 45 p.

Morton, D.M. 2004. Preliminary digital geologic map of the 30' x 60' Santa Ana quadrangle, southern California, version 2.0: United States Geological Survey Open-File Report 99-172, scale 1:100,000, 55 p.

Morton, D.M., and Miller, F.K. 2006. Geologic map of the San Bernardino and Santa Ana 30' x 60' quadrangles, California, version 1.0: U.S. Geological Survey Open-File Report 2006-1217, 199 p.

Morton, P.K., Miller, R.V., and Evans, J.R. 1979. Environmental geology of Orange County, California: California Division of Mines and Geology Open-File Report 79-8, 474 p.

Petersen, M.D., Cramer, C.H., Faneros, G.A., Real, C.R., and Reichle, M.S. 1997. Potential ground shaking in the Orange 7.5-minute Quadrangle, Orange County, California: p. 35-

45 *in* Seismic hazard zone report for the Orange 7.5-minute Quadrangle, Orange County, California, California Division of Mines and Geology Seismic Hazard Zone Report 001, 45 p.

Reynolds, R.E. 1987. Paleontologic resource assessment, Midway-Sunset Cogeneration Project, Kern County, California: unpublished report prepared for Southern California Edison Company by San Bernardino County Museum, San Bernardino, CA, 15 p.

1990. Paleontological mitigation program, Midway-Sunset Cogeneration Project, Kern County, California: unpublished report prepared for Midway-Sunset Cogeneration Company, by San Bernardino County Museum, San Bernardino, CA, 45 p.

Rogers, T.H. 1965. Geologic map of California – Santa Ana sheet: California Division of Mines and Geology, scale 1:250,000.

Schoellhamer, J. E., Vedder, J. G., Yerkes, R. F., and Kinney, D. M., 1981, Geology of the northern Santa Ana Mountains, California: U. S. Geological Survey Professional Paper 420-D, 109 p.

Schwartz, D.E., and Colburn, I.P. 1989. Late Tertiary to recent chronology of the Los Angeles Basin, Southern California: p. 48-53 *in* Collins, L. G. (editor), Geologic excursions in the greater Los Angeles area, Spring conference of the Far West Section, National Association of Geology Teachers, 85 p.

Shipman, P. 1977. Paleoecology, taphonomic history and population dynamics of the vertebrate assemblage from the middle Miocene of Fort Turnan, Kenya: unpublished PhD Dissertation, New York University, New York, 193 p.

1981. Spatial distribution of fossils in sediments: p. 65-98, *in* P. Shipman, Life history of a fossil, an introduction to taphonomy and paleoecology, Harvard University Press, Cambridge, MA, 222 p.

Society of Vertebrate Paleontology. 1995. Assessment and mitigation of adverse impacts to nonrenewable paleontologic resources – standard guidelines: Society of Vertebrate Paleontology News Bulletin, vol. 163, p. 22-27.

1996. Conditions of receivership for paleontologic salvage collections: Society of Vertebrate Paleontology News Bulletin, vol. 166, p. 31-32.

Spencer, L.A. 1990. Paleontological mitigation program, Midway-Sunset Cogeneration Project, Natural Gas Pipeline, Kern County, California: unpublished report prepared for Midway-Sunset Cogeneration Company by Paleo Environmental Associates, Inc., Altadena, CA, 12 p.

West, R.M. 1991. State regulation of geological, paleontological, and archaeological collecting: Curator, vol. 34, p. 199-209.

Yerkes, R.F., McCulloh, T.H., Schoellhamer, J.E., and Vedder, J.G. 1965. Geology of the Los Angeles Basin California – an introduction; Geology of the eastern Los Angeles Basin Southern California: U. S. Geological Survey Professional Paper 420-A, 57 p.