

# SR-241 / SR-91 Express Lanes Connector Project

ORANGE COUNTY AND RIVERSIDE COUNTY, CALIFORNIA

City of Anaheim, City of Yorba Linda, and City of Corona

12-ORA-241 PM 36.1/39.1

12-ORA-91 PM 14.7/18.9

08-RIV-91 PM 0.0/1.5

0K9700 / 1200020097

## Supplemental Paleontological Identification Report and Paleontological Evaluation Report



Prepared for:  
Foothill/Eastern Transportation Corridor Agency, Project Sponsor

and for:  
State of California Department of Transportation, Lead Agency



August 2015

*The environmental review, consultation, and any other action required in accordance with applicable Federal laws for this project is being, or has been, carried-out by Caltrans under its assumption of responsibility pursuant to 23 USC 327.*

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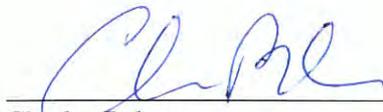
and for:

State of California Department of Transportation, Lead Agency

August 2015

STATE OF CALIFORNIA  
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## Summary of Findings

The California Department of Transportation (Caltrans) District 12, in cooperation with the Foothill/Eastern Transportation Corridor Agency (F/ETCA) proposes the State Route 241 (SR-241) / State Route 91 (SR-91) Express Lanes Connector Project (Proposed Project) to construct a median-to-median connector between SR-241 and the tolled lanes in the median of SR-91 (SR-91 Express Lanes). SR-241 is a tolled facility, starting at the Oso Parkway interchange, in south Orange County, to its terminus at SR-91. The SR-91 Express Lanes is a two-lane tolled facility located within the median of SR-91, from State Route 55 (SR-55), to the Orange/Riverside County line (east of the SR-241 interchange). The existing interchange connects all lanes of the northbound and southbound SR-241 to non-tolled, general purpose lanes of eastbound and westbound SR-91. There is currently no direct connection between the SR-241 and the SR-91 Express Lanes.

Improvements for the connector are limited to 5.9 mi in the cities of Anaheim and Yorba Linda from south of the Windy Ridge Wildlife Undercrossing on SR-241 to Coal Canyon Undercrossing on SR-91. The remaining 2.8 mi of the Proposed Project is limited to FasTrak signage improvements (advance signage) in the cities of Anaheim (1.2 mi total), Yorba Linda (0.1 mi) and Corona (1.5 mi), with exact placement pending the Final Design process. The Proposed Project is mostly within existing Caltrans right-of-way, with one partial acquisition adjacent to eastbound SR-91. Construction access and staging areas would occur within existing Caltrans right-of-way.

This Supplemental Paleontological Identification Report/Paleontological Evaluation Report (PIR/PER) was prepared to address project modifications that incorporated new areas that were not evaluated in the original PIR/PER that was prepared for the project (Smith, 2014). Although this Supplemental PIR/PER contains information on the entire project, its focus is on the new areas. For more detailed discussions on the other areas of the project, please see the original PIR/PER (Smith, 2014).

The proposed median-to-median connector is a later phase of the Eastern Transportation Corridor (ETC) project, previously approved in 1994. It was originally evaluated as a SR-241/SR-91 high-occupancy vehicle (HOV) direct connector in the 1991 ETC Draft Environmental Impact Report/ Environmental Impact Statement (Draft EIR/EIS), 1992 ETC Final EIR, and the 1994 ETC Final EIS (all of which studied a broader project area with improvements on SR-133, SR-241, and SR-261).

The area studied for this project is the Area of Project Disturbance (APD) for all areas of the Proposed Project where excavation is proposed. The locality search included a buffer area extending over 1 mile (mi) from the APD to assist with determining the paleontological sensitivities of geologic formations. The APD is based on the horizontal and vertical extent of anticipated ground-disturbing activities.

Where excavation may occur within the APD, nine types of sediment are exposed on the surface. Two of these sediments, Artificial Fill and late Holocene Landslide Deposits, do not have the potential to contain paleontological resources because of their young age (less than 11,700 years); however, they may be on top of units that do have the potential to contain paleontological resources. Two sediment types, Young Alluvial Fan Deposits and Young Axial Channel Deposits, do not have the potential to contain paleontological resources at depths shallower than approximately 10 feet (ft) below the surface, but may have the potential once a depth greater than 10 ft is reached. Five sediment types, the Schulz Ranch Member of the Williams Formation, the Santiago Formation, the Undifferentiated Sespe/Vaqueros Formation, the Topanga Formation, and Very Old Alluvial Fan Deposits have the potential to contain paleontological remains. It should be noted that some areas within the APD—on the eastern end of the project on the south side of SR-91— are within areas for lane striping or advanced signage where excavation will not occur and have exposures of the Silverado Formation and the Baker Canyon Member of the Ladd Formation; as no excavation will be occurring in these areas, there are no discussions on these formations. Within the areas under study by this Supplemental PIR/PER where excavation will occur, there are four geologic units: the Santiago Formation, Very Old Alluvial Fan Deposits, Young Alluvial Fan Deposits, and Young Landslide Deposits. All four of these units were discussed in the original PIR/PER (Smith, 2014), and are the focus of this Supplemental PIR/PER.

Recommendations from the California Environmental Quality Act (CEQA) along with guidelines from Caltrans are consistent with the recommendations of the Society of Vertebrate Paleontology (SVP) and indicate that impacts to nonrenewable paleontological resources must be considered during project design and construction within sensitive sediments. The literature review and locality searches through museums and data maintained at LSA Associates, Inc. (LSA) produced information showing that sediments dating from the Late Cretaceous to the Pleistocene Periods within the APD have the potential to contain significant nonrenewable paleontological resources. Thus, it is likely that paleontological resources would be

encountered during the project excavation phase of construction within these sediments.

To reduce impacts to nonrenewable paleontological resources, recommendations are made for the development of a Paleontological Mitigation Plan (PMP) for those portions of the Proposed Project that are identified as having a high paleontological sensitivity, which would follow Caltrans guidelines along with recommendations from the SVP prior to completion of final project design. These recommendations include the following:

- Attendance at the pregrade meeting by a qualified paleontologist or representative. At this meeting, the paleontologist will explain the likelihood for encountering paleontological resources, what resources may be discovered, the methods of recovery that will be employed, and what construction personnel should do in the event paleontological resources are encountered when a monitor is not present.
- A preconstruction field survey in areas identified as having high paleontological sensitivity after vegetation and paving have been removed, followed by salvage of any observed surface paleontological resources prior to the beginning of additional grading. This requirement is consistent with Mitigation Measure P-1 in the ETC EIR/EIS, which reads “In conjunction with final design, an intensive pregrading survey of the entire alignment to locate fossil sites not recorded during the environmental review process shall be conducted by a qualified paleontologist. Vertebrate remains and representative samples of invertebrate remains shall be collected and recorded. The paleontologist shall, based on the field survey results, reclassify rock units of unknown importance to low, moderate or high importance.”
- During construction excavation, a qualified vertebrate paleontological monitor shall initially be present on a full-time basis whenever excavation will occur within the sediments that have a high paleontological sensitivity rating, and on a spot-check basis for excavation in sediments that have a low sensitivity rating. Monitoring may be reduced to a part-time basis if no resources are being discovered in sediments with a high sensitivity rating (monitoring reductions, when they occur, will be determined by the qualified Principal Paleontologist). The monitor shall inspect fresh cuts and/or spoils piles to recover paleontological resources. The monitor shall be empowered to temporarily divert construction equipment away from the immediate area of the discovery. The monitor shall be equipped to rapidly stabilize and remove fossils to avoid prolonged delays to

construction schedules. If large mammal fossils or large concentrations of fossils are encountered, Caltrans will consider using heavy equipment on site to assist in the removal and collection of large materials. This requirement is consistent with Mitigation Measure P-2 in the ETC EIR/EIS which reads “In conjunction with site preparation and grading, the paleontologist shall monitor clearing and grading in areas underlain by rock units of high importance full-time, in areas underlain by rock units of moderate importance on a half-time basis and will spot check but not monitor grading in areas underlain by rock units of low importance. If sufficient important fossil remains are found during field survey or construction monitoring in an area underlain by a rock unit of low or moderate importance, the paleontologist shall raise the importance of the rock unit and increase the monitoring effort, as appropriate. The number of monitors to be stationed in each construction area during grading shall be based on the amount of rock to be moved per day.”

- Mitigation Measure P-3 in the ETC EIR/EIS states that “In conjunction with site preparation and grading, the paleontologist shall collect rock samples from suitable horizons in formations of high, moderate and unknown importance. At the paleontologist's discretion and to reduce any construction delay, the grading contractor shall assist in collecting the samples and moving them to an adjacent off site location for later transportation by the monitor to the Orange County Natural History Museum or a similar facility.” [The Orange County Natural History Museum no longer exists. However, the John D. Cooper Archaeological and Paleontological Center (established in 2009 and located in Santa Ana), which is associated with Orange County Parks and California State University, Fullerton, is the current repository for archaeological and paleontological collections.]
- Localized concentrations of small (or micro-) vertebrates may be found in all native sediments. Therefore, it is recommended that these sediments occasionally be spot-screened on site through 1/8- to 1/20-inch mesh screens to determine whether microfossils are present. If microfossils are encountered, sediment samples (up to 3 cubic yards, or 6,000 pounds) shall be collected and processed through 1/20-inch mesh screens to recover additional fossils.
- Mitigation Measure P-4 in the ETC EIR/EIS states that “If fossil remains are found during site preparation, grading or construction, the paleontologist shall temporarily stop work and notify TCA of the work stoppage. The TCA shall follow the procedures in Chapter 7 of TCA Administrative Code for development of mitigation if mitigation is determined to be necessary.” In addition, Caltrans

- District 12 Environmental Branch will be notified of any paleontological finds as well as any work stoppages associated with the finds.
- Recovered specimens shall be prepared to the point of identification and permanent preservation. This includes the sorting of any washed mass samples to recover small invertebrate and vertebrate fossils, the removal of surplus sediment from around larger specimens to reduce the volume of storage for the repository and storage cost, and the addition of approved chemical hardeners/stabilizers to fragile specimens. This requirement is consistent with Mitigation Measure P-5 in the ETC EIR/EIS which reads “After the completion of the on-site monitoring, the paleontologist shall process all collected rock samples for microvertebrate and other fossil remains, prepare and identify all collected remains, incorporate them into a retrievable storage system, and file accompanying field notes, maps and photographs at the Orange County Natural History Museum or a similar facility.” [This will likely be the John D. Cooper Archaeological and Paleontological Center.]
  - Specimens shall be identified to the lowest taxonomic level possible and curated into an institutional repository with retrievable storage. The repository institutions usually charge a one-time fee based on volume, so removing surplus sediment is important. The repository institution may be a local museum or university with a curator who can retrieve the specimens on request. Caltrans requires that a draft curation agreement be in place with an approved curation facility prior to the initiation of any paleontological monitoring or mitigation activities.
  - Preparation and submittal of the Paleontological Mitigation Report (PMR) documenting completion of the PMP for the Lead Agency (Caltrans). This requirement is consistent with Mitigation Measure P-6 in the ETC EIR/EIS, which reads “Following completion of the monitoring, identification, storage and documentation activities, the paleontologist shall prepare a summary report presenting an inventory and describing the significance of accessioned remains.”

Implementation of these recommendations will reduce impacts to nonrenewable paleontological resources. More project-specific measures may need to be developed during preparation of the PMP to refine these measures during final project design.

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## List of Acronyms

ac	acre/acres
APD	Area of Potential Disturbance
APN	Assessor's Parcel Number
BLM	Bureau of Land Management
Caltrans	California Department of Transportation
CCO	Construction Change Order
CCR	California Code of Regulations
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
Chambers	Chambers Group, Inc.
CIP	Corridor Improvement Project
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
ESAs	Environmentally Sensitive Areas
ETC	Easter Transportation Corridor
FHWA	Federal Highway Administration
ft	foot/feet
HOV	High-Occupancy Vehicle
I-5	Interstate 5
LACM	Natural History Museum of Los Angeles County
LSA	LSA Associates, Inc.
Ma	Million years
mi	mile/miles
NALMA	North American Land Mammal Age
NPS	National Park Service
NEPA	National Environmental Policy Act
NNL	National Natural Landmark
PA/ED	Project Approval/Environmental Document
PIR	Paleontological Investigation Report
PEA	Paleo Environmental Associates, Inc.
PER	Paleontological Evaluation Report
PM	Post Mile
PMP	Paleontological Mitigation Plan
PMR	Paleontological Mitigation Report
PRC	Public Resources Code
PSS	Paleontological Stewardship Summary
RE	Resident Engineer
SBCM	San Bernardino County Museum

*List of Acronyms*

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SER	Standard Environmental Reference
sp.	species
SMC	Systems Management Concept
SR-55	State Route 55
SR-71	State Route 71
SR-91	State Route 91
SR-241	State Route 241
SVP	Society of Vertebrate Paleontology
TCA	Transportation Corridor Agencies
USGS	United States Geological Survey

# **Chapter 1. Introduction**

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## **1.1. Project Description**

The California Department of Transportation (Caltrans) District 12, in cooperation with the Foothill/Eastern Transportation Corridor Agency (F/ETCA) proposes the State Route 241 (SR-241) / State Route 91 (SR-91) Express Lanes Connector Project (Proposed Project) to construct a median-to-median connector between SR-241 and the tolled lanes in the median of SR-91 (SR-91 Express Lanes). SR-241 is a tolled facility, starting at the Oso Parkway interchange, in south Orange County, to its terminus at SR-91. The SR-91 Express Lanes is a two-lane tolled facility located within the median of SR-91, from State Route 55 (SR-55), to the Orange/Riverside County line (east of the SR-241 interchange). The existing interchange connects all lanes of the northbound and southbound SR-241 to non-tolled, general purpose lanes of eastbound and westbound SR-91. There is currently no direct connection between the SR-241 and the SR-91 Express Lanes.

The Proposed Project, located at the junction of SR-241 and SR-91 within the cities of Anaheim, Yorba Linda and Corona and counties of Orange and Riverside, would provide improved access between SR-241 and SR-91 and is proposed to be a tolled facility. The proposed median-to-median connector project encompasses 12-ORA-241 (PM 36.1/39.1), 12-ORA-91 (PM 14.7/18.9), and 08 RIV-91 (PM 0.0/1.5) for a length of approximately 8.7 mi.

Improvements for the connector are limited to 5.9 mi in the cities of Anaheim and Yorba Linda from south of the Windy Ridge Wildlife Undercrossing on SR-241 to Coal Canyon Undercrossing on SR-91. The remaining 2.8 mi of the Proposed Project is limited to FasTrak signage improvements (advance signage) in the cities of Anaheim (1.2 mi total), Yorba Linda (0.1 mi) and Corona (1.5 mi), with exact placement pending the Final Design process. The Proposed Project is mostly within existing Caltrans right-of-way, with one partial acquisition adjacent to eastbound SR-91. Construction access and staging areas would occur within existing Caltrans right-of-way.

The proposed median-to-median connector is a later phase of the Eastern Transportation Corridor (ETC) project, previously approved in 1994. It was originally evaluated as a SR-241/SR-91 high-occupancy vehicle (HOV) direct connector in the 1991 ETC Draft Environmental Impact Report/ Environmental Impact Statement

(Draft EIR/EIS), 1992 ETC Final EIR, and the 1994 ETC Final EIS (all of which studied a broader project area with improvements on SR-133, SR-241, and SR-261).

The Systems Management Concept (SMC) for the ETC projected that each Build Alternative would be staged, incorporating general purpose traffic and eventually HOV lanes, to meet the forecasted demand. Under the SMC, ETC construction would be completed in one stage, with three or more phases.

To implement this later phase of the ETC, a Supplemental Draft EIR/EIS is being prepared to focus on the eastern portion of the original project and to address changes to environmental conditions and regulatory requirements. Various alternatives were studied in the 1991 ETC Draft EIR/EIS, 1992 ETC Final EIR, and the 1994 ETC Final EIS; however, the Supplemental Draft EIR/EIS will include a No Build and only one Build Alternative for the median-to-median connector for the following reasons:

- There are limited locations for a median-to-median connector between SR-241 and SR-91;
- The median-to-median connector is a component of a previously approved project and alternative selected during a 1992 EIR Certification and 1994 Record of Decision (ROD);
- Various alternatives were studied for the previously approved project which required consideration of a reasonable range of alternatives; and
- The Supplemental Draft EIR/EIS is being prepared to address changes to environmental conditions and regulatory requirements and not to change the previously approved project as a whole.

The Proposed Project is being coordinated with the Orange County Transportation Authority (OCTA) and the Riverside County Transportation Commission (RCTC). The SR-91 Express Lanes are tolled and are operated by OCTA, from SR-55 to the Orange County/Riverside County line. Easterly from the County line, the lanes are HOV non-tolled lanes; however, as part of the RCTC SR-91 Corridor Improvement Project (SR-91 CIP), RCTC will operate median tolled lanes starting from the County line and ending at Interstate 15 (I-15). As part of the SR-91 CIP, the median tolled lanes include a connector to southbound I-15 general purpose lanes. Implementation

of the SR-91 CIP along with the Proposed Project would provide a direct connection between SR-241 and southbound I-15.

Caltrans and the F/ETCA intend to begin construction of the Proposed Project in 2017.

### **1.1.1. Additional Project Information**

The project is located within portions of Irvine Ranch Sections 23, 25, 26, and 28, Township 4, South Range 8 West; portions of Irvine Ranch Sections 28, 30, 32, 36 and unsectioned areas of Township 3 South, Range 8 West; and unsectioned portions of Township 3 South, Range 7 West San Bernardino Baseline and Meridian, and is depicted on the *Black Star Canyon* and *Prado Dam, California* 7.5-minute series United States Geological Survey (USGS) topographic maps. The Project Location is shown in Figure 1.

