COUNTY OF SAN DIEGO

GUIDELINES FOR DETERMINING SIGNIFICANCE

PALEONTOLOGICAL RESOURCES

LAND USE AND ENVIRONMENT GROUP

Department of Planning and Land Use
Department of Public Works

March 19, 2007

Modified January 15, 2009

APPROVAL

I hereby certify that these **Guidelines for Determining Significance for Paleontological Resources** are a part of the County of San Diego, Land Use and Environment Group's Guidelines for Determining Significance and were considered by the Director of Planning and Land Use, in coordination with the Director of Public Works on the 19th day of March, 2007.

GARY PRYOR
Director of Planning and Land Use

JOHN SNYDER
Director of Public Works

Attest: ERIC GIBSON
Deputy Director of Planning and Land Use

I hereby certify that these **Guidelines for Determining Significance for Paleontological Resources** are a part of the County of San Diego, Land Use and Environment Group's Guidelines for Determining Significance and have hereby been approved by the Deputy Chief Administrative Officer (DCAO) of the Land Use and Environment Group on the 19th day of March, 2007. The Director of Planning and Land Use is authorized to approve revisions to these Guidelines for Determining Significance for Paleontological Resources, except any revisions to the Guidelines for Determining Significance presented in Chapter 5.0 must be approved by the Deputy CAO.

Approved, March 19, 2007

CHANDRA WALLAR
Deputy CAO

EXPLANATION

These Guidelines for Determining Significance for Paleontological Resources and information presented herein shall be used by County staff for the review of discretionary projects and environmental documents pursuant to the California Environmental Quality Act (CEQA). These Guidelines present a range of quantitative, qualitative, and performance levels for particular environmental effects. Normally, (in the absence of substantial evidence to the contrary), non-compliance with a particular standard stated in these Guidelines will mean the project will result in a significant effect, whereas compliance will normally mean the effect will be determined to be "less than significant." Section 15064(b) of the State CEQA Guidelines states:

> "The determination whether a project may have a significant effect on the environment calls for careful judgment on the part of the public agency involved, based to the extent possible on factual and scientific data. An ironclad definition of significant effect is not always possible because the significance of an activity may vary with the setting."

The intent of these Guidelines is to provide a consistent, objective and predictable evaluation of significant effects. These Guidelines are not binding on any decision-maker and do not substitute for the use of independent judgment to determine significance or the evaluation of evidence in the record. The County reserves the right to modify these Guidelines in the event of scientific discovery or alterations in factual data that may alter the common application of a Guideline.

LIST OF PREPARERS AND TECHNICAL REVIEWERS

County of San Diego

Bobbie Stephenson, DPLU, Primary Author
Jason Giffen, DPLU, Contributing Author
Eric Gibson, DPLU, Contributing Author

Jim Bennett, DPLU, Technical Review
Cathy Cibit, DPLU, Technical Review

Other Contributors

Tom Deméré, Ph.D., Curator of the Paleontology Department and Director of the Department of PaleoServices, San Diego Natural History Museum, Contributing Author
George L. Kennedy, Ph.D., Senior Paleontologist, Brian F. Smith and Associates, Contributing Author
John A. Minch, Ph.D., Principal, John Minch and Associates, Contributing Author

Paleontological Resources Technical Review Panel

Thomas A. Deméré, Ph.D., Curator of Paleontology and Director of the Department of PaleoServices, San Diego Natural History Museum
George L. Kennedy, Ph.D., Senior Paleontologist, Brian F. Smith and Associates
John A. Minch, Ph.D., Principal, John Minch and Associates

TABLE OF CONTENTS

LIST OF TABLES

<u>Table</u>

LIST OF FIGURES

<u>Figure</u>

LIST OF ATTACHMENTS

Attachment

List of Acronyms

CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
DPLU	Department of Planning and Land Use
DPW – ESU	Department of Public Works – Environmental Services Unit
NEPA	National Environmental Policy Act
NNL	National Natural Landmark
PRC	Public Resource Code
PRPA	Proposed Paleontological Resources Preservation Act
USC	United States Code

INTRODUCTION

This document provides guidance for evaluating adverse environmental effects that a proposed development project may cause to paleontological resources. Specifically, this document addresses the following question listed in the CEQA Guidelines 2006, Appendix G, Environmental Checklist Form, Section V, Cultural Resources:

Would the project:

c) Directly or indirectly destroy a unique paleontological resource or site?

Paleontological resources are found in geologic deposits of sedimentary rock (e.g. sandstone, siltstone, mudstone, claystone, or shale). These deposits may be exposed at the surface in areas like sea cliffs, valley slopes, and roadcuts, but are typically buried under surficial soil deposits. The geologic deposits contain fossils of extinct organisms therefore, they are limited and non-renewable.

1.0 GENERAL PRINCIPLES AND EXISTING CONDITIONS

1.1 Defining Paleontological Resources

Paleontological resources are the remains and/or traces of prehistoric life, exclusive of human remains, and including the localities where fossils were collected and the sedimentary rock formations from which they were obtained/derived. The defining character of fossils is their geologic age. Fossils or fossil deposits are generally regarded as older than 10,000 years, the generally accepted temporal boundary marking the end of the last late Pleistocene glacial event and the beginning of the current period of climatic amelioration of the Holocene (Figure 1).

Preservation of organic remains is rare, requiring a unique combination of physical and biological factors. Skeletal tissue with a high percentage of mineral matter is the most readily preserved; soft tissues not intimately connected with the skeletal parts are least likely to be preserved (Raup and Stanley 1978). For this reason the fossil record contains a biased selection not only of types of organisms but also of parts of organisms. For example, two groups of abundant organisms in shallow marine environments are bivalve and gastropod mollusks and polychaete worms. However, whereas mollusks, with their calcium carbonate shells, are the dominant fossils in many marine formations, the polychaete worms are barely recognized in fossil deposits. The same can be said of vertebrate fossils. For example, much of the paleontological knowledge about mammals is based on teeth alone, the teeth being generally more durable than other parts of the skeleton. The best preserved fossils are of those organisms that lived within a sedimentary depositional environment or were buried by sediment shortly after death, thus partially insulating them from destructive chemical and physical processes.

Fossil remains commonly include marine shells, bones and teeth of fish, reptiles, and mammals, leaf assemblages, and petrified wood. Fossil traces include internal and external molds (impressions) and casts. Trace fossils (i.e., ichnofossils) include evidence of past activities of fossil organisms, such as footprints and trackways, burrows and boreholes, coprolites, nests and (packrat) middens. Fossils, fossil traces, and trace fossils are found in the sedimentary rocks and unconsolidated sediments of natural ancient environments such as the oceans, rivers, lakes, deltas, beaches, and lagoons.

A geologic formation is a body of rock identified by its lithic characteristics (e.g., grain size, texture, color, mineral content) and stratigraphic position. Formations are mappable at the Earth's surface or traceable in the subsurface and are formally named and described in the geologic literature. The fossil content may also be a characteristic of a formation.

There is a direct relationship between fossils and the geologic formations within which they are enclosed; therefore, with sufficient knowledge of the geology and stratigraphy of a particular area and the paleontological resource potential, it is possible to reasonably predict where fossils might or might not be found. This is the case in San Diego County where a general overview of the geologic setting provides a basis for reasonably predicting the location of paleontological resources.

San Diego County is underlain by a number of distinct geologic rock units (i.e., formations) that record portions of the past 450 million years of Earth's history (Abbott 1999, Walawender 2000). In general, time periods late in geologic history are better represented than periods further back in time because the younger rocks are less likely to have been eroded away or metamorphosed. In San Diego County, the geologic record is most complete for parts of the past 75 million years, represented by the Cretaceous Period, the Eocene, Oligocene, and Pliocene Epochs of the Tertiary Period, and the Pleistocene Epoch of the Quaternary Period (Figure 1).

1.2 Unique Paleontological Resources

What makes a paleontological resource unique can be defined in a variety of ways. For the purposes of this document, a unique paleontological resource is any fossil or assemblage of fossils, or paleontological resource site or formation that meets any one of the following criteria:

- Is the best example of its kind locally or regionally;
- Illustrates a paleontological or evolutionary principle (e.g. faunal succession; plant or animal relationships);
- Provides a critical piece of paleobiological data (illustrates a portion of geologic history or provides evolutionary, paleoclimatic, paleoecological, paleoenvironmental or biochronological data);

- Encompasses any part of a “type locality” of a fossil or formation;
- Contains a unique or particularly unusual assemblage of fossils;
- Occupies a unique position stratigraphically within a formation; or
- Occupies a unique position, proximally, distally or laterally within a formation’s extent or distribution.

1.3 Existing Conditions

1.3.1 Brief Geologic History of San Diego County

San Diego County is located along the Pacific Rim, an area characterized by island arcs with subduction zones forming mountain ranges and deep oceanic trenches, active volcanoes, and earthquakes. During the Mesozoic Era subduction of the ancient oceanic plate under the continental plate created an archipelago of volcanic islands in the San Diego area. The heat caused by the subduction produced massive volumes of magma that either erupted at the surface forming volcanic rocks or congealed deep in the Earth’s crust to form plutonic rocks (e.g. granite). This resulted in the creation of the plutonic rocks now exposed in the mountainous central part of the County. Subsequent heating also metamorphosed the volcanic and sedimentary rocks of the arc as well as the older Paleozoic rocks, forming the foothills of the western part of the ranges. Continuing subduction of the oceanic plate under the continent caused uplifting and erosion that unroofed the deeply buried plutonic rocks to form a steep and rugged, mountainous coastline. Younger Mesozoic and Cenozoic sedimentary rocks have buried these older rocks west of the mountains, while a thick accumulation of Cenozoic sedimentary rocks including layers of lava and ash has filled the basins east of the mountains.

During the Cenozoic Era, a tectonic spreading center began to separate the southwestern part of North America, including San Diego County, from the rest of the continent. The spreading center formed the Gulf of California and the Salton Trough Region. The slow northwestward movement of San Diego County caused intermittent uplift with subsequent erosion, as well as down warping with subsequent deposition of thick accumulations of sediments.

Recorded in these Cenozoic sedimentary rocks are: conditions of higher rainfall and subtropical climates that supported coastal rain forests with exotic faunas and floras; periods of extreme aridity and volcanism; sea level fluctuations (oceanic inundations and retreats); a great Eocene river and delta; and the formation of new seaways.

1.3.2 Geomorphic Regions

A geomorphic province and its regions establish areas that contain particular assemblages of landforms, geology, and fossils. San Diego County lies within the Peninsular Ranges Province, which is here divided into three regions: the Coastal Plain, the Peninsular Range, and the Salton Trough (the desert). This section describes the characteristics of each of these regions and focuses on the unincorporated portions of the County of San Diego.

Coastal Plain Region

The Coastal Plain Region is bounded on the west by the Pacific Ocean and on the east by the western edge of the foothills, and lies mostly within the boundaries of incorporated cities. The following community plan areas (CPAs) of the unincorporated County are all or partly within the Coastal Plain Region:

- Pendleton – DeLuz
- County Islands
- North County Metropolitan (most)
- San Dieguito
- Lakeside (west)
- Valle de Oro
- Spring Valley
- Sweetwater
- Otay (west)

The Coastal Plain Region is an area characterized by interbedded marine and non-marine sedimentary rock units deposited over the last 75 million years. The sedimentary rocks overlie a buried topography of plutonic crystalline rocks composed of granite, granodiorite, etc. Many of the level surfaces in the coastal areas, including most of the mesa tops and coastal benches, are elevated marine terraces, and these, as well as the broad, level floodplains of river valleys, are characteristic features of the Coastal Plain Region (Bergen et al. 1996).

Many sedimentary rock units containing paleontological resources are within the Coastal Plain Region, including:

- Unnamed Quaternary River Terrace deposits representing the sediments of ancient river courses and sometimes containing important vertebrate remains;
- Marine terrace deposits of the Bay Point Formation and the Lindavista Formation that have produced large and diverse assemblages of marine invertebrate fossils locally along the coast and inland to elevations of about 300 feet;
- Marine deposits of the San Diego Formation, which have produced one of the largest and most diverse assemblages of Pliocene marine fossils in the world;
- Fluvial sedimentary rocks of the Otay Formation, with so many well preserved remains that it is now considered the richest source of Oligocene terrestrial vertebrates in California;

- Fluvial sedimentary rocks of the Friars Formation and member C of the Santiago Formation, which have produced the best preserved assemblages of middle and late Eocene terrestrial mammals in California; and
- Other formations, including the Capistrano, San Mateo, San Onofre Breccia, Monterey, Sweetwater, Mission Valley, Stadium Conglomerate, Ardath Shale, Torrey Sandstone, Delmar, Point Loma, and Lusardi formations.

Peninsular Ranges Region

The Peninsular Ranges Region covers most of San Diego County between the foothills of Cowles Mountain and Bernardo Mountain on the west and the steep escarpments of In-Ko-Pah Gorge and Palomar Mountain on the east.

The following community and subregional planning areas of the unincorporated County are all or partly within the Peninsular Ranges Region:

- Fallbrook
- Rainbow
- Pala/Pauma
- Bonsall
- Valley Center
- North County Metropolitan (east)
- North Mountain
- Ramona
- Julian
- Lakeside (east)
- Pepper Drive – Bostonia
- Alpine
- Central Mountain
- Otay (east)
- Jamul/Dulzura
- Mountain Empire
- Crest/Dehesa/Harbison Canyon/Granite Hills

The Peninsular Ranges Region is primarily underlain by plutonic igneous rocks that formed from the cooling of molten magmas deep within the earth's crust. These magmas were generated during subduction of an oceanic crustal plate that was converging on the North American Plate between 120 and 90 million years ago. Over this long period of time, extensive masses of plutonic rocks accumulated within the crust. Intense heat associated with these plutonic intrusions metamorphosed the ancient sedimentary rocks that were already there. These metasediments are now preserved in the Peninsular Ranges Region as marbles, slates, schist, quartzites, and gneiss. Younger undeformed sedimentary rocks occur in various areas of the Peninsular Ranges Region.

The Peninsular Ranges Region contains paleontological resources in Quaternary alluvial and alluvial fan deposits in many of the mountain valleys. Some of the more southern mountain valleys contain Quaternary peat deposits.

Sedimentary rock units containing paleontological resources in the Peninsular Ranges Region include:

Sedimentary rock (sandstone, siltstone and conglomerate), including the Pauba Formation and the Temecula Arkose, that have filled the Warner Basin with up to 1,000 feet of upper Pliocene and lower to upper Pleistocene sediments and have yielded diverse assemblages of vertebrate fossils in southern Riverside County;

- Table Mountain Gravels that have yielded fossil remains of Miocene terrestrial mammals; and
- Jurassic metasedimentary rocks mapped as the Santiago Peak Volcanics that have produced rare, but important marine invertebrate fossils.

