PALEONTOLOGICAL RESOURCES ASSESSMENT
OF THE PROPOSED LONG BEACH UNIFIED SCHOOL DISTRICT FACILITY MASTER PLAN,
CITY OF LONG BEACH, COUNTY OF LOS ANGELES, CALIFORNIA

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Chilao Flat, Long Beach, Los Alamitos, Torrance, Santa Catalina East, and South Gate, CA United States
Geological Survey 7.5' Quadrangles

January 2017
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EXECUTIVE SUMMARY

The Long Beach Unified School District (the “District” or “LBUSD”) is preparing environmental documentation for the proposed Facility Master Plan (the “Plan”) (see Long Beach Unified School District 2008 and Updates 2013 and 2016). The Plan would include various improvements to 94 schools and 12 administrative facilities throughout the District. Excavations associated with these improvements could have the potential to impact paleontological resources.

PCR Services Corporation (PCR) conducted a paleontological resources assessment of the facility locations to determine the potential impacts to paleontological resources and to develop management guidelines and mitigation measures to avoid, reduce, or mitigate potential impacts for the purpose of partially complying with the paleontological resources requirements of the California Environmental Quality Act (CEQA). The scope of work for this assessment included a paleontological resources records search through the Natural History Museum of Los Angeles County (NHMLAC), and a review of paleontological literature and geologic maps.

No known paleontological resources have been identified from the NHMLAC records within a school or administrative site; however, multiple fossil localities have been identified in the vicinity of the facilities at various depths (from five feet to 60 feet below the ground surface) in the fossiliferous older Quaternary Alluvium deposits that currently underlie the facility locations at depth. The surficial deposits at the facility locations primarily consist of younger Quaternary Alluvium deposits which are unlikely to contain paleontological resources given the young age of these deposits (e.g., Holocene Epoch, or present day to 12,000 years before present). Therefore, shallow excavations associated with the improvements are unlikely to impact paleontological resources. However, deeper excavations into the deeper and older Quaternary Alluvium deposits at the facility locations have the potential to impact paleontological resources. As a result, recommended mitigation measures are provided in Chapter 8 of this report that would reduce potentially significant impacts to previously unknown paleontological resources that are unexpectedly discovered during project implementation to a less than significant level.
1.0 INTRODUCTION

1.1 PROPOSED PROJECT AND LOCATION

The District is proposing to implement the District Facility Master Plan which would include various improvements to school and administrative facilities throughout the District. The majority of the facilities are located within the City of Long Beach, while others are located on Santa Catalina Island and in the Angeles National Forest (Figure 1, Regional Map). The facility locations are depicted in multiple Townships, Ranges, and Sections of the Chilao Flat, Long Beach, Los Alamitos, Torrance, Santa Catalina East, and South Gate, California, United States Geological Survey (USGS) 7.5’ topographic quadrangle maps (Figure 2, Vicinity Map). As shown in Figure 3, Aerial Photograph, the majority of the facilities are located in dense urban settings, but Camp Hi Hill is located within a wilderness area surrounded by open space.

1.2 PROJECT DESCRIPTION

The Plan proposes many potential improvements to numerous school and administrative facilities within the boundaries of the District. These improvements have been classified into the following categories: New Building, Major Renovation, Moderate Renovation, Minor Renovation, and General Maintenance. The specific types of activities associated with each of these categories are defined in more detail, as follows:

**New Building:** Entails building a new school facility either on the same site as an existing facility or at a new location.

**Major Renovation:** Includes creating appropriate learning environments and extensive renovation to bring the building up to current codes and may include an addition. This would include replacement or upgrades to building components (handicapped accessibility, heating/ventilation/air conditioning, roof, electrical, windows, flooring, ceiling, lighting, technology infrastructure) and interior reconfiguration of space to support educational programs. After having undergone a major renovation, an existing building would be comparable to a new building.

**Moderate Renovation:** Includes creating appropriate learning environments and bringing a school building up to current codes. The amount of work to be completed would be less extensive than a major renovation. This could include replacement or upgrades to building components (handicapped accessibility, heating/ventilation/air conditioning, roof, electrical, windows, flooring, ceiling, lighting, technology infrastructure) and some interior reconfiguration of space to support educational programs. This level of renovation would primarily focus on addressing code requirements.

**Minor Renovation:** Includes selective upgrades of some systems or building components. This renovation could include replacement or repair to one or more building systems such as: boilers, heating/ventilation, roofing, flooring, ceiling, lighting, electrical upgrades or painting. It may also include some minor reconfiguration of interior spaces.

**General Maintenance:** The ongoing maintenance and upkeep of a building, extending its useful life. Some of these funds are budgeted on an annual basis as part of the district’s maintenance and operations budget.
Excavations associated with these proposed improvements have the potential to impact paleontological resources. These impacts are discussed in Chapter 7 of this report.

1.3 SCOPE OF STUDY AND PERSONNEL

PCR conducted a paleontological resources assessment of the Plan from October 2012 through January 2013 to identify potential impacts to paleontological resources and to develop management guidelines and mitigation measures to avoid, reduce, or mitigate potential impacts for the purpose of partially complying with the paleontological resources requirements of CEQA. The scope of this assessment included a paleontological resources records search through the NHMLAC, and a review of paleontological literature and geologic maps.

The paleontological resources assessment was conducted by Mr. Kyle Garcia, Mr. Gavin Archer, M.A., RPA, and Dr. Michael Williams, Ph.D. Project management and quality control was overseen by Mr. Archer. Dr. Williams conducted additional geological research and assisted in the preparation of Chapter 3. The records search was commissioned through the NHMLAC by Mr. Garcia who also assisted in the preparation of this report. The records search was conducted by Dr. Samuel A. McLeod, Ph.D., Collections Manager, Vertebrate Paleontology, at the NHMLAC. Qualifications of key personnel are provided in Appendix A.
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2.0 REGULATORY SETTING

The majority of the laws and regulations regarding paleontological resources are implemented at the federal level and include protection measures on federal lands (i.e., federally managed lands such as those of the U.S. Bureau of Land Management) and do not pertain to the District; therefore, these federal laws and regulations are not be discussed in this report. CEQA is the primary state law governing and affecting the management and protection of paleontological resources on the state level and CEQA-mandated preservation of paleontological resources is described below.

2.1 STATE LEVEL

2.1.1 California Environmental Quality Act

CEQA is the principal statute governing environmental review of projects occurring in the State. CEQA requires lead agencies to determine if a proposed project would have a significant impact on paleontological resources. In particular, Appendix G (part V) of the CEQA Guidelines provides guidance relative to significant impacts on paleontological resources, states that “a project will normally result in a significant impact on the environment if it will...directly or indirectly destroy a unique paleontological resource or site or unique geologic feature.”