Figure 1 also depicts the locations within the project that are covered by this Supplemental PIR/PER that were not studied in the original PIR/PER (Smith, 2014) and that are now part of the Area of Potential Disturbance (APD). These new areas are:

- An approximately 5-acre (ac) partial acquisition area on the south side of SR-91, roughly between Coal Canyon and Gypsum Canyon.
- An easterly extension of the project termini for advance signage (with no ground disturbance beyond the roadway) between Coal Canyon Undercrossing and west of State Route 71 (SR-71).

The 5 ac partial acquisition area is within a larger 40,000 ac Irvine Ranch National Natural Landmark (NNL) (as designated by the National Park Service in 2006). As defined in 6 CFR Part 62, an NNL is “an area ...of national significance ...because it is an outstanding example(s) of major biological and geological features.” The Irvine Ranch NNL is partially developed; nevertheless, the designation applies to all open space areas of the Irvine Ranch, regardless of whether individual parcels contain outstanding examples of major biological and geological features.

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## **1.2. Need and Purpose**

### **1.2.1. Project Need**

The project is needed to improve access between the SR-241 and SR-91 Express Lanes. The lack of connectivity between the SR-241 and the SR-91 Express Lanes negatively affects traffic flow, worsens an already congested SR-91 during peak hours, and results in a long queue of vehicles on northbound SR-241 trying to access eastbound SR-91. As a result, motorists inappropriately “queue jump” (i.e., change lanes at the last minute) during congested traffic periods, contributing to delays.

### **1.2.2. Project Purpose**

As stated in the Final EIR and Final EIS, the overall objective of the ETC was to accommodate traffic growth associated with planned and approved development in the County of Orange. Specifically, the ETC was proposed to meet the following objectives, which are applicable to the Proposed Project (which is a later phase of the ETC):

- To provide relief for existing freeways;
- To improve traffic flow on the regional transportation system;
- To service existing and planned development consistent with the General Plans of the counties and the cities in areas that will benefit from the project;
- To employ advanced transportation technology for the maximum operational and design efficiency and automatic vehicle monitoring for toll collections; and
- To implement the County of Orange Master Plan of Arterial Highways.

In addition to the originally intended objectives, changed circumstances at the junction of SR-241 and SR-91 have led to the following updated objectives for the Proposed Project:

- Implement the buildout of the ETC, as approved in 1994;
- Attain compatibility with the SR-91 mainline and Express Lanes;
- To improve traffic flow by minimizing queue-jumping on northbound SR-241 at the westbound SR-91 general purpose lane connector and at the eastbound SR-91 general purpose lane connector.
- To help achieve the Regional Mobility Plan goals of reducing emissions from transportation sources by improving movement in congested areas along the SR-241 and SR-91; and
- To enhance the efficiency of the tolled system, thereby reducing congestion on the non-tolled system on the SR-91.

### **1.3. Project Alternatives**

Two alternatives are being analyzed in this document: Alternative 1 (Two-Lane Express Lane Connector) and the No Build Alternative.

#### **1.3.1. Build Alternative (Two-Lane Express Lanes Connector)**

The Build Alternative would construct a two-lane express lane median-to-median connector between SR-241 and SR-91 which would connect lanes from the median of northbound SR-241 to the existing eastbound SR-91 Express Lanes. The reverse movement would also be accommodated, from the westbound SR-91 Express Lanes to the median of southbound SR-241. The connector would be tolled.

On SR-241 at the southern end of the project (near PM 36), FasTrak signage would be improved approximately 0.2 mi south of the Windy Ridge Wildlife Undercrossing. For southbound SR-241, an additional lane and shoulder would be provided by widening the Windy Ridge Wildlife Undercrossing into the existing median and improving the highway median approximately 10,000 ft to the north. For northbound SR-241, starting approximately 5,000 ft north of the Windy Ridge Wildlife Undercrossing, an additional lane and shoulder will be provided by improving the highway median approximately 5,000 ft to the north. At this point on SR-241 (approximately PM 38), the two connector lanes would converge within the existing median on fill and two new bridge structures approximately 700 ft (over the northbound SR-241 to westbound SR-91 general purpose lane connector) and 2,000 ft in length (to merge with SR-91). All approximate lengths will be further refined during the Final Design process.

Additional pavement would be added between the existing northbound SR-241/eastbound SR-91 and the northbound SR-241/westbound SR-91 general purpose connectors in order to accommodate a concrete barrier separation to prevent vehicles traveling on the westbound SR-91 general purpose connector to “queue jump” into the eastbound SR-91 general purpose connector. This would improve traffic flow on the SR-241.

The Build Alternative would merge into the existing OCTA SR-91 Express Lanes at the western limits of the RCTC SR-91 CIP which extends the SR-91 Express Lanes further east to I-15. The Build Alternative is also compatible with the approved SR-91 CIP for both the initial and ultimate configurations, including the number and

widths of the SR-91 Express Lanes, express auxiliary lanes, and general purpose lanes.

#### **1.3.1.1. Improvements on Eastbound SR-91**

At the western end of SR-91 project terminus, FasTrak signage improvements would occur approximately within the first 0.1 mi of the project. The Gypsum Canyon Road on- and off-ramps and the northbound-SR-241-to-eastbound-SR-91 general purpose connector would be realigned to accommodate the Proposed Project.

To accommodate the addition of the median-to-median connector, the existing eastbound SR-91 lanes would be shifted to the south by adding pavement to the south and restriping. The number of existing eastbound SR-91 general purpose lanes would be maintained within the project limits. At the eastern terminus of the connector bridge structure, the eastbound connector lane would continue for approximately 1 mi within the SR-91 median prior to tapering to tie in to the SR-91 CIP Express Lanes at Coal Canyon Undercrossing. Also near the eastern terminus of the connector lane bridge structure (approximately 2,000 ft west of Gypsum Canyon Road), one additional eastbound auxiliary express lane would be provided, connecting to the auxiliary lane for the SR-91 CIP also at Coal Canyon Undercrossing. These improvements would provide a four-lane express lane facility and tapering down to three lanes, between the connector and Coal Canyon Undercrossing.

The eastbound SR-91 Express Lanes would also have striped buffers (tapering from 0 ft to 4 ft). The Proposed Project would provide a striped buffer to separate the general purpose lanes from the SR-91 Express Lanes and a new striped buffer to temporarily separate the connector lane from the SR-91 Express Lanes. Additional separators within the striped buffers will be further considered during the Final Design process.

Approximately 3,600 ft west of Coal Canyon Undercrossing, grading would occur to accommodate the shift of the lanes to the south. The grading and construction of an access road would encroach into County-owned land on Assessor's Parcel Number (APN) 085-071-56. Approximately 5 ac of land on this parcel would be acquired from the County of Orange for Caltrans right-of-way. To the north of this parcel, a 1,000 ft retaining wall would be required, but would not be viewable from the highway. Further details for the retaining wall and the exact length will be determined during the Final Design process.

### **1.3.1.2. Improvements on Westbound SR-91**

At the eastern terminus of the connector bridge structure, the westbound connector lane would extend for approximately 1 mi within the SR-91 median, with the lane tapering approximately 1,000 ft west of Coal Canyon Undercrossing. For the eastern 1,000 ft of the westbound connector express lane, one additional westbound auxiliary express lane would be provided to accommodate merging and diverging to and from the SR-91 Express Lanes. These improvements would provide a four-lane express lane facility for approximately 1,000 ft. To provide the additional SR-91 Express Lanes, restriping would occur between points east of the Gypsum Canyon Road Undercrossing and west of Coal Canyon Undercrossing.

There would be a striped buffer (tapering from 0 ft to 2 ft) to separate the westbound SR-91 Express Lanes from the general purpose lanes. Additional separators within the striped buffer will be further considered during the Final Design process. At the eastern end of SR-91 project terminus, FasTrak signage improvements would occur between Coal Canyon Undercrossing and Green River Road within the existing median and highway footprint of westbound SR-91. (No roadway improvements would occur in this area.)

### **1.3.2. No Build Alternative**

Under this alternative, no direct toll connector would be constructed between SR-241 and SR-91. The No Build Alternative:

- Would not close the toll connector gap between SR-241 and the SR-91 Express Lanes;
- Would maintain the existing connections between SR-241 and SR-91 in the Project Area;
- Would not prevent motorists from inappropriately “queue jumping” during congested traffic periods, thereby disrupting traffic flow on the northbound SR-241 connector to the eastbound SR-91 general purpose lanes during PM Peak hours; and
- Would provide a benchmark by which the public and decision-makers can compare the magnitude of the effects of the Build Alternative.

## **1.4. Purpose of Investigation**

Significant nonrenewable paleontological resources including vertebrate fossils and unique or scientifically important invertebrate fossils and remains of fossil plants are recognized by the State of California and the National Environmental Policy Act of

1969 (NEPA). These regulations require that adverse effects to paleontological resources be avoided, or if they cannot be avoided, mitigated. NEPA does not specifically direct federal agencies to preserve paleontological resources, but preserving “important historic, cultural, and natural aspects of our natural heritage” (Section 1019(b)(4)) is interpreted to include fossils.

The paleontological records search and field assessment were conducted pursuant to the California Environmental Quality Act (CEQA), Public Resources Code (PRC) 21000 (Division 13, CEQA Appendix G, PRC 5097.5). The assessment documents the potential for paleontological resources older than 10,000 years to occur in the Project Area.

#### **1.4.1. Federal Regulations**

A project must comply with one or more federal regulations concerning paleontological resources, if (1) the project involves land under the jurisdiction of a federal agency, (2) a federal agency has oversight on the project, and/or (3) a permit, a license, authorization, or funding from a federal agency is required to complete the project. Because the Proposed Project is not on federal land, the majority of federal regulations concerning paleontological resources do not apply. However, the Proposed Project has federal funding and oversight by the Federal Highway Administration (FHWA), a federal agency; therefore, the following federal regulations apply to the Proposed Project:

**National Environmental Policy Act of 1969 (NEPA) (42 United States Code [USC] 4321-4375).** NEPA established a national policy for the protection, promotion, enhancement, and understanding of the environment and created the Council on Environmental Quality. As part of this act, Section 101(b)(4) (42 USC 4331) seeks to “preserve important historic, cultural, and natural aspects of our national heritage, and maintain, wherever possible, an environment which supports diversity and variety of individual choice.” NEPA requires that the environmental effects of a proposed federal project or action be evaluated, and regulations for implementing this evaluation are found in Title 40 of the Code of Federal Regulations (CFR), Sections 1500–1508. Because this project involves funding from and oversight by a federal agency (FHWA), compliance with NEPA regulations is required.

**Archaeological and Paleontological Salvage (23 USC 305).** As part of the Federal Aid Highway Act of 1956 (23 USC et seq.), this federal law authorizes the appropriation and use of federal funds for paleontological salvage as necessary by the highway department of any state in compliance with 16 USC 431–433. According to 23 CFR 1.9(a), the use of federal aid funds must be in conformity with federal and State law. Under this statute, mitigation of impacts to paleontological resources during development of the Proposed Project may be an eligible federal project cost, provided the necessary documentation is submitted to the FHWA.

Because a portion of the Proposed Project covered by this Supplemental PIR/PER is currently within an NNL, a discussion on the NNL is included below.

The NNL program was established in 1962 and is administered under the Historic Sites Act of 1935. Implementing regulations were first published in 1980 under 36 CFR 1212, and the program was redesignated as 36 CFR 62 in 1981. An NNL is defined as:

... an area designated by the Secretary of the Interior as being of national significance to the United States because it is an outstanding example(s) of major biological and geological features found within the boundaries of the United States or its Territories or on the Outer Continental Shelf (36 CFR 62.2).

National significance describes:

... an area that is one of the best examples of a biological community or geological feature within a natural region of the United States, including terrestrial communities, landforms, geological features and processes, habitats of native plant and animal species, or fossil evidence of the development of life (36 CFR 62.2).

Federal agencies and their agents (e.g., Caltrans) should consider the existence and location of designated NNLs, and of areas found to meet the criteria for national significance, in assessing the effects of their activities on the environment under Section 102(2)(c) of NEPA (42 USC 4321). The National Park Service (NPS) is responsible for providing requested information about the NNL Program for these assessments (36 CFR 62.6(f)). However, other than consideration under NEPA,

NNLs are afforded no special protection. Furthermore, there is no requirement to evaluate a paleontological resource for listing as an NNL. Finally, project proponents (State and local) are not obligated to prepare an application for listing potential NNLs, should such a resource be encountered during project planning and delivery.

#### **1.4.2. California Department of Transportation Regulations**

As this project is within State highway right-of-way, the Proposed Project is obligated to follow the guidelines specified in the Caltrans Standard Environmental Reference (SER). Specifically, the SER Environmental Handbook, Volume 1 Chapter 8 (Caltrans, 2015) deals with paleontology. The guidelines are designed to address impacts to paleontological resources prior to the beginning of construction. In most cases, three documents are required to be prepared: a Paleontological Investigation Report (PIR), a Paleontological Evaluation Report (PER), and a Paleontological Mitigation Plan (PMP). The PIR and PER are often combined into a single document. The PIR and PER must be prepared prior to completion of the Project Approval/ Environmental Document (PA/ED) phase in order to minimize construction delays. The PMP must be developed prior to the beginning of construction.

The purpose of the PIR is to identify whether or not paleontological resources may be present within the Project Area; the purpose of the PER is to evaluate the significance of the resources, if it is determined that resources are likely to be present; and the purpose of the PMP is to develop mitigation for significant resources. Occasionally the PIR/PER will determine that, despite the results of the literature search, it is unlikely that the Proposed Project will encounter significant resources during construction. This may be due to the removal of sensitive sediments as a result of previous construction in the area, or to the burying of sensitive sediments with fill deeper than depths that will be encountered during construction related to the Proposed Project. In these cases, a PMP will not be required, and the reason will be specified in the PIR/PER. At the conclusion of grading, two additional documents may need to be prepared: a Paleontological Mitigation Report (PMR) and a Paleontological Stewardship Summary (PSS).

#### **1.4.3. State Regulations**

Under State law, paleontological resources are protected by both CEQA and PRC Section 5097.5.

Under CEQA, Appendix G, Lead Agencies are required to consider impacts to the direct or indirect destruction of unique resources that are of value to the region or

State. Appendix G is a checklist with several choices given, including: Potentially Significant Impact, Less than Significant with Mitigation Incorporation, Less than Significant Impact, and No Impact. Specifically, in Appendix G, Section V (c), Lead Agencies are required to consider impacts to paleontological resources.

The California PRC Section 5097.5 states:

(a) 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.

(b) 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.

Because the Proposed Project involves public lands as defined in Section 5097.5(b), Caltrans and F/ETCA are required to comply with PRC 5097.5.

## **Chapter 2. Significance and Sensitivity**

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### **2.1. Summary of Significance**

Detailed discussions on paleontological significance are included in the original PIR/PER that was prepared for the Proposed Project (Smith, 2014). As such, this Supplemental PIR/PER uses an abbreviated summary defining significance in paleontological resources. All vertebrate fossils that can be related to a stratigraphic context are significant and are considered a significant nonrenewable paleontological resource. Invertebrate and plant fossils as well as other environmental indicators associated with vertebrate fossils are considered significant. Certain invertebrate and plant fossils that are regionally rare or uncommon, or help to define stratigraphy, age, or taxonomic relationships are considered significant.

### **2.2. Summary of Sensitivity**

Detailed discussions on paleontological sensitivity are included in the original PIR/PER that was prepared for the Proposed Project (Smith, 2014). As such, this Supplemental PIR/PER uses an abbreviated summary to define paleontological sensitivity and the potential for significant paleontological resources. A formation or rock unit has paleontological sensitivity or the potential for significant paleontological resources if it previously has produced, or has lithologies conducive to the preservation of vertebrate fossils and associated or regionally uncommon invertebrate and plant fossils. All sedimentary rocks and certain extrusive volcanic rocks and mildly metamorphosed rocks are considered to have potential for paleontological resources.

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## **Chapter 3. Methods**

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To ensure that research was comprehensive, the paleontological resources “Research Area” was expanded beyond the Area of Potential Disturbance (APD). A “Research Area” boundary of up to 1 mi on either side of the Project APD was used as a study area in the original PIR/PER (Smith, 2014). Research involved review of available geological and paleontological literature concerning or related to the stratigraphy of the Project Area and requests for paleontological locality data from Southern California museums. The results letters from the museums are included in Appendices A and B.

### **3.1. Literature Review and Records Search**

The locality search included a review of area geology and any fossil resources recovered within sediments similar to those that will be encountered during the implementation of the Proposed Project. In addition, the paleontological sensitivity of the sediments exposed in the Project Area was determined based on fossil finds from similar sediments in Southern California.

The purpose of a locality search is to establish the status and extent of previously recorded paleontological resources within and adjacent to the Project Area and to determine which geologic sediments were likely to be exposed during ground-disturbing activities associated with the proposed improvements. With this knowledge, an informed assessment can be made of the potential effects of the Proposed Project on paleontological resources in the area, anticipating the kinds of resources that might be encountered during earthmoving activities, and determining the paleontological sensitivities for each geologic formation or unit exposed in the Project Area.

In February 2007, during initial Project Scoping for paleontological resources, a locality search was completed through the Natural History Museum of Los Angeles County (LACM), the San Bernardino County Museum (SBCM), and records maintained at LSA Associates, Inc. (LSA). The locality search included the current APD along SR-241 as well as areas along SR-91 between SR-241 and SR-71. Individuals contacted included Dr. Sam McLeod, Curator of Vertebrate Paleontology at the LACM, and Eric Scott, Curator of Vertebrate Paleontology at the SBCM. The results letters from the LACM and SBCM are provided in Appendices A and B, respectively.