Salton Trough Region

San Diego County's eastern desert and Desert Subregional Planning Area lies within the Salton Trough Region. The Salton Trough is the northern landward extension of the proto-Gulf of California, the deepest part of which currently lies beneath the Salton Sea. The Salton Trough is undergoing active deformation related to faulting along the San Jacinto and Elsinore fault zones, which are related to the San Andreas Fault system. Since the early Miocene (~24 million years ago) the Salton Trough has been filling with sediments, which are now up to 5 miles thick. The major source of the sediments on the San Diego County side of the trough is erosion of the Peninsular Ranges. Dry lake beds, filled with sediments, are notable features of the region.

Sedimentary rock units in the Salton Trough Region that have produced important paleontological resources in San Diego County include:

- The Ocotillo Conglomerate and the Borrego Formation that have produced primarily Pleistocene mollusk and other invertebrate fossils as well as terrestrial vertebrate fossils;
- Imperial Group, from which a large number of late Miocene to early Pliocene subtropical to tropical, shallow water marine invertebrates (e.g., corals, mollusks, crustaceans, and echinoderms), excellently preserved, have been found (Powell 1995);
- The Palm Spring Group consisting of five formations (Arroyo Diablo Formation, Olla Formation, Tapiado Claystone, Hueso Formation, and Canebrake Conglomerate) that is important because its terrestrial vertebrate fossils provide critical information on the evolution and diversification of Pliocene through Pleistocene paleocommunities characteristic of this region's North American Land Mammal Ages (Cassiliano 2002);
- Other formations, including the Brawley and Split Mountain Formations, the Canebrake Conglomerate, and the Alverson Volcanics; and
- Later Quaternary alluvium, and older terraces, fanglomerates, and valley-fill alluvium (Deméré and Walsh 1993).

1.3.3 Types of Fossils and Their Occurrence in San Diego County

The fossil record preserved in the rocks of San Diego County is unique in many respects and consists of important fossils and fossil assemblages that are either poorly represented or altogether unknown in other areas of California and North America. Especially significant are the late Cretaceous, Eocene, Oligocene, Pliocene, and Pleistocene portions of the local record. Fossils of Paleozoic age are extremely rare locally, as are fossils of Triassic and Jurassic age. Refer to Figure 1 for a relative and absolute time scale.

The majority of San Diego County fossils are represented by shells and/or tests of marine invertebrates (corals, mollusks, crustaceans, and echinoderms). However, important skeletal remains of terrestrial vertebrates (reptiles, birds, and mammals) characterize certain geologic rock units and time intervals. The local terrestrial fossil record also consists of remains and impressions of plants including leaf assemblages and petrified wood.

Although fossil discoveries in the Coastal Plain Region have been made in natural outcrops of sedimentary strata, such as occur in sea cliffs and valley, canyon, and gully slopes, the vast majority of recent discoveries have been made in temporary exposures produced by grading activities for land use projects, such as commercial, residential, and pubic development projects. The few fossil discoveries known from the Peninsular Ranges Region occur in areas of steep topography where erosion of sedimentary rocks has produced natural outcrops (e.g., Jacumba Valley). In other areas of the Peninsular Ranges Region where sedimentary rocks occur but are not well exposed (e.g., Warner Valley), future grading activities may likely create artificial exposures with the potential for important fossil discoveries. In the Salton Trough Region of the County almost all known fossil discoveries have been made in areas with natural outcrops of exposed sedimentary rocks. These exposures are the result of combined factors of aridity, limited soil and vegetative cover, and episodic high rates of erosion.

Coastal Plain Region

Fossils known from the Coastal Plain Region are widespread and locally abundant. In the northern portion of the Coastal Plain Region the oldest well-preserved fossils are Late Cretaceous in age (~75 million years) and consist of remarkably diverse assemblages of marine invertebrates (e.g., protists, clams, oysters, rudists, snails, cowries, scaphopods, nautiloids, ammonites, crabs, and sea urchins) and marine vertebrates (e.g., sharks, rays, and bony fish). Rare, but significant skeletal remains of dinosaurs (e.g., ankylosaur and hadrosaur) have also been recovered from these Cretaceous deposits (Point Loma Formation). Although the majority of these Cretaceous fossils have come from sites in Carlsbad, equivalent aged rocks occur in the Camp Pendleton area of the unincorporated County and have the potential for similar significant discoveries. Extensive deposits of Eocene age (~40 to 48 million years ago) also occur in the Camp Pendleton area. Correlative strata (Santiago Formation) in Oceanside, Carlsbad, and Vista contain a diverse fossil record consisting of marine, estuarine and terrestrial fossils and fossil assemblages. The marine and estuarine fossils primarily include shells and tests of mollusks (clams, oysters, and snails), crustaceans (e.g., ghost shrimp, mantis shrimp, and crabs), and echinoderms (e.g., sea urchins). Terrestrial fossils consist of extremely well preserved skulls, teeth, and/or bones of reptiles (tortoise, lizard, and snake), birds (bathornithids and pelagornithids), and mammals (opossums, insectivores, bats, prosimian primates, miacid and creodont carnivores, tapirs, brontotheres, amynodonts, protoreodonts, and leptoreodonts). Terrestrial plant fossils include stem and/or leaf impressions of horsetail reeds, fan palms, tropical hardwood trees, tropical vines, and broadleaf trees. The only Miocene-age sedimentary rocks known from the Coastal Plain Region occur in the Oceanside and Camp Pendleton areas. Fossils from these deposits (San Mateo Formation) include skeletal remains of late Miocene (5 to 7 million year old) marine fishes (e.g., sharks, rays, and bony fish), sea birds (e.g., loons, grebes, cormorants, and flightless auks), and marine mammals (e.g., fur seals, walruses, dolphins, porpoises, sperm whales, baleen whales, and sea cow). Pleistocene-age fossils in the northern portion of the Coastal Plain Region occur in marine and river terrace deposits (Bay Point Formation and unnamed river terrace deposits). The former consist of well-preserved shells of estuarine and marine invertebrates such as mollusks (e.g., clams, oysters, scallops, snails, and scaphopods), crustaceans (e.g., ostracods, crabs, and barnacles), and echinoderms (e.g., sea urchins and sand dollars). Fossils from Pleistocene river terrace deposits consist of skulls, teeth, and/or bones of amphibians (e.g., frogs and salamanders), reptiles (turtles and lizards), birds (e.g., coots, ducks, grebes, quail, and hawks), and mammals (e.g., ground sloth, capybara, squirrel, gopher, packrat, kangaroo rat, rabbit, horse, tapir, camel, bison, deer, mammoth, and mastodon).

The oldest fossils from the central portion of the Coastal Plain Region are Late Jurassic in age (~140 million years) and include poorly preserved shells and molds of marine invertebrates (e.g., radiolarians, belemnites, ammonites, and clams) and permineralized wood from discovery sites in Los Penasquitos Canyon, La Zanja Canyon, and/or Fairbanks Ranch (Santiago Peak Volcanics). Eocene (~40 to 48 million year old) sedimentary rocks in the central Coastal Plain Region are exposed in the Fairbanks Ranch, La Jolla Valley, 4S Ranch and Lakeside areas of the unincorporated County. Discoveries of fossils in Eocene strata (Torrey Sandstone, Scripps Formation and Friars Formation) in these areas consist of shells and molds of marine, estuarine, and terrestrial mollusks (e.g., clams, oysters, marine and terrestrial snails), and other invertebrates, rare insects, and skeletal remains of estuarine crocodiles, freshwater pond turtles and terrestrial lizards, turtles, snakes and mammals (e.g., prosimian primates, rodents, miacid carnivores, and protoreodonts). Leaf assemblages, including rare water lily leaves, and permineralized wood are also known from these formations. Eocene fossils and fossil assemblages from strata in the incorporated areas of the central Coastal Plain Region (Ardath Shale, Scripps Formation, Friars Formation, Stadium Conglomerate, Mission valley Formation, and Pomerado Conglomerate) are more widespread and diverse and include shells and molds of marine and estuarine invertebrates (e.g., protists, corals, mollusks, crustaceans, and echinoderms), bones and teeth of marine and estuarine vertebrates (e.g., sharks, rays, bony fish, turtle, and crocodiles), skulls, bones and teeth of terrestrial vertebrates (e.g., reptiles, birds, and mammals), and leaf impressions and permineralized wood of terrestrial plants (e.g., horsetail reeds, fan palms, tropical hardwood trees, tropical vines, and broadleaf trees). Although Pliocene and Pleistocene deposits and their contained fossils are known from portions of the central Coastal Plain Region, none occur in that portion situated within the unincorporated County.

In the southern portion of the Coastal Plain Region the oldest well-preserved fossils are Eocene in age (~42 million years old) and consist of shells and molds of a variety of marine invertebrates (e.g., clams, oysters, snails, and crabs), as well as land snails, collected in the Otay Mesa and Spring Valley areas (Mission Valley Formation and Sweetwater Formation) and bones and teeth of terrestrial mammals (opossums, insectivores, and rodents) recovered from construction-related exposures in the Bonita-Sweetwater and Spring Valley areas (Sweetwater Formation). Unique to the southern Coastal Plain Region are outcrops of Oligocene sedimentary rocks (Otay Formation) such as those exposed by development of the EastLake community in eastern Chula Vista. Here significant skeletal remains of terrestrial reptiles (tortoise and lizards), birds (bathornihids, cranes, and quail), and mammals (e.g., insectivores, gophers, mice, beavers, dogs, nimravids, rhinoceros, camels, oreodonts, and chevrotains) have been collected along with sparse fossil impressions of freshwater plants (e.g., rushes). These Oligocene-age strata also occur in the Proctor Valley and Bonita-Sweetwater areas of the unincorporated County. Pliocene (~2 to 4 million year old) strata in the Bonita-Sweetwater and Otay Mesa areas of the southern Coastal Plain Region are known for their large and diverse assemblages of well-preserved marine invertebrate fossils including protists (e.g., foraminiferans), corals (e.g., branching stony corals), mollusks (e.g., clams, oysters, scallops, snails, and scaphopods), crustaceans (e.g., mantis shrimp, hermit crabs, shore crabs, and barnacles), and echinoderms (e.g., sea urchins, sand dollars, and sea stars). The San Diego Formation has also produced perhaps the most significant assemblage of Pliocene marine vertebrates known from western North America. Fossils include skeletal remains (skulls, bones, and/or teeth) of fishes (e.g., sharks, rays, and bony fish), sea birds (e.g., grebes, loons, auklets, flightless auks, gannets, boobies, albatross, cormorant, and surf scooter), and marine mammals (e.g., fur seal, walruses, river dolphin, porpoise, beluga whale, sperm whale, baleen whales, and sea cow). Late Pleistocene (~200 to 300 thousand year old) strata in the southern Coastal Plain Region have produced sparse, but significant fossils of terrestrial vertebrates from sites in the Bonita-Sweetwater area. These fossils consist of skulls, teeth, and/or bones of birds (e.g., passenger pigeon, song bird, and coot) and mammals (e.g., ground sloth, mole, mice, rabbit, dire wolf, horse, camel, deer, mastodon, and mammoth).

Peninsular Ranges Region

Known fossil occurrences in the Peninsular Ranges Region are extremely rare, but provide a glimpse of the potential for future discoveries of significant fossils in this portion of the County. For example, in Jacumba Valley middle Miocene (~16 million year old) sedimentary rocks (Table Mountain Gravels) interbedded with volcanic flow and ash deposits (Jacumba Volcanics) have produced sparse skeletal remains of unidentified artiodactyls (i.e., even-toed ungulates such as pigs, camels, deer, and cattle). Correlative deposits in the Imperial County portion of the Coyote Mountains along County Road S-2 have produced skeletal and dental remains of rodents and camel. Another area of unproven paleontological potential in the Peninsular Ranges Region is in Warner Valley near Lake Henshaw. Geologists have mapped the sedimentary rocks in this basin as Pleistocene in age and correlative with Pleistocene fossil-bearing deposits (Pauba Formation and Temecula Arkose) in Temecula Valley. Although no fossils have been documented from the Warner Valley Pleistocene deposits, diverse assemblages of terrestrial fossils are known from Temecula Valley. These assemblages include shells and tests of freshwater mollusks and diatoms, as well as skulls, teeth, and/or bones of shrew, rabbit, kangaroo rat, gopher, wolf, badger, bobcat, horse, camel, pronghorn, deer, and mammoth. To the west of Warner Valley in the Pala area are Pleistocene alluvial fan deposits (Pala Conglomerate). A single isolated horse tooth has been reported from these deposits; an indication of the potential for additional discoveries in this and similar Pleistocene alluvial fan deposits of the Peninsular Range Region.

Salton Trough Region

The Salton Trough Region is locally underlain by a thick sequence of Miocene, Pliocene, Pleistocene, and Holocene strata. The Carrizo Badlands and Coyote Mountains in the southern portion of the Salton Trough Region expose Miocene and Pliocene (~4 to 7 million year old) strata that have produced large and diverse assemblages of marine invertebrate fossils. These fossils consist of shells, tests, and molds of branching corals, brain corals, clams, oysters, scallops, snails, crabs, barnacles, sea urchins, sand dollars, and sea stars. Also recovered from these strata (Imperial Group) are sparse skeletal remains of marine vertebrates (e.g., sharks, rays, bony fish, walrus, dolphin, baleen whale, and sea cow). In the central and northern portions of the Salton Trough Region (Vallecito Badlands and Borrego Badlands) a nearly continuous series of younger Pliocene and Pleistocene (~200,000 to 3 million year old) strata (Palm Spring Group) are well exposed and have produced fossils and fossil assemblages of terrestrial vertebrates. These fossils may very well represent the most complete record of Plio-Pleistocene vertebrates in North America. Recovered fossils consist of skulls, teeth, and/or bones of amphibians (e.g., frogs), reptiles (e.g., tortoise, lizard, snake), birds (e.g., loon, grebe, pelican, condor, flamingo, ducks, hawk, eagle, turkey, quail, crane, coot, owl, and crow), and mammals (e.g., shrew, mole, bat, ground sloth, rabbit, squirrel, gopher, kangaroo rat, woodrat, vole, wolf, coyote, fox, short-faced bear, raccoon, skunk, badger, jaguar, horse, tapir, camel, llama, deer, pronghorn, and mammoth).