The CEQA Guidelines do not define “directly or indirectly destroy,” but it can be reasonably interpreted as the physical damage, alteration, disturbance, or destruction of a paleontological resource. The CEQA Guidelines also do not define the criteria or process to determine whether a paleontological resource is significant or “unique.” Some state agencies, such as the California Department of Transportation (Caltrans), have developed their own “significance criteria”, as follows:

National - a National Natural Landmark eligible paleontological resource is an area of national significance (as defined under 36 CFR 62) that contains an outstanding example of fossil evidence of the development of life on earth. This is the only codified definition of paleontological significance.

Scientific - definitions of a scientifically significant paleontological resource can vary by jurisdictional agency and paleontological practitioner.

According to Caltrans Standard Environmental Reference (SER) for Paleontology (Caltrans 2008), scientifically significant paleontological resources are identified sites or geologic deposits containing individual fossils or assemblages of fossils that are unique or unusual, diagnostically or stratigraphically important, and add to the existing body of knowledge in specific areas, stratigraphically, taxonomically, or regionally (Reynolds, 1990:6 in Caltrans 2008). Particularly important are fossils found in situ (undisturbed) in primary context (e.g., fossils that have not been subjected to disturbance subsequent to their burial and fossilization). As such, they aid in stratigraphic correlation, particularly those offering data for the interpretation of tectonic events, geomorphological evolution, paleoclimatology, the relationships between aquatic and terrestrial species, and evolution in general. Discovery of in situ fossil bearing deposits is rare for many species, especially vertebrates. Terrestrial vertebrate fossils are often assigned greater significance than other fossils because they are rarer than other types of fossils. This is primarily due to the fact that the best conditions for fossil preservation include little or no disturbance after death and quick burial in oxygen.
depleted, fine-grained sediments. While these conditions often exist in marine settings, they are relatively rare in terrestrial settings (e.g., as a result of pyroclastic flows and flashflood events). This has ramifications on the amount of scientific study needed to adequately characterize an individual species and therefore affects how relative sensitivities are assigned to formations and rock units.

Nevertheless, the lead agency shall determine the criteria or process to evaluate the significance of a paleontological resource and they shall determine whether a given paleontological resource is significant or “unique.”
3.0 GEOLOGICAL AND PALEONTOLOGICAL CONTEXT

This chapter reviews the geological and paleontological conditions at the facility locations and in surrounding areas, and briefly describes the major known paleontological resources in the areas. The discussion is divided into the coastal mainland, Catalina Island, and San Gabriel Mountains portions of the District.

3.1 COASTAL MAINLAND

The City of Long Beach (the “City”) is located within the Peninsular Ranges Geomorphic Province (Norris and Webb 1990; California Geological Survey 2002). This province extends from the transverse ranges (i.e. the San Gabriel and San Bernardino Mountains) in the north to Lower California in the south. On the east it is bordered by the Colorado Desert Geomorphic Province (California Geological Survey 2002).

The area is tectonically dominated by the Newport-Inglewood Fault Zone, which extends along the entire coast of the City, roughly paralleling the coastline. Movement along this fault is responsible for the devastating Long Beach earthquake in 1933. Minor uplifts along the fault zone occur in Signal Hill and the Dominguez Hills.

According to the geological mapping of Saucedo et al. (2003), the surficial deposits of the City are mainly divided into older paralic deposits (Qop), and young alluvial fan and valley deposits (Qyf). Old alluvial floodplain deposits (Qoa) crop out in the northwest corner of the City, and the area’s bays and harbors are surrounded by artificial fill (Saucedo et al. 2003). Old paralic deposits crop out along the coast, are late to middle Pleistocene age, and consist of mostly poorly-sorted, reddish brown sands, silts, and clays. The majority of the surficial deposits in the Long Beach area are comprised of Holocene young alluvial fan and valley deposits that are not well-sorted, and consist of sands, silts, and clays (ibid.).

While the young alluvial fan and valley deposits are generally too young to yield scientifically significant fossils, the old paralic deposits and old alluvial floodplain deposits are Pleistocene age, and have produced fossils. Marine mollusks have been observed in the older paralic deposits in Signal Hill and nearby Bolsa Chica wetlands (Pers. Obs.). Table 1 lists fossil vertebrate specimens reported by Jefferson (1991a, b) nearest to facility locations.

Although the young alluvial fan and valley deposits are not old enough to yield significant paleontological resources, it must be considered that old alluvial floodplain and paralic deposits underlie the surficial young alluvial fan and valley deposits, and excavations into and through these surficial deposits have the potential encounter paleontological resources.

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1 By Michael J. Williams, Ph.D.
2 Interfingered marine and continental sediments
### Table 1