## **3.2. Field Inspection**

### **3.2.1. Pedestrian Survey**

A pedestrian survey was not completed during preparation of the original PIR/PER (Smith, 2014) as much of the area is along existing freeways with little to no access to exposed sediment. However, two previous paleontological studies had been completed in the vicinity of the Proposed Project that cover the same area. During grading associated with the original construction of SR-241, Paleo Environmental Associates, Inc. (PEA) provided paleontological mitigation monitoring (Lander, 2003). During preparation of the initial paleontological assessment of the SR-91 lane additions between SR-241 and SR-71, Chambers Group, Inc. (Chambers) completed a field survey of a majority of the Project Area (Wagner, 2006). The surveys conducted by Chambers included walking the areas of the Proposed Project and examining the exposed sediments in the areas of the proposed earthwork. The purpose of this survey was to confirm the geology as it is mapped, determine where potential cuts will occur, and determine whether any fossils were exposed on the surface.

During the preparation of this Supplemental PIR/PER, LSA conducted a pedestrian survey of the approximately 5 ac area that is within the Irvine Ranch. This area had not been previously surveyed during prior studies. The survey was completed by walking parallel transects spaced by approximately 10 meters in the flatter areas, as well as by examining outcrops from a distance where the terrain was too steep. The purpose of this survey was to confirm the geology as it is mapped, and determine whether any fossils were exposed on the surface.

## **3.3. Personnel**

Brooks R. Smith is an Associate at LSA and a member of the Cultural and Paleontological Resources Group, as well as a County of Orange Certified Paleontologist. Mr. Smith completed this Supplemental PIR/PER, as well as the original PIR/PER (Smith, 2014). He has over 22 years of experience with paleontological salvage programs and has extensive experience collecting paleontological resources, as well as preparing paleontological mitigation monitoring plans and assessment reports, surveying for paleontological resources, salvaging large fossil specimens, conducting fossil identification and curation, and writing final mitigation monitoring reports at the conclusion of construction projects (see Appendix C).

# Chapter 4. Results

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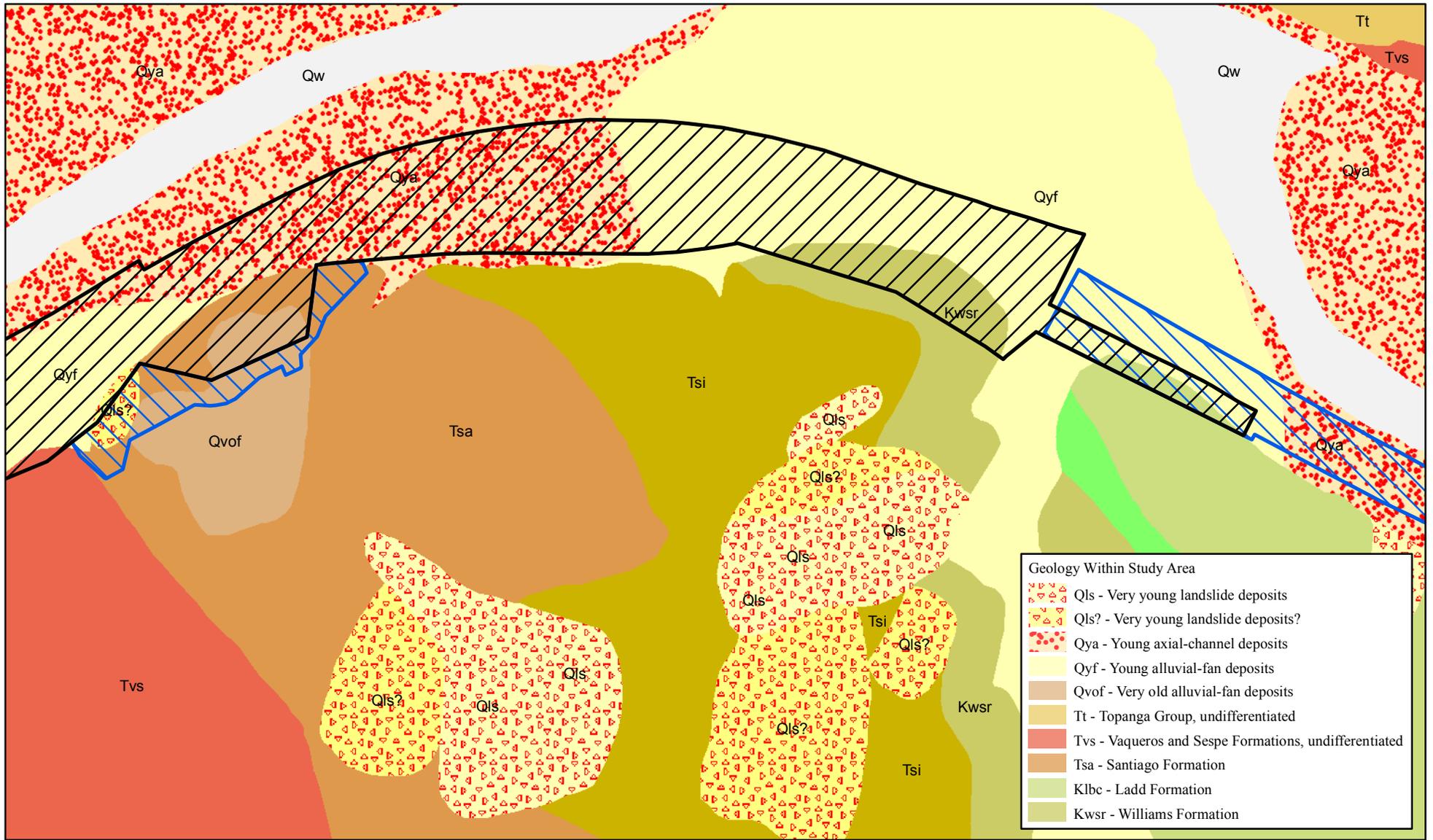
## 4.1. Locality Search

### 4.1.1. Geology

The Project Area is located at the northern end of the Peninsular Range Geomorphic Province, a 900 mi long northwest-southeast trending structural block that extends from the tip of Baja California to the Transverse Ranges and includes the Los Angeles Basin (Norris and Webb, 1976). The total width of the province is approximately 225 mi, with a maximum landbound width of 65 mi (Sharp, 1976). This region is characterized by a series of mountain ranges separated by northwest-trending valleys subparallel to faults branching from the San Andreas Fault. The trend of topography is similar to that of the Coast Ranges Geomorphic Province located to the north, but the geology is more like that of the Sierra Nevada, with granitic rock intruding on the older metamorphic rocks. It contains extensive pre-Cretaceous (> 65 million years ago) igneous and metamorphic rocks covered by limited exposures of post-Cretaceous sedimentary deposits.

Specifically, the Proposed Project is located in Santa Ana Canyon, where the Santa Ana River passes between the Santa Ana Mountains on the south and the Chino Hills to the north. According to the geology map prepared by Morton (2004), various geological units and formations have the potential to be encountered while excavating for the Proposed Project. The formations and units that have the potential to be encountered include: the Schulz Ranch member of the Williams Formation, the Santiago Formation, the undifferentiated Sespe/Vaqueros Formation, the Topanga Formation, and Very Old Alluvial Fan Deposits. In addition, Quaternary deposits that include Holocene landslides, Young Axial Channel Deposits, and Young Alluvial Fan Deposits also occur within the Project Alignment. In addition, although not mapped by Morton (2004), Artificial Fill likely exists in some areas, based on prior development within the footprint of the Proposed Project. However, within areas covered by this Supplemental PIR/PER where ground disturbance will occur, only four of these units are present: the Santiago Formation, Very Old Alluvial Fan Deposits, Young Alluvial Fan Deposits, and Quaternary Landslides. Each of these units and locations where they will be encountered is depicted on Figure 2, summarized in Table A, and briefly described below. Please note that Figure 2 focuses on the areas covered by this Supplemental PIR/PER where ground disturbance will occur; for location of and descriptions of the other units, please refer to the original PIR/PER (Smith, 2014).

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**Geology Within Study Area**

- Qls - Very young landslide deposits
- Qls? - Very young landslide deposits?
- Qya - Young axial-channel deposits
- Qyf - Young alluvial-fan deposits
- Qvof - Very old alluvial-fan deposits
- Tt - Topanga Group, undifferentiated
- Tvs - Vaqueros and Sespe Formations, undifferentiated
- Tsa - Santiago Formation
- Klbc - Ladd Formation
- Kwsr - Williams Formation

**LEGEND**

- Project Location Studied in 2014 PIR/PER
- New Project Area Studied in Current (2015) Supplemental PIR/PER



SOURCE: Morton (2004)

I:\RBF1101\GIS\Geology.mxd (4/20/2015)

**FIGURE 2**

*SR-241/SR-91 Express Lanes Connector*

**Geology Map**

12-ORA-241 PM 36.1/39.1  
 12-ORA-91 PM 14.7/18.9  
 08-RIV-91 PM 0.0/1.5  
 EA 0K9700

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**Table A Geologic Time Periods and Geologic Units within the Project APD Covered by this Supplemental PIR/PER**

Epoch	Age (years ago)	Geologic Formation/Unit	Map Symbol
<b>Quaternary Period</b>			
Holocene	Less than 5,000	Landslide Deposits	Qls
Late Pleistocene to Holocene	126,000 to present	Young Alluvial Fan Deposits	Qyf
Early to Middle Pleistocene	2.54 Ma to 300,000	Very Old Alluvial Fan Deposits	Qvof
<b>Tertiary Period</b>			
Middle Eocene	50–42 Ma	Santiago Formation	Tsa

APD = Area of Project Disturbance

PIR/PER = Paleontological Investigation Report/Paleontological Evaluation Report

Ma = Million years

SR-91 = State Route 91

SR-241 = State Route 241

#### 4.1.1.1. Santiago Formation

The middle Eocene Santiago Formation is composed of marine and nonmarine sediments up to 2,690 ft thick. It conformably overlies the Silverado Formation and is in turn conformably overlain by the Undifferentiated Sespe/Vaqueros Formation. In general, the lower beds appear to be marine in origin while the upper beds are nonmarine in origin. The lower beds are light gray to yellowish gray, medium coarse-grained friable sandstone. In some areas, the basal portion of these beds is a conglomerate up to 225 ft thick. The sandstone is arkosic, with essentially equal amounts of quartz and feldspar, and minor biotite that increases toward the top of the unit. The gravels are primarily siliceous plutonics and metavolcanics derived from the Santa Ana Mountains. It is massive, broadly crossbedded, and contains thin, discontinuous, lenticular lenses of greenish gray clay that are only tens of feet in lateral extent. Also present are lenses of fine siltstone and fine grained, well-bedded sandstone.

The upper beds are grayish-yellow to white, friable, fine- to medium-grained sandstone interbedded with reddish-brown and greenish-gray mottled sandy siltstone and claystone and some small discontinuous lenses of pebbly conglomerate. The sandstone tends to be poorly sorted, poorly bedded, and angular to subangular. Conglomerate clasts are well-rounded red and green metavolcanics, light-colored plutonics, and sedimentary rocks. Montmorillonite is the main clay mineral in the siltstone and claystone lenses with minor amounts of kaolinite. Morton et al. (1976) believe that the upper beds in the northern Santa Ana Mountains, which consist of massive, pebbly sandstone, are possibly nonmarine. Schoellhamer et al. (1981) also suggest a nonmarine deposition in the Santa Ana Mountains. This unit is

present on the east and west sides of the 5 ac area covered by this Supplemental PIR/PER. The unit will also be encountered beneath the younger units described below.

#### **4.1.1.2. Very Old Alluvial Fan Deposits**

The Very Old Alluvial Fan Deposits that are present within the Project Area were deposited during the early to middle Pleistocene (approximately 2.58 million to 300,000 years ago). Pleistocene Alluvial Fan Deposits are composed mixtures of coarse-grained sand and cobble, gravel-sand deposits, and sometimes silty sand deposits. They are usually found on elevated terraces above the active stream channel, or on the sides of hills above a canyon or valley. They can also be found at depth below more recent alluvial deposits. These sediments are generally slightly to moderately consolidated, and when exposed on the surface, they have usually been dissected by erosional gullies, and have some soil development. Colors are variable and based on upstream geology, but are usually shades of reddish-brown. This unit is mapped as occurring on the flatter and elevated central area of the approximate 5 ac parcel covered by this Supplemental PIR/PER.

#### **4.1.1.3. Late Pleistocene to Holocene Alluvium**

Late Pleistocene to Holocene Alluvium also known as Young Alluvium is a geologically recent deposit of gravel, sand, silt, or mud that was deposited by flowing water in a stream or river. It is found within or very close to active stream and river drainages and is usually loosely consolidated. Sand grains are generally subangular to subrounded, while the gravels and cobbles are rounded to well-rounded. The upper several feet of these deposits may be quite young and less than several 1,000 years old. Within the portion of the Proposed Project covered by this Supplemental PIR/PER where ground disturbance will occur, Young Alluvial Fan Deposits are the only type of alluvial sediment from the Late Pleistocene to Holocene that will be encountered. The Young Alluvial Fan Deposits are usually found on the alluvial fans that flank wide valleys but can also be found within narrow canyons.

#### **4.1.1.4. Holocene Landslide Deposits**

Holocene landslide deposits consist of blocks and flows of the underlying sediments and formations. As mapped, these deposits are from the late Holocene and are all likely less than 5,000 years old. They formed as canyon cutting and aqueous erosion caused slope failure. Their composition is dependent on the underlying units that have slid. Sometimes they are no deeper than several feet and only involve movement of soil. However, sometimes they are massive, covering several acres with ruptures tens

of feet deep extending well into the underlying bedrock. This unit is mapped as occurring on the west side of the approximate 5 ac area.

#### **4.1.2. Survey Results**

Chambers did not observe any fossils within any of the units that outcrop along the SR-91, but was able to confirm most of the mapped geology where it was exposed (Wagner, 2006).

During the monitoring program associated with the original construction of SR-241, PEA collected numerous fossils from most of the geologic units present within the overall project (Lander, 2003).

LSA paleontologist Brooks Smith completed the survey for this Supplemental PIR/PER on March 17, 2015. During the survey, the geology was essentially confirmed to be as mapped. Because of a thick growth of weeds and brush, ground visibility was around 30 percent or less. Due to the poor visibility, and although the presence of the Santiago Formation, the Very Old Alluvial Fan Deposits and the Young Alluvial Fan Deposits could be confirmed as being present, the Quaternary Landslide Deposits could not definitively be verified. No paleontological resources were observed during this survey.

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# **Chapter 5. Paleontological Resources**

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## **5.1. Results from Records Search and Literature Review**

### **5.1.1. Records Search Results**

#### **5.1.1.1. Natural History Museum of Los Angeles County**

The LACM has one record of a vertebrate paleontological find within the Project Area and knows of other localities recovered nearby from formations/units that outcrop within the Project Area. Locality LACM 4315 is located within the Topanga Formation on the southwest side of the intersection of SR-91 and Gypsum Canyon Road (within the Project APD), and it contained several species of sharks. LACM states that all units that the Proposed Project crosses except the young alluvial deposits have the potential to contain significant paleontological remains.

The LACM recommends that a mitigation plan be developed that includes monitoring to quickly and professionally recover any fossils that may be encountered while not impeding development during grading within the Sespe/Vaqueros Formation and Santiago Formation. Any recovered fossils should be placed into a scientific institution for the benefit of current and future generations. A copy of the LACM locality search letter is attached at the end of this document (Appendix A).

#### **5.1.1.2. San Bernardino County Museum**

The SBCM does not have any recorded localities within the Project Area. However, it knows of several localities, some of which are within 0.5 mi of the Project Alignment. These localities are within similar formations/units that may be encountered during ground-disturbing activities. These localities include SBCM 5.5.12 in the Santiago Formation that contained abundant gastropods and several from within Pleistocene alluvium from the nearby Chino Hills that contained extinct Pleistocene vertebrates. The SBCM states that the following formations may be encountered during ground-disturbing activities within the Project Area and have a high paleontological sensitivity: the Ladd Formation, the Silverado Formation, the Santiago Formation, the Sespe and Vaqueros Formations, the Topanga Formation, the Puente Formation, and the older alluvium (nonmarine terrace deposits).

Because there are sediments within the Project Area that have high paleontological sensitivity, the SBCM recommends that a qualified vertebrate paleontologist develop a program to mitigate impacts to the nonrenewable resources that may be encountered

during excavation in these sediments. The mitigation program should be consistent with CEQA and follow the guidelines of the SVP.

## **5.1.2. Literature Search Results**

### **5.1.2.1. Santiago Formation**

Yerkes (1957) describes a fossiliferous buff to gray-brown in fine- to medium-grained concretionary sandstone in the upper part of the lower beds of the Santiago Formation that contains silicified logs. Schoellhamer et al. (1981) report 19 fossil localities within this unit in the northern Santa Ana Mountains that include a diverse fauna of invertebrates, including gastropods and bivalves. Lander (2003) reports that within Orange and San Diego Counties, the lower beds of this Formation contain numerous fossilized mollusks, while the upper beds contain fossilized logs up to 40 ft in length, leaves from several plant species, and the bones and teeth of lizards, snakes, turtles, birds, marsupials, and mammals. During grading for the SR-241 toll road, Lander (2003) found the oldest reported crocodylian remains from Orange County as well as some fossil plant remains.