2.0 EXISTING REGULATIONS AND STANDARDS

In the County of San Diego, adverse impacts to paleontological resources are primarily addressed through the California Environmental Quality Act (CEQA). The County's Grading Ordinance also addresses paleontological resources. Additional federal and state regulations that govern the assessment and protection of paleontological resources can be found in Attachment B, as well as professional guidelines.

2.1 State Regulations and Standards

California Environmental Quality Act (CEQA) [California Code of Regulations, Guidelines for Implementation of CEQA, Appendix G, Title 14, Chapter 3 §15000-15387 and 21000-21178 http://ceres.ca.gov/ceqa/].

Under CEQA, lead agencies are required to consider impacts to unique paleontological resources. CEQA is concerned with assessing impacts associated with the direct or indirect destruction of unique paleontological resources or sites, as defined in Section 1.1.1, that are of value to the region or state.

2.2 Local Regulations and Standards

Grading Ordinance

Section 87.430 of the Grading Ordinance provides for the requirement of a paleontological monitor at the discretion of the County. In addition, the suspension of grading operation is required upon the discovery of fossils greater than twelve inches in any dimension. The ordinance also requires notification of the County Official (e.g. Permit Compliance Coordinator). The ordinance gives the County Official the authority to determine the appropriate resource recovery operations, which the permittee shall carry out prior to the County Official's authorization to resume normal grading operations.

Conservation Element (Part X) of the San Diego County General Plan [http://ceres.ca.gov/planning/counties/San_Diego/plans.html, LUPIN - LUPIN > All Counties > San Diego County > Plans]

The Conservation Element of the San Diego County General Plan provides policies for the protection of natural resources. In addition, Appendix G of the Conservation Element lists Unique Geologic Features for conservation, many of which are fossiliferous formations.

3.0 ASSESSING PALEONTOLOGICAL RESOURCE POTENTIAL AND SENSITIVITY

There is a direct relationship between the type of rock (i.e., igneous, metamorphic or sedimentary) and the depositional environment (e.g., marine, lagoonal, lacustrine, fluvial, terrestrial) under which a geologic formation was originally deposited. Therefore, with an understanding of the geology of the County, it is possible to reasonably predict whether paleontological resources might be present. A map of detailed geologic and paleontological information overlain with the project footprint is needed for the first level of review to determine if paleontological resources may occur on a project site.

Several sources are available to help assess the potential for paleontological resources to be present on a project site (Attachment C). Geologic maps (at scales of 1:24,000, 1:100,000, etc.) of areas of San Diego County show the distribution of various geologic formations. Based on these maps and information on previously recorded fossil finds, geologic formations in San Diego County have been characterized as having High, Moderate, Low, Marginal, or No Potential for paleontological resource (Deméré and Walsh 1993). Because paleontological resources usually are irregularly dispersed throughout a geologic formation, both vertically as well as laterally, the location of fossils within a particular formation cannot be pre-determined. Comparing the project site to a resource map showing the potential of formations to produce fossils is the first step in assessing the potential for paleontological resources to be present on a project site. More precise determinations of the potential presence of paleontological resources can be made by studying more detailed geologic maps. Further evaluation may require a field survey of the project site by a paleontologist.

3.1 <u>Resource Potential Ratings and Sensitivity of Paleontological Resources</u>

Sensitivity levels are rated for individual geologic formations, as it is the formation that contains the fossil remains. The sensitivity levels are the same as the resource potential ratings.

Based on the geologic formations in San Diego County, levels of paleontological resource potential and sensitivity have been developed (Deméré and Walsh 1993) and are shown on the "San Diego County Paleontological Sensitivity" map (Figure 2). Paleontological Resource Potential Ratings and Sensitivity of Geologic Formations in San Diego County (Table 1) lists the formations in the County that are known to contain or have the potential to contain unique paleontological resources. The resource potential ratings and geologic formation sensitivity levels are described below.

3.1.1 High

High resource potential and high sensitivity are assigned to geologic formations known to contain paleontological localities with rare, well preserved, critical fossil materials for stratigraphic or paleoenvironmental interpretation, and fossils providing important information about the paleoclimatic, paleobiological and/or evolutionary history (phylogeny) of animal and plant groups. In general, formations with high resource potential are considered to have the highest potential to produce unique invertebrate fossil assemblages or unique vertebrate fossil remains and are, therefore, highly sensitive.

3.1.2 Moderate

Moderate resource potential and moderate sensitivity are assigned to geologic formations known to contain paleontological localities. These geologic formations are judged to have a strong, but often unproven, potential for producing unique fossil remains (Deméré and Walsh 1993).

3.1.3 Low

Low resource potential and low sensitivity are assigned to geologic formations that, based on their relatively young age and/or high-energy depositional history, are judged unlikely to produce unique fossil remains. Low resource potential formations rarely produce fossil remains of scientific significance and are considered to have low sensitivity. However, when fossils are found in these formations, they are often very significant additions to our geologic understanding of the area.

3.1.4 Marginal

Marginal resource potential and marginal sensitivity are assigned to geologic formations that are composed either of volcaniclastic (derived from volcanic sources) or metasedimentary rocks, but that nevertheless have a limited probability for producing fossils from certain formations at localized outcrops. Volcaniclastic rock can contain organisms that were fossilized by being covered by ash, dust, mud, or other debris from volcanoes. Sedimentary rocks that have been metamorphosed by heat and/or pressure caused by volcanoes or plutons are called metasedimentary. If the sedimentary rocks had paleontological resources within them, those resources may have survived the metamorphism and still be identifiable within the metasedimentary rock, but since the probability of this occurring is so limited, these formations are considered marginally sensitive.

3.1.5 No Potential

No resource potential is assigned to geologic formations that are composed entirely of volcanic or plutonic igneous rock, such as basalt or granite, and therefore do not have any potential for producing fossil remains. These formations have no paleontological resource potential, i.e. they are not sensitive.

3.2 Resource Potential and Sensitivity of Geologic Formations in Unincorporated San Diego County

Most of the unincorporated areas of San Diego County are underlain by geologic formations with no, low, or marginal paleontological resource potential and sensitivity and are unlikely to contain important fossils. Nonetheless, areas of high and moderate sensitivity, which do have the potential to contain unique paleontological resources (i.e. fossils), are present in Camp Pendleton, the San Dieguito area, Spring Valley, and Otay Mesa in the Coastal Plain Region, Warner Valley and Jacumba Valley in the Peninsular Ranges Region, and the Anza Borrego Desert and Coyote Mountains in the Salton Trough Region.

4.0 TYPICAL ADVERSE EFFECTS

Paleontological resources are non-renewable and, as such, they cannot be replaced. The destruction, disturbance or alteration of a paleontological resource causes an irreversible loss of information about prehistoric life on Earth. A project can result in two types of adverse effects on paleontological resources, direct and indirect.

4.1 Direct Impacts

Direct impacts occur through the destruction or alteration of a paleontological resource or site by grading, excavation, trenching, boring, tunneling or other activity that disturbs the subsurface geologic formation. Excavation operations are the most common ways for paleontological resources to be adversely impacted and can result in the permanent loss of resources and valuable information. The most extensive excavation impacts are usually associated with mass grading, where earth-movers are used in combination with bulldozers to rip and transport massive amounts of soil and bedrock. Front-end loaders, track hoes, and trucks can also be used in mass excavation operations. Smaller amounts of earth are moved during, boring, trenching and tunneling and typically the impacts are less extensive.

4.2 Indirect Impacts

Indirect impacts are not specifically caused by a development project, but may be a reasonably foreseeable result of such a project. Typical indirect impacts to paleontological resources include:

- Destruction or loss of surface fossils from increased erosion, and
- The non-scientific or unauthorized surface collection or subsurface excavation of a fossil or paleontological site.

5.0 GUIDELINES FOR DETERMINING SIGNIFICANCE

CEQA requires analysis of the entire project or "the whole of the action." However, only ground disturbing aspects of the project have the potential to impact paleontological resources. Strata containing these resources usually underlie the soil surface, but occasionally they are exposed in natural cliff faces, valley slopes, or roadcuts. The determination of significance process and mitigation for potentially significant impacts is diagrammed in Figure 8.

An affirmative response to or confirmation of the following Guideline will generally be considered a significant impact related to paleontological resources as a result of project implementation, in the absence of scientific evidence to the contrary:

> ***The project proposes activities directly or indirectly damaging to a unique paleontological resource or site. A significant impact to paleontological resources may occur as a result of the project, if project-related grading or excavation will disturb the substratum or parent material below the major soil horizons in any paleontologically sensitive area of the County, as shown on the San Diego County Paleontological Resources Potential and Sensitivity Map (see Figure 2).***

This guideline is derived from CEQA (Appendix G). It requires the evaluation of paleontological resources to determine whether or not a proposed action will have a significant effect upon paleontological resources.

Significant paleontological resources can occur in any of the rocks of San Diego County other than those that are igneous (No Potential). Soils are derived from the parent bedrock below them and the organic material on the surface. The percolation of water into the parent material erodes the rock and allows roots to penetrate. These processes break down the parent material to form soil, and can cause fossils to decompose within the soil horizon. Below the soil horizons the parent material is intact. A geotechnical soil survey can be conducted to determine soil horizon depths. Soil horizons are identified as follows:

- Organic Horizon: occurs at the surface and contains vegetation and organic materials;
- Surface Horizon: occurs adjacent to the Organic Horizon and contains organic materials;
- Subsoil Horizon: occurs below the Surface Horizon, but above the Substratum Horizon. Organic materials are present, but in lesser quantity than in the Surface Horizon.
- Substratum Horizon: occurs at the deepest level of soils and is below the major soil horizons. Fossils are likely to be present in and below the substratum.

Soil horizons vary considerably in depth across the County, depending on the type of bedrock, organic material, climate, and surface waters of the area. San Diego County boring data show that the soil depth can range from zero to 65 feet. In general, soils are shallow on slopes and mesa tops, and deeper on valley floors. Figure 7 is a diagram showing the relationships of the various soil horizons.

6.0 STANDARD MITIGATION AND PROJECT DESIGN CONSIDERATIONS

A significant impact requires mitigation under CEQA. With mitigation the impact would be reduced to a level below significance. The County's standard paleontological resources mitigation requirements are described in this section and are diagrammed on Figure 8. Impacts to potentially significant paleontological resources require mitigation in the form of monitoring during grading. The goal of paleontological resources mitigation is the recovery, curation, and permanent archival storage of significant fossil remains, thus preserving what would otherwise have been destroyed and lost by excavation activities.

6.1 Mitigation Requirements

Since an impact to paleontological resources does not typically occur until the substratum is excavated, monitoring during excavation is the essential measure to mitigate significant impacts to paleontological resources to a level below significance. The type of monitoring required is based on the amount of excavation and the site's paleontological resource potential and sensitivity (Figure 9). It is the opinion of local paleontological professionals that when the volume of excavation exceeds 2,500 cubic yards, the potential loss of paleontological resources is much higher than for lesser amounts of excavation. Therefore, the County requires the following monitoring, and subsequent salvage of significant paleontological resources if they are found, to adequately mitigate potentially significant impacts:

- For projects within areas of High or Moderate Paleontological Resources Potential that propose excavation equal to or greater than 2,500 cubic yards, the services of a Project Paleontologist and a Paleontological Resources Monitor are required.
- For projects within areas of High or Moderate Paleontological Potential that propose excavation of less than 2,500 cubic yards, monitoring by a Standard Monitor is required.
- For projects within areas of Low or Marginal Potential, monitoring by a Standard Monitor is required.

A Project Paleontologist is a person with a Ph.D. or Master's Degree in Paleontology or related field, and who has knowledge of San Diego County paleontology and documented experience in professional paleontological procedures and techniques. A Paleontological Resources Monitor is defined as an individual with at least one year of experience in field identification and collection of fossil materials under the supervision of a Project Paleontologist. A Standard Monitor is any one person who is on the project site during all the original cutting of undisturbed substratum. The Standard Monitor must be designated by the Applicant and given the responsibility of watching for fossils so that the project is in conformance with Section 87.430 of the Grading Ordinance.

Mitigation conditions are to be placed on grading plans, and projects must conform to the requirements of the Grading Ordinance. Section 87.430 of the Grading Ordinance provides for the requirement of a paleontological monitor at the discretion of the County. In addition, the suspension of grading operation is required upon the discovery of fossils greater than twelve inches in any dimension.

6.2 Mitigation for Excavation Equal to or Greater than 2,500 Cubic Yards in High or Moderate Potential Areas

Monitoring by a Project Paleontologist or by a Paleontological Resources Monitor under the supervision of the Project Paleontologist is required if undisturbed substratum or deeper bedrock in High or Moderate potential areas (see Figure 9) are to be excavated pursuant to a discretionary permit.

The Project Paleontologist must conduct or supervise the following mitigation tasks:

- Monitoring of excavation operations to discover unearthed fossil remains, generally involving monitoring of ongoing excavation activities (e.g., sheet grading pads, cutting slopes and roadways, basement and foundation excavations, and trenching).

- Salvage of unearthed fossil remains, typically involving simple excavation of the exposed specimens, but possibly also plaster-jacketing of individual large and/or fragile specimens, or more elaborate quarry excavation of richly fossilferous deposits.

- Recording of stratigraphic, geologic and geographic data to provide a context for the recovered fossil remains, including accurate plotting (mapping) on grading plans and standard topographic maps of all fossil localities, description of lithologies of fossil-bearing strata, measurement and description of the overall stratigraphic section (unless considered by the Project Paleontologist to be infeasible), and photographic documentation of the geologic setting.

- Laboratory preparation (cleaning and repair) of collected fossil remains to the point of identification (not exhibition), generally involving removal of enclosing sedimentary rock material, stabilization of fragile specimens (using glues and other hardeners), and repair of broken specimens. See Figure 10 for examples.

- Curation of prepared fossil remains, typically involving scientific identification and cataloguing of specimens; and entry of data into one or more accredited institutional (museum or university) collection (specimen/species lot and/or locality) databases. Curation is necessary so that the specimens are available for scientific research (see Figure 10).

- Transferal, for archival storage, of cataloged fossil remains and copies of relevant field notes, maps, stratigraphic sections and photographs to an accredited institution (museum or university) in California that maintains paleontological collections, preferably:

    - San Diego Natural History Museum
    - Los Angeles County Museum
    - San Bernardino Museum of Natural History
    - University of California Museum of Paleontology, Berkeley
    - Anza-Borrego Desert State Park

- Preparation of a final report summarizing the results of the field investigation, laboratory methods, stratigraphic information, types and importance of collected fossils, and any necessary graphics to document the stratigraphy and precise fossil collecting localities.