**Fossil Vertebrate Specimens Reported by Jefferson (1991a, b) Near Facilities**

<table>
<thead>
<tr>
<th>Location</th>
<th>Locality Identifier</th>
<th>Fossil Specimens</th>
<th>Geologic Formation (Age)</th>
<th>Nearest Facilities (Approximate Miles From Facility)</th>
</tr>
</thead>
<tbody>
<tr>
<td>S Alameda St and 223rd St, Long Beach</td>
<td>Unknown</td>
<td>Camelidae (camel), Proboscidea (mammoth)</td>
<td>Rancholabrean (Late Pleistocene)</td>
<td>Webster (0.73), CDC/CDS – The Willows (0.83)</td>
</tr>
<tr>
<td>Anaheim St. and Henry Ford Boulevard, Wilmington</td>
<td>LACM 1163</td>
<td><em>Bison</em> sp.</td>
<td>Rancholabrean (Late Pleistocene)</td>
<td>Cabrillo (1.40)</td>
</tr>
<tr>
<td>Bixby Park, Long Beach</td>
<td>LACM 1005</td>
<td><em>Mammuthus</em> sp. cf. <em>M. columbi</em> (mammoth)</td>
<td>Rancholabrean</td>
<td>Burbank (0.48)</td>
</tr>
<tr>
<td>Bixby Road between Atlantic and Orange Avenues, Long Beach</td>
<td>Unknown</td>
<td>?<em>Mammuthus</em> sp. (mammoth)</td>
<td>Rancholabrean (Late Pleistocene)</td>
<td>Hughes (0.15), Longfellow (0.15)</td>
</tr>
<tr>
<td>Cherry Avenue and Spring St., Long Beach</td>
<td>Unknown</td>
<td><em>Mammuthus</em> sp. (mammoth)</td>
<td>Rancholabrean</td>
<td>Burroughs (0.46), Nutrition Services (0.79)</td>
</tr>
<tr>
<td>Dominguez Hills</td>
<td>LACM 1643</td>
<td><em>Mammuthus</em> sp. (mammoth)</td>
<td>Rancholabrean</td>
<td>CAMS (&lt;0.10)</td>
</tr>
<tr>
<td>Long Beach near Belmont Pier</td>
<td>LACM 2031</td>
<td><em>Tapirus</em>, <em>Bison</em> sp. cf. <em>B. antiquus</em> (bison)</td>
<td>Rancholabrean</td>
<td>Mann (0.51), Fremont (0.72), Lowell (0.91)</td>
</tr>
<tr>
<td>Miramar Street, Long Beach</td>
<td>Unknown</td>
<td>Proboscidea (mammoth)</td>
<td>Rancholabrean</td>
<td><em>Specific locational information not provided</em></td>
</tr>
<tr>
<td>Pine Avenue and 12th Street</td>
<td>LACM 3550</td>
<td>Camelidae (camel)</td>
<td>Rancholabrean</td>
<td>Washington (0.19), Renaissance (0.28), PAAL (0.33), Personnel Commission (0.42), Poly (0.52), Cedar (0.52)</td>
</tr>
<tr>
<td>Pixie Avenue and Cover Street, Lakewood</td>
<td>Unknown</td>
<td><em>Mammuthus</em> sp. (mammoth)</td>
<td>Rancholabrean</td>
<td>Madison (0.77), Hughes (0.88), Hoover (0.98)</td>
</tr>
<tr>
<td>Signal Hill North, Long Beach</td>
<td>Unknown</td>
<td>Specimens not listed</td>
<td>Age not given</td>
<td>Near Alvarado, Browning, Butler (Roosevelt), Signal Hill, GTE Site (Nelson Academy)</td>
</tr>
<tr>
<td>Signal Hill, Long Beach</td>
<td>Unknown</td>
<td><em>Equus</em> sp. (horse)</td>
<td>Rancholabrean</td>
<td>Near Alvarado, Browning, Butler (Roosevelt), Signal Hill, GTE Site (Nelson Academy)</td>
</tr>
</tbody>
</table>
Table 1 (Continued)

Fossil Vertebrate Specimens Reported by Jefferson (1991a, b) Near Facilities

<table>
<thead>
<tr>
<th>Location</th>
<th>Locality Identifier</th>
<th>Fossil Specimens</th>
<th>Geologic Formation</th>
<th>Nearest Facilities</th>
<th>(Approximate Miles From Facility)</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S. Veterans Hospital, Long Beach</td>
<td>LACM 3757</td>
<td><em>Thomomys</em> sp., <em>Canis</em> sp. cf. <em>C. latrans</em>, <em>Equus</em> sp., <em>Hemiauchenia</em> sp., cf. <em>Clemmys</em> sp., Squamata, <em>Gavia</em> sp., <em>Chendytes lawi</em>&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Palos Verdes Sand&lt;sup&gt;b&lt;/sup&gt;/Rancholabrean</td>
<td>Kettering (0.75), Lowell (0.80), Hill (0.86), Gant (1.0)</td>
<td></td>
</tr>
</tbody>
</table>

<sup>a</sup> See Table 3 for common names for these specimens<br>
<sup>b</sup> The Palos Verdes Sand formation is a Quaternary marine terrace deposit that is equivalent to the old paralic deposits of Saucedo et al. (2003)

Source: PCR Services Corporation, 2013

### 3.2 SANTA CATALINA ISLAND

Santa Catalina Island is an exposed ridge crest in the California continental borderland geomorphic province (Rowland 1984). The province, a region of northwest-southeast trending basins and ridges, is largely submerged. The island's geology consists mostly of a Mesozoic metamorphic basement complex intruded and overlain by Miocene igneous rocks with minor deposits of Tertiary sedimentary rocks.

Catalina Schist, a Mesozoic metamorphic complex comprised of blueschist, greenschist, and amphibolite derived from mafic igneous and sedimentary rocks, makes up most of the geology of the northwestern half of the island (ibid.). Catalina Schist has been dated to 95-109 million years ago during the uppermost Low Cretaceous.

Three marine sedimentary units, intruded by Miocene dacitic and gabbroic dikes and sills, and overlain by non-marine redbeds (sandstone, conglomerate, and mudstone) are exposed at the eastern tip of the island (ibid.). The uppermost, a Miocene breccia, is underlain by two unnamed middle Miocene units. The lowermost contains burrows similar to those in Lower Cretaceous through Eocene strata known elsewhere.

Quartz diorites of the Catalina pluton are exposed throughout most of the southeastern portion of the island (ibid.). The pluton has yielded an oldest date of 19 million years ago in the late Miocene, but is estimated to range in age from 19 to 14 million years old in the middle Miocene.

Outcrops at the eastern tip of the island and in the eastern isthmus compare favorably, but not exactly, with lower and middle Miocene San Onofre Breccia (ibid.). The breccia was deposited from an eroded Catalina Schist source area.

About one-quarter of the island is covered with andesitic and dacitic domes of volcanic rocks which are the remnants of a small volcanic archipelago (ibid.). They are believed to represent a 3-4 million-year-long...
volcanic episode. Middle Miocene sedimentary rocks which occur within the volcanic sequence are fossiliferous and include diatoms, foraminifera, smelt and herring scales, and mollusks.

In the Mount Banning area, southeast of Little Harbor, are outcrops of very fossiliferous, middle Miocene volcaniclastic sediments (ibid.). They include sea urchin spines, ostracodes, foraminifera, bryozoa, barnacles, brachiopods, snails, and clams.

Thin beds of tuffaceous sandstone and siltstone underlying Quaternary terrace deposits are exposed on a ridge near Little Harbor (ibid.). Both the older upper Miocene and younger Pliocene beds include fossils of benthic foraminifers.

### 3.3 SAN GABRIEL MOUNTAINS

Camp Hi-Hill is located in the upper West Fork San Gabriel River canyon below and to the northeast of San Gabriel Peak and Mount Disappointment, and within the California transverse ranges geomorphic province. The San Gabriel Mountains are a fault-bounded block of ancient crystalline rocks (SCAMP 2004). Upper-plate and lower-plate rocks are separated by the Vincent Thrust.