### **5.1.2.2. Very Old Alluvial Fan Deposits**

Very Old Alluvial Fan Deposits were deposited during the early to middle Pleistocene. Like the Young Alluvium discussed above, fossils are known in similar deposits from excavations for roads, housing developments, and quarries within the Southern California area (Jefferson, 1991a, and 1991b.; Reynolds and Reynolds, 1991; and Miller, 1971). Mammoths are the indicator fossil for the Pleistocene Epoch, which is divided into the older Irvingtonian North American Land Mammal Ages (NALMA), which spans the period between 1.8 million and 300,000 years ago, and the Rancholabrean NALMA, which spans the last 300,000 years of the Pleistocene. The indicator fossil for the Rancholabrean NALMA is *Bison* sp. Both NALMAs contain other fossils such as horse, coyote, rodents, birds, reptiles, and fish that help describe climatic and habitat conditions during the last 2 million years. There is a potential for these types of fossils whenever Pleistocene alluvial sediments are exposed. Based on the age of these sediments, it is likely that fossils from the Irvingtonian NALMA will be encountered.

### **5.1.2.3. Young Alluvium**

Young Alluvium includes the Young Alluvial Fan Deposits. These sediments were deposited during the late Pleistocene to Holocene (126,000 years ago to the present). The upper 10 ft of these sediments were likely deposited during the Holocene (11,700 years ago to the present). As such, although the approximate upper 10 ft of these

sediments can contain remains of plants and animals, generally not enough time has passed for the remains to become fossilized. In addition, the remains are contemporaneous with modern species, and these remains are usually not considered to be significant. However, once a depth of 10 ft is reached, it is likely the sediment will be older than 11,700 years old, and there will be a potential to encounter paleontological resources from the late Pleistocene. Fossils are known in similar deposits from excavations for roads, housing developments, and quarries within the Southern California area (Jefferson, 1991a and 1991b; Reynolds and Reynolds, 1991; and Miller, 1971). Mammoths are the indicator fossil for the Pleistocene Epoch, which is divided into the older Irvingtonian NALMA that spans the period between 1.8 million and 300,000 years ago, and the Rancholabrean NALMA that spans the last 300,000 years of the Pleistocene. The indicator fossil for the Rancholabrean NALMA is *Bison* sp. Both NALMAs contain other fossils such as horse, coyote, rodents, birds, reptiles, and fish that help describe climatic and habitat conditions during the last 2 million years. There is a potential for these types of fossils whenever Pleistocene alluvial sediments are exposed. Based on the age of these sediments, it is likely that fossils from the Rancholabrean NALMA will be encountered.

#### **5.1.2.4. Holocene Landslide Deposits**

There is a potential for fossils within Late Holocene Landslide Deposits if the rock unit that slid contained fossils. However, the movement of these deposits has them out of context, and they are not considered to be scientifically significant. These deposits are considered to have a low paleontological sensitivity. Once excavation passes through these deposits, the sensitivity of the area would change to that of the underlying unit, which in some cases may be high.

#### **5.1.3. Records Search and Literature Search Conclusions**

The specific sensitivities for units within the Supplemental PIR/PER study area where ground disturbance will occur are listed in Table B. These sensitivities are based on the Paleontological Potential Sensitivity Scale used by Caltrans. Sensitivities (and potential) for the Santiago Formation and Very Old Alluvial Fan Deposits are both high, based on the presence of significant fossil remains that have been recovered from these units in other areas. It is likely that similar significant resources may be encountered if these units are encountered during excavation associated with the Proposed Project in the areas covered by this Supplemental PIR/PER. Holocene Landslide Deposits do not have a paleontological sensitivity themselves, but are usually assigned a sensitivity of “low” in the event that excavation extends below the

**Table B Geologic Units and Geologic Units and Paleontological Sensitivity<sup>1</sup> within the Portions of the Project APD covered by this Supplemental PIR/PER**

<b>Geologic Unit</b>	<b>Paleontological Sensitivity (Caltrans)</b>
Young Alluvium	Low (0–10 ft) and High (below 10 ft)
Holocene Landslide Deposits	Low
Very Old Alluvial Fan Deposits	High
Santiago Formation	High

Source: Society of Vertebrate Paleontology and California Department of Transportation Guidelines.

<sup>1</sup> Also known as Paleontological Potential.

APD = Area of Project Disturbance

Caltrans = California Department of Transportation

ft = feet

PIR/PER = Paleontological Identification Report/Paleontological Evaluation Report

SR-91 = State Route 91

SR-241 = State Route 241

landslide material to the underlying formation or unit, at which point the sensitivity of that area would change to the sensitivity of the underlying unit. The Young Alluvial Fan Deposits are too young to contain paleontological resources within the upper approximate 10 ft because the upper 10 ft are likely from the Holocene; however, once a depth of 10 ft is reached it is likely that the sediments are from the Pleistocene and are old enough to contain scientifically significant resources. Thus, once a depth of 10 ft is reached, the paleontological sensitivity of the area becomes High.

The Paleontological Resources Sensitivity Map (Figure 3) graphically presents a summary of the Project Area and the underlying formations with paleontological sensitivity, presented as sensitivity polygons. Figure 3 focuses on the area covered by this Supplemental PIR/PER where ground disturbance will occur. Please refer to the original PIR/PER (Smith, 2014) for the sensitivities of the other areas of the project.

Paleontological resource sensitivity ratings for sedimentary polygons are consistent with those used by both Caltrans and the SVP:

- High sensitivity (H) is based on formations or mappable rock units that are known to contain or have the correct age and depositional conditions to contain significant paleontological resources.
- Low sensitivity (L) is determined by a qualified vertebrate paleontologist conducting a literature and records review as well as a field survey. Low sensitivity cannot be determined simply by looking for rock unit descriptions on a geologic map. For instance, an area mapped as Qal may actually be a thin, surficial layer of non-fossiliferous sediments covering fossil-rich Pleistocene sediments. An area mapped as granite may be covered by a Pleistocene soil

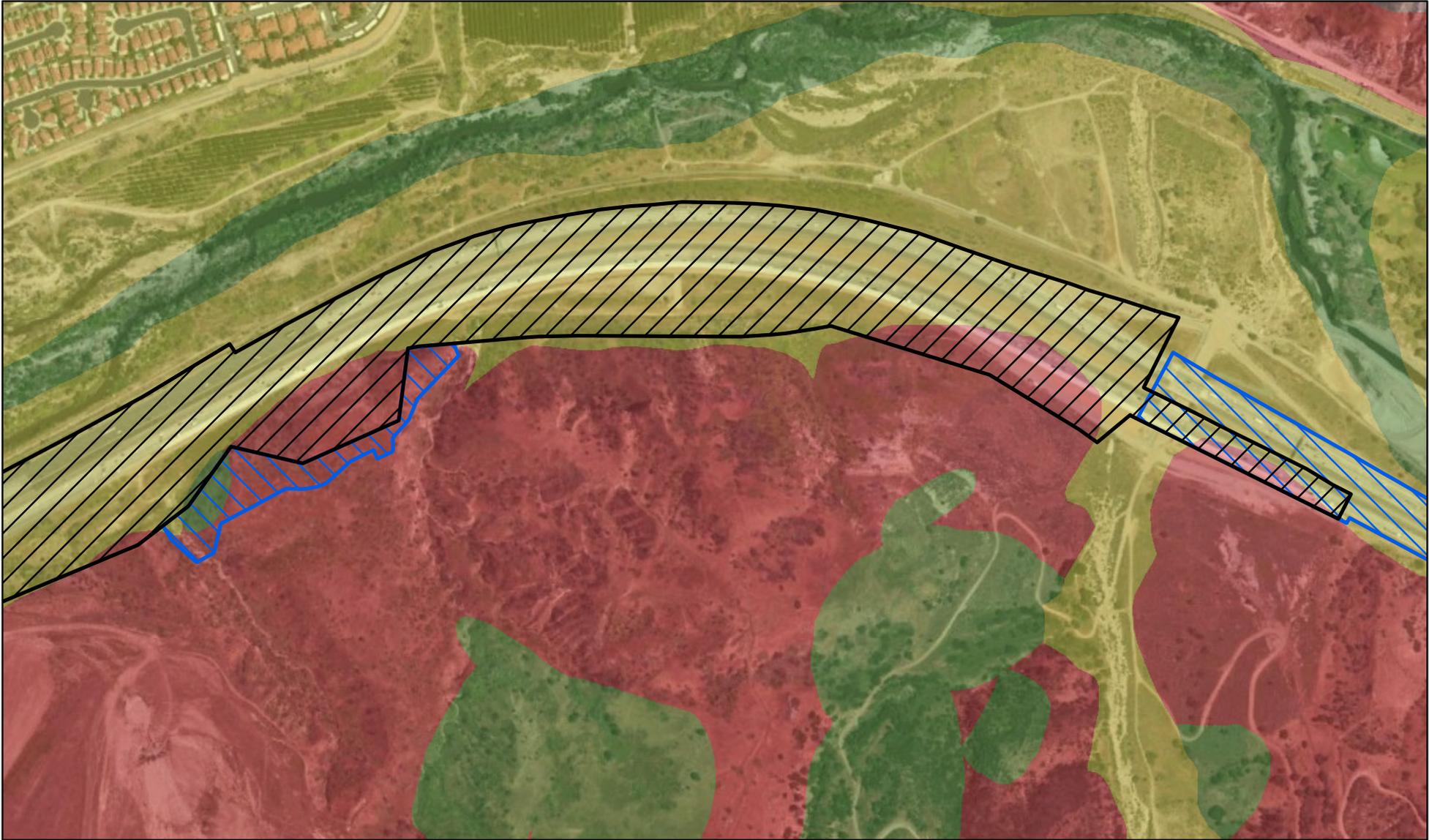
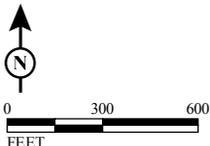


FIGURE 3

LEGEND

-  Project Location Studied in 2014 PIR/PER
-  New Project Area Studied in Current (2015) Supplemental PIR/PER

- Paleontological Resources Sensitivity
-  Low
  -  Low 0-10', High below 10'
  -  High



SR-241/SR-91 Express Lanes Connector  
Paleontological Resources Sensitivity Map

12-ORA-241 PM 36.1/39.1  
12-ORA-91 PM 14.7/18.9  
08-RIV-91 PM 0.0/1.5  
EA 0K9700

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horizon that contains fossils. The actual sensitivity must be determined by a records search and field inspection.

Figure 3 shows that portions of the Proposed Project are located in areas identified with high paleontological sensitivity at surface and at depth, as well as areas of low paleontological sensitivity. Grading and excavation will occur with implementation of the Proposed Project.

#### **5.1.4. Results Summary**

The Proposed Project is anticipated to disturb sediments with low or high potential to contain significant, nonrenewable paleontological resources. Where excavation will occur within the 5 ac parcel in the Irvine Ranch NNL, there are four sediment types: Holocene Landslides (low potential), Young Alluvial Fan Deposits (low potential from the surface to depths up to 10 ft and a high potential below 10 ft), Very Old Alluvial Fan Deposits (high potential), and the Santiago Formation (high potential).

One LACM fossil locality is known to be within the Project Area, and one SBCM locality is known to be within 0.5 mi. Both the LACM and the SBCM know of localities in other areas with the same sediments that are present within the project area. Research also documented known fossil localities within sediments similar to those within the project, some located in proximity to the Project Area. Based on the positive results of this PIR/PER study, it is recommended that a PMP be prepared for the Proposed Project following the Caltrans SER guidelines. These paleontological resource impact minimization measures within the PMP shall be incorporated into the plans, specifications, and estimates for the Proposed Project.

## **5.2. Recommendations for Paleontological Mitigation Plan**

The SVP and Caltrans present similar guidelines for adequate mitigation of impacts to significant, nonrenewable paleontological resources. Excerpts from individual guidelines follow:

### **5.2.1. Society of Vertebrate Paleontology**

Recommended general guidelines for conformable impact mitigation to significant nonrenewable paleontological resources have been published by the SVP (1995) along with conditions of receivership that the repository institution can require when receiving fossils recovered from construction projects (SVP, 1996). In areas determined through a records check and field survey to have a high potential for significant paleontological resources, an adequate program for mitigating the impact of development should include the following:

- A preliminary survey and surface salvage of any observed fossils prior to construction
- Monitoring and salvage during project excavation
- Preparation, including screen washing to recover small specimens (if applicable) and specimen preparation to a point of stabilization and identification
- Identification, cataloging, curation, and storage in a museum or university that has a curator who can retrieve the specimens upon request
- A final report of the finds and their significance after all operations are completed

All phases of mitigation are to be supervised by a professional paleontologist who maintains the necessary paleontological collecting permits (if required) and repository agreements. The Lead Agency ensures compliance with the measures developed to mitigate the impacts of excavation during the initial assessment. To ensure compliance from the start of the project, a statement that confirms the site's potential sensitivity, confirms the repository agreement with an established institution, and indicates the program for impact mitigation should be deposited with the Lead Agency and contractors before work begins. The program will be reviewed and accepted by the Lead Agency's designated vertebrate paleontologist. If a mitigation program is initiated early in the course of project planning, construction delays due to paleontologic salvage activities can be minimized or avoided.

### **5.2.2. California Department of Transportation**

Caltrans has developed a similar set of guidelines to reduce impacts to paleontological resources. These recommendations start with avoidance of the resource area by the project and continue with recommendations for impact minimization measures during construction excavation.

#### **5.2.2.1. Avoidance**

Avoidance of project impacts can be achieved by project redesign so that paleontological resources are completely outside the project's impact area (e.g., a different alignment route that misses the resource or a construction approach that does not entail construction excavation that would impact fossiliferous strata).

#### **5.2.2.2. Environmentally Sensitive Areas**

A related strategy creates an Environmentally Sensitive Area (ESA) around a paleontological locality. ESAs are a standard part of the Caltrans and FHWA toolkit to protect resources within or adjacent to a project while concurrently delivering the project. Generally, these involve some combination of fencing or cyclic monitoring as

an alternative to excavation monitoring. In the event that the special measures prove ineffective for one reason or another, more traditional mitigation is necessary. This fallback sometimes affects delivery schedules and/or total project costs. If viable and properly implemented, however, ESAs can reduce costs and time associated with more extensive traditional mitigation approaches.

### 5.2.2.3. Paleontological Mitigation Plan

Since the geology of California is diverse and the nature of the fossils that it contains varies from one outcrop to the next, Caltrans does not provide a generic paleontological resource impact mitigation, but instead presents a format for the PMP that can be utilized by the professional project paleontologist who has been retained to manage paleontological resources during project development. A full list of sections of the PMP is included in Caltrans' SER Environmental Handbook, Volume 1, Chapter 8 (Caltrans, 2015). Briefly, the PMP sections are:

- **Introduction:** A brief discussion of the goals of the proposed study, of the construction project effects, and why mitigation is needed (e.g., compliance with CEQA).
- **Background:** Pertinent information should be provided to demonstrate familiarity with the project area and the type of fossils and rock units under study.
- **Description of the Resource:** A description of the rock units, boundaries of the fossiliferous formations, and locations of exposures in the vicinity of the project study area and in the APD.
- **Proposed Research:** A clear, concise description of why the paleontological resource is significant or has scientific importance, and how the study is expected to address current gaps in the paleontological data.
- **Scope of Work:** The work plan to mitigate project effects, including all fieldwork and laboratory efforts. This may include:
  - Procedures for interfacing paleontological and construction personnel developed in consultation with the Resident Engineer (RE).
  - Construction monitoring programs should be outlined.
  - Salvage methods should be outlined, from large specimen recovery to collection and processing of microfossils.
  - Recovered specimens should be prepared to a point of identification and stabilized for preservation in conformance with individual repository requirements.

- All recovered specimens should be cataloged using the format of the proposed curation facility.
- Not all located fossils need to be recovered. Criteria for the discarding of specific fossil specimens should be made explicit.
- **Decision Thresholds:** How and when fieldwork will achieve the study goals, allowing fieldwork to cease, or any circumstances under which additional effort might be needed to achieve study goals.
- **Schedule:** The schedule for completing the proposed work may appear as text or in graphic form (e.g., a timeline) and include a start date, the duration of fieldwork and laboratory processing, and the time required for report preparation.
- **Justification of Cost Estimate:** Provides narrative support for the cost estimate, including the basis for person-hour estimates, clarification of overhead percentages, and any other costs.
- **Cost Estimate:** This is often presented as an appendix; this documentation should present a tabular summary of costs for the proposed effort and include all proposed numbers and levels of personnel, time, and costs.
- **Bibliography:** The bibliography should include only those references cited in the plan.
- **Curation:** The curation facility should be identified and a draft curation agreement included. A curation agreement with an approved facility must be in place prior to initiating any paleontological monitoring or mitigation activities.

The plan should be prepared by or under the supervision of a qualified Principal Paleontologist and submitted for review sufficiently in advance of an anticipated start-work date so that all involved agencies have time to comment, the Lead Agency has time to adjust the plan to accommodate such input, and the plan may be resubmitted for all necessary approvals. It is imperative that all agencies with jurisdiction over a paleontological site are in agreement as to the level of effort in the mitigation plan, including agreement on the applicability of pertinent laws, regulations, and permit requirements. When properly designed, the PMP serves as a basis for obtaining any necessary permits from other agencies.

Specific interagency issues may include, but are not limited to, health and safety issues; employee access and egress; collection, removal, and stockpiling of fossiliferous sediment; wet screen processing of fossiliferous sediment and disposal of muddy wastewater; and use of chemicals (kerosene) to break down specific types of indurated fossiliferous sediment. Agency permits that may be needed for access or

to conduct the work of monitoring and salvage should be applied for and obtained in advance of the project.

