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

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SUMMARY OF FINDINGS

The California Department of Transportation (Caltrans) is proposing to widen the existing shoulder of State Route 74 (SR-74) to a continuous 4-foot (ft) shoulder in both directions, install centerline rumble strips, construct turnouts, and install metal beam guard rails at various locations, and make drainage improvements. The project objectives are to reduce cross-centerline collisions and improve drainage. The project is located just to the east of the City of San Juan Capistrano in an unincorporated area of the County of Orange (County), California.

The area studied for this project (study area) at a minimum includes all areas of the SR-74 Safety Project where excavation is proposed. This study area is based on the horizontal and vertical extent of anticipated ground-disturbing activities. The paleontological locality search conducted as part of the analysis included a buffer area extending over 1 mile (mi) from the study area to assist with determining the paleontological sensitivities of geologic formations and units that are present within the project.

The study area includes areas with exposures of native sediments as well as Artificial Fill; therefore, this report addresses the potential for impacts to all sediments, native or artificial. Within the study area there are seven geologic units either mapped as being exposed on the surface or the subsurface, or known to be present within the project area. Four of these sediments, the San Onofre Breccia, Young Landslide Deposits, Young Axial Channel Deposits, and Artificial Fill, do not have the potential to contain paleontological resources because of their depositional environment, their young age (less than 11,700 years), or disturbed context. The Santiago Formation, the San Onofre Breccia, Very Old Axial Channel Deposits, and Old Axial Channel Deposits are also mapped, or likely to occur within the project, and have the potential to contain paleontological remains due to their age and record of producing fossils in the general area.

Recommendations from the California Environmental Quality Act (CEQA) and 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 Eocene through Pleistocene Periods within the study area have the potential to contain significant nonrenewable paleontological resources. Thus, it is likely that paleontological resources will 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 SR-74 Safety Project that are identified as having a High paleontological sensitivity, which would follow the guidelines of Caltrans and recommendations from the SVP prior to completion of final project design. These recommendations include:

- Attendance at the pregrade meeting by a qualified paleontologist or representative. At this meeting, the paleontologist will explain the likelihood of encountering paleontological resources, what resources may be discovered, and the methods of recovery that will be employed.
- 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.
- 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 when excavating 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, the grading contractor will consider using heavy equipment on site to assist in the removal and collection of large materials.
- 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 [cy], or 6,000 pounds) shall be collected and processed through 1/20-inch mesh screens to recover additional fossils.
- 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 and cost of storage for the repository, and the addition of approved chemical hardeners/stabilizers to fragile specimens.
- 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 upon 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).

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

1.0 INTRODUCTION

1.1 INTRODUCTION

Caltrans is proposing to widen the existing shoulder of SR-74 to a continuous 4 ft shoulder in both directions, install centerline rumble strips, construct turnouts, and install metal beam guard rails at various locations. The project objectives are to reduce cross-centerline accidents and improve drainage within culverts that are within the project area. This project does not increase capacity.

The project is located within portions of Sections 33, 34, and 35, Township 7 South, Range 7 West, San Bernardino Baseline and Meridian, and is depicted on the *Cañada Gobernadora, California* 7.5-minute series United States Geological Survey (USGS) topographic map. The location and regional vicinity of the proposed project are illustrated in Figure 1. Most of the proposed improvements will occur within the existing Caltrans right of way (ROW); however, this project will require a Permanent Drainage Easement (PDE), Permanent Slope Easement (PSE), and Temporary Construction Easement (TCE). The project passes through unincorporated County of Orange, California.

1.2 PURPOSE AND NEED

1.2.1 Purpose

The purpose of the SR-74 Safety Project is to reduce cross-centerline collisions.