Lower-plate rocks are a complex of metamorphosed marine sedimentary and volcanic rocks known as the Pelona Schist (SCAMP 2004). The Pelona Schist is believed to date to the late Cretaceous or early Paleozoic. Upper-plate rocks, most common in the western and central areas of the range, are very old (Proterozoic) metamorphic and plutonic rocks intruded by various Mesozoic plutonic events. In the southeastern area of the range, a belt of mylonite overlies a terrane of metamorphosed sedimentary rock, and associated plutonic rocks and high grade metamorphic rocks. Throughout the range, most canyon sides are covered by unstable hill-slope rock debris. Lower elevations are covered by younger Quaternary Alluvium alluvial fan deposits derived from higher elevations (McLeod 2012).
4.0 METHODS

4.1 PALEONTOLOGICAL RESOURCES RECORDS SEARCH

On October 4, 2012, Mr. Garcia commissioned a paleontological resources records search through the NHMLAC in Los Angeles, California. This institution maintains files of regional paleontological site records as well as supporting maps and documents. This records search entailed an examination of current geologic maps and known fossil localities inside and within the general vicinity of the District. The objective of the records search was to determine the geological formations underlying District facilities, whether any paleontological localities have previously been identified within the District or in the same or similar geologic formations near the District, and the potential for construction excavations associated with the Plan to encounter paleontological resources.

The paleontological records search was conducted by Dr. Samuel A. McLeod, Collections Manager, Vertebrate Paleontology Department, at the NHMLAC. The NHMLAC collections include over 150,000 catalogued specimens of fossil vertebrates, primarily from California. They include representatives of every class of fossil vertebrates ranging in age from the Ordovician to late Pleistocene. The invertebrate paleontology database contains information on almost 30,000 fossil invertebrate localities and over 1.2 million specimens.

The paleontological records are indexed using USGS 1:24,000-scale topographic maps, also known as 7.5-minute quadrangles (1 inch = 2,000 feet). The area portrayed on each sheet ranges from 64 square miles at latitude 30 degrees north to 49 square miles at latitude 49 degrees north. Eight 7.5-minute quadrangles were searched as shown on Table 2, Searched Quadrangles, below.

<table>
<thead>
<tr>
<th>LBUSD Areas</th>
<th>7.5-Minute Quadrangles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coastal Mainland</td>
<td>Long Beach</td>
</tr>
<tr>
<td></td>
<td>Los Alamitos</td>
</tr>
<tr>
<td></td>
<td>South Gate</td>
</tr>
<tr>
<td></td>
<td>Torrance</td>
</tr>
<tr>
<td>San Gabriel Mountains</td>
<td>Chilao Flat</td>
</tr>
<tr>
<td>Santa Catalina Island</td>
<td>Santa Catalina East</td>
</tr>
<tr>
<td></td>
<td>Santa Catalina North</td>
</tr>
<tr>
<td></td>
<td>Santa Catalina West</td>
</tr>
</tbody>
</table>

Source: PCR Services Corporation, 2013

4.2 ADDITIONAL RESEARCH

PCR staff reviewed the NHMLAC records search results and conducted follow-up research for information on paleontological resources and geologic conditions in the Plan area and vicinity. In particular, PCR reviewed paleontological literature and relevant geologic maps. The results of this research are summarized in the context statement that is provided in Chapter 3 of this report.
5.0 RESULTS

5.1 PALEONTOLOGICAL RESOURCES RECORDS SEARCH

Results of the paleontological resources records search through the NHMLAC indicate that no known fossil localities from the NHMLAC database have been previously identified within the boundaries of a school or administrative site. However, several localities have been recorded within a one-mile radius of certain facilities in the fossiliferous older Quaternary Alluvium deposits that currently underlie all of the facility locations at depth. The surficial deposits that underlie the facility locations primarily consist of younger Quaternary Alluvium deposits which are not conducive to retaining paleontological resources given the young age of these deposits (e.g., Holocene Epoch, or present day to 12,000 years before present).

Table 3 lists the paleontological localities near the facility locations as reported by NHMLAC (McLeod 2008, 2009, 2012). Table 4 summarizes the geologic deposits in the study area and their paleontological potential as described by McLeod (2012). The paleontological resources records search results letter from the NHMLAC (see McLeod 2012) is provided in Appendix B of this report.

### Table 3

<table>
<thead>
<tr>
<th>Locality Identifier</th>
<th>Fossil Specimen(s)</th>
<th>Depth Below Surface</th>
<th>Nearest Facilities (Approximate Miles From Facility)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LACM 1005</td>
<td>Ground sloth, mammoth</td>
<td>60 feet</td>
<td>Burbank (0.46), Mann (0.72), Franklin (0.75)</td>
</tr>
<tr>
<td>LACM 1144</td>
<td>Bison, camel, seal lion</td>
<td>&lt;48 feet</td>
<td>Edison (0.10), Chavez (0.42), International (0.44), Renaissance (0.44), Washington (0.57)</td>
</tr>
<tr>
<td>LACM 1163</td>
<td>Bison</td>
<td>5 feet</td>
<td>Cabrillo (1.37)</td>
</tr>
<tr>
<td>LACM 1643</td>
<td>Mammoth</td>
<td>No depth given</td>
<td>CAMS (&lt;0.10)</td>
</tr>
<tr>
<td>LACM 2031</td>
<td>Bison</td>
<td>25 feet</td>
<td>Mann (0.51), Fremont (0.72), Lowell (0.91)</td>
</tr>
<tr>
<td>LACM 3550</td>
<td>Sea lion, camel, bison</td>
<td>&lt;48 feet</td>
<td>Washington (0.19), Renaissance (0.28), PAAL (0.33), Personnel Commission (0.42), Poly (0.52), Cedar (0.52)</td>
</tr>
<tr>
<td>LACM 3757</td>
<td>Rays, sharks, bony fish, turtle, birds, terrestrial mammals</td>
<td>No depth given</td>
<td>Kettering (0.75), Lowell (0.80), Hill (0.86), Gant (1.0)</td>
</tr>
<tr>
<td>LACM 6746</td>
<td>Mammoth</td>
<td>No depth given</td>
<td>Lowell (0.63), Kettering (1.0), Gant (1.0), Hill (1.0)</td>
</tr>
<tr>
<td>LACM 6896</td>
<td>Whale</td>
<td>&lt;100 feet</td>
<td>Chavez (0.20), Edison (0.47), International (0.68), Renaissance (0.76), Stevenson (0.84)</td>
</tr>
<tr>
<td>LACM 7739</td>
<td>Marine vertebrates</td>
<td>55 feet</td>
<td>Mann (0.59), Burbank (0.59), Franklin (1.0)</td>
</tr>
</tbody>
</table>