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## **Chapter 6. Summary**

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The portion of the Proposed Project covered by this Supplemental PIR/PER where ground disturbance will occur crosses two fossiliferous sediments: the middle Eocene Santiago Formation and the early to middle Pleistocene Very Old Alluvial Fan Deposits, both of which have a high paleontological sensitivity. One other sediment type, Young Alluvial Fan Deposits, is present and has a low paleontological sensitivity from the surface to approximately 10 ft below the surface, and a high paleontological sensitivity below a depth of 10 ft. An additional unit, Holocene Landslide Deposits, is also present and has a low paleontological sensitivity; however, Landslide Deposits often have variable thicknesses, and once excavation extends below them, the paleontological sensitivity for the area where this unit is mapped may change to either high or low, depending on the sensitivity of the sediment that is encountered. This study presents summary definitions of paleontological significance and sensitivity, the results of records search requests, and reviews of geological and paleontological literature.

The findings of this Supplemental PIR/PER are the same as the original PIR/PER, in that this study does not anticipate special paleontological situations that would require Proposed Project redesign to avoid critical localities or strata. This includes the area of the Proposed Project within the Irvine Ranch NNL. The sediments that will be encountered in this area are all present in other portions of the NNL, and there are no known unique paleontological resources present that helped to contribute to the Irvine Ranch NNL listing. In addition, as stated in the discussion on NNLs (Section 1.5.1) other than consideration under NEPA, NNLs are afforded no special protection. However, because there are areas of high paleontological sensitivity within the Project Area, preparation of a Caltrans PMP is recommended prior to completion of final design within those areas of the Proposed Project identified as having high sensitivity. This PMP should be synthesized from outlines and guidelines provided by Caltrans and the SVP, and specifically tailored to the resources and sedimentary formations that will be encountered during excavation within the Project Area.

This study recommends that the section of the PMP describing the excavation monitoring for the Proposed Project include the following:

- Attendance at the pregrade meeting by a qualified paleontologist or representative. At this meeting, the paleontologist will explain the likelihood for encountering paleontological resources, what resources may be discovered, the

methods of recovery that will be employed, and what construction personnel should do in the event paleontological resources are encountered when a monitor is not present.

- A preconstruction field survey in areas identified as having high paleontological sensitivity after vegetation and paving have been removed, followed by salvage of any observed surface paleontological resources prior to the beginning of additional grading. This requirement is consistent with Mitigation Measure P-1 in the ETC EIR/EIS, which reads “In conjunction with final design, an intensive pregrading survey of the entire alignment to locate fossil sites not recorded during the environmental review process shall be conducted by a qualified paleontologist. Vertebrate remains and representative samples of invertebrate remains shall be collected and recorded. The paleontologist shall, based on the field survey results, reclassify rock units of unknown importance to low, moderate or high importance.”
- During construction excavation, a qualified vertebrate paleontological monitor shall initially be present on a full-time basis whenever excavation will occur within the sediments that have a high paleontological sensitivity rating, and on a spot-check basis for excavation in sediments that have a low sensitivity rating. Monitoring may be reduced to a part-time basis if no resources are being discovered in sediments with a high sensitivity rating (monitoring reductions, when they occur, will be determined by the qualified Principal Paleontologist). The monitor shall inspect fresh cuts and/or spoils piles to recover paleontological resources. The monitor shall be empowered to temporarily divert construction equipment away from the immediate area of the discovery. The monitor shall be equipped to rapidly stabilize and remove fossils to avoid prolonged delays to construction schedules. If large mammal fossils or large concentrations of fossils are encountered, Caltrans will consider using heavy equipment on site to assist in the removal and collection of large materials. This requirement is consistent with Mitigation Measure P-2 in the ETC EIR/EIS, which reads “In conjunction with site preparation and grading, the paleontologist shall monitor clearing and grading in areas underlain by rock units of high importance full-time, in areas underlain by rock units of moderate importance on a half-time basis and will spot check but not monitor grading in areas underlain by rock units of low importance. If sufficient important fossil remains are found during field survey or construction monitoring in an area underlain by a rock unit of low or moderate importance, the paleontologist shall raise the importance of the rock unit and increase the monitoring effort, as appropriate. The number of monitors to be stationed in each

- construction area during grading shall be based on the amount of rock to be moved per day.”
- Mitigation Measure P-3 in the ETC EIR/EIS states that “In conjunction with site preparation and grading, the paleontologist shall collect rock samples from suitable horizons in formations of high, moderate and unknown importance. At the paleontologist's discretion and to reduce any construction delay, the grading contractor shall assist in collecting the samples and moving them to an adjacent off-site location for later transportation by the monitor to the Orange County Natural History Museum or a similar facility.” [The Orange County Natural History Museum no longer exists. However, the John D. Cooper Archaeological and Paleontological Center (established in 2009 and located in Santa Ana), which is associated with Orange County Parks and California State University, Fullerton, is the current repository for archaeological and paleontological collections.]
  - Localized concentrations of small (or micro-) vertebrates may be found in all native sediments. Therefore, it is recommended that these sediments occasionally be spot-screened on site through 1/8- to 1/20-inch mesh screens to determine whether microfossils are present. If microfossils are encountered, sediment samples (up to 3 cubic yards, or 6,000 pounds) shall be collected and processed through 1/20-inch mesh screens to recover additional fossils.
  - Mitigation Measure P-4 in the ETC EIR/EIS states that “If fossil remains are found during site preparation, grading or construction, the paleontologist shall temporarily stop work and notify TCA of the work stoppage. The TCA shall follow the procedures in Chapter 7 of the TCA Administrative Code for development of mitigation if mitigation is determined to be necessary.” In addition, Caltrans District 12 Environmental Branch will be notified of any paleontological finds as well as any work stoppages associated with the finds.
  - Recovered specimens shall be prepared to the point of identification and permanent preservation. This includes the sorting of any washed mass samples to recover small invertebrate and vertebrate fossils, the removal of surplus sediment from around larger specimens to reduce the volume of storage for the repository and storage cost, and the addition of approved chemical hardeners/stabilizers to fragile specimens. This requirement is consistent with Mitigation Measure P-5 in the ETC EIR/EIS, which reads “After the completion of the on-site monitoring, the paleontologist shall process all collected rock samples for microvertebrate and other fossil remains, prepare and identify all collected remains, incorporate them into a retrievable storage system, and file accompanying field notes, maps and

photographs at the Orange County Natural History Museum or a similar facility.”  
[This will likely be the John D. Cooper Archaeological and Paleontological Center.]

- Specimens shall be identified to the lowest taxonomic level possible and curated into an institutional repository with retrievable storage. The repository institutions usually charge a one-time fee based on volume, so removing surplus sediment is important. The repository institution may be a local museum or university with a curator who can retrieve the specimens on request. Caltrans requires that a draft curation agreement be in place with an approved curation facility prior to the initiation of any paleontological monitoring or mitigation activities.
- Preparation and submittal of the PMR documenting completion of the PMP for the Lead Agency (Caltrans). This requirement is consistent with Mitigation Measure P-6 in the ETC EIR/EIS, which reads “Following completion of the monitoring, identification, storage and documentation activities, the paleontologist shall prepare a summary report presenting an inventory and describing the significance of accessioned remains.”

Implementation of these recommendations will reduce impacts to nonrenewable paleontological resources. More project-specific measures may need to be developed during preparation of the PMP to refine these measures during final project design.

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**Appendix A.** Records Search Results from  
the Natural History Museum  
of Los Angeles County

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Natural History  
Museum of Los Angeles County

900 Exposition Boulevard • Los Angeles, CA 90007

Vertebrate Paleontology Section  
Telephone: (213) 763-3325  
FAX: (213) 746-7431  
e-mail: smcleod@nhm.org



31 January 2008

LSA Associates, Inc.  
20 Executive Park, Suite 200  
Irvine, California 92614-4731

Attn: Brooks Smith, Cultural and Paleontological Resources Group

re: Paleontological Resources Records Search for the proposed State Route 241 Connector to State Route 91 Project, LSA Project # CHM0702, near the City of Corona, Orange and Riverside Counties, project area

Dear Brooks:

I have searched our paleontology collection records for the locality and specimen data for the proposed State Route 241 Connector to State Route 91 Project, LSA Project # CHM0702, near the City of Corona, Orange and Riverside Counties, project area as outlined on the sections of the Prado Dam and Black Star Canyon USGS topographic quadrangle maps that you sent to me via e-mail on 30 January 2008. We have one vertebrate fossil locality that lies directly within the proposed project area, and other localities nearby from the same sedimentary deposits that occur in the proposed project area.

Along the Riverside Freeway (Highway 91) surface deposits in the lower lying portions of the proposed project route area in the Santa Ana River channel consist of younger Quaternary Alluvium, either as fluvial sands and gravels from the Santa Ana River or as fan deposits from the adjacent hills to the south. At the eastern end of the proposed project route area around the intersection with the Corona Freeway (Highway 71) there are exposures of older Quaternary Alluvium in the less steeply inclined portions of the elevated terrain. The more steeply inclined portions of the elevated terrain in the eastern end of the proposed project route area have exposures of the marine late Miocene Puente Formation (also known as the Sycamore Canyon Formation or members of the Monterey Formation in this area). Just west of the intersection of the Riverside Freeway (Highway 91) with Green River Road there are exposures of the marine middle Miocene Topanga Formation, the late Oligocene or early Miocene Sespe and Vaqueros Formations (these may be difficult to distinguish in this area but the Sespe Formation is typically terrestrial and the Vaqueros is typically marine), the Eocene Santiago Formation, the marine Paleocene Silverado Formation and the marine late Cretaceous Ladd Formation. On the west side of the Whittier Fault, just west of Riverside / Orange County line, there are exposures of the

Mesozoic Santiago Peak volcanics and then a reversal of the sequence of rocks from the Silverado Formation up through the Topanga Formation.

Further west along the proposed project route area, from just east of the intersection of the Riverside Freeway (Highway 91) with Coal Canyon Road, there are additional exposures of the marine late Cretaceous Ladd Formation, then exposures of the Paleocene Silverado Formation, the marine Eocene Santiago Formation, and late Oligocene to early Miocene Sespe / Vaqueros Formations undifferentiated. Where the proposed project route area turns south at the intersection of the Riverside Freeway (Highway 91) and the Eastern Transportation Corridor (Highway 241) there are further exposures of the late Oligocene to early Miocene Sespe / Vaqueros Formations undifferentiated and of the marine Middle Miocene Topanga Formation.

The igneous rocks of the Santiago Peak volcanics, of course, will be devoid of fossils. The younger Quaternary alluvial deposits found in the lower lying portions of the proposed project route area on the southern side of the Santa Ana River drainage typically do not contain significant vertebrate fossils, at least in the uppermost layers, and we have no vertebrate fossil localities anywhere nearby from such deposits. Our closest fossil vertebrate locality from older Quaternary deposits is LACM 1207, almost due east of the eastern-most portion of the proposed project route area between Corona and Norco, that produced a fossil specimen of deer, *Odocoileus*.

Our closest fossil vertebrate localities in the Puente Formation are about sixty localities, LACM 5560, 6307-6337, 7266-7267, 7269-7270, 7272-7284, 7373-7381, 7383, and 7386, just south of Los Serranos and west of the Corona Freeway (Highway 71) directly north of the western portion of the proposed project route area. These localities have produced a rich fauna of fossil fish and marine mammals (see attached for composite fauna from these localities). Our closest vertebrate fossil locality from the Topanga Formation is LACM 6292, along Santiago Canyon Road directly west of the Santiago Reservoir south-southwest of the proposed project route area, that produced a fossil specimen of dog shark, *Mustelus*. We have one vertebrate fossil locality, LACM 4315, from the marine Vaqueros portion of the Sespe / Vaqueros Formations undifferentiated, that lies directly within the proposed project route area. Locality LACM 4315, on the southwest side of the intersection of the intersection of the Riverside Freeway (Highway 91) and Gypsum Canyon Road, produced fossil specimens of basking shark, *Cetorhinus*, sand shark, *Carcharhinus*, angel shark, *Squatina*, and stingray, *Dasyatis*.

Our closest vertebrate fossil localities from the Santiago Formation all occur in San Diego County far to the south-southeast of the proposed project route area, but specimens from one of those localities, LACM 68102, including the fossil camel *Protylopus pearsonensis* and the fossil horned artiodactyl *Leptoreodon leptolophus*, were published in the scientific literature by D.J. Golz (1976. Eocene Artiodactyla of southern California. LACM Science Bulletin, 26:1-85). Our only Silverado Formation locality from this area, LACM 4634, produced a specimen of a fossil

turtle, Testudinidae. Our closest vertebrate fossil locality from the Ladd Formation is LACM 4221, in Silverado Canyon directly south of the eastern portion of the proposed project route area, produced specimens of the fossil sharks *Squalicorax* and *Cretolamna appendiculata*.

Excavations in the small exposures of the Santiago Peak volcanics in the proposed project route area will not encounter any fossils. Surface grading or shallow excavations in the younger Quaternary Alluvium exposed in the lower lying portions of the proposed project area are unlikely to encounter significant vertebrate fossils. Deeper excavations in those areas that extend down into older Quaternary deposits, however, as well as any excavations in the exposures of the Puente Formation, the Topanga Formation, the Sespe / Vaqueros Formations, the Santiago Formation, the Silverado Formation, or the Ladd Formation found in the more elevated portions of the proposed project route area, may well encounter significant remains of fossil vertebrates. Any substantial excavations in the proposed project area, therefore, should be monitored closely to quickly and professionally recover any fossil remains while not impeding development. Any fossils collected should be placed in an accredited 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,

A handwritten signature in cursive script that reads "Samuel A. McLeod".

Samuel A. McLeod, Ph.D.  
Vertebrate Paleontology

enclosures: appendix, invoice

Composite fossil fauna from Puente Formation localities just south of Los Serranos, Chino Hills  
 Localities LACM 5560, 6307-6337, 7266-7267, 7269-7270, 7272-7284, 7373-7381, 7383, and 7386

Osteichthyes

Clupeiformes

Clupeidae - herrings

*Ganolytes* *cameo*

*Xyne* *grex*

Gadiformes

Gadidae - cods

*Eclipes*

Moridae - moras

Myctophiformes

Myctophidae - lanternfishes

Perciformes

Carangidae - jacks; amberjacks; pompanos

*Decapterus*

*Pseudoseriola*

Gempylidae - snake mackerels; escolars; oilfishes

*Thyrsocles* *kriegeri*

Sciaenidae - croakers

*Lompoquia*

Scombridae - mackerels & tunas

*Sarda*

*Scomber*

Serranidae - sea basses & groupers

Sparidae - porgies

*Plectrites* *classeni*

Salmoniformes

Bathylagidae - deep sea smelts

Salmonidae - trouts & salmons

*Oncorhynchus*

Scorpaeniformes

Scorpaenidae - scorpionfishes & rockfishes

Stomiatiiformes

Chauliodontidae - viperfish

*Chauliodus* *eximius*

Sternoptychidae - hatchetfishes

*Argyropelecus*

Mammalia

Carnivora

Otariidae - eared seal [sea lions]

*Pithanotaria*

Cetacea

Balaenopteridae - rorqual baleen whales

Phocoenidae - porpoises

Physeteridae - sperm whales

*Scaldicetus*

**Appendix B.** Records Search Results from  
the San Bernardino County  
Museum

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# SAN BERNARDINO COUNTY MUSEUM



COUNTY OF SAN BERNARDINO  
PUBLIC AND SUPPORT  
SERVICES GROUP

2024 Orange Tree Lane • Redlands, California USA 92374-4560  
(909) 307-2669 • Fax (909) 307-0539 • www.sbcountymuseum.org  
TDD (909) 792-1462

ROBERT L. McKERNAN  
Director

11 February 2008

LSA  
FEB 21 2008

LSA Associates, Inc.  
attn: Brooks Smith  
20 Executive Park, Suite 200  
Irvine, CA 92614

RECEIVED  
IRVINE

re: **PALEONTOLOGY LITERATURE AND RECORDS REVIEW, SR-241  
CONNECTOR TO SR-91, ORANGE AND RIVERSIDE COUNTIES, CALIFORNIA**

Dear Mr. Smith,

The Division of Geological Sciences of the San Bernardino County Museum (SBCM) has completed a literature review and records search for the above-named project alignment in Orange and Riverside Counties, California. The proposed project alignment traverses portions of sections 29, 30, and 31, Township 3 South, Range 7 West; sections 25, 26 (projected), 33 (projected), 34 (projected), 35 (projected), and 36, Township 3 South, Range 8 West; and section 4 (projected), Township 4 South, Range 8 West, San Bernardino Base and Meridian, as seen on the Black Star Canyon, California (1967 edition) and the Prado Dam, California (1967 edition, photorevised 1981) 7.5' United States Geological Survey topographic quadrangle maps.

Previous geologic mapping of the area (Durham and Yerkes, 1964; Rogers, 1965; Morton, 2004) indicates that the proposed project alignment traverses a number of geologic units with high potential to yield significant nonrenewable paleontologic resources, including (from oldest to youngest): the Baker Canyon and Holz Shale Members of the Ladd Formation (late Cretaceous Period) (= units **Klbc**, **Klhs**); the Silverado Formation (Paleocene Epoch) (= **Tsi**); the Santiago Formation (middle Eocene) (= **Tsa**); undifferentiated rocks of the Vaqueros and Sespe Formations (late Eocene through early Miocene Epochs) (= **Tvs**); the Topanga Formation (middle Miocene) (= **Tt**); the Yorba and Sycamore Canyon Members of the Puente Formation (Miocene and early Pliocene) (= **Tpy**, **Tpsc**); Quaternary very old fan deposits (early Pleistocene Epoch) (= **Qvof**); and Quaternary fan deposits (middle to later Pleistocene Epoch) (= unit **Qof**). The undifferentiated Sespe and Vaqueros rocks have high potential to yield significant nonrenewable paleontologic resources, and so are assigned high paleontologic sensitivity. The Quaternary fan gravels have undetermined paleontologic potential; depending upon their lithology, they may have high paleontologic sensitivity.