6.2.1 Grading Plan Conditions

Conditions to be put onto the grading plans follow:

Paleontological Resources Monitoring by a Project Paleontologist

A Project Paleontologist or Paleontological Resources Monitor (under the supervision of the Project Paleontologist) shall be on-site during initial cutting, grading or excavation into the substratum. The Project Paleontologist is a person with a Ph.D. or Master's Degree in Paleontology or a related field, and who has knowledge of San Diego County paleontology and documented experience in professional paleontological procedures and techniques. A Paleontological Resources Monitor is defined as an individual with at least one year of experience in field identification and collection of fossil materials under the supervision of a Project Paleontologist. The Paleontological Resources Monitor shall work under the direct supervision of the Project Paleontologist. The applicant shall authorize the Project Paleontologist and/or Paleontological Resources Monitor to direct, divert, or halt any grading activity, and to perform all other acts required by the provisions listed below.

A. Monitor initial cutting, grading or excavation into the substratum;

B. If paleontological resources are unearthed the Project Paleontologist or Paleontological Monitor, under supervision by the Project Paleontologist, shall:

    1. Direct, divert, or halt any grading or excavation activity until such time that the sensitivity of the resource can be determined and the appropriate recovery implemented;

    2. Salvage unearthed fossil remains, including simple excavation of exposed specimens or, if necessary, plaster-jacketing of large and/or fragile specimens or more elaborate quarry excavations of richly fossiliferous deposits;

    3. Record stratigraphic and geologic data to provide a context for the recovered fossil remains, typically including a detailed description of all paleontological localities within the

project site, as well as the lithology of fossil-bearing strata within the measured stratigraphic section, if feasible, and photographic documentation of the geologic setting;

4. Prepare collected fossil remains for curation, to include cleaning the fossils by removing the enclosing rock material, stabilizing fragile specimens using glues and other hardeners, if necessary, and repairing broken specimens;

5. Curate, catalog and identify all fossil remains to the lowest taxon possible, inventory specimens, assign catalog numbers, and enter the appropriate specimen and locality data into a collection database; and

6. Transfer the cataloged fossil remains to an accredited institution (museum or university) in California that maintains paleontological collections for archival storage and/or display. The transfer shall include copies of relevant field notes, maps, stratigraphic sections, and photographs.

C. The Project Paleontologist shall prepare a final Paleontological Resources Mitigation Report summarizing the field and laboratory methods used, the stratigraphic units inspected, the types of fossils recovered, and the significance of the curated collection.

D. Submit TWO hard copies of the final Paleontological Resources Mitigation Report to the Director of DPLU for final approval of the mitigation, and submit an electronic copy of the report according to the County DPLU's Electronic Submittal Format Guidelines.

6.2.2 Qualifications

A Project Paleontologist is a person who has, to the satisfaction of the Planning and Land Use Director:

- A Ph.D. or M.S. or equivalent in paleontology or closely related field (e.g., sedimentary or stratigraphic geology, evolutionary biology, etc.);
- Demonstrated knowledge of southern California paleontology and geology; and
- Documented experience in professional paleontological procedures and techniques.

A Paleontological Resources Monitor is defined as an individual with at least one year of experience in field identification and collection of fossil materials.

6.2.3 Mitigation Responsibilities

Applicant's Responsibilities

The applicant shall:

- Prior to any excavation or earth disturbance and prior to approval of any Grading or Improvement Plan, retain a Project Paleontologist to be responsible for implementing these mitigation measures.

- Submit a copy of a letter signed by the Project Paleontologist or Paleontological firm that states the applicant has retained their services and acknowledges agreement to perform and/or be responsible for concurrence with mitigation measures stated in this section.

- Authorize the Project Paleontologist or Paleontological Monitor to direct, divert, or halt any grading and/or excavation activity for the evaluation and/or recovery of exposed fossil remains and to perform all other acts required by these guidelines to preserve paleontological resources.

- Cause conditions for the paleontological resource mitigation program to be placed on the first sheet of the grading plan set and shall cause these conditions to be performed.

The applicant will ensure that two hard copies and one digital copy of the final Paleontological Resources Mitigation Report are submitted to the Director of Planning and Land Use, at 5201 Ruffin road, Suite B, San Diego, CA 92123-1666. The digital copy must be prepared in accordance with the County DPLU's Electronic Submittal Format Guidelines.

Project Paleontologist's Responsibilities

The Project Paleontologist is in charge of all aspects regarding the paleontological mitigation program for the project. Responsibilities will include:

Preparing a letter that states the name and firm of the Project Paleontologist who has been retained by the applicant, and that acknowledges responsibility for concurrence with the project's mitigation measures.

- Supervising the Paleontological Monitor(s) and directing them in the field.

- Attending the pre-grading/pre-construction meeting to consult with grading contractors regarding the requirement of monitoring for paleontological resources, the potential importance and uniqueness of fossils and other paleontological resources that could be found during grading and excavation for the project, and the regulations that govern the protection of paleontological resources,

- Ensuring that recovered fossil remains are cleaned, sorted, repaired, cataloged, and submitted to an appropriate scientific institution, and

- Writing the Paleontological Resources Mitigation Report for the project.

Paleontological Resource Monitor's Responsibilities

The Paleontological Monitor shall:

- Coordinate with the project superintendent daily regarding grading and excavation schedules.

- Monitor the original cutting (grading and excavation activities) of previously undisturbed formations of sedimentary rocks that may contain paleontological resources for unearthed fossils. The frequency of monitoring depends upon the rate of excavation, the materials excavated, and the abundance of fossils,

- Divert or temporarily halt construction activities in the area where paleontological resources have been found to allow recovery of fossil remains, and

- If necessary for the recovery of small fossil remains, collect bulk sedimentary matrix samples for screen-washing.

6.2.4 Reporting

A Paleontological Resources Mitigation Report shall be required for the project, even if fossils are not found during the monitoring. A suggested outline for the report is provided in Attachment D.

The report shall summarize the results of the mitigation program, including field and laboratory methodology, monitoring dates, location and the geologic and stratigraphic setting, monitoring efforts, conclusions and references cited, and if paleontological resources were found, list(s) of collected fossils and their paleontological significance, descriptions of any analyses,. The report shall include appropriate graphics (index map, fossil localities, stratigraphic column) and photographic documentation of where monitoring was conducted and where any fossils and other paleontological resources were found. If fossils are found, a summary stratigraphic section shall be included that records the stratigraphic section exposed by the excavation (i.e., lithology and stratigraphic thicknesses) and stratigraphic positions of recovered paleontological resources.

Two hard copies and an electronic copy of the report shall be submitted to the Director, Department of Planning and Land Use of the County of San Diego within 90 days following the termination of paleontological monitoring on the project site. Exceptions will be considered by DPLU. Reports are to be submitted to the Director of Planning and Land Use at 5201 Ruffin Road, Suite B, San Diego, CA 92123-1666.

6.2.5 Mitigation Completion

Fossils Not Found

Mitigation will be deemed complete when the County's Permit Compliance Coordinator, on behalf of the Director of Planning and Land Use, receives the final report.

Fossils Found

Mitigation will be deemed complete when the County's Permit Compliance Coordinator, on behalf of the Director of Planning and Land Use, receives the final report, and a letter from the accredited institution stating that the collection has been received and accepted.

6.3 Mitigation for Excavation Not Requiring the Services of a Project Paleontologist

For any excavation into the substratum that does not require the expertise of a Project Paleontologist as described in Section 6.3.1, incidental monitoring by a Standard Monitor is required. A Standard Monitor is any one person who is on the site during all the original cutting of undisturbed substratum. A Standard Monitor must be designated by the Applicant and given the responsibility of watching for fossils so that the project is in conformance with Section 87.430 of the Grading Ordinance. If a fossil of greater than twelve inches in any dimension, including circumference, is encountered during excavation or grading, all excavation operations in the area where the fossil was found shall be suspended immediately, the DPLU's Permit Compliance Coordinator shall be notified, and a Project Paleontologist shall be retained by the applicant to assess the significance of the find and, if the fossil is significant, to oversee the salvage program, including salvaging, cleaning, and curating the fossil(s), and documenting the find, as described below.

6.3.1 Grading Plan Conditions

Monitoring for Paleontological Resources

Monitoring for paleontological resources requires that a Standard Monitor be designated and that the Standard Monitor watches for fossils. During initial cutting, grading or excavation of the substratum. If a fossil of greater than twelve inches in any dimension, including circumference, is encountered excavation or grading in the area where the fossil was found shall be suspended immediately, the County's Permit Compliance Coordinator shall be notified, and a Project Paleontologist shall be retained by the applicant to evaluate the significance of the find and to salvage, clean, and curate the fossil(s), and to document the find, as described below.

The Project Paleontologist is a person with a Ph.D. or Master's Degree in Paleontology or related field, and who has knowledge of San Diego County paleontology and documented experience in professional paleontological procedures and techniques. The Project Paleontologist will:

1. Salvage unearthed fossil remains, including simple excavation of exposed specimens or, if necessary, plaster-jacketing of large and/or fragile specimens, or richly fossiliferous deposits;

2. Record stratigraphic and geologic data to provide a context for the recovered fossil remains, typically including a detailed description of all paleontological localities within the project site, as well as the lithology of fossil-bearing strata within the measured stratigraphic section, if feasible, and photographic documentation of the geologic setting;

3. Prepare collected fossil remains for curation, to include cleaning the fossils by removing the enclosing rock material, stabilizing fragile specimens using glues and other

hardeners, if necessary, and repairing broken specimens;

4. Curate, catalog and identify the fossil remains to the lowest taxon possible, inventory specimens, assign catalog numbers, and enter the appropriate specimen and locality data into a collection database; and

5. Transfer the cataloged fossil remains to an accredited institution (museum or university) in California that maintains paleontological collections for archival storage and/or display. The transfer shall include copies of relevant field notes, maps, stratigraphic sections, and photographs.

6. Prepare a Paleontological Resources Mitigation Report summarizing the field and laboratory methods used, the stratigraphic units inspected, the types of fossils recovered, and the significance of the fossils collected.

7. Submit TWO hard copies of the final Paleontological Resources Mitigation Report to the Director of DPLU for final approval of the mitigation, and submit an electronic copy of the report according to the County DPLU's Electronic Submittal Format Guidelines.

6.3.2 Reporting

Fossils Not Found

If no fossils of greater than 12 inches in any dimension are found during grading and excavation, a letter shall be submitted to the County Department of Planning and Land Use identifying who conducted the monitoring, stating that no fossils were found, and signed by the Standard Monitor. The letter shall be submitted to the County within 90 days following cessation of grading and excavation. The format of the letter is provided in Appendix E.

Fossils Found

If fossils meeting the description above are found and the services of a Project paleontologist are retained, the paleontologist will prepare a report documenting the mitigation program, including field and laboratory methodology, location and the geologic and stratigraphic setting, list(s) of collected fossils and their paleontological significance, descriptions of any analyses, conclusions, and references cited. The report shall include appropriate graphics (index map, fossil localities, stratigraphic column) and photographic documentation of where the fossil(s) and other paleontological resources were found. A summary stratigraphic section shall be included that records the stratigraphic section exposed by the excavation (i.e., lithology and stratigraphic thicknesses) and stratigraphic positions of recovered paleontological resources, to the extent possible.

Two hard copies and an electronic copy of the report shall be submitted to the Director, Department of Planning and Land Use of the County of San Diego within 90 days following the collection of fossil on the project site. Exceptions will be considered by

DPLU. Reports are to be submitted to the Director of Planning and Land Use at 5201 Ruffin Road, Suite B, San Diego, CA 92123-1666.

6.3.3 Mitigation Completion

Fossils Not Found

Mitigation will be deemed complete when the County's Permit Compliance Coordinator, on behalf of the Director of Planning and Land Use, receives a letter from the Standard Monitor stating that monitoring was conducted and no fossils were encountered during grading and excavation. A sample letter is provided as Appendix E.

Fossils Found

If fossils were found, mitigation will be deemed complete when a final report prepared by the Project Paleontologist, and a letter from the accredited institution stating that the fossil has been received and accepted, are received by the County's Permit Compliance Coordinator.

6.4 Project Design Considerations

Project design considerations to avoid or minimize impacts to paleontological resources include reducing the depth and volume of excavation into the substratum to the minimum necessary for completing the project.

7.0 REFERENCES

Abbott, P. L. 1999. The rise and fall of San Diego [subtitled] 150 million years of history recorded in sedimentary rocks. Sunbelt Publications, San Diego. Pp. i-xxiv + 1-231, illustrated.

Bergen, F.W., H.J. Clifford, and S.G. Spear. 1996. Geology of San Diego County, Legacy of the Land. Sunbelt Publications, San Diego. Pp. 1-175, illustrated.

Cassiliano, M. L. 2002. Revision of the stratigraphic nomenclature of the Plio-Pleistocene Palm Spring Group (new rank), Anza-Borrego Desert, Southern California. Proceedings of the San Diego Society of Natural History 38;1-30, figs. 1-22, pl.1.

City of San Diego. 2004. Draft Paleontological Guidelines, November. http://www.sandiego.gov/development-services/news/pdf/sdtceqa.pdf accessed September 12, 2006.

County of San Diego. 2002. General Plan, Part X, Conservation Element, pp. X-72, April. http://library.ceres.ca.gov/cgi-bin/display_page?page=10&elib_id=962&format=gif .

Deméré, T., Ph.D. Curator of the Paleontology Department, San Diego Natural History Museum. E-mail communication, October 14, 2006.

Deméré, T.A., and S.L. Walsh. 1993. Paleontological Resources of San Diego County. Unpublished report prepared for the San Diego County Department of Public Works by the Department of Paleontology, San Diego Natural History Museum.

Jefferson, G.T. and I. Lindsay. 2006. Fossil Treasures of the Anza-Borrego Desert. Sunbelt Publications, San Diego, California.

Neuendorf, K. E. E., Mehl, J. P., Jr., and Jackson, J. A., eds. 2005. Glossary of Geology. Fifth edition. American Geological Institute, Alexandria, Virginia. 779 pp.

Raup, D.M. and S.M. Stanley. 1978. Principles of Paleontology. W.H. Freeman and Company, San Francisco.

Remeika, P., 1995. Basin tectonics, stratigraphy, and depositional environments of the western Salton Trough detachment. *In* Paleontology and Geology of the Western Salton Trough Detachment, Anza-Borrego Desert State Park, California, edited by P. Remeika, and A. Sturz. San Diego Association of Geologists Field Trip Guidebook I: 3-54.