Source: PCR Services Corporation, 2013
### Table 4

**Summary of Geologic Deposits in the Study Area and their Paleontological Potential**

<table>
<thead>
<tr>
<th>LBUSD Area</th>
<th>7.5-Minute Quadrangle(s)</th>
<th>Locality</th>
<th>Type of Deposit</th>
<th>Deposit Category</th>
<th>Paleontological Potential</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coastal Mainland</td>
<td>Long Beach</td>
<td>From Dominguez Hills to Coyote Creek and Pacific Ocean</td>
<td>Surficial deposits in less elevated terrain in west portion derived predominantly as fluvial deposits from Dominguez Channel, Compton Creek, and Los Angeles River</td>
<td>Younger Quaternary Alluvium</td>
<td>Typically do not contain significant vertebrate fossils, at least in the uppermost layers</td>
</tr>
<tr>
<td></td>
<td>Los Alamitos</td>
<td></td>
<td>Surficial deposits in less elevated terrain in east portion derived predominantly as fluvial deposits from Coyote Creek and San Gabriel River</td>
<td>Younger Quaternary Alluvium</td>
<td>Typically do not contain significant vertebrate fossils, at least in the uppermost layers</td>
</tr>
<tr>
<td></td>
<td>South Gate</td>
<td></td>
<td>Exposures of older Quaternary terrestrial sediments in elevated terrain in central portion</td>
<td>Palos Verdes Sand</td>
<td>Known to produce significant vertebrate fossils</td>
</tr>
<tr>
<td></td>
<td>Torrance</td>
<td></td>
<td>Exposures of older Quaternary marine deposits</td>
<td>San Pedro Sand</td>
<td>Known to produce significant vertebrate fossils</td>
</tr>
<tr>
<td>San Gabriel Mountains</td>
<td>Chilao Flat</td>
<td>San Gabriel River northwest of Mount Wilson</td>
<td>Surficial deposits in less elevated terrain derived as alluvial fan deposits from surrounding hills</td>
<td>Younger Quaternary Alluvium</td>
<td>Typically do not contain, but have potential to produce, significant vertebrate fossils at shallow depths</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Bedrock in adjacent elevated terrain</td>
<td>Plutonic igneous rock</td>
<td>Do not contain fossils</td>
</tr>
<tr>
<td>Santa Catalina Island</td>
<td>Santa Catalina North</td>
<td>Isthmus Cove</td>
<td>Surficial deposits in lowest lying terrain derived as alluvial fan deposits from adjacent hills</td>
<td>Quaternary Alluvium</td>
<td>Typically do not contain, but have potential to produce, significant vertebrate fossils at shallow depths</td>
</tr>
<tr>
<td></td>
<td>Santa Catalina West</td>
<td></td>
<td>Bedrock in more elevated terrain</td>
<td>Blueschist (a metamorphosed volcanic rock)</td>
<td>Does not contain recognizable fossils</td>
</tr>
</tbody>
</table>
Table 4 (Continued)

<table>
<thead>
<tr>
<th>LBUSD Area</th>
<th>7.5-Minute Quadrangle(s)</th>
<th>Locality</th>
<th>Type of Deposit</th>
<th>Deposit Category</th>
<th>Paleontological Potential</th>
</tr>
</thead>
<tbody>
<tr>
<td>Santa Catalina</td>
<td>East</td>
<td>Southwest side of Avalon</td>
<td>Surficial deposits in lowest lying terrain derived from drainages</td>
<td>Younger Quaternary fluvial deposits</td>
<td>Similar deposits are known to produce significant vertebrate fossils</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Surficial deposits in low lying terrain</td>
<td>Quaternary terrace deposits</td>
<td>Similar deposits are known to produce significant vertebrate fossils</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Bedrock in adjacent elevated terrain</td>
<td>Plutonic igneous rocks</td>
<td>Do not contain fossils</td>
</tr>
</tbody>
</table>

Source: PCR Services Corporation, 2013

5.2 ADDITIONAL RESEARCH

The results of the additional research of the Plan area and vicinity informed preparation of the paleontological context provided in Chapter 3.
6.0 EVALUATION

As discussed in Chapter 2 of this report, the CEQA Guidelines do not define the criteria or process to determine whether a paleontological resource is significant or “unique.” Some state agencies, such as Caltrans, have developed their own “significance criteria” which include the criteria listed in Chapter 2 of this report. Nevertheless, the lead agency shall determine the criteria or process to evaluate the significance of a paleontological resource and they shall determine whether a given paleontological resource is significant or “unique.”

As discussed in the previous chapter, no known paleontological resources from the NHMLAC records were recorded within the school or administrative site; therefore, no evaluation of known paleontological resources is necessary at this time.

For each improvement involving construction excavations in previously undisturbed, native sediments, the paleontological potential of the sediments to be excavated may need to be evaluated prior to the commencement of the excavations.
7.0 IMPACTS/EFFECTS ANALYSIS

The purpose of this chapter is to discuss the potential impacts to paleontological resources associated with implementing the Plan.

7.1 CEQA SIGNIFICANCE THRESHOLDS

The current CEQA Guidelines state that a project will have a significant impact on the environment if it will 
*directly or indirectly destroy a unique paleontological resource or site or unique geologic feature.*

The CEQA Guidelines do not define “directly or indirectly destroy,” but it can be reasonably interpreted as the physical damage, alteration, disturbance, or destruction of a paleontological resource.

7.2 POTENTIAL IMPACTS

7.2.1 Project Description

As discussed earlier, the District is proposing to adopt and implement the District’s Facility Master Plan. The Plan proposes many potential improvements to numerous school and administrative facilities within the boundaries of the District. Improvements associated with the Plan that include construction excavations (e.g., grubbing/clearing, grading, trenching, and boring) into previously undisturbed, native sediments are activities with potential to impact, or cause a substantial adverse change to paleontological resources. As stated in the Plan, many of the improvements identified are minor, consisting of enhancements to existing facilities without notable construction activity. Some improvements may require more notable construction activity inclusive of grading for athletic fields and site grading/preparation for new buildings and/or major renovations.

Improvements that do not require excavation activities cause no impacts to paleontological resources and therefore no additional analyses or mitigation is required for these specific types of improvements. These improvements would include but are not limited to: painting, roofing improvements, ceiling improvements, window improvements, reconfiguration of interior spaces, building additions that do not require excavation, and other general maintenance activities. Other improvement activities that include excavations into heavily disturbed soils or artificial fill would also cause no impact to intact and significant paleontological resources since they have likely been fragmented and displaced by previous disturbances (such as the original construction of a given school site) and there is very limited to no potential to encounter intact and significant paleontological resources in artificial fill.