The late Cretaceous Ladd Formation consists of marine and locally nonmarine conglomerate, sandstone, siltstone and shale, and is fossiliferous throughout its extent. The Baker Canyon Conglomerate (**Klbc**) consists of marine and, possibly, locally nonmarine conglomerate; sparsely distributed sandstone beds yield abundant mollusc fossils (Morton, 2004). The Holz Shale Member

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County Administrator's Office  
ROBERT L. McKERNAN  
Assistant County Administrator  
Public and Support  
Services Group

SHARON MITZELFELD  
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Director of Supervisors  
First District DEANNE HANSENBERG  
Second District GARY C. UVITT  
JOSUE GONZALEZ  
Third District

Fourth District  
Power District

(= **Klhs**) consists of marine shale, siltstone, sandstone, localized conglomerate, and yields abundant foraminifera and megafossils (Morton, 2004). Although primarily marine in nature, the Ladd Formation has also yielded fossil remains of terrestrial vertebrates, particularly several fossils of extinct hadrosaurian dinosaurs (Hilton, 2003). This formation is therefore assigned high paleontologic sensitivity.

The Paleocene Silverado Formation (**Tsi**) contains coal seams, lignite beds and commercial clay deposits, as well as abundant fossil mollusks (Woodring and Popenoe, 1945) and vertebrate fossils. The Silverado Formation grades upwards into the Santiago Formation (**Tsa**), a continental and marine sandstone and conglomerate rock unit (Woodring and Popenoe, 1945; Schoellhamer and others, 1981). The lower part of this formation contains abundant marine mollusks, while the upper portion commonly yields silicified wood that is likely of terrestrial rather than marine origin (Morton, 2004).

Rocks of the undifferentiated Sespe and Vaqueros Formations (**Tvs**) consist of interbedded marine and nonmarine sandstones and conglomerates. Locally, marine fossil-bearing strata of the Vaqueros Formation are bed-by-bed interlayered with nonmarine rocks of the Sespe Formation, to such a degree that the formations cannot be mapped as separate units (Morton, 2004). The continental Sespe Formation and interbedded marine Vaqueros Formation are both abundantly fossiliferous; the former has yielded fossil remains of terrestrial vertebrate fossils ranging in age from the Eocene through to the early Miocene, while the marine Vaqueros Formation has yielded shallow water marine megafossils (Morton, 2004).

The Topanga Formation (**Tt**) is a shallow-water marine sandstone unit with small amounts of siltstone and conglomerate deposited during the middle Miocene Epoch, ~18 million years ago (mya) to 16 mya. Exposures of the Topanga Formation are highly fossiliferous throughout Los Angeles and Orange Counties. Marine vertebrates including pinnipeds, whales, dolphins and sea cows, as well as microplankton, clams, snails, bony fish, sharks, sea turtles, and birds have all been collected from this unit. The Topanga Formation has high paleontologic sensitivity throughout its extent.

The Puente Formation was originally named by Eldridge and Arnold (1907) from exposures in the Puente Hills. The Puente Formation is considered to be equivalent to the Upper Miocene Monterey Formation (Blake, 1856) which is widespread in the Coast Range province of California as well as in the Palos Verdes Hills and the San Juan Capistrano area (Bramlette, 1946; Vedder and others, 1957; Vedder, 1975; Woodring and others, 1940; Woodring and others, 1946; Schoellhamer and others, 1981). The Yorba and Sycamore Canyon Members of the Puente Formation (**Tpy**, **Tpsc**) are the uppermost and youngest of the Miocene sediments in this formation (Durham and Yerkes, 1964; Rogers, 1965). The Yorba Member has yielded foraminifera and fish scales from exposures in the Santa Ana Mountains; foraminifera are also abundant in a few sites in the Puente Hills. The fossils indicate a deep water depositional environment, probably greater than 1,800 feet. The thin-bedded, well-laminated sandstone probably reflects deposition by turbidity currents from shallower depths (Durham and Yerkes, 1964; Schoellhamer and others, 1981). The shoreline may have extended as far east as Ontario before trending south to the Santa Ana River (Woodford and others, 1946).

Until 1985, diagnostic fossils were reported to be sparse in the Sycamore Canyon Member both in the Santa Ana Mountains (Schoellhamer and others, 1981) and in exposures in the Puente Hills, although foraminifera are locally common. However, several thousand specimens have since been exposed and recovered from the Sycamore Canyon Member, representing a minimum of 62 identified taxa of microfossil invertebrates and megafossil vertebrates, invertebrates, plants, and marine algae. Taxa identified include whales, bird, marine turtle, shark, bony fishes, terrestrial leaves, wood, reeds, and seaweeds. These fossils, in conjunction with lithologic and stratigraphic data gathered during monitoring, indicated that deposition occurred in near-shore water at a depth near the oxygen-minimum boundary during the latest Miocene Epoch, approximately 8 million years before present.

Surface and subsurface deposits of Pleistocene fan sediments (**Qvof** and **Qof**) include gravels, sands, and clays (Morton, 2004). Of these lithologies, the sands and clays have high paleontologic sensitivity, while the gravels may not be as conducive to the preservation of paleontologic resources (although occasionally significant fossil remains can be recovered from such sediments). Pleistocene older alluvial sediments throughout Riverside County and the Inland Empire have been extensively reported to yield significant fossils of plants and extinct animals from the Ice Age (Jefferson, 1991; Reynolds and Reynolds, 1991; Woodburne, 1991; Springer and Scott, 1994; Scott, 1997; Springer and others, 1998, 1999, 2007; Anderson and others, 2002). Fossils recovered from these Pleistocene sediments represent extinct taxa including mammoths, mastodons, ground sloths, dire wolves, short-faced bears, sabre-toothed cats, large and small horses, large and small camels, and bison (Springer and Scott, 1994; Scott, 1997; Springer and others, 1998, 1999, 2007; Anderson and others, 2002).

For this review, Craig R. Manker of the Division of Geological Sciences, SBCM conducted a search of the Regional Paleontologic Locality Inventory (RPLI). The results of this records search indicated that no paleontologic localities are recorded from along the proposed project alignment. However, exposures of the Baker Canyon and Holz Shale Members of the Ladd Formation have yielded fossils from within ½ mile of the project corridor. Localities SBCM 5.5.4 - 5.5.6 are recorded in the RPLI as yielding leaf fragments, water reeds, and molluscs from this formation. The proximity of these localities to the project corridor demonstrates the high paleontologic sensitivity of the Ladd Formation in this region.

Exposures of the Silverado Formation within ½ mile of the proposed project alignment have yielded fossil remains from four localities (SBCM 5.5.7 - 5.5.9 and 5.5.11). Fossils recovered from these localities include water reeds, leaves, wood fragments (including some with insect borings), and abundant molluscs. These localities demonstrate the high paleontologic sensitivity of the Silverado Formation near the project alignment.

Exposures of the Santiago Formation immediately adjacent to the proposed project alignment have yielded fossils from locality SBCM 5.5.12. Fossils recovered from this locality include abundant gastropods. The proximity of this locality to the proposed project corridor demonstrate the high paleontologic sensitivity of the Santiago Formation in this area.

Exposures of the Puente Formation in the near vicinity of the proposed project alignment have yielded fossil resources from thirty-nine (39) resource localities (SBCM 1.116.16 to 1.116.23, 1.116.180 to 1.116.205, 5.5.35, 5.5.40, 5.5.44 - 5.5.45, and 5.5.47). Fossils identified from these localities include fish bones and scales, as well as shark teeth. Nearby exposures of the Puente Formation in Chino Hills to the northwest have yielded several hundred vertebrate fossils of Miocene age from over one hundred discrete resource localities. This wealth of fossil material clearly demonstrates the high paleontologic sensitivity of the Puente Formation in the vicinity of the proposed project corridor.

Additionally, numerous localities in the Chino Hills region have yielded fossil remains of extinct Pleistocene vertebrates from Pleistocene older alluvial sediments mapped (Durham and Yerkes, 1964; Rogers, 1965) as similar to the sediments present along the proposed project corridor.

### **Recommendations**

The results of the literature review and the check of the RPLI at the SBCM demonstrate that excavation for the proposed project has high potential to impact significant nonrenewable paleontologic resources. This property is therefore assigned high paleontologic sensitivity along much of its length. Excavation into the Ladd Formation, the Silverado Formation, the Santiago Formation, undifferentiated rocks of the Vaqueros and Sespe Formations, the Topanga Formation, the Puente Formation, and/or older alluvium of Pleistocene age will require a qualified vertebrate paleontologist to develop a program to mitigate impacts to nonrenewable paleontologic resources. This mitigation program should be consistent with the provisions of the California Environmental Quality Act (Scott and Springer, 2003), as well as with regulations currently implemented by the County of Riverside and the proposed guidelines of the Society of Vertebrate Paleontology. This program should include, but not be limited to:

1. A full paleontologic resource assessment in advance of excavation or development, including a field survey, to locate and recover significant nonrenewable paleontologic resources exposed at the surface.
2. Monitoring of excavation in areas identified as likely to contain paleontologic resources by qualified paleontologic monitors. Based upon the results of this review, areas of concern along the proposed alignment include undisturbed surficial and subsurface rocks of the Ladd Formation, the Silverado Formation, the Santiago Formation, the Vaqueros and Sespe Formations, the Topanga Formation, the Puente Formation, and/or older alluvium of Pleistocene age. Paleontologic monitors should be equipped to salvage fossils as they are unearthed, to avoid construction delays, and to remove samples of sediments likely to contain the remains of small fossil invertebrates and vertebrates. Monitors must be empowered to temporarily halt or divert equipment to allow removal of abundant or large specimens.
3. Preparation of recovered specimens to a point of identification and permanent preservation, including washing of sediments to recover small invertebrates and vertebrates. Preparation

and stabilization of recovered fossils are essential in order to fully mitigate adverse impacts to significant resources (Scott and others, 2004).

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

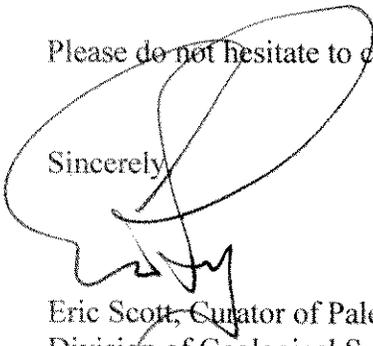
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Please do not hesitate to contact us with any further questions you may have.

Sincerely,



Eric Scott, Curator of Paleontology  
Division of Geological Sciences  
San Bernardino County Museum

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# **Appendix C. Resume**

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## EXPERTISE

Paleontological  
Assessment Reports and  
Paleontological Resources  
Impact Mitigation  
Programs

Archaeological and  
Paleontological Mitigation  
Monitoring Reports

Paleontological and  
Archaeological Resource  
Monitoring

Archaeological Excavation

Fossil Collection, Salvage,  
Identification, and  
Curation

GPS Data Collection and  
Analysis

Geologic Data Collection  
and Interpretation

## EDUCATION

University of California,  
Santa Cruz, B.S., Earth  
Science (Geology), 1989.

California State  
University, Fullerton,  
Archaeological field  
methods course on San  
Nicolas Island, June–July  
1993.

## PROFESSIONAL RESPONSIBILITIES

Mr. Smith is a project manager at LSA with 22 years of experience in paleontology. He is responsible for scheduling paleontological and archaeological monitors on both large- and small-scale projects, as well as acting as an intermediary between clients and agencies such as the United States Department of Interior, Bureau of Land Management (BLM), and the United States Department of Agriculture, Forest Service (Forest Service). Mr. Smith also prepares paleontological assessment reports, paleontological resources impact mitigation programs (PRIMPs), and monitoring reports following the completion of both cultural and paleontological mitigation monitoring.

While in the field, Mr. Smith acts as a Field Coordinator or Co-Field Coordinator during field surveys for paleontological and archaeological resources prior to construction/development activities. Mr. Smith also monitors for and collects cultural and scientific resources during grading activities; documents and tests archaeological sites; assists with the salvage of large fossil remains with the use of plaster casts; assists with large-scale wet and dry screening of sediments for fossils; collects and analyzes data from handheld global positioning system (GPS) units; and collects and analyzes geologic and geomorphic data for use in reports.

## PROJECT EXPERIENCE

### **Coyote Canyon Landfill Newport Beach, California**

Mr. Smith provided paleontological mitigation monitoring during the time the Coyote Canyon Landfill was active. Mr. Smith collected resources, prepared resources to the point of identification, identified collected resources, and input the resources into the fossil catalog.

### **Frank R. Bowerman Landfill Orange County, California**

Mr. Smith has provided paleontological resources monitoring on this project and assisted in the salvage of large-scale paleontological resources. Mr. Smith has prepared several year-end summary reports as well as 3-year summary reports documenting monitoring activities in addition to finds. Mr. Smith also prepared a paleontological resources assessment for the landfill.

### **Prima Deshecha Landfill San Juan Capistrano, California**

Mr. Smith provided paleontological mitigation monitoring during excavation associated with landfill operations and collected paleontological resources as they were uncovered by the grading operations. Mr. Smith also assisted with cultural resources testing of several prehistoric sites that were within proposed expansion areas.

## PROFESSIONAL EXPERIENCE

Archaeological and Paleontological Surveyor, Monitor, Excavator, Report Preparer, and Paleontological Field Coordinator, LSA Associates, Inc., Irvine, California, July 1992–Present.

Geologist, Mission Geoscience, Newport Beach, California, November 1993–February 1994.

Paleontologist, John Minch and Associates, San Juan Capistrano, California, February–June 1992.

Geologist, Soil and Testing Engineers, Inc., Placentia, California, September 1989–February 1992.

## CERTIFICATIONS

40-Hour Hazardous Materials Handling and Response, current through February 2015

County of Orange, Certified Paleontologist

City of San Diego, Qualified Paleontologist

## PROFESSIONAL ORGANIZATIONS/ MEMBERSHIPS

San Diego Association of Geologists

UCSC Alumni Association

Society of Vertebrate Paleontology

## PROJECT EXPERIENCE (CONTINUED)

### **California Department of Transportation Orange, Riverside, and San Bernardino Counties, California**

Mr. Smith has prepared numerous Paleontological Investigation Reports (PIRs) and Paleontological Evaluation Reports (PERs) for the California Department of Transportation (Caltrans) following the guidelines in the Caltrans Standard Environmental Reference, Environmental Handbook, Volume 1, Chapter 8 – Paleontology. These reports are usually combined into a single document and involve geological formation studies, paleontological research at local museums, and field surveys to help determine whether proposed Caltrans projects will encounter paleontological resources during project development, and if so, whether those paleontological resources are significant. Mr. Smith has also prepared Paleontological Mitigation Plans (PMPs) for Caltrans that include developed paleontological mitigation procedures that must be in place during Caltrans road widening projects in order to protect the significant paleontological resources that have the potential to be encountered during grading.

### **The Bluffs Retail Center Newport Beach, California**

LSA was retained by the Irvine Company to provide cultural and paleontological resource mitigation monitoring during grading associated with the Bluffs Retail Center located in Newport Beach. Mr. Smith provided archaeological and paleontological monitoring for this project. Mr. Smith also assisted with the salvage of several fossil localities that contained significant fossil shark teeth. Mr. Smith was also the lead author for the final paleontological mitigation monitoring report.

### **Orchard at Saddleback, Phase I Lake Forest, California**

LSA was retained by W.A.L.F. LLC to provide cultural and paleontological resource mitigation monitoring during grading associated with the Phase I portion of the Orchard at Saddleback, located within the City of Lake Forest. Mr. Smith provided archaeological and paleontological monitoring during grading and was the lead author for the final paleontological mitigation monitoring report.

### **Orchard at Saddleback, Phase II Lake Forest, California**

LSA was retained by Wetrust America to provide cultural and paleontological resource mitigation monitoring during grading associated with the Phase II portion of the Orchard at Saddleback, located within the City of Lake Forest. Mr. Smith provided archaeological and paleontological monitoring during grading and was the lead author for the final paleontological mitigation monitoring report, as well as co-author for the cultural resources monitoring report.

**PROJECT EXPERIENCE (CONTINUED)**

**Del Mar Fairgrounds**

**Del Mar, California**

LSA was retained by the 22<sup>nd</sup> District Agricultural Association to provide technical studies needed to assist the 22<sup>nd</sup> District Agricultural Association during future expansion plans at the Fairgrounds. Mr. Smith authored the paleontological resources assessment report.

**Laguna Canyon Road (State Route 133) Widening**

**Orange County, California**

LSA was retained by Caltrans to provide cultural and paleontological resource mitigation monitoring along Laguna Canyon Road during its widening and realignment between State Route 73 (SR-73) and Old Laguna Canyon Road. Mr. Smith provided archaeological and paleontological monitoring for this project, as well as preparation of stratigraphic sections and identification of paleontological specimens. Mr. Smith also assisted on the excavation of archaeological site CA-ORA-1055 and was the lead author for the final paleontological mitigation monitoring report, as well as a contributing author for the final archaeological mitigation monitoring report.

**Los Coches Creek Area Middle School**

**El Cajon, California**

Mr. Smith performed a cultural resources survey of an 80-acre parcel as part of an assessment report prior to the construction of the school. During the survey, Mr. Smith recorded numerous undiscovered prehistoric and historic cultural resources.