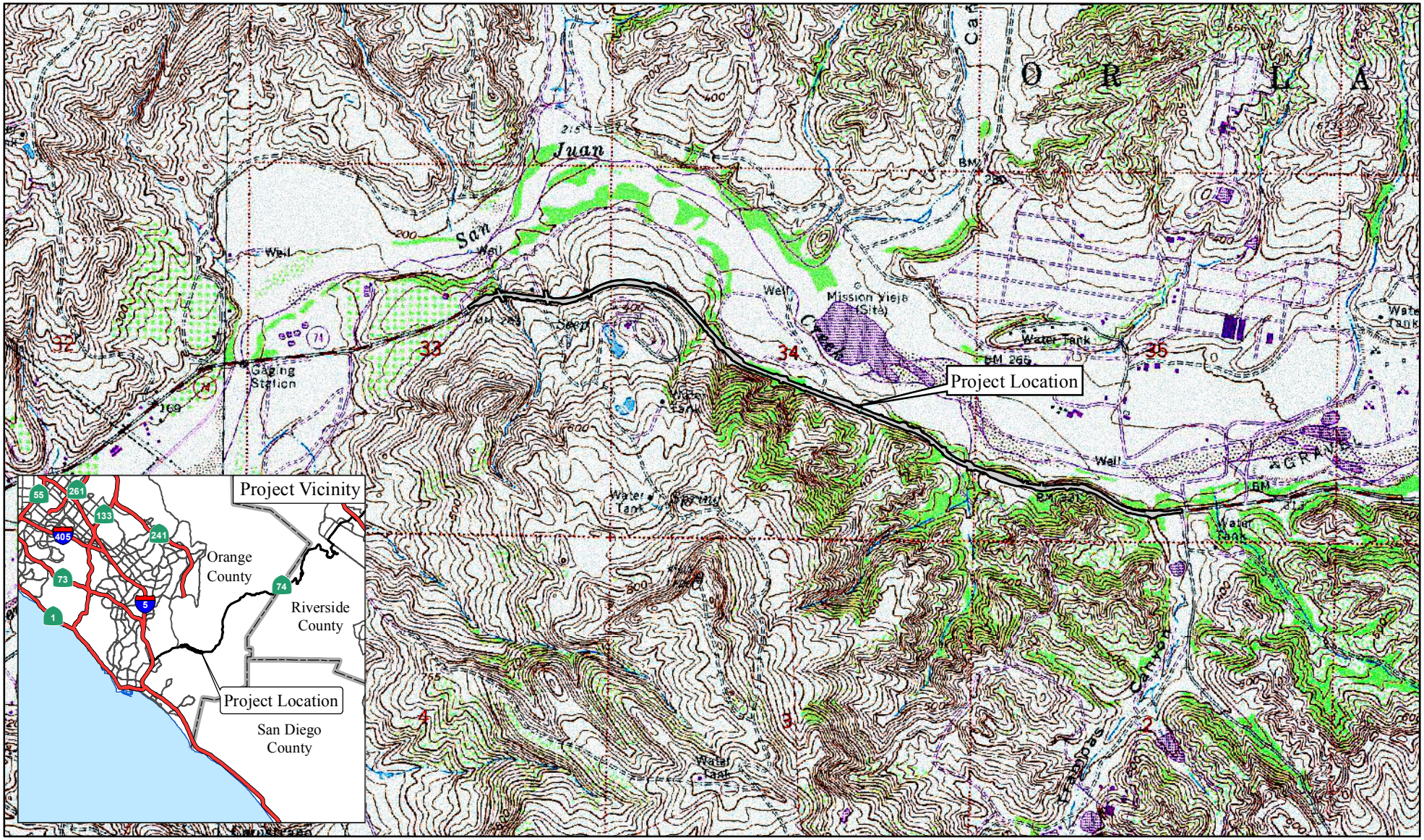
1.2.2 Need

This segment of SR-74 is operating with high cross-centerline collisions.

1.2.3 Deficiencies

This segment of the SR-74 is a two-lane winding highway with compound curves at certain locations. Most of the existing horizontal curves within the project limits do not meet standard stopping sight distance (SSD) due to nonstandard shoulder widths and nonstandard horizontal clearance. Certain horizontal curves also do not meet minimum radius requirements as shown in Highway Design Manual (HDM), Table 203.2.

The existing pavement includes a 12 ft travel lane and 0–2 ft wide shoulder in each direction. The total pavement width ranges between 24 to 28 ft. Currently, there is no median barrier or centerline rumble strips. Beyond the outside shoulder is loose soil, which has eroded over a period of time. As a result, shoulders have dropped below the paved roadway surface.