7.2.2 Paleontological Resources

As discussed earlier in this report, no known paleontological resources have been identified from the NHMLAC records within the boundaries of a school or administrative site; however, multiple fossil localities have been identified in the vicinity of the facilities at various depths (from five feet to 60 feet below the ground surface) in the fossiliferous older Quaternary Alluvium deposits that currently underlie all of the facility locations at depth.
The surficial deposits that underlie the facility locations primarily consist of younger Quaternary Alluvium deposits which are not conducive to retaining paleontological resources given the young age of these deposits (e.g., Holocene Epoch, or present day to 12,000 years before present). Therefore, shallow excavations associated with the improvements are unlikely to impact paleontological resources. However, deeper excavations into the fossiliferous older Quaternary Alluvium deposits that underlie the facility locations have the potential to impact paleontological resources. As a result, recommended mitigation measures are provided in the following section that would reduce potentially significant impacts to previously unknown paleontological resources that are unexpectedly discovered during project implementation to a less than significant level.
8.0 RECOMMENDED MANAGEMENT GUIDELINES AND MITIGATION MEASURES

8.1 MITIGATION MEASURES

For improvements implemented under the Plan that do not require excavation activity, no further analyses, management guidelines, or mitigation measures are warranted since these types of improvements would have no impact to paleontological resources.

For improvements implemented under the Plan that require excavation activity (e.g., clearing/grubbing, grading, trenching, or boring) into native sediments and that reach depths of five feet or greater, the following mitigation measures (Paleo-1, -2, and -3) are recommended:

Paleo-1: **Conduct Paleontological Construction Monitoring.** If excavations associated with an improvement will reach depths of five feet or greater into native sediments, the District shall retain a qualified paleontologist to monitor excavation activities into the fossiliferous older Quaternary Alluvium deposits. Monitoring shall consist of visually inspecting fresh exposures of rock for larger fossil remains and, where appropriate, collecting wet or dry screened sediment samples of promising horizons for smaller fossil remains. The frequency of monitoring shall be based on the rate of construction excavation, proximity to known paleontological resources or fossiliferous geologic formations (i.e., older Quaternary Alluvium), the materials being excavated (native sediments versus artificial fill), and the depth of excavation, and if found, the abundance and type of paleontological resources encountered. Full-time field observation can be reduced to part-time inspections if determined adequate by the qualified paleontologist.

Paleo-2: **Cease Ground-Disturbing Activities and Implement Treatment Plan if Paleontological Resources are Encountered.** If a potentially significant fossil is found, the paleontological monitor shall be authorized to temporarily divert or redirect grading and other excavation activities in the area of the exposed fossil to facilitate evaluation and, if necessary, salvage. At the paleontologist’s discretion and to reduce any construction delay, the grading and excavation contractor shall assist in removing rock samples for initial processing. Any fossils encountered and recovered shall be prepared to the point of taxonomic identification, catalogued, and donated to a suitable museum or other suitable repository. Any fossils collected shall be donated to a public, non-profit institution with a research interest in the materials, such as the Natural History Museum of Los Angeles County. Accompanying notes, maps, and photographs, and reports shall also be filed at the repository.

Paleo-3: **Prepare Paleontological Monitoring Report.** Upon completion of the above activities, the paleontologist shall prepare a report summarizing the results of the monitoring and salvaging efforts, the methodology used in these efforts, and a description of the fossils collected and their significance. The report shall be submitted to the District, the Natural History Museum of Los Angeles County, and representatives of other appropriate or concerned agencies to signify the satisfactory completion of the Project and required mitigation measures.

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3 The District shall review available geotechnical studies to determine whether excavation activities will impact native soils. If a geotechnical study is not available for review, then a qualified paleontologist shall coordinate with the District to make a determination based on the soil conditions observed during paleontological monitoring of a given excavation activity.
9.0 REFERENCES CITED

California Geological Survey
   2002 California Geomorphic Provinces, Note 36, 4 p.

Caltrans

Jefferson, G. T.
   1991a A Catalogue of Late Quaternary Vertebrates from California, Part One, Nonmarine Lower Vertebrate and Avian Taxa. Natural History Museum of Los Angeles County Technical Reports No. 5, 60 p.


Long Beach Unified School District

Mcleod, Samuel
   2008 Paleontological Records Search for the Proposed Golden Shore Master Plan, in the City of Long Beach, Los Angeles County, project area. Report on file at PCR Services Corporation, 1 Venture, Suite 150, Irvine, CA 92618

   2009 Paleontological Records Search for the Proposed Second and PCH Development EIR Project, in Long Beach, Los Angeles County, project area. Report on file at PCR Services Corporation, 1 Venture, Suite 150, Irvine, CA 92618

   2012 Paleontological Records Search for the Proposed Long Beach Unified School District Facilities Project, Los Angeles County, project areas. Report on file at PCR Services Corporation, 1 Venture, Suite 150, Irvine, CA 92618

Norris, R. M., and R. W. Webb

Rowland, Stephen M.

Saucedo, G. J., Greene, G. H., Kennedy, M. P., and S. P. Bezore
   2003 Geologic Map of the Long Beach 30' x 60' Quadrangle, California.

[SCAMP] Southern California Areal Mapping Project
Gavin Archer, M.A., RPA, DIRECTOR OF ARCHAEOLOGICAL & PALEONTOLOGICAL RESOURCES

Education
- M.A., Anthropology (Archaeology Thesis), University of Arizona, Tucson, Arizona, 1990
- B.A., Anthropology, University of Arizona, Tucson, Arizona, 1987
- Archaeology Field School University of Alaska, Fairbanks, Alaska, 1986

Registrations/Certifications
- Member, Register of Professional Archaeologists
- Certified Archaeologist, County of Riverside

Professional Affiliations
- Society for Historical Archaeology
- California Cultural Resource Preservation Alliance, Member of the Board of Directors

Summary
Mr. Archer has studied and practiced anthropology and archaeology in California, and several other states since 1982. His research interests include the prehistory, history and ethnography of the American West. His expertise includes all aspects of archaeological investigation, documentary research, Native American consultation, permitting, and regulatory compliance.

Mr. Archer has successfully managed diverse cultural resources consulting projects for public and private sector clients, and including a variety of resources: Native American prehistoric occupation sites, traditional cultural properties, and sacred lands, and Historic Period sites, buildings, and structures. Examples of his field experience include: a central Alaskan Paleoindian encampment, windward O‘ahu Island pondfields, Archaic, Hohokam, and Trincheras villages of the Sonoran Desert, and the Tomato Springs sites of coastal southern California with hunter-gatherer occupation components dating from 7,500 years before present to Spanish contact in the late 1700s. His research has also included landfill “garbology,” Tarahumara ethnoarchaeology, Great Depression homesteading, and the early 20th century remains of downtown Phoenix and Los Angeles.

Experience
Cal State Fullerton Native American Graves Protection and Repatriation Act (NAGPRA) Consulting – Mr. Archer was recently selected to provide NAGPRA consulting services to CSUF. He will lead the PCR team in the repatriation plans for the Little Lake site and the preparation of a strategic plan regarding repatriation for future sites.