**Marine Corps Base Camp Pendleton**

**San Diego, California**

LSA was contracted to conduct extensive testing of an ethnographically recorded village site. Mr. Smith provided cultural resource testing of Site CA-SDI-10156/H. LSA was contracted to provide cultural resource monitoring during removal of potentially hazardous soil in the Stewart Mesa area of the base. Mr. Smith delineated known cultural resource sites and provided monitoring during excavation.

**Southern California Edison On-Call**

**Los Angeles, Orange, Riverside, San Bernardino, and San Diego Counties, California**

LSA performs archaeological resource assessments for Southern California Edison's (SCE) pole replacement program. Assessments include record searches for previously recorded resources and studies; field surveys around poles; recordation of observed resources, if any; and recommendations. To date, over 1,000 poles have been assessed. Mr. Smith performed field surveys, recorded resources, and synthesized data.

**State Route 73 Widening**

**Costa Mesa, California**

LSA was contracted to provide paleontological monitoring during the widening of SR-73 between stations 74+00 and 82+00. The project area is located in the median of SR-73 within an approximately 0.5-mile stretch between the Birch Street overcrossing on the south and the northbound Bristol Street overcrossing on the north. Mr. Smith provided paleontological monitoring and fossil identification, and wrote the mitigation monitoring report.

## **PROJECT EXPERIENCE (CONTINUED)**

### **San Joaquin Hills Transportation Corridor (State Route 73) Orange County, California**

LSA was contracted to provide paleontological mitigation monitoring for the San Joaquin Hills Transportation Corridor between El Toro Road in the south and Newport Coast Drive in the north. Mr. Smith provided paleontological resource monitoring (scheduling up to five monitors), fossil identification and curation, and assisted with writing the final mitigation monitoring report.

### **State Route 71 Widening Chino, California**

LSA was contracted to provide paleontological and cultural resource monitoring during the widening of State Route 71 (SR-71). Mr. Smith provided paleontological and cultural resource monitoring, fossil identification, and curation of collected paleontological remains.

### **El Camino Real Widening North of Cougar Drive Carlsbad, California**

LSA provided paleontological resources mitigation monitoring during the widening of a portion of El Camino Real north of Cougar Drive in the City of Carlsbad from two lanes to three. The project involved removing a section of hill measuring approximately 100 feet long, 30 feet wide, and up to 15 feet high in the Cretaceous Point Loma Formation. LSA collected several fossil localities containing clams, snails, crabs, and plant material. Mr. Smith provided some of the monitoring for this project, and was the lead author for the mitigation monitoring report.

### **San Diego Gas & Electric On-Call Environmental Services California**

LSA provides support documentation to San Diego Gas & Electric (SDG&E) to satisfy Natural Communities Conservation Plan (NCCP), California Environmental Quality Act, California Public Utility Commission (CPUC), California Coastal Commission, United States Army Corps of Engineers (Corps), California Department of Fish and Wildlife (CDFW), and Regional Water Quality Control Board requirements. Mr. Smith mainly works on SDG&E projects that require cultural resource studies. Representative projects include the following:

- **Shadowridge-Meadowlark Tap: Rebuild TL 13811:** LSA provided a cultural resource assessment for an approximately 4-mile transmission line located in San Diego. The assessment included a cultural resources search through the South Coastal Information Center, and an intensive pedestrian survey for all proposed new pole locations and staging areas. Finally, LSA made recommendations for each separate pole location. Mr. Smith was involved in all aspects of the cultural resource assessment.
- **Firestorm 2007 Environmental and Biological Monitoring:** LSA provided on-call support for monitoring services immediately following the October 2007 wildfires in San Diego, including documentation of access road regrading and erosion control consultation; data compilation, analysis, and interpretation; and data form entry for compliance with Corps Regional General Permit 63. Mr. Smith provided both cultural and biological surveys along several of the burned pole alignments.

## **PROJECT EXPERIENCE (CONTINUED)**

### **Southern California Gas Company Los Angeles County, California**

LSA was retained by the Southern California Gas Company (SCG) to provide cultural resource monitoring for its Line 85, Line 119, and Line 225 located in the Angeles National Forest (ANF) north of Castaic Lake. As these lines pass through the ANF and are located on land under the jurisdiction of the Forest Service, it was necessary for LSA to apply for an Archaeological Resources Protection Act (ARPA) Permit for each line. LSA's role on these projects was to ensure that mitigation measures developed by the Forest Service to protect cultural resources were implemented and followed. These measures included: providing worker training for the identification and importance of cultural resources; protecting the National Register of Historic Places (National Register)-listed Old Ridge Route (ORR), a historic road built in 1915 between Los Angeles and Bakersfield; monitoring for cultural resources during construction and having a monitor present at each work area; counting and documenting the numbers and types of vehicles traveling along the Old Ridge Route on a daily basis; and providing video documentation of the Old Ridge Route both before and after the project was completed. Mr. Smith was the project manager for these three SCG projects and scheduled up to three monitors per day at various locations, depending on daily construction needs; provided cumulative vehicle counts on a weekly basis to the ANF; and coordinated between the ANF archaeologist and SCG as needed. Mr. Smith also assisted in preparing reports at the completion of each project documenting the results of the monitoring.

### **South Orange County Infrastructure Improvement Project, State Route 241 Orange and San Diego Counties, California**

The Transportation Corridor Agencies (TCA) proposes extending existing State Route 241 (SR-241) from its current terminus at Oso Parkway south to Interstate 5, just south of San Clemente. The project is located in portions of both southern Orange County and northern San Diego County. Mr. Smith assisted during surveying all the unsurveyed portions of the project, recording new cultural resources that were discovered and writing the survey reports and other cultural resource documents associated with this project. Mr. Smith also provided cultural resource clearance during the initial geotechnical investigations associated with the project to ensure no undiscovered cultural resources were impacted.

### **Plains All American Pipeline Los Angeles County, California**

LSA was retained as a subconsultant to Stantec Consulting to provide cultural resource monitoring during repairs to several of Plains All American Pipeline (PAAPL) pipelines (including Line 2000 and Line 63), and during a geotechnical investigation to address landslide problems in the ANF north of Castaic Lake. As these projects are located on lands administered by the Forest Service, it was necessary for LSA to apply for an ARPA Permit for each project to protect cultural resources and ensure all protection measures required by the Forest Service were implemented and followed. These measures included: providing worker training for the identification and importance of cultural resources; protecting the National Register-listed ORR, a historic road built in 1915 between Los Angeles and Bakersfield; monitoring for cultural resources during construction and having a monitor present at each work area; counting and documenting the numbers and types of vehicles traveling along the ORR on a daily basis; and providing video documentation of the ORR both before and after each project's completion. Mr. Smith served as the project manager for projects and scheduled monitors, provided cumulative vehicle counts on a weekly basis to the Forest Service; provided coordination between the Forest Service archaeologist, PAAPL, and Stantec as needed; and assisted with the preparation of the final monitoring reports.

## **PROJECT EXPERIENCE (CONTINUED)**

### **Moro Ridge Radio Site Project Crystal Cove State Park, California**

Mr. Smith prepared a paleontological resources assessment for the Moro Ridge Radio Site project. This project proposed to add an 800-megahertz (MHz) public safety radio facility to the Newport Coast area, where coverage is currently lacking. The assessment included an examination of geology maps, research into expected fossils within the geologic formations in the project area, a field survey to confirm the geology and determine whether there were any paleontological resources exposed on the surface of the project area, and recommendations for mitigating impacts to paleontological resources during construction.

## **SELECTED REPORTS**

*Interstate 15/State Route 79 South Interchange Improvement Project Combined Paleontological Identification Report/Paleontological Evaluation Report, City of Temecula, Riverside County, California. California Department of Transportation District 8, EA 43230,08-RIV-15-PM-3.0/4.0, 08-RIV-79-PM-19.6/19.8, Caltrans Project No. 0800000668. Prepared for California Department of Transportation, District 08. LSA Project No. RBF1303. December 2014.*

*Paleontological Mitigation Plan for Interstate 15/Cajalco Road Interchange Improvement Project City of Corona Riverside County, California. California Department of Transportation, District 08, EA No. 0J6101 PM 36.4/37.6, EFIS Project Identification No. 0800000308. Prepared for California Department of Transportation, District 08. LSA Project No. JCV1201. December 2014.*

*Paleontological Resources Addendum Memorandum for the Interstate 15/Railroad Canyon Road Interchange Improvement Project, California. E.A. 08-0A400, 08-RIV-15-PM-16.3/21.0 Federal Project No. STPL-5058(073). Memorandum prepared for the California Department of Transportation, District 08. LSA Project No. SAE1401. December 2014.*

*Paleontological Mitigation Plan for Interstate 15/State Route 79 South Interchange Improvement Project City of Temecula Riverside County, California. California Department of Transportation District 08, EA NO. 43230, 08 RIV 15 PM 3.0/4.0, 08 RIV 79 PM 19.6/19.8. Enterprise Resource Planning Financial Infrastructure (EFIS) Project Identification No. 0800000668. Prepared for the California Department of Transportation District 08. LSA Project No. RBF1303. November 2014.*

*Paleontological Resource Assessment Carmax Automotive Dealership City of Murrieta, County of Riverside California. Prepared for Leighton Consulting, Inc. LSA Project No. LAA1401. November 2014.*

*Addendum to the Paleontological Resources Assessment for the Villages of Lakeview Project for Off-site Roadway Segments, Intersection Improvements, Storm Drain Line and Training Dike Located in the Community of Lakeview, Riverside County, California. Prepared for Lewis Operating Corp. LSA Project No. LEW1301. November 2014.*

*Peer Review of the Paleontological Resources Assessment for the Paradise Knolls Project, Jurupa Valley, Riverside County, California that was prepared by CRM TECH – September 11, 2014. Memorandum prepared for Kent Norton at LSA. LSA Project No. CJV1401. October 2014.*

**SELECTED REPORTS (CONTINUED)**

*Paleontological Assessment for Gateway Center Specific Plan 250, Amendment Number 1 (SP250A1), Riverside County, California.* Letter report prepared for Standard Portfolio Riverside, LLC. LSA Project No. KEF1301. September 2014.

*Paleontological Resources Impact Mitigation Program Perris Marketplace, Phase 1 City of Perris Riverside County, California.* Prepared for Greenberg Farrow. LSA Project No. FFA1301. August 2013.

*Paleontological Resources Assessment 951 South Beach Boulevard, City of La Habra, County of Orange, California.* Prepared for Fairfield Residential. LSA Project No. FED1401. August 2014.

*Paleontological Identification Report for the U.S. 101/Holly Street Interchange Reconstruction Project, City of San Carlos, San Mateo County, California.* California Department of Transportation District 4, E.A. 1G6200, 4-SM101-PM-8.1/8.6. Prepared for the California Department of Transportation District 4. LSA Project No. RAJ1302. July 2014.

*Addendum for the Paleontological Resources Assessment for Off-site Water and Sewer Infrastructure Improvements and Off-site Trails Associated with the Villages of Lakeview Project, Riverside County, California* Prepared for Lewis Operating Corp. LSA Project No. LEW1301. May 2014.

*Paleontological Resources Assessment Camp Tahquitz Pedestrian Bridge San Bernardino County, California.* Prepared for Long Beach Area Scout Council. LSA Project No. BSU1401. March 2014.

*Results of Archaeological Monitoring for the Southern California Gas Company's Line 6001 and 6902 Exposure Repairs Undertaking, Cuff Road, Niland, Imperial County, California.* Letter report submitted to the Bureau of Land Management El Centro Field Office. LSA Project No. SCG1101F. March 2014.

*Peer Review of Paleontological Studies prepared for the Veterans Administration Medical Clinic Project in the City of Loma Linda, Los Angeles County, California.* Letter report prepared for Community Development Department, Planning Division, City of Loma Linda. LSA Project No. LLD1401. February 2014.

*Paleontological Resources Identification Report for the State Route 44 Improvements Project between Interstate 405 and Interstate 5, Cities of Santa Ana, Irvine, and Tustin, Orange County California.* the California Department of Transportation, District 12 E.A. No. 0J3400/ EFIS Project Identification Number 1200020328, 12-ORA-55-PM-6.4/10.3. Prepared for the California Department of Transportation, District 12. LSA Project No. HDR1102. February 2014.

*Paleontological Assessment for the Harbor Boulevard Improvements Project, City of Garden Grove, California.* Letter report prepared for the City of Garden Grove. LSA Project No. GCC1301. January 2014.

*Paleontological Mitigation Plan for Interstate 15/Cajalco Road Interchange Improvement Project, City of Corona, Riverside County, California.* District 08, E.A. No. 08-0J6101, PM 36.10/37.64, EFIS Project Identification No. 0800000308. Prepared for the California Department of Transportation, District 08. LSA Project No. JCV1201. January 2014.

**SELECTED REPORTS (CONTINUED)**

*SR91/SR241 Express Lanes Connector Project, Paleontological Resources Identification and Evaluation Report., City of Anaheim, Orange County California. California Department of Transportation, District 12. EA0K9700, 12-ORA-91-PM-14.7/17.9, 12-ORA-241-PM-36.1/38.7, Project No. 1200020097. Prepared for the California Department of Transportation, District 12. LSA Project No. RBF1101. January 2014.*

*Paleontological Resources Assessment Green Valley Specific Plan Stockpile Location Project, City of Perris, Riverside County, California. Submitted to Jon Shumaker. LSA Project No. GLA1401. January 2014.*

*Paleontological Assessment for Tentative Tract 18917 Located in the Town of Apple Valley, San Bernardino County, California. Letter report prepared for Pulte Homes. LSA Project No. PHC1301. November 2013.*

*Paleontological Resource Services for the State Route 91 Westbound Widening Project (EA 0C5703), Located in the Cities of Anaheim and Fullerton, Orange County, California. Letter report prepared for the California Department of Transportation, District 12. LSA Project No. CDT1125. September 2013.*

*Results of Paleontological Monitoring for the CVS Pharmacy Project, City of Menifee, Riverside County, California. Prepared for KZ DevCo, LP. LSA Project No. KDZ1001. August 2013.*

*Paleontological Resources Impact Mitigation Plan, Perris Marketplace, Phase I, City of Perris, Riverside County, California. Prepared for Greenberg Farrow. LSA Project No. GFA1301. September 2013.*

*Paleontological Resources Identification Report for the State Route 55 Improvement Project Between Interstate 405 and Interstate 5, Cities of Santa Ana, Irvine, and Tustin, County of Orange, California. Report prepared for the California Department of Transportation, District 12. Updated from September 2013 version. LSA Project No. HDR1102. June 2013.*

*Paleontological Resources Identification and Evaluation Report La Pata Avenue Extension Project. Project No. ORA-120504/STPL-5955(066). (Coauthored with Steven W. Conkling). Prepared for the County of Orange Department of Public Works. LSA Project No. ORG1101. June 2013.*

*Paleontological Resources Assessment California State University Long Beach Foundation project, City of Long Beach, California. Prepared for the City of Long Beach. LSA Project No. CLB1205. June 2013.*

*Paleontological Resources memo for the Technology Drive Extension Project, City of Irvine, Orange County, California. Memorandum prepared for the California Department of Transportation, Environmental. LSA Project No. ICD1310. May 2013.*

*Paleontological Mitigation Report State Route 91 widening Project Between State Route 55 and State Route 241, Cities of Anaheim and Yorba Linda, 12-ORA-91, PM 9.1 to 15.1, E.A. Number 0G3300. Prepared for the California Department of Transportation, District 12. LSA Project No. CDT1106. May 2013.*

*Paleontological Resources Assessment for the La Entrada Specific Plan, City of Coachella, Riverside County, California. Submitted to the City of Coachella. LSA Project No. CLA1201A. May 2013.*

**SELECTED REPORTS (CONTINUED)**

*Paleontological Assessment for the Proposed Trabuco Creek Channel Restoration and Trail Improvements Project Adjacent to the Saddleback Valley Christian School, Located in the City of San Juan Capistrano, Orange County, California.* Letter report submitted to Saddleback Valley Christian Schools. LSA Project No. SAD1301. May 2013.

*Paleontological Resources Identification and Evaluation Report Tesoro Extension, Orange County, California.* (Coauthored with Steven W. Conkling). Prepared for the California Department of Transportation, District 12. LSA Project No. TCA1201. May 2013.

*Paleontological Resources Assessment North Star Solar Generation Tie Line Switching Station and Related Facilities Near Mendota, Fresno County, California.* (Coauthored with Sarah Rieboldt, Ph.D.). Prepared for North Star Solar, LLC. LSA Project No. FTS1301. May 2013.

*Results of Paleontological Monitoring Program for the Oak Springs Ranch Project, City of Wildomar, Riverside County, California.* Letter report prepared for GLJ Partners. LSA Project No. GLJ1202. April 2013.

*Addendum for the Paleontological Resources Assessment for Additions of a 118-Acre Nutrilite Property, a 2.6-Acre Multi-Use Area (PA 16) and a 13.8-Acre Recreation Area (PA 29) to the Villages of Lakeview Project, Riverside County, California* Prepared for Lewis Operating Corp. LSA Project No. LEW1301. March 2013.

*Final Report on the Results of the Paleontological Resources Monitoring and Mitigation Program, CPV Sentinel, Southern California Gas Company Natural Gas Line Project, Riverside County, California.* Prepared for Sierra Research. LSA Project No. SIE1201. February 2013.

*Paleontological Identification Report for the Whittier Avenue Sidewalk Safety Project, Yale Street to Cornell Street, City of Hemet, Riverside County, California.* Federal Project No. SRTSL 5956(212), 08-RIV-0-Hemet. Prepared for the California Department of Transportation, District 8. LSA Project No. RCT1016. February 2013.

*Results of Paleontological Monitoring Program for the Mercado Park Project in the City of Perris, Riverside County, California.* Letter Report submitted to the City of Perris. LSA Project No. PIS1201. January 2013.