Society of Vertebrate Paleontology. Standard Measures for Assessment and Mitigation of Adverse Impacts to Nonrenewable Paleontological Resources. Draft manuscript. http://www.vertpaleo.org/policy/policy_statement_conformable_Impact.htm, accessed August 25, 2006.

United States Geological Survey. http://vulcan.wr.usgs.gov/LivingWith/VolcanicPast/Places/volcanic_past_wyoming.html, accessed October 16, 2006.

Walawender, M. J. 2000. The Peninsular Ranges – A geological guide to San Diego's back country. Kendall/Hunt Publishing Company, Dubuque, Iowa. Pp. i-ix + 1-114, illustrated.

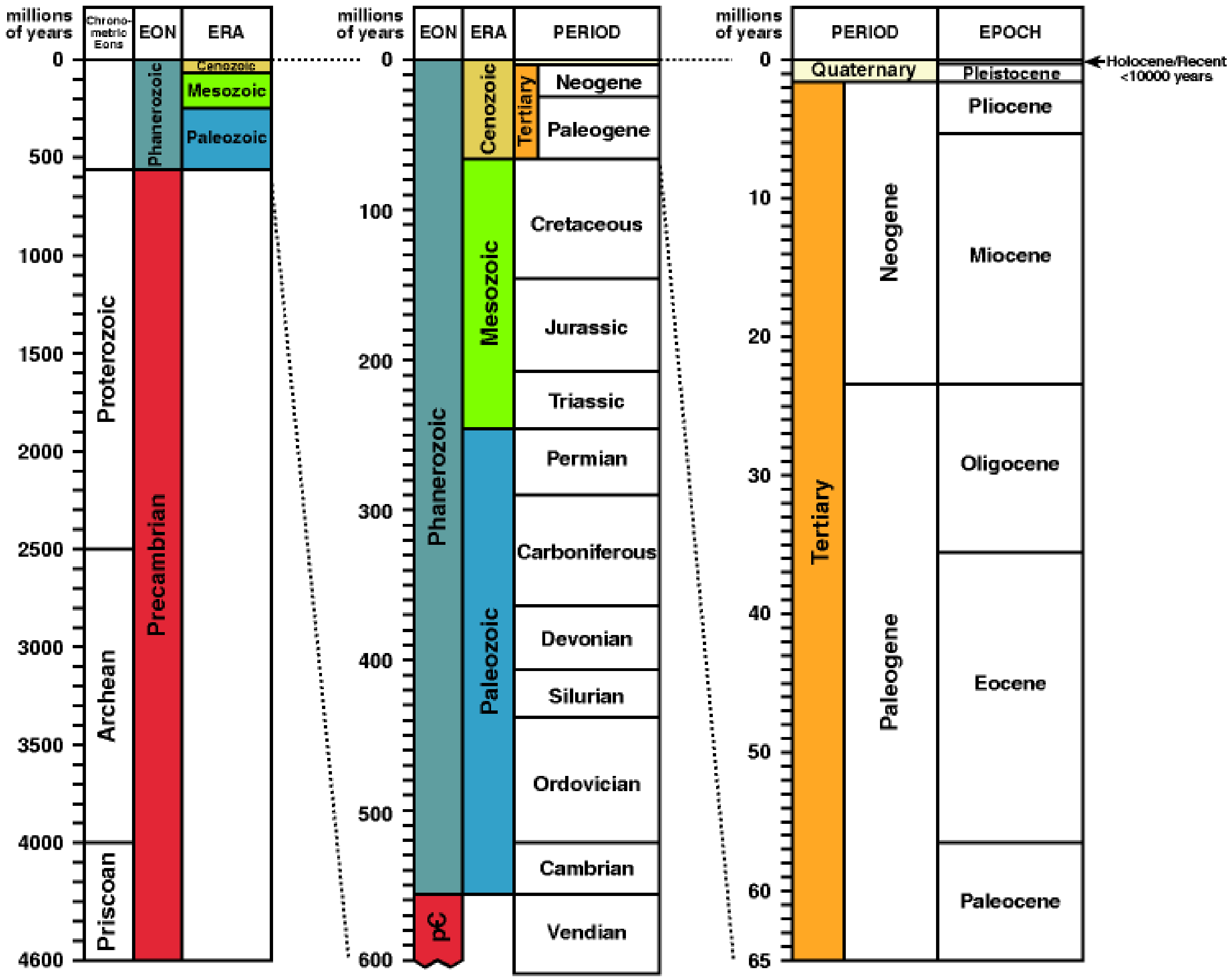
Table 1
Formations with a High or Moderate Potential to Contain Paleontological Resources in San Diego County[1]

Coastal Plain Region	**Salton Trough Region**
Ardath Shale	Borrego Formation
Bay Point Formation	Brawley Formation
Capistrano Formation	Canebrake Conglomerate
Delmar Formation	Imperial Group/Formation
Friars Formation	• Deguynos Formation
Lusardi Formation	• Latrania Formation
Lindavista/Mission Valley Formation	Later Quaternary alluvial fan deposits
Monterey Formation	Ocotillo Conglomerate
Otay Formation	Palm Spring Group/Formation
Point Loma Formation	• Arroyo Diablo Formation
San Diego Formation	• Canebrake Conglomerate
San Mateo Formation	• Hueso Formation
Santiago Peak Volcanics*	• Olla Formation
Stadium Conglomerate	• Tapiado Claystone Formation
Sweetwater Formation	Split Mountain Group/Formation
Torrey Sandstone	• Alverson Volcanics
San Onofre Breccia	• Elephant Trees Conglomerate
Unnamed marine terrace deposits	
Unnamed river terrace deposits	
Peninsular Ranges Region	
Alluvial deposits of mountain valleys	
Older Quaternary alluvial fan deposits	
Pauba Formation	
Santiago Peak Volcanics*	
Table Mountain Gravels	
Temecula Arkose	

*Only the metasedimentary portion of the Santiago Peak Volcanics contains fossils. A Project Paleontologist may identify the Santiago Peak Volcanics formation on site as non-metasedimentary, which would result in no significant impact to paleontological resources, therefore, precluding the need for monitoring.

[1] Excavation below the soil horizons into these geologic formations may cause a significant impact to paleontological resources and requires the services of a Project Paleontologist and a Paleontological Resources Monitor.

Figure 1
Geologic Time Scale



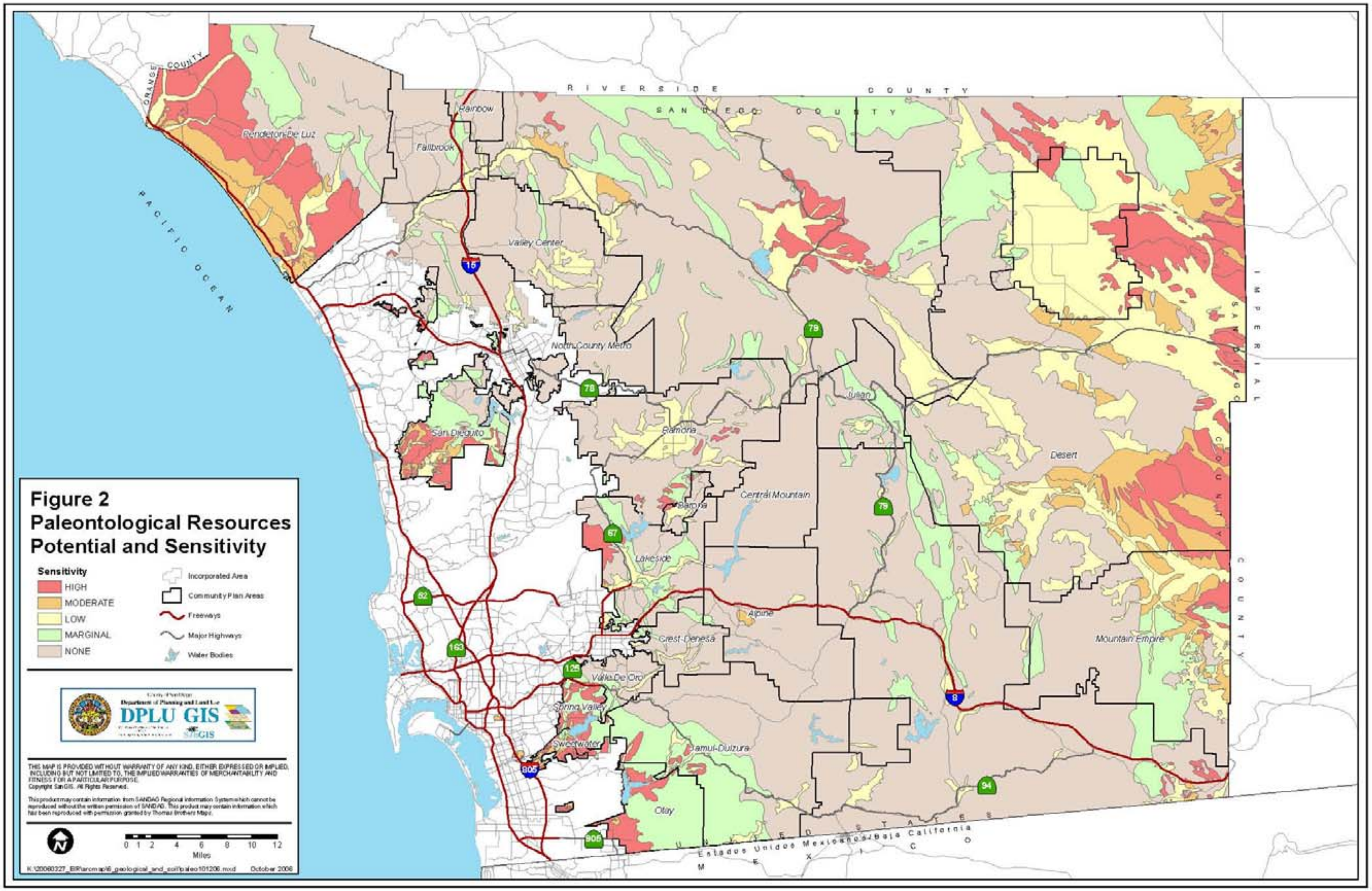


Figure 2
Paleontological Resources
Potential and Sensitivity

Figure 3
Cenozoic and Mesozoic Formations of the Coastal Plain Province

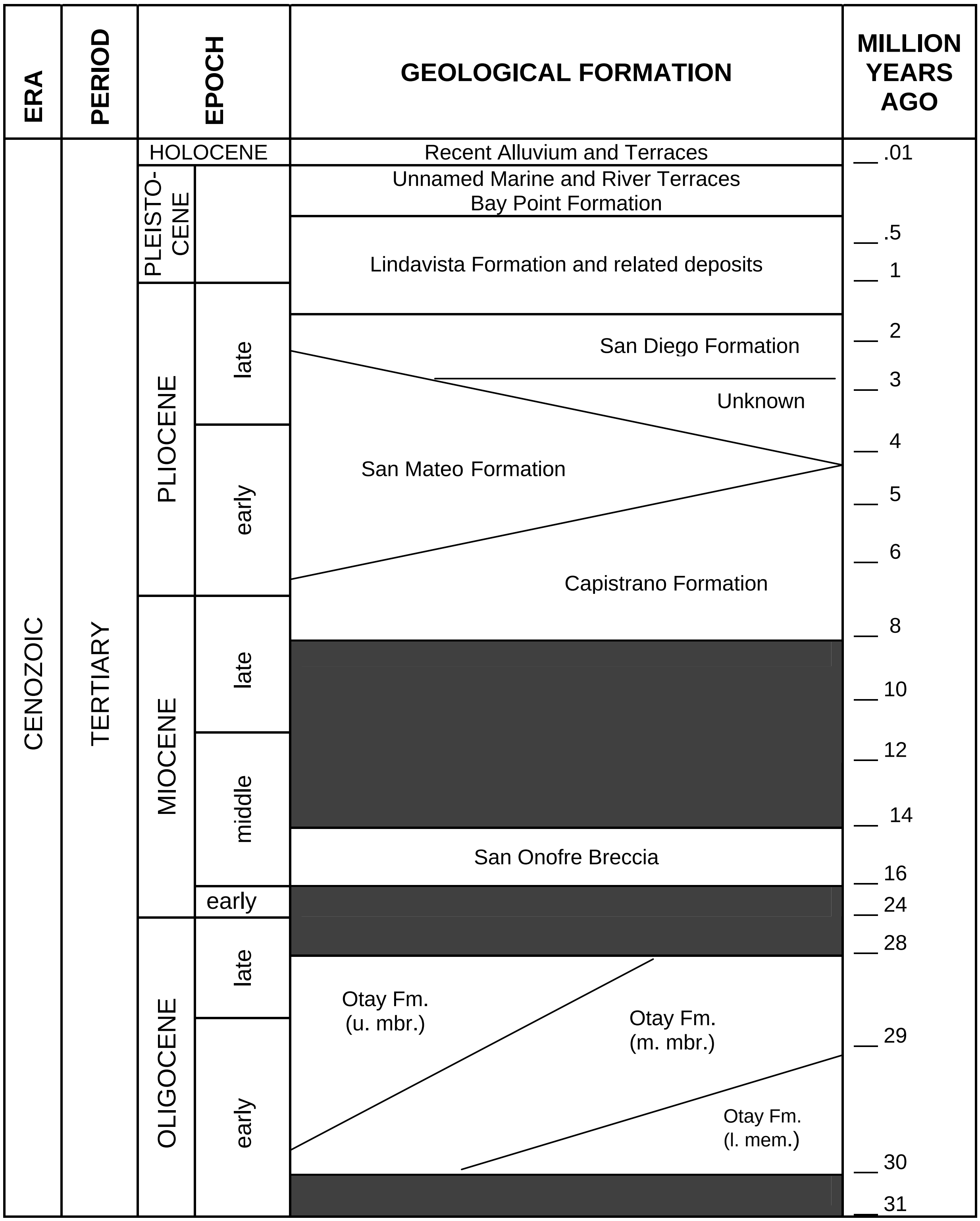


Figure 4
Cenozoic and Mesozoic Formations in the Coastal Plain Province

ERA	PERIOD	EPOCH		GEOLOGICAL FORMATION		MILLION YEARS AGO
CENOZOIC	TERTIARY	EOCENE	middle			40
				Santiago Fm. (Member C)	Pomerado Cong. / Sweetwater Fm.	
					Mission Valley Fm.	
					Stadium Cong. (up. mbr.)	
						44
				Santiago Fm. (Members (A & B)	Stadium Cong. (Cyp. Cyn. Mbr)	
					Stadium Cong. (lwr. mbr.)	46
					Friars Formation	
					Scripps Formation	48
					Ardath Shale	
			early	Torrey Sandstone	Mount Soledad Fm.	50
				Delmar Formation		
						52
				"Unnamed Formation"		54
						56
		PALEOCENE				65
MESOZOIC	CRETACEOUS	UPPER		Cabrillo Formation		70
				Point Loma Formation		75
				Lusardi Formation		80
		LOWER				120
	JURASSIC	UPPER		Santiago Peak Volcanics		130
						140