Redeveloping in Historic Downtown San Juan Capistrano, Orange County, California – Mr. Archer conducted test excavations to evaluate the significance of archaeological deposits on a site in historic downtown San Juan Capistrano. Excavations were conducted adjacent to Acjacheme, an indigenous ancestral village site, and the 18th Century Spanish Mission San Juan Capistrano. Some deposits were found to include prehistoric and protohistoric Native American artifacts, including rare early pottery fragments. Mission Period artifacts were also found. The study was completed in cooperation with the Juaneño Band of Mission Indians and is in use for the planning of mixed-use redevelopment of the site.

Recovering Human Remains on a Southern California Coastal Bluff – Mr. Archer conducted an excavation to recover human remains unearthed at a home in a neighborhood which was built, in the 1940s, on a prehistoric Native American village site. Sediments and artifacts at the site indicated a Late Prehistoric (AD 450-1500) date. The excavation was completed in cooperation with the Juaneño Band of Mission Indians. The remains were repatriated to the Juaneño for reburial and home improvement work recommenced.

Repairing Crude Oil Pipelines in Angeles National Forest, Los Angeles County, California – Mr. Archer conducted a monitoring program for Plains All American Pipeline. The repair work required vehicle access along the Old Ridge Route, a highway built in 1913 and listed on the National Register of Historic Places. The monitoring program ensured that the Old Ridge Route and historical sites along it were not damaged, and the repair work was completed in compliance with Angeles National Forest’s conditions of project approval.

Nursing Home Expansion in Murrieta, Riverside County, California – At the behest of Capital Funding, LLC, Mr. Archer conducted a cultural resources reassessment of the proposed building site made possible through federal funding for the construction of an additional building at an existing nursing home in Murrieta. As a result of the funding, the project triggered a need to comply with the National Historic Preservation Act. Mr. Archer reviewed existing monitoring and mitigation requirements. The re-assessment provided the basis for monitoring and mitigation measures similar to those previously established for the property which were in compliance with the National Historic Preservation Act.

Realigning a Highway to Summit Valley, San Bernardino County, California – Mr. Archer completed an archaeological survey for the County of San Bernardino. The eight-mile-long Summit Valley Road Realignment runs from Hesperia along Antelope Valley to Horsethief Canyon and Summit Valley. Eight archaeological sites were recorded by the survey, including prehistoric Native American lithic artifact scatters and the remains of early twentieth century homesteading. The survey results are assisting the further planning and future construction of the realignment.

Bringing Retail Opportunities to the Historic Community of Highgrove, Riverside County, California – Mr. Archer conducted the assessment for the proposal to build a much-needed shopping plaza on a long-vacant lot in the unincorporated community of Highgrove, which facilitated county permitting for the project. Highgrove has a rich agricultural heritage and the area includes historic canals, railroads, and buildings. A required a cultural resources assessment in accordance with Riverside County standards and guidelines.
Kyle Garcia, SENIOR ARCHAEOLOGIST

Education
- B.A., Physical Anthropology, University of California, Santa Barbara, California, 2004

Professional Experience
Mr. Garcia has contributed his services and archaeological expertise to over 300 projects at PCR subject to requirements of the California Environmental Quality Act (CEQA), Section 106 of the NHPA, the National Environmental Policy Act (NEPA), and other federal, State, and local regulations. These projects included energy, infrastructure, utility, residential, commercial, mixed-use, schools, parks, trail systems, and urban redevelopment serving a variety of public and private sector clients throughout California and Arizona. In addition to his archaeological work, Mr. Garcia has been cross-trained in paleontological mitigation monitoring and assisted in the excavations of a Miocene whale fossil near Irvine, California.

Projects:
- Southern California Edison (SCE) where he has served as the Project Director and Manager for over 100 SCE projects and managed SCE purchase order contracts in excess of $1.5M. These projects were subject to requirements of CEQA, Section 106 of the NHPA, and other local ordinances. These projects included deteriorated pole replacements, conduit and vault installations, distribution circuit installations, and emergency on-call archaeological survey and monitoring services for SCE property during recent southern California wildfires. Mr. Garcia not only managed the budgets and supervised the work but he also conducted most of the record searches, surveys, report writing, site recordation, and client/agency coordination for these projects. These projects also entailed rapid response services including close-interval surveys, construction monitoring, and sensitivity assessments for SCE property in areas damaged by the wildfires.

- Mr. Garcia presented a paper at the 72nd Annual Meeting for the Society of American Archaeology Conference in Austin, Texas in 2007. The paper focused on prehistoric ‘yoni’ features encountered on a project site proposed to be developed in western Riverside County, California.

- Mr. Garcia has also gained valuable experience with recording historic and prehistoric archaeological sites with Garmin, Magellan, and sub-meter Trimble GeoXT Global Positioning System (GPS) units. He has worked with GIS software such as ArcPad, ArcGIS, and ArcView, and developed methods for using these products to accurately and efficiently record archaeological sites.
Michael J. Williams, Ph.D., Principal Paleontologist

**Education**
- Ph.D., Geology and Geophysics, Louisiana State University, Baton Rouge, Louisiana, 2009
- B.S., Zoology, Louisiana State University, Baton Rouge, Louisiana, 2002

**Summary**
Michael Williams is a paleontologist with over 12 years of paleontological experience, including sediment processing, survey, geologic map review, construction monitoring, fossil collection, identification, and curation. In addition, he has experience stabilizing, molding, casting, and sculpting fossilized remains of large mammals. Dr. Williams has four years of experience in California geology and paleontology and has published numerous articles in scholarly journals.

His expertise includes the evolution, biostratigraphy, biogeography, and paleoecology of fossil herpetofaunas. He has performed numerous surveys, excavations, and monitoring for a variety of development projects throughout southern California in Los Angeles, Orange, Riverside, San Diego, and San Bernardino counties.

He has experience in the academic, laboratory, museum, and field setting. Over the years he has performed several field excavations and sorted, identified, and curated hundreds of fossil microvertebrates. As a result he is proficient in the computerized vertebrate specimen database Paradox 7.

**Relevant Project Experience**

**Whisler Ranch, Lake Forest, Orange County, California** – Dr. Williams performed paleontological construction monitoring services during the ground-disturbing activities associated with the proposed 13-acre Whisler Ranch residential development in the City of Lake Forest. Duties include inspecting sidewall profiles and spoil piles for fossils, supervising on-site paleontological monitors, and collection and analysis/identification of Miocene fossils that were encountered during construction.

**Cascade Solar Project, San Bernardino County, California** – Dr. Williams performed the records search and associated paleontological survey and report for the proposed Cascade Renewable Energy project located on 150 acres in the Sunfair community in an unincorporated region of San Bernardino County.