LEGEND

Project Location

FIGURE 1

0 1000 2000
FEET

USGS 7.5' QUAD - CANADA GOBERNADORA ('88)

I:\CDT1121\GIS\Paleo_ProjLoc.mxd (11/30/2012)

SR-74 Safety Project

Project Location and Vicinity

EA 0L7200/1200020180
12-ORA-74, PM 2.93/5.06

The Traffic Accident Surveillance and Analysis System (TASAS) for the time period from January 1, 2004, to December 31, 2008, indicates that 2 out of 38 accidents in this segment of the highway were cross-centerline collisions. Most likely these accidents are due to drivers making an overcorrection after drifting off roadway pavement and travelling into unpaved shoulder.

This segment of the SR-74 does not have paved turnouts. Based on the 2008 Annual Average Daily Truck Traffic on the California State Highway System, the volume consists of 11.7 percent of trucks using this segment of the highway.

Most culverts within the project limits are over 20 years old. Some of these culverts are filled with debris, have broken inlets/outlets, rusty metal pipes, and poor extensions. Emergency work has been done in the last several years due to heavy rainfall.

1.3 PROJECT DESCRIPTION

SR-74 (Ortega Highway) is the only east/west route that connects south Orange County to Riverside County. The first section of SR-74 from post mile (PM) 0.0 to 3.0 is a four-lane highway except from PM 1.0 to 1.9, which is a two-lane highway. This section is fairly flat terrain and surrounded by business, commercial, and residential developments. The second section of SR-74 from PM 3.0 to 16.6 (at the County line) is a two-lane winding highway with hilly and mountainous terrain surrounded by undeveloped areas.

Caltrans proposes to widen the existing shoulder to a continuous 4 ft shoulder in both directions, install centerline rumble strips, construct turnouts, and install metal beam guard rails at various locations. Shoulder widening will require roadway excavation in certain cut sections and construction of retaining walls in certain fill sections. Most existing culverts within the project limits will be replaced as part of the scope of this project. This safety project begins 0.37 mi east of Antonio Parkway/La Pata (PM 2.930) to west of Conrock Entrance/Christianitos Road (PM 5.069), in an unincorporated area of the County of Orange.

Two alternatives, including the No Build Alternative, will be analyzed as a part of the Draft Initial Study/Environmental Assessment (IS/EA). The project alternatives are described below.

1.3.1 Alternative 1: No Build Alternative

The No Build Alternative would have this segment of the SR-74 remain in its present condition. This alternative would not address the safety issues within the project limits. The No Build Alternative is not the preferred alternative for the project.

1.3.2 Alternative 2: Recommended Alternative

Caltrans proposes the following improvements to help reduce cross-centerline collisions. Alternative 2 proposes to widen existing shoulder width to 4 ft in both directions. It is also proposed to install centerline rumble strips, construct 12 ft turnouts in the eastbound direction and 15 ft turnouts in the westbound direction, and install metal beam guard rails/end treatments at various locations. The proposed improvements will require roadway excavation, construction of retaining walls, replacement

of most of the existing culverts, and acquisition of temporary construction easements, permanent drainage easements, and slope easements.

General Scope of Work.

a. Widening the existing pavement continuously to provide a 12 ft travel lane and 4 ft outside shoulder in both directions with safety edges
b. Installing metal beam guard rails/end treatments at various locations
c. Constructing retaining walls and regrading embankments as needed in some fill sections
d. Excavating in cut sections as needed, providing rock nets in certain areas to prevent falling rocks
e. Saw cutting along the edge of the travelway in both directions and excavating roadway pavement as needed for the proposed shoulder width
f. Constructing earth swales along the toe of the slope to prevent water sheet flow across the highway pavement
g. Installing centerline rumble strips per current Caltrans Standard Plans
h. Installing roadside signs as needed
i. Removing/replacing existing culverts by either trenching or cure-in-place lining method
j. Relocating/constructing drainage features and extending culverts as needed to match the proposed highway widening limit
k. Constructing turnouts with structural pavement as shown in typical cross-sections

1.3.3 Summary of Excavation Parameters

Within the SR-74 Safety Project, project plans call for excavation that may extend up to 4 ft beneath the finished surface, which, depending on the area, may be up to or over 10 ft beneath the existing surface elevations, mainly in areas where cut slopes are needed to widen the roadway. New excavation will support widening the roadway, construction of retaining walls, making repairs to existing culverts, and extending existing culverts, to match the widened roadway.