Figure 5
Cenozoic Formations of the Peninsular Ranges Province

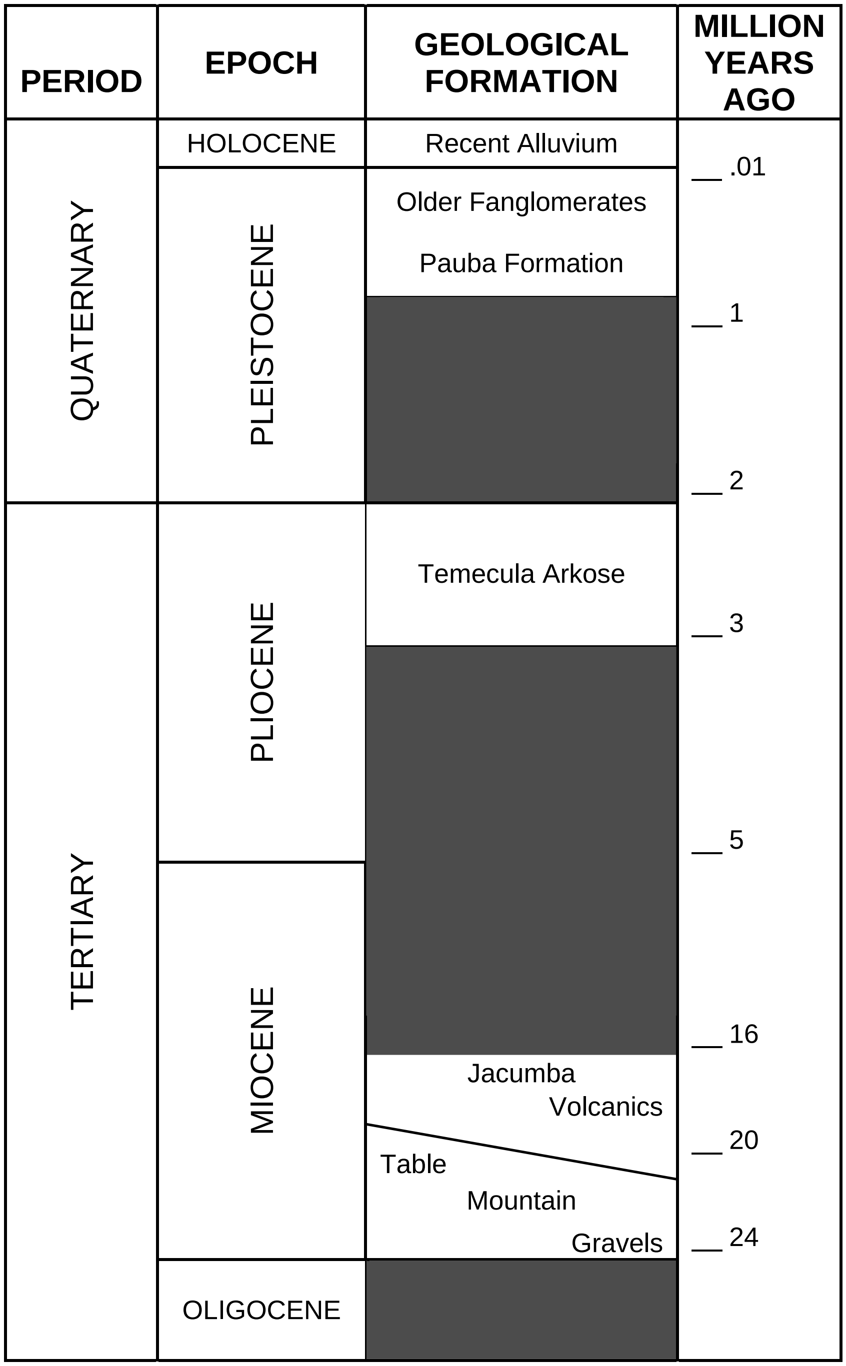


Figure 6
Cenozoic Formations of the Salton Trough Province

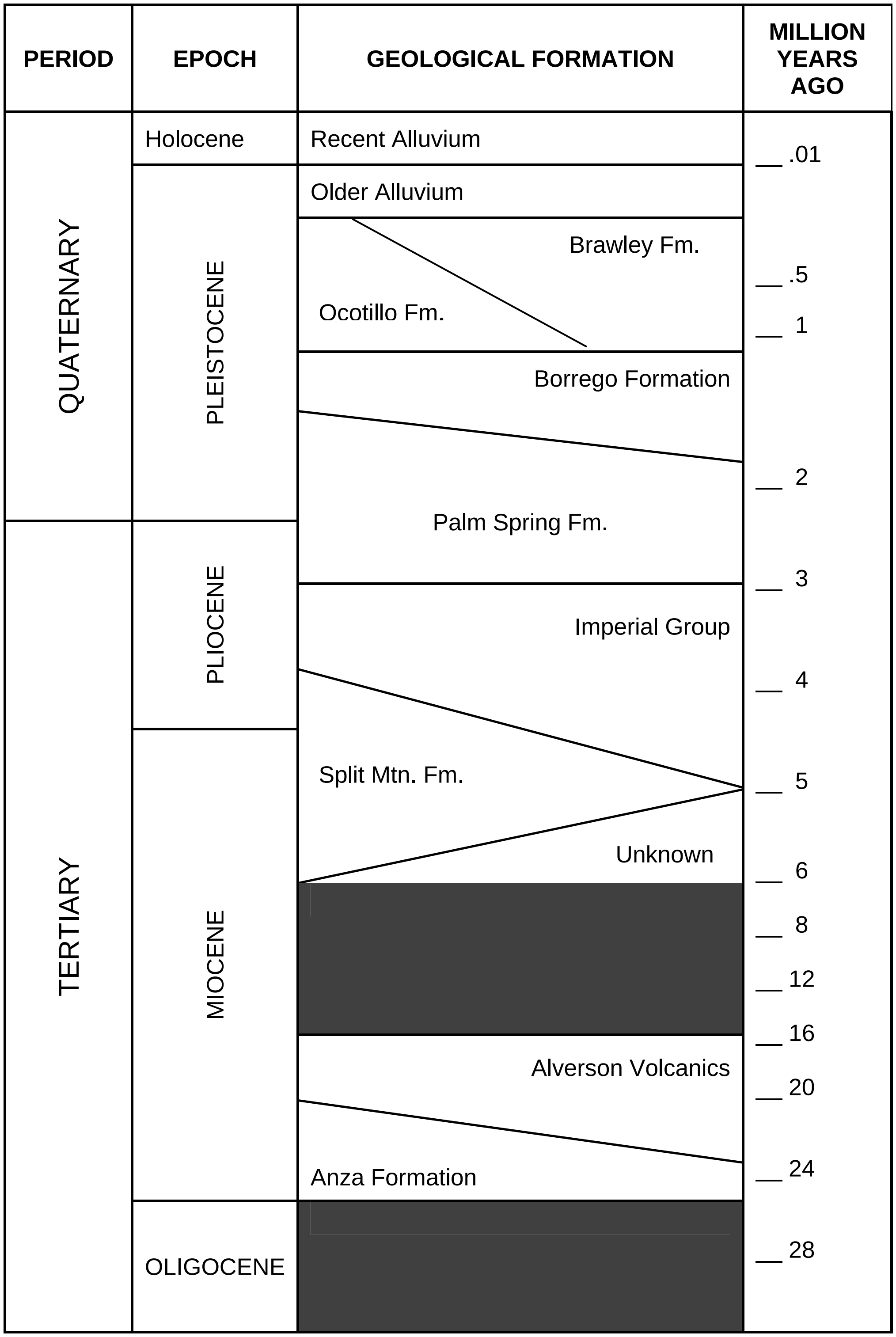
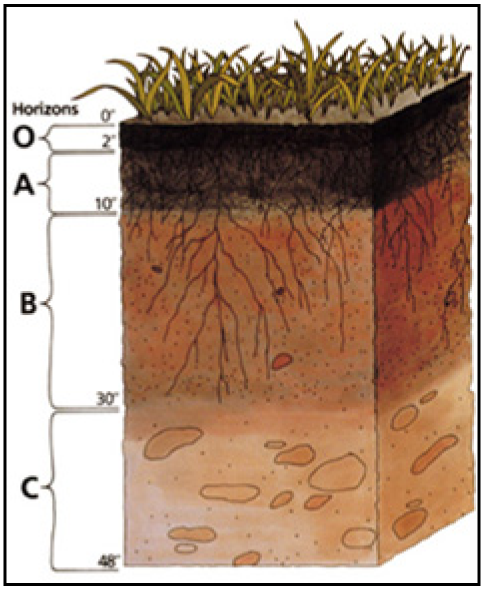


Figure 7
Major Soil Horizons

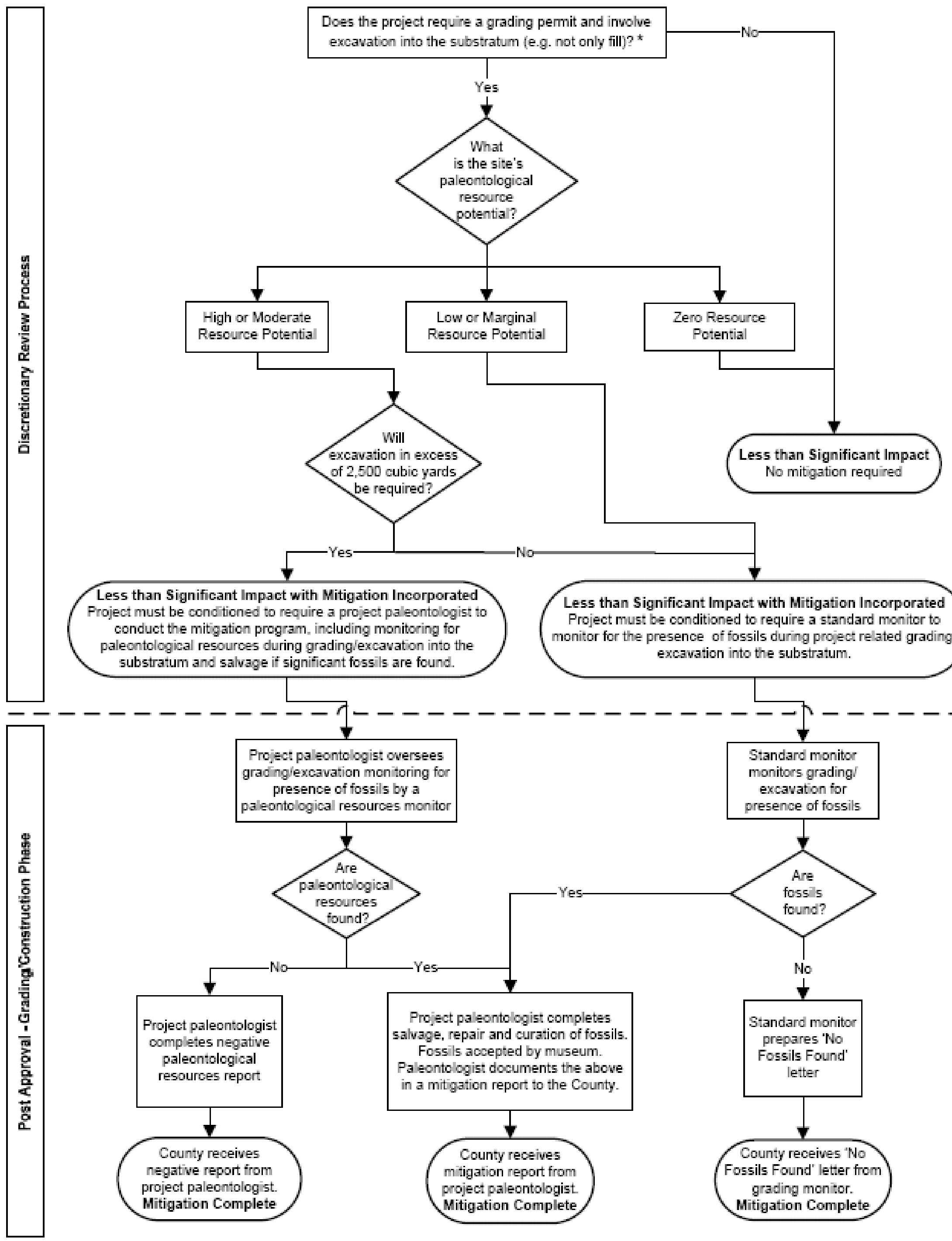


Source: USDA Natural Resources
Conservation Service

Major Soil Horizons
O = Organic horizon
A = Surface horizon
B = Subsoil
C = Substratum

Hard bedrock, which is not soil, uses the letter **R.**

Figure 8
Paleontological Resources CEQA Significance Determination and Mitigation Process



*Only excavation that penetrates the substratum can impact paleontological resources. If excavation would not penetrate the soil substratum, the applicant may be required to provide evidence of the depth of grading and the depth to the substratum. Consult staff paleontology specialist for guidance.