**I-215/Newport Avenue Overcrossing Bridge Reconstruction Project, Grand Terrace, San Bernardino County, California** – Dr. Williams performed the paleontological services associated with the requisite Paleontological Identification and Evaluation (PIR-PER) report for the San Bernardino Associated Governments’ project per California Department of Transportation (Caltrans) guidelines. The proposed project includes excavation activities for retaining walls, spread footings (for the bridge piers), and drainage improvements associated with the removal and replacement of the existing Newport Avenue Overcrossing Bridge in the City of Grand Terrace. The paleontological services included survey, geologic map review, record searches, and report preparation.

**Oasis Date Gardens, Coachella Valley, Riverside County, California** – Dr. Williams conducted paleontological research, field survey, and assisted with report preparation for the proposed 165-acre Oasis Date Gardens Specific Plan project. The proposed project would demolish one large building on the eastern edge of the site and redevelop the property for senior housing and other mixed-uses.

**Our Lady Fatima Catholic Church Expansion, San Clemente, Orange County, California** – Dr. Williams performed paleontological construction monitoring services during the ground-disturbing activities associated with the proposed church expansion project. During the project, he identified and recovered a partial baleen whale skeleton.

**I-405 Extension, Seal Beach to Fountain Valley, Orange County, California** – Dr. Williams performed paleontological survey of the proposed project is support of the CalTrans PIR-PER report.

**Selected Publications**


Williams, M.J. 2009. Miocene herpetofaunas from the Central Gulf Coast, USA: their paleoecology, biogeography, and biostratigraphy.
Planning Consultants Research  
One Venture, Suite 150  
Irvine, CA   92618

Attn: Kyle J. Garcia, Senior Archaeologist I

re: Paleontological Records Search for the proposed Long Beach Unified School District facilities Project, Los Angeles County, project areas

Dear Kyle:

I have conducted a thorough search of our Vertebrate Paleontology records for the proposed Long Beach Unified School District facilities Project, Los Angeles County, project areas as outlined on the portions of the Santa Catalina West, Santa Catalina North, Santa Catalina East, Chilao Flat, Torrance, South Gate, Los Alamitos, and Long Beach USGS topographic quadrangle maps that you sent to me via e-mail on 4 October 2012. We have at least one vertebrate fossil locality that may lie directly within the boundaries of proposed project areas, and we have other localities nearby from the same sedimentary deposits that occur in the proposed project areas.

For the northern Santa Catalina Island site of the proposed project areas, near Isthmus Cove as depicted on the Santa Catalina West and Santa Catalina North quadrangles, surficial deposits in the lowest lying terrain consist of younger Quaternary Alluvium, derived as alluvial fan deposits from the adjacent hills. These deposits typically do not contain significant vertebrate fossils, at least in the uppermost layers, but they always retain the potential to produce significant vertebrate fossils. Bedrock in the more elevated terrain at this site consists of blueschist, a metamorphosed volcanic rock that will not contain any recognizable fossils.
For the southern Santa Catalina Island site of the proposed project areas, on the southwestern side of Avalon as depicted on the Santa Catalina East quadrangle, surficial deposits in the lowest lying terrain consist of Quaternary terrace deposits, with younger Quaternary fluvial deposits in the adjacent lower lying terrain derived from the drainages. Although we have no vertebrate fossil localities nearby from such deposits on Santa Catalina Island, we have numerous localities throughout southern California from similar deposits. Bedrock in the adjacent elevated terrain consists of plutonic igneous rocks that will not contain fossils.

For the San Gabriel Mountains site of the proposed project areas, on the San Gabriel River northwest of Mount Wilson as depicted on the Chilao Flat quadrangle, surficial deposits in the less elevated terrain consist of younger Quaternary Alluvium, derived as alluvial fan deposits from the surrounding hills. We have no vertebrate fossil localities nearby from these deposits, although they may contain significant vertebrate fossils at shallow depth. Bedrock in the adjacent elevated terrain consists of plutonic igneous rocks that will not contain fossils.

For the numerous Long Beach vicinity sites of the proposed project areas, from the Dominguez Hills to Coyote Creek and the Pacific Ocean as depicted on the Torrance, South Gate, Los Alamitos, and especially the Long Beach quadrangles, surficial deposits in the less elevated terrain in both the east and western portions consist of younger Quaternary Alluvium, derived predominantly as fluvial deposits from the Dominguez Channel, Compton Creek, and the Los Angeles River in the west and from Coyote Creek and the San Gabriel River in the east. Primarily in the elevated terrain in the central portion of this part of the proposed project areas there are exposures of older Quaternary terrestrial sediments of the Palos Verdes Sand. In a few places there are exposures of the older Quaternary marine deposits of the San Pedro Sand that underlie the Palos Verdes Sand.

The younger Quaternary Alluvium typically does not contain significant vertebrate fossils, at least in the uppermost layers, and we thus have fewer vertebrate fossil localities in the western portion of this part of the proposed project areas near the Los Angeles River and also fewer in the northern and eastern portions of this part of the proposed project areas near the San Gabriel River and where the Los Angeles and San Gabriel Rivers most closely approach one another. Our vertebrate fossil localities in the vicinity are mostly from the Palos Verdes Sand in the southern portion of this part of the proposed project areas, but occur from north of the Dominguez Hills to the beach along San Pedro Bay.

We have at least one vertebrate fossil locality that may occur with the boundaries of one of the proposed project area sites, LACM 1643, on the southwestern side of the Dominguez Hills near University Drive and Analee Avenue, that produced a fossil specimen of mammoth, *Mammuthus*. We may have other fossil vertebrate localities that occur within, adjacent to, or near the various Long Beach area vicinity sites in this part of the proposed project areas, but that can be considered in a more specific examination of the sites.
Excavations in the metamorphic or igneous bedrock found in Santa Catalina and San Gabriel Mountains sites of the proposed project areas will not uncover any vertebrate fossils. Shallow excavations in the younger Quaternary Alluvium exposed in the northern Santa Catalina and San Gabriel Mountain sites, as well as portions of the Long Beach vicinity part of the proposed project areas, are unlikely to encounter any significant fossil vertebrate remains. Deeper excavations in those areas that extend down into older Quaternary deposits, as well as any excavations in the exposures of older Quaternary terrace deposits in the southern Santa Catalina site, and excavations in the exposures of the Palos Verdes Sand or even the San Pedro Sand in much of the Long Beach vicinity part of the proposed project areas, however, may well uncover significant vertebrate fossils. Any substantial excavations in the sedimentary deposits in the proposed project areas, therefore, should be monitored closely to quickly and professionally recover any fossil remains discovered while not impeding development. Any fossils recovered during mitigation should be deposited in an accredited and permanent scientific institution for the benefit of current and future generations.

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

Sincerely,

[Signature]

Samuel A. McLeod, Ph.D.
Vertebrate Paleontology

enclosure: invoice