There are several culverts that have either inlets or outlets located outside of the State ROW line. PDEs at various locations will be required. Hillside excavation is needed to accommodate a 4 ft shoulder at some locations that will require PSEs. Currently, estimated areas for PDEs and PSEs are being used for cost estimate purposes only. Further studies will take place during the Plans, Specifications, and Estimates (PS&E) phase. Temporary Construction Easements (TCE) will also be needed in some areas during construction that may require some ground-disturbing activities.

1.4 PURPOSE OF INVESTIGATION

Scientifically significant nonrenewable paleontological resources, including vertebrate fossils and unique or scientifically important invertebrate fossils and remains of fossil plants, are recognized by

the State 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 101(b)(4)) is interpreted to include fossils.

The paleontological locality search and field assessment were conducted pursuant to CEQA and the California Public Resources Code (PRC). This assessment documents the potential for paleontological resources older than 10,000 years to occur in the project area.

1.4.1 Caltrans Regulations

As this project is within a State highway ROW, the 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, 2012), 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 Identification Report (PIR), a Paleontological Evaluation Report (PER), and a 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 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 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 PMR and a Paleontological Stewardship Summary (PSS).

1.4.2 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."

Consequently, Caltrans, as well as local project proponents, is required to comply with PRC 5097.5 for its own activities, including construction and maintenance, as well as for permit actions (e.g., encroachment permits) undertaken by others.

1.4.3 Local Regulations

Caltrans is not required to comply with local laws and ordinances; however, it will endeavor to do so to the extent possible. Various cities and counties have passed ordinances and resolutions related to paleontological resources within their jurisdictions. These regulations are usually included within the General Plans of cities or counties and provide additional guidance on assessment and treatment measures for projects subject to CEQA compliance. Project staff should periodically coordinate with local entities to update their knowledge of local requirements.

As this project is located within an unincorporated portion of the County, the County of Orange Standard Conditions of Approval (SCA) would apply. Paleontological guidelines within the County of Orange SCA include:

- **A5:** Records search and Survey
- **A6:** Preconstruction salvage of known fossil localities within the project
- **A7:** Monitoring of grading activities, collection and identification of fossils, curation of fossils into a museum repository, and preparation of a monitoring report

Protection of paleontological resources following Caltrans guidelines meet and or exceed the paleontological protection contained within the County of Orange SCA.

2.0 SIGNIFICANCE

2.1 DEFINITION OF SIGNIFICANCE

If a paleontological resource, such as a rock unit or formation with the potential to contain fossils, cannot be avoided during construction, the significance of the resource must be assessed before mitigation measures are proposed. According to Caltrans (2012), there are two generally recognized types of paleontological significance:

- **National:** A National Natural Landmark eligible paleontological resource is an area of national significance (as defined under 36 Code of Federal Regulations [CFR] 62) that contains an outstanding example of fossil evidence of the development of life on earth. This is the only codified definition of paleontological significance.
- **Scientific:** Definitions of a scientifically significant paleontological resource can vary by jurisdictional agency and paleontological practitioner.

Scientifically significant paleontological resources are "identified sites or geologic deposits containing individual fossils or assemblages of fossils that are unique or unusual, diagnostically or stratigraphically important, and add to the existing body of knowledge in specific areas, stratigraphically, taxonomically, or regionally" (Caltrans, 2012). Fossils are particularly important when they are found undisturbed in their primary context because they aid in stratigraphic correlation, evolution, and paleoclimatology.

> Significant, nonrenewable fossil resources under SVP guidelines consist of "vertebrate fossils and their taphonomic and associated environmental indicators. This definition excludes invertebrate or botanical fossils except when present within a given vertebrate assemblage" or as defined by a project paleontologist or Lead Agency (SVP, 1995).

The SVP provides the following definitions of significance.

- **Significant Paleontological