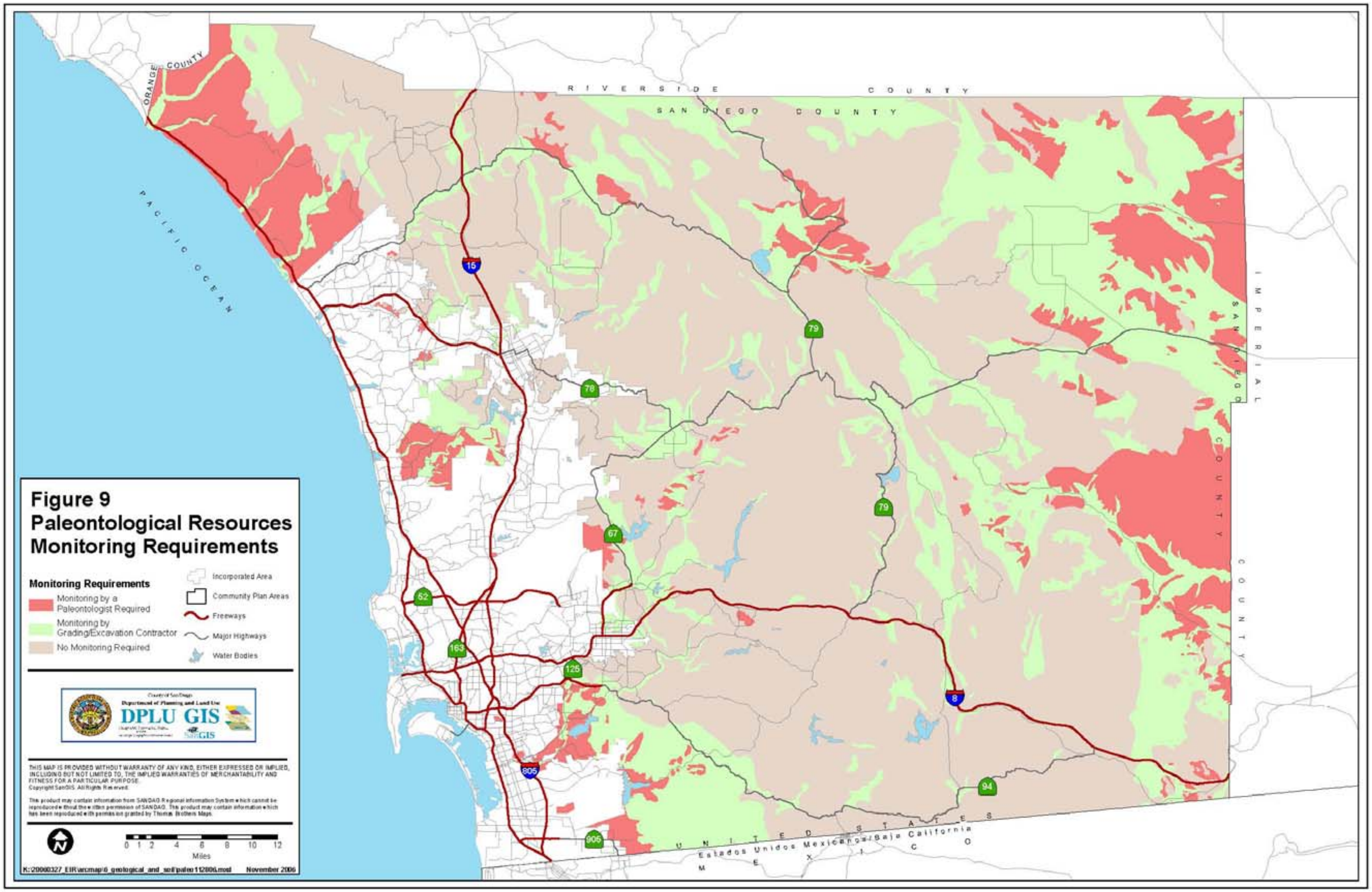


Figure 9
Paleontological Resources
Monitoring Requirements
Monitoring Requirements
Monitoring by a Paleontologist Required
Monitoring by Grading/Excavation Contractor
No Monitoring Required
Incorporated Area
Community Plan Areas
Freeways
Major Highways
Water Bodies
DPLU GIS
THIS MAP IS PROVIDED WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.
Copyright SanGIS. All Rights Reserved.
0 1 2 4 6 8 10 12
Miles
November 2006
RIVERSIDE COUNTY
SAN DIEGO COUNTY
ORANGE COUNTY
PACIFIC OCEAN
IMPERIAL COUNTY
UNITED STATES
Estados Unidos Mexicanos/Baja California
MEXICO
15
79
78
67
52
163
125
805
905
8
94

Figure 10
Examples of Uncurated and Curated Paleontological Resources*

a. Shell Bed in the Field

b. Cleaned and Curated Shells

c. Uncleaned Brontothere Skull

d. Partially Cleaned Brontothere Skull

e. Cleaned and Curated Brontothere Skull

* Photographs courtesy of the San Diego Natural History Museum.

[Attachment A]

DEFINITIONS

Alluvium – Relatively young, usually unlithified materials deposited by a variety of sedimentary processes, such as rivers, beaches, windstorms, etc.

Ammonite – An extinct group of coiled mollusks that lived during the Mesozoic Era.

Amynodont – An ancient ancestor to the rhino.

Ankylosaur – 'Stiff reptile', a four-legged armored dinosaur.

Arkose – Sandstones denoting high feldspar content. Feldspar is a common mineral in igneous and metamorphic rocks.

Artiodactyl – Even-toed ungulate.

Batholith – A great body of granitic rocks composed of many different plutons of crystallized magma.

Bathornithids – Extinct crane-like birds.

Belemnites – Squid-like carnivores with a soft body around an internal, pencil-shaped shell.

Biogeography – The branch of geology concerned with the separation and differentiation of rock units by means of the study of the fossils they contain.

Breccia – A sedimentary rock of lithified gravel in which the clasts are relatively sharp and angular.

Brontotheres – A family of large, rhinoceros-like mammals that were common in the Eocene and Oligocene and were ancestors of the horse, rhinoceros, and tapir.

Cenozoic – An era of geologic time from the beginning of the Tertiary period (65 million years ago) to the present. Its name is from Greek and means "new life."

Chevrotain – A small ruminant mammal.

Clasts – Pebbles, cobbles, or boulders.

Conglomerate – A sedimentary rock of lithified gravel in which the clasts are relatively rounded.

Correlative – having two spatially separate stratigraphic units that are equivalent in time.

Creodont – Carnivorous mammal of the Eocene, with scissor teeth that evolved to slice meat.

Cretaceous – The final period of the Mesozoic era, spanning the time between 145 and 65 million years ago. The name is derived from the Latin word for chalk ("creta") and was first applied to extensive deposits of this age that form white cliffs along the English Channel between Great Britain and France.

Crystalline – Rock composed of crystals that either formed directly from molten magma or lava (igneous rocks), or that formed under intense heat and pressure deep below the surface of the earth (metamorphic rocks).

Ecology – A branch of biology dealing with the relations between living plants and animals and their environment.

Ecosystem – The environment, its living parts, and the nonliving factors that affect it.

Eocene – An epoch of the lower Tertiary period, spanning the time between 55.5 and 33.7 million years ago. Its name is from the Greek words "eos" (dawn) and "ceno" (new).

Fanglomerate – A conglomerate or breccia that was originally deposited in an alluvial fan and has since become cemented into solid rock.

Fluvial – Relating to sedimentary deposition by rivers.

Foraminiferans – Tiny one-celled marine organisms that secrete a shell of calcium carbonate. Common as fossils in marine sedimentary rocks.

Formation – A lithostratigraphic unit whose major defining characteristics that it be mappable over an appreciable area. Formations can contain members, and several formations can comprise a group.

Fossil – The remains, trace, or imprint of an organism that has been preserved in the Earth's crust since some past geologic time (Neuendorf et al. 2005).

Fossiliferous deposit – that part of a rock unit or formation that contains a concentration of fossils.

Gabbro – A dark-colored plutonic rock characterized by relatively large amounts of iron and magnesium-bearing minerals.

Hadrosaur – Late Cretaceous duckbill dinosaur.

Holocene – An epoch of the Quaternary period, spanning the time from the end of the Pleistocene (8,000 years ago) to the present. It is named after the Greek words "holos" (entire) and "ceno" (new).

Ichnofossil – A trace fossil, such as that of an animal's track or burrow.

Jurassic – The middle period of the Mesozoic era, spanning the time between 213 and 145 million years ago. It is named after the Jura Mountains between France and Switzerland, where rocks of this age were first studied.

Leptoreodont – An ancient relative of pigs.

Lithologic Unit – A body of rock that is consistently dominated by a certain lithology or similar color, mineralogic composition, and grain size. It may be igneous, sedimentary, or metamorphic and may or may not be consolidated.

Lithology – The study or description of the composition and appearance of rocks.

Mesozoic – An era of geologic time between the Paleozoic and the Cenozoic, spanning the time between 248 and 65 million years ago. The word Mesozoic is from Greek and means "middle life."

Metamorphic rocks – Deeply buried igneous or sedimentary rocks altered by heat and pressure, now exposed at the surface of the earth as a result of uplift and erosion.

Miacid – Squirrel-sized carnivores, similar to modern day pine martens in appearance and behavior.

Miocene – An epoch of the upper Tertiary period, spanning the time between 23.8 and 5.3 million years ago. It is named after the Greek words "meion" (less) and "ceno" (new).

Mosasaur – Large, predaceous marine reptiles that lived during the Cretaceous Period.

Nimravid – An extinct mammalian, commonly called false sabre-tooth but not actually related to the sabre-tooths.

Oligocene – An epoch of the early Tertiary period, spanning the time between 33.7 and 23.8 million years ago. It is named after the Greek words "oligos" (little, few) and "ceno" (new).

Oreodont – Hoofed mammals (ungulates), distantly related to modern camels and swine.

Outcrop – An exposure of sedimentary or crystalline rock that can be inspected and studied.

Paleontology – The branch of science that deals with extinct and fossilized organisms.

Pacific Rim – A political and economic term used to designate the countries on the edges of the Pacific Ocean as well as the various island nations within the region.

Paleobiogeography – The branch of paleontology that deals with the geographic distribution of plants and animals in past geologic time, especially with regard to ecology, climate, and evolution.

Paleocene – Earliest **e**poch of the Tertiary period, spanning the time between 65 and 55.5 million years ago. It is named after the Greek words "palaois" (old) and "ceno" (new).

Paleoclimate – The climate of a given period of time in the geologic past.

Paleoecology – The study of the relationships between ancient plants and animals and their environments.

Paleoenvironment – Environment in the geologic past.

Paleontologist – Scientist who studies fossils.

Paleontology – The study of life in past geologic time based on fossil plants and animals and including phylogeny, their relationships to existing plants, animals, and environments, and the chronology of the Earth's history (Neuendorf et al. 2005).

Paleontological resource – The remains and/or traces of prehistoric life, exclusive of human remains, and including the localities where fossils were collected and the sedimentary formations from which they were obtained/derived.

Paleozoic – An era of geologic time, from the end of the Precambrian to the beginning of the Mesozoic, spanning the time between 544 and 248 million years ago. The word Paleozoic is from Greek and means "old life."

Pelagorni–thids – Giant late Eocene marine birds.

Permineralize – To replace the hard parts with minerals during fossilization.

Phylogeny – The evolutionary development and history of a species or higher taxonomic group of organisms.

Pleistocene – An epoch of the Quaternary period, spanning the time between 1.8 million years ago and the beginning of the Holocene at 8,000 years ago. It is named after the Greek words "pleistos" (most) and "ceno" (new).

Pliocene – Final epoch of the Tertiary period, spanning the time between 5.3 and 1.8 million years ago. It is named after the Greek words "pleion" (more) and "ceno" (new).

Pluton – Body of igneous rock formed beneath the surface of the earth by consolidation of magma.

Polychaete – A class of annelid worms, generally marine, with a pair of fleshy protrusions on each body segment that bear many bristles. Often called bristle worms.

Prosimian – Primitive primate of the suborder Prosimii, which includes the lemurs, lorises, galagos, and tarsiers. Of or relating to this suborder.

Protist – An organism that belongs to the kingdom Protista, which includes forms with both plant and animal affinities, i.e., protozoans, bacteria, and some algae, fungi, and viruses.

Protoreodont – Small pig like herbivore.

Provenance – Place of origin or earliest known history.

Quaternary – The second period of the Cenozoic era, spanning the time between 1.8 million years ago and the present. It contains two epochs: the Pleistocene and the Holocene. It is named after the Latin word "quatern" (four at a time).

Riverine – Of or on a river or river-bank; riparian.

Rudist – An extinct bivalve mollusk from the Jurassic and Cretaceous that had two different sized and shaped shells; they usually were attached to the substrate and were either solitary or in reef-like masses.

Sediment – Solid unconsolidated rock and mineral fragments that come from the weathering of rocks and are transported by water, air, or ice and form layers on the Earth's surface. Sediments can also result from chemical precipitation or secretion by organisms.

Sedimentary rock – A rock that is the result of consolidation of sediments.

Sensu lato – "In the broad sense."

Silurian – A period of the Paleozoic, spanning the time between 440 and 410 million years ago. It is named after a Celtic tribe called the Silures.

Stratigraphy – The branch of geology concerned with the formation, composition, ordering in time, and arrangement in space of sedimentary rocks.

Subfossil – Materials having living parts that can become fossils but whose fossilization process is not complete, either for lack of time or because the condition in which the materials were buried were not optimal for fossilization. Subfossil material comes from Quaternary deposits. The main importance of subfossil vs. fossil remains is that the former contain organic material, which can be used for radiocarbon dating or extraction and sequencing of DNA, protein, or other biomolecules.

Tertiary – The first period of the Cenozoic era (after the Mesozoic era and before the Quaternary period), spanning the time between 65 and 1.8 million years ago.

Test – Shell or supporting skeleton of an invertebrate, such as a foraminifera or echinoid.

Triassic – The earliest period of the Mesozoic era, spanning the time between 248 and 213 million years ago. The name Triassic refers to the threefold division of rocks of this age in Germany.

Type locality – location where the holotype (type specimen) was collected.

Volcaniclastics – Fragments derived from volcanic sources (which may be transported some distance from their place of origin

[Attachment B]

REGULATIONS AND STANDARDS

Federal Regulations and Standards

American Antiquities Act of 1906 [16 USC §431-433, http://www.cr.nps.gov/local-law/anti1906.htm]
The American Antiquities Act forbids, and establishes criminal sanctions for, the disturbance of any object of antiquity on federal land without obtaining a permit from an authorizing authority.

National Registry of Natural Landmarks [16 USC 461-467, http://www.eh.doe.gov/nepa/tools/guidance/Volume3/Regulations/36_CFR_62_NNL.pdf]
The National Natural Landmarks Program, established in 1962 under the authority of the Historic Sites Act of 1935, recognizes and encourages the conservation of outstanding examples our country's natural history. As the only natural areas program of national scope that identifies and recognizes the best examples of biological and geological features in both public and private ownership, National Natural Landmarks (NNLs) are designated by the Secretary of the Interior, with the owner's concurrence, as being of national significance, defined as being one of the best examples of a biological community or geological feature within a natural region of the U.S., including terrestrial communities, landforms, geological features and processes, habitats of native plant and animal species, or fossil evidence of the development of life (36 CFG 62.2). The National Park Service administers the NNL Program, and if requested, assists NNL owners and managers with the conservation of these important sites.

National Environmental Policy Act (NEPA) [42 USC §4321, http://www4.law.cornell.edu/uscode/42/ch55.html]
The National Environmental Policy Act of 1969 requires that paleontological and geological resources be considered when assessing the environmental impacts of proposed federal projects.