*Paleontological Resources Assessment Pelican Industrial Project, City of Perris, Riverside County, California.* Prepared for Pelican Properties. LSA Project No. PEL1201. January 2013.

*Paleontological Resources Identification and Evaluation Report for State Route 74 Safety Project, from just East of Antonio Parkway/La Pata Avenue to the Conrock Entrance/Cristianitos Road, Unincorporated Orange County, California.* California Department of Transportation District 12, E.A. Number 0C7200/1200020180, 12-ORA-74 PM 2.9/5.069. Prepared for the California. California Department of Transportation District 12. LSA Project No. CDT1121 January 2013.

*Paleontological Resources Assessment Camarillo Academy High School + Performing Arts Center, Oxnard Union High School District, Ventura County, California.* Prepared for the Oxnard Union High School District. LSA Project No. OSD1102. December 2012.

**SELECTED REPORTS (CONTINUED)**

*Addendum Class III Inventory Ocotillo Sol Project (Formerly the Imperial Valley Photovoltaic [IVPV] Project), Imperial County, California.* (Co-authored with Frederick W. Lange, RPA, Ph.D., edited by Roderic McLean, M.A., RPA) Submitted to the Bureau of Land Management, El Centro Field Office. LSA Project No. SGE0905. November 2012.

*Paleontological Resources Assessment Rancho Vista Village (PA12-0033/3004), City of Temecula, Riverside County, California.* (Co-authored with Frederick W. Lange, Ph.D.). Prepared for the City of Temecula. LSA Project No. TMU1201. August 2012.

*Paleontological Resources Identification and Evaluation Report for the Interstate 5 Widening Project from State Route 73 to El Toro Road, Cities of Lake Forest, Laguna Hills Laguna Niguel Laguna Woods, Mission Viejo and San Juan Capistrano, County of Orange, California. California Department of Transportation District 12, E.A. 0K0200/1200000313, 12-ORA-5, PM 12.4 to 18.9.* Report prepared for the California Department of Transportation, District 12. LSA Project No. TSY1102. October 2012.

*Paleontological Mitigation Plan for the State Route 91 Westbound Widening(Northbound State Route 55 to the Westbound State Route 91 Connector Through the Tustin Avenue Interchange), City of Tustin, Orange County, California. 12-ORA-91, PM 7.9/9.5, E.A. No. oC5600\1200000078.* Report prepared for the California Department of Transportation, District 12. LSA Project No. CDT1110. October 2012.

*Paleontological Resources Analysis for the SR-55/Newport Boulevard Improvement Project, City of Costa Mesa, County of Orange, California.* LSA Project No. TRT1101A. September 2012.

*Paleontological Resources Assessment for the Harrington Village Apartments, City of Corona, County of Riverside, California.* Prepared for Harrington Village, LLC., LSA Project No. HAR1201. September 2012.

*Paleontological Resources Identification Report for the State Route 55 Improvement Project Between Interstate 405 and Interstate 5, Cities of Santa Ana, Irvine, and Tustin, County of Orange, California.* Report prepared for the California Department of Transportation, District 12. LSA Project No. HDR1102. September 2012.

*Paleontological Mitigation Plan for the State Route 73 Detention Basin Storm Water Mitigation and Slope Stability Project, Cities of Laguna Niguel, Aliso Viejo, Laguna Beach, Irvine, and Newport Beach, County of Orange, California.* Report prepared for the California Department of Transportation, District 12. LSA Project No. CDT1120. August 2012.

*Paleontology Memo for the Towne Center Residential Project, City of Lake Forest County of Orange, California.* LSA Project No. CLF1201. July 2012.

*Paleontological Resources Mitigation and Monitoring Plan for the Water Valley Substation Project, San Bernardino County, California.* Prepared for Southern California Edison. LSA Project No. SCE1205. July 2012.

*Paleontological Resources Assessment for the Camarillo Academy High School + Performing Arts Center, Ventura County, California.* Report prepared for the Oxnard Union High School District. LSA Project No. OSD1102. July 2012.

**SELECTED REPORTS (CONTINUED)**

*Paleontological Resources Identification and Evaluation Report for the State Route 57/Lambert Road Interchange Improvement Project, City of Brea, County of Orange, California.* Report prepared for the California Department of Transportation, District 12. LSA Project No. RBF1104. May 2012.

*Paleontological Resources Assessment for the Taft Recycling and Sanitary Landfill, Kern County California.* Report prepared for the Kern County Waste Management Department. LSA Project No. KCY1102. March 2012.

*Paleontological Mitigation Plan for the Interstate 15/Baseline Road Interchange Project, City of Rancho Cucamonga, San Bernardino County, California. District 08-SBD-15, KP10.1/11.4n (PM 6.3/7/1), E.A. No. 08-497101. Project No. 080000078.* Report prepared for the California Department of Transportation, District 8. LSA Project No. DMJ531. March 2012.

*Paleontological Resources Impact Mitigation Plan for the CVS Pharmacy Store, City of Menifee, County of Riverside, California.* Report prepared for KZ Development Company, LP. LSA Project No. KDZ1001. March 2012.

*Paleontological Resources Impact Mitigation Plan for the South Coast Winery Report and Spa Hotel Expansion, Riverside County, California.* Report prepared for South Coast Winery, Resort and Spa. LSA Project No. SGV1001. March 2012.

*Paleontological Locality Search of the Proposed Valle Vista Channel Extension Project in the Community of Valle Vista, Riverside County, California.* Letter report prepared for the Riverside Flood Control and Water Conservation District. LSA Project No. RCF1102. February 2012.

*Paleontological Resources Assessment for the Cottonwood Avenue Building Expansion Project, City of Riverside, Riverside County, California.* Report prepared for PanCal Sycamore Canyon 257 LLC. LSA Project No. PNC1101. February 2012.

*Paleontological Mitigation Plan for the I-10/Tippecanoe Avenue Interchange Improvement Project, Phase 2, Cities of Loma Linda and San Bernardino, San Bernardino County, California.* Report prepared for the California Department of Transportation, District 8. LSA Project No. RMN0802A. February 2012.

*Results of Archaeological Resource Monitoring for Plains All American Pipeline Line-63 Gas Blowout and Sag Side Boom Permanent Repairs Project, Angeles National Forest, Los Angeles County, California.* (Co-authored with Antonina Delu, M.A., RPA). Report prepared for Angeles National Forest, Supervisor's Office. LSA Project No. SNS1006. December 2011.

*Paleontological Mitigation Plan for the Tippecanoe Avenue Interchange Improvement Project, Phase 1, Cities of Loma Linda and San Bernardino, San Bernardino County, California. PM25.3/27/3, PN 0800020451, E.A. No. 448112.* Report prepared for the California Department of Transportation, District 8. LSA Project No. RMN0802A. December 2011.

*Paleontological Resources Identification and Evaluation Report for the Shoemaker Bridge Replacement Project, City of Long Beach, Los Angeles County, California.* Report prepared for the California Department of Transportation, District 7. LSA Project No. URS1002. December 2011.

**SELECTED REPORTS (CONTINUED)**

*Paleontological Resource Assessment and Paleontological Resources Impact Mitigation Monitoring Plan for Stratford Ranch Industrial Park, Tentative Tract 36382, City of Perris, Riverside County, California.* Report prepared for Mission Pacific Land Company. LSA Project No. MPL1101. December 2011.

*Paleontological Mitigation Report for the Interstate 215/State Route 74 Interchange Improvements Project, Riverside County, California.* Report prepared for the California Department of Transportation, District 8. LSA Project No. RCN1002. December 2011.

*Paleontological Resources Assessment for the Quail Brush Generation Project, San Diego County, California.* Report prepared for Tetra Tech EC. LSA Project No. TTE1101. November 2011.

*Paleontological Assessment for the Vancouver Street Sewer Extension Project, City of Carlsbad, San Diego County, California.* Letter report prepared for the City of Carlsbad. LSA Project No. HCR1103A. November 2011.

*Results of Archaeological Resource Monitoring for Plains All American Pipeline Qwest Fiber Optic Line Repair Project, Angeles National Forest, Los Angeles County, California.* (Co-authored with Antonina Delu, M.A., RPA). Report prepared for Angeles National Forest, Supervisor's Office. LSA Project No. SNS1102. November 2011.

*Paleontological Analysis for the State Route 125/State Route 94 Interchange Branch Connector Project, San Diego County, California.* LSA Project No. TYL1003. October 2011.

*Supplemental Paleontological Resources Identification and Evaluation Report for the Mid County Parkway Project, Riverside County, California.* Report prepared for the California Department of Transportation, District 8. LSA Project No. JCV531. September 2011.

*Paleontological Mitigation Plan, I-15/I-215 Interchange Improvements Project, Community of Devore, San Bernardino County, California.* Report prepared for the California Department of Transportation, District 8. LSA Project No. LIM0705. September 2011.

*Paleontological Monitoring Report for Geotechnical Trench Excavations for the I-15/I-215 Interchange Improvements Project, Community of Devore, San Bernardino County, California.* Report prepared for the California Department of Transportation, District 8. LSA Project No. LIM0705. August 2011.

*Paleontological Resources Assessment, Tentative Tract 36382, Altfillisch Property Project, City of Eastvale, Riverside County, California.* Report prepared for Altfillisch Construction Company. LSA Project No. AFL1101. July 2011.

*Addendum, Paleontological Identification and Evaluation Report for the Interstate 215/Barton Road Interchange Improvement Project, Cities of Grand Terrace and Colton, San Bernardino County, California.* Report prepared for the California Department of Transportation, District 8. LSA Project No. SBA330. July 2011.

*Paleontological Resources Assessment for the Southern California Edison Banducci Substation and Telecommunications Routes Project, Tehachapi, Kern County, California.* Letter report prepared for Southern California Edison. LSA Project No. SCE1105A. July 2011.

**SELECTED REPORTS (CONTINUED)**

*Paleontological Analysis for the Century City Center Project, City and County of Los Angeles.* Memorandum prepared for Nicole Dubois with LSA, Associates, Inc. LSA Project No. CCY1101. June 2011.

*Paleontological Resource Assessment for Utility Pothole Program, Interstate 15/Interstate 215 Interchange Improvements Project, San Bernardino County, California.* Letter report prepared for the California Department of Transportation, District 8. LSA Project No. LIM0705. June 2011.

*Paleontological Resources Assessment for the Ocotillo Sol Photovoltaic Project, Imperial County, California.* Letter report prepared for the Bureau of Land Management, California Desert District. LSA Project No. SGE0905-T009B. May 2011.

*Addendum Paleontological Resources Identification Report for the Glen Helen Parkway Grade Separation, Community of Devore, San Bernardino County, California. Federal Project No. BRLS-5954 (108) 08-925051L.* Prepared for the California Department of Transportation, District 8. LSA Project No. LIM531. May 2011.

*Paleontological Resources Identification Report for the Extension of State Street Project, City of San Bernardino, San Bernardino County, California. E.A. OP760, Project No. 08-000020047, Federal Project No. STPL-5033(044).* Prepared for the California Department of Transportation, District 8. LSA Project No. LIM531. May 2011.

*Paleontological Resources Identification Report for the Glen Helen Parkway Grade Separation, Community of Devore, San Bernardino County, California. Federal Project No. BRLS-5954 (108) 08-925051L.* Prepared for the California Department of Transportation, District 8. LSA Project No. LIM531. April 2011.

*Paleontological Mitigation Recommendations for Utility Pothole Program, Interstate 15/Interstate 215 Interchange Improvements Project, San Bernardino County, California.* Letter report prepared for the California Department of Transportation, District 8. LSA Project No. LIM0705. April 2011.

*Results of Archaeological Resource Monitoring for Plains All American Pipeline Line-2000 Dig 20 and 21 Anomaly Repair Projects, Angeles National Forest, Los Angeles County, California.* (Co-authored with Antonina Delu, M.A., RPA). Report prepared for Angeles National Forest, Supervisor's Office. LSA Project Nos. SNS1003 and SNS1005. April 2011.

*Paleontological Resources Assessment for the Chevron Pipe Line Company Midway-Belridge Pipeline Replacement Project, Kern County, California.* Report prepared for Chevron Pipe Line Company. LSA Project No. SNS1004. March 2011.

*Cultural Resources Assessment and Class III Inventory for the Chevron Pipe Line Company Midway-Belridge Pipeline Replacement Project, Kern County, California.* Report prepared for Chevron Pipe Line Company. LSA Project No. SNS1004. March 2011.

*Paleontological Resources Assessment for the Perris Boulevard Widening Project, City of Perris, Riverside County, California.* Letter report prepared for Mr. Kenneth Phung. LSA Project No. TLK1001. February 2011.

**SELECTED REPORTS (CONTINUED)**

*Paleontological Resources Assessment for the Perris Boulevard Widening Project, City of Perris, County of Riverside, California.* Letter report prepared for the City of Perris. LSA Project No. TLK1001. February 2011.

*Paleontological Resources Identification and Evaluation Report for the Shoemaker Bridge Replacement Project, City of Long Beach, Los Angeles County, California.* Report prepared for the California Department of Transportation, District 7. LSA Project No. URS1002. February 2011.

*Cultural Resources Monitoring for the Restoration Work for Southern California Gas Company's Line-85 Permanent Repairs Project, Angeles National Forest, Los Angeles County, California.* Letter report prepared for the Angeles National Forest on behalf of Southern California Gas Company. LSA Project No. SCG0801. January 2011.

*Paleontological Assessment for the Five Winds Ranch Project, City of Yucaipa, San Bernardino County, California.* Letter report prepared for the City of Yucaipa Public Works Department. LSA Project No. YCA1002. November 2010.

*Paleontological Mitigation Plan Mission Boulevard Widening Project, City of Ontario, San Bernardino County, California. District 08-SBD-O-Ontario. EA 08-924850.* Report prepared for the California Department of Transportation, District 8. LSA Project No. DMJ0602. October 2010.

*Paleontological Assessment for the CVS Pharmacy Store, Huntington Beach, California.* Letter Report prepared for KZ Development Company, LP. LSA Project No. KDZ1002. October 2010.

*Paleontological Assessment for the 5-Winds Ranch, City of Yucaipa, California.* Letter Report prepared for the Public Works Department, City of Yucaipa. LSA Project No. YCA1102. October 2010.

*Paleontological Resource Assessment for the Southern California Edison Pisgah Substation Upgrade/Expansion, San Bernardino County, California.* Letter report prepared for Southern California Edison. LSA Project No. SCE0801Y. September 2010.

*Paleontological Mitigation Report for the Vail Lake Transmission Main and Pump Station Project, Riverside County, California.* Report prepared for Kennedy/Jenks Consultants. LSA Project No. KJE0601. September 2010.

*Results of Cultural Resources Monitoring for the Southern California Gas Company Ivy Street Bridge Pipeline Boring Project, City of Murrieta, County of Riverside, California.* (co-authored with Terri Fulton). Prepared for San Diego Gas and Electric Company. LSA Project No. SCG0602k. September 2010.

*Results of Archaeological Resource Monitoring for Plains All American Pipeline Line-2000 Anomaly Repair Project, Angeles National Forest, Los Angeles County, California.* (Co-authored with Antonina Delu, M.A., RPA). Prepared for the Angeles National Forest on behalf of Stantec Consulting Services. LSA Project No. SNS1002. September 2010.

**SELECTED REPORTS (CONTINUED)**

*Results of Archaeological Resource Monitoring for Plains All American Pipeline Osito Canyon Geotechnical Boring Project, Angeles National Forest, Los Angeles County, California.* (Co-authored with Antonina Delu, M.A., RPA). Prepared for the Angeles National Forest on behalf of Stantec Consulting Services. LSA Project No. SNS1001. September 2010.

*Paleontological Mitigation Plan for State Route 91 Widening Project Between State Route 55 and State Route 24, Cities of Anaheim and Yorba Linda, Orange County, California. District 12-ORA-91, PM 9.1 to 15.1.* Prepared for the California Department of Transportation, District 12. LSA Project No. CDT1001. May 2010.

*Cultural Resources Monitoring for the Southern California Gas Company Trabuco Creek Bridge Betterment Project (eTS8327), City of San Juan Capistrano, Orange County, California.* Letter Report prepared for the City of San Juan Capistrano on behalf of Southern California Gas Company. LSA Project No. SCG0902. March 2010.

*Results of Archaeological Resource Monitoring for Southern California Gas Company Line-119 Abandonment Project, Angeles National Forest, Los Angeles County, California.* (Co-authored with Antonina Delu, M.A., RPA). Prepared for the Angeles National Forest on behalf of Southern California Gas Company. LSA Project No. SCG0602J. March 2010.

*Results of Archaeological Resource Monitoring for Southern California Gas Company Line-225 - Templin Highway Repair Project, Angeles National Forest, Los Angeles County, California.* (Co-author with Antonina Delu, M.A. RPA) Prepared for the Angeles National Forest on behalf of Southern California Gas Company. LSA Project No. SCG0602I. March 2010.

*Paleontological Resources Identification and Evaluation Report for State Route 91 Corridor Improvements Project, Cities of Anaheim, Yorba Linda, Corona, Norco and Riverside Counties of Orange and Riverside, California. Districts 8 and 12 – ORA-91-R14.43/R18.91; RIV-91-R0.00/R13.04; RIV-15-35.64/45.14.* (Co-authored with Robert Reynolds and Michael Pasenko) Prepared for the California Department of Transportation, District 8. LSA Project No. PAZ0701. January 2010.

*Paleontological Mitigation Report for the Widening of El Camino Real North of Cougar Drive, City of Carlsbad, San Diego County, California.* Report prepared for the City of Carlsbad, Design Division. LSA Project No. HCR0803. January 2010.

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