Federal Land Policy and Management Act of 1976 [43 USC §35, http://www4.law.cornell.edu/uscode/43/ch35schl.html]
The Federal Land Policy and Management Act of 1976 directs the Bureau of Land Management (BLM) to manage lands for multiple uses in a manner that will protect the quality of scientific, historical, and archaeological values. The Act also provides guidelines for the acquisition and management of these resources.

State Regulations and Standards

Public Resources Code [PRC §5097.5, http://ceres.ca.gov/nahc/statepres.html]
The California Public Resource Code states:

> No person shall knowingly and willfully excavate upon, or remove, destroy, injure or deface any historic or prehistoric ruins, burial grounds, archaeological or vertebrate paleontological site, including fossilized footprints, inscriptions made by human agency, or any other archaeological, paleontological or historical feature, situated on public lands, except with the express permission of the public agency having jurisdiction over such lands. Violation of this section is a misdemeanor.

As used in this section, "public lands" means lands owned by, or under the jurisdiction of, the state, or any city, county, district, authority, or public corporation, or any agency thereof.

PRC 5097-5097.6 - Archaeological, Paleontological and Historical Sites

PRC Section 5097-5097.6 outlines the requirements for cultural resource analysis prior to the commencement of any construction project on State Lands. The State Agency proposing the project may conduct the cultural resource analysis or they may contract with the State Department of Parks and Recreation. In addition, this section identifies that the unauthorized disturbance or removal of archaeological, historical, or paleontological resources located on public lands is a misdemeanor. It prohibits the knowing destruction of objects of antiquity without a permit (expressed permission) on public lands, and provides for criminal sanctions. This section was amended in 1987 to require consultation with the California Native American Heritage Commission (NAHC) whenever Native American graves are found. Violations for the taking or possessing remains or artifacts are felonies.

Professional Standards

Society for Vertebrate Paleontology

[http://www.vertpaleo.org/policy/policy_statement_conformable_Impact.htm]

The Society for Vertebrate Paleontology (1995) issued a draft set of "Standard Guidelines" that are now widely followed. The guidelines identify two key phases for protecting vertebrate paleontological resources from project impacts: 1) Assess the likelihood that the project's area of potential effect contains significant paleontological resources that could be directly or indirectly impacted, damaged, or destroyed as a result of the project, and 2) Formulate and implement measures to mitigate potential adverse impacts.

[Attachment C]

GEOLOGIC MAP LIST

The following geologic quadrangle maps may be consulted for further geologic information. Some of these are available only online via the internet. An up to date listing of digital geologic quadrangle maps produced by the California Geological Survey (previously the California Division of Mines and Geology) can be found at:

http://www.consrv.ca.gov/cgs/rghm/rgm/southern_region_quads.htm

Published (Paper) Maps, CDs and 1:100,000 Scale Maps

Brooks, Baylor, and Roberts, Ellis. Geology of the Jacumba area, San Diego and Imperial Counties, *in* Jahns, R. H., ed., Geology of southern California. California Division of Mines, Bulletin 170: map sheet no. 23 (scale 1:62,500). 1954.
[= *Jacumba* 1:62,500 scale quadrangle]

Cassiliano, M. L. Revision of the stratigraphic nomenclature of the Plio-Pleistocene Palm Spring Group (new rank), Anza-Borrego Desert, southern California. Proceedings of the San Diego Society of Natural History, 38: 1-30, figs. 1-22, pl. 1 (map sheet, scale ~1:28,570). 2002.
[*Arroyo Tapiado* and *Carrizo Mountain NE* [western part] 1:24,000 scale quadrangles; parts of adjoining quads]

Hoggatt, W. C. Geologic map of Sweeney Pass quadrangle, San Diego County, California. U. S. Geological Survey, Open-File Report 79-754: [report? +] map sheet[s] (scale 1:24,000). 1979.
[*Sweeney Pass* 1:24,000 scale quadrangle]

Hoggatt, W. C., and Todd, V. R. Geologic map of the Descanso quadrangle, San Diego County, California. U. S. Geological Survey, Open-File Report 77-406: [report? +] map sheet(s) (scale 1:24,000). 1977.
[*Descanso* 1:24,000 scale quadrangle]

Kennedy, M. P. Geology of the western San Diego metropolitan area, California. Del Mar, La Jolla, and Point Loma quadrangles. Section A, *of* Geology of the San Diego metropolitan area, California. California Division of Mines and Geology, Bulletin 200: 7-39, figs. 1-9, photos 1-8, pls. 1A-3A (map sheets, scale 1:24,000), table 1. 1975.
[*Del Mar, La Jolla* and *Point Loma* 1:24,000 scale quadrangles]

Kennedy, M. P., and Peterson, G. L. Geology of the eastern San Diego metropolitan area, California. La Mesa, Poway, and SW1/4 Escondido quadrangles. Section B *of* Geology of the San Diego metropolitan area, California. California Division of Mines and Geology, Bulletin 200: 41-56, figs. 1-3, pls. 1B-3B [map sheets, scale 1:24,000], tables 1-2. 1975.
[*La Mesa, Poway,* and *Escondido* [SW1/4] 1:24,000 scale quadrangles]

Kennedy, M. P., and Tan, S. S. Geology of National City, Imperial Beach and Otay Mesa quadrangles, southern San Diego metropolitan area, California. California Division of Mines and Geology, Map Sheet 29: 1 map sheet, scale 1:24,000. 1977.
[*National City, Imperial Beach* and *Otay Mesa* 1:24,000 scale quadrangles]

Geologic map of the Oceanside 30' x 60' quadrangle, California. California Geological Survey, Regional Geologic Map Series, 1:100,000 scale, Map no. 2: 2 sheets. 2005.
[*Oceanside 30' x 60'* quadrangle, scale 1:100,000]
[<http://www.consrv.ca.gov/cgs/rghm/rgm/southern_region_quads.htm>]

Geologic map of the San Diego 30' x 60' quadrangle, California. California Geological Survey, Regional Geologic Map Series, 1:100,000 scale, Map no. 3: 2 sheets. 2005.
[*San Diego 30' x 60'* quadrangle, scale 1:100,000]

[<http://www.consrv.ca.gov/cgs/rghm/rgm/southern_region_quads.htm>]

Merriam, R. H. Geology of Santa Ysabel [15'] quadrangle, San Diego County, California. California Division of Mines, Bulletin 177: 7-20, figs. 1-xxx, pls. 1-xxx (pl. 1, map sheet, scale 1:62,500). 1958.
[*Santa Ysabel* 1:62,500 scale quadrangle]

Tan, S. S., and Kennedy, M. P. Geologic maps of the northwestern part of San Diego County, California. California Division of Mines and Geology, DMG Open-File Report 96-02: pls. 1-2 (map sheets, scale 1:24,000, with limited text). 1996.
[*Oceanside, San Luis Rey, San Marcos, Encinitas,* and *Rancho Santa Fe* 1:24,000 scale quadrangles]

Theodore, T. G., and Sharp, R. V. Geologic map of the Clark Lake quadrangle, San Diego County, California. U. S. Geological Survey, Miscellaneous Field Studies Map MF-644: 1 sheet (scale 1:24,000). 1975.
[*Clark Lake* 1:24,000 scale quadrangle] [Anza Borrego area]

Todd, V. R. Geologic map of the Cuyamaca Peak 7 1/2-minute quadrangle, San Diego County, California. U. S. Geological Survey, Open-File Report 77-405: [report? +] map sheet(s) (scale 1:24,000). 1977a.
[*Cuyamaca Peak* 1:24,000 scale quad]

Geologic map of the Agua Caliente Springs quadrangle, San Diego County, California. U. S. Geological Survey, Open-File Report 77-742: [report? +] map sheet(s) (scale 1:24,000). 1977b.
[*Agua Caliente Springs* 1:24,000 scale quad]

Geologic map of the Viejas Mountain quadrangle, San Diego County, California. U. S. Geological Survey, Open-File Report 78-113: [report? +] map sheet, scale 1:24,000. 1978a.
[*Viejas Mountain* 1:24,000 scale quad]

Geologic map of the Monument Peak quadrangle, San Diego County, California. U. S. Geological Survey, Open-File Report 78-697: [report? +] map sheet, scale 1:24,000. 1978b.
[*Monument Peak* 1:24,000 scale quad]

Geologic map of the Mount Laguna 71/2-minute quadrangle, San Diego County, California. U. S. Geological Survey, Open-File Report 79-862: [report? +] map sheet[s] (scale 1:24,000). 1979.
[*Mount Laguna* 1:24,000 scale quadrangle]

Geologic map of the Alpine quadrangle, San Diego County, California. U. S. Geological Survey, Open-File Report 80-82: [report? +] map sheet[s] (scale 1:24,000). 1980.
[*Alpine* 1:24,000 scale quadrangle]

Geologic map of the Tule Springs quadrangle, San Diego County, California. U. S. Geological Survey, Open-File Report 82-221: [report? +] 1 sheet (scale 1:24,000). 1982.
[*Tule Springs* 1:24,000 scale quadrangle]

Geologic map of the El Cajon Mountain quadrangle, San Diego County, California. U. S. Geological Survey, Open-File Report 83-781: [report? +] map sheet – scale 1:24,000. 1984.
[*El Cajon Mountain* 1:24,000 scale quadrangle]

Geologic map of the Mount Laguna [15'] quadrangle, San Diego County, California. U. S. Geological Survey, Open-File Report 95-522: [report? +] map sheet(s) (scale 1:62,500). 1995.
[*Mount Laguna* 1:62,500 scale quadrangle]

Todd, V. R., compiler. Preliminary geologic map of the El Cajon 30' x 60' quadrangle, southern California, version 1.0. U. S. Geological Survey, Open-File Report 2004-1361: 1-30, sheets 1-2 (scale 1:100,000). 2004.
[*El Cajon 30' x 60'* quadrangle, scale 1:100,000]
[< http://pubs.usgs.gov/of/2004/1361/>]

Wagner, D. L. Geologic map of the Tubb Canyon 7.5-minute quadrangle, San Diego County, California. California Geological Survey, CD-Rom CD 2000-008. 2000.
[*Tubb Canyon* 1:24,000 scale quadrangle] [Anza Borrego area]

Weber, F. H., Jr. Geology and mineral resources of San Diego County, California. California Division of Mines and Geology, County Report 3: 1-309, figs. 1-59, photos 1-89, pls. 1-11, tables 1-3. [Title page reads "Geology and mineral resources …"; cover title reads "Mines and mineral resources …".] 1963.
[Map of entire county, scale ~1:124,750]

Digital Maps

Digital geologic maps (1:24,000 scale) are available from the California Geological Survey for the following 7.5 minute quadrangles at:

<http://www.consrv.ca.gov/cgs/rghm/rgm/southern_region_quads.htm>.

Others are in the process of being prepared.

Quadrangles for which Digital Geologic Maps are Available		
Aguanga	Las Pulgas Canyon	San Clemente
Bonsall	Margarita Peak	San Onofre Bluff
El Cajon	Morro Hill	San Vicente Reservoir
Escondido	Otay Mesa	Temecula
Fallbrook	Pala	Vail Lake
Jamul Mountains	Pechanga	Valley Center

[Attachment D]

PALEONTOLOGICAL RESOURCES MITIGATION REPORT OUTLINE

COVER PAGE

TABLE OF CONTENTS

GLOSSARY OF TERMS AND ACRONYMS

EXECUTIVE SUMMARY

1.0 INTRODUCTION
- **1.2 Project Description**
- **1.3 Personnel**

2.0 METHODOLOGY
- **2.1 Field Methods**
  - **2.1.1 Monitoring**
  - **2.1.2 Fossil Salvage**
  - **2.1.3 Stratigraphic Data Collection**
  - **2.1.4 Resource Potential/Sensitivity**
- **2.2 Laboratory Methods**
  - **2.2.1 Specimen Preparation**
  - **2.2.2 Curation**

3.0 MONITORING RESULTS
- **3.1 Stratigraphy**
  - **3.1.1 ____ Formation**
  - **3.1.2 ____ Formation**
  - **3.1.3 ____ Formation**
  - **3.1.4 …etc.**
- **3.2 Paleontological Resources Collecting Localities**
  - **3.2.1 Locality # ___**
  - **3.2.2 Locality # ___**
  - **3.2.3 Locality # ___**
  - **3.2.4 …etc.**

4.0 ANALYSIS RESULTS
- **4.1 Geologic Setting**
- **4.2 Paleontology**
  - **4.2.1 Previous Finds**
  - **4.2.2 Invertebrate Fauna**
  - **4.2.3 Vertebrate Fauna**
  - **4.2.4 Flora**
- **4.3 Paleoclimate**
- **4.4 Biochronology**

5.0 SIGNIFICANCE OF PALEONTOLOGICAL RESOURCES

6.0 DISPOSITION OF THE SALVAGED AND CURATED PALEONTOLOGICAL RESOURCES

7.0 REFERENCES

ATTACHMENTS

[Appendix E]

Sample 'No Fossils Found' Letter

This letter is to be prepared on company letterhead and signed by the person who monitored excavation on the site:

Permit Compliance Coordinator
County of San Diego
Department of Planning and Land Use
5201 Ruffin Road, Suite B
San Diego, CA 92123

Reference: (Project Common Name, Permit Numbers/DPLU Environmental Log No.)

Permit Compliance Coordinator:

I hereby certify that excavation below the soil horizons was monitored for fossils in accordance with the requirements of the County of San Diego Guidelines for Determining Significance for Paleontological Resources and that no fossils were found. Grading and/or excavation began on (date) and ended on (date). Approximately __ cubic yards were excavated on the project site.

Monitoring was conducted by:

Name of monitor(s):
Monitor's contact information:

If you have any questions, please contact me at:

Sincerely,

(Name)
(Title)

[Attachment F]

SUMMARY OF MODIFICATIONS AND REVISIONS

Guidelines for Determining Significance for Paleontological Resources were originally approved on March 19, 2007. The following is a summary of revisions made since original document approval.

First Modification, January 15, 2009, by Bobbie Stephenson, Land Use/Environmental Planner and approved by Eric Gibson, DPLU Director:

- Clarified definition of a unique paleontological resource;
- Updated text to be consistent in using the terms Project Paleontologist, Paleontological Resources Monitor, and Standard Monitor;
- Clarified text to ensure that monitoring is required only for initial cutting, grading or excavation into the substratum;
- Corrected the flowchart to follow mitigation requirements outlined in the text; and
- In Attachment B, Regulations and Standards, deleted Proposed Paleontological Resources Preservation Act because it has not been enacted and added PRC 5097-5097.6 – Archaeological, Paleontological and Historic Sites because it pertains to paleontological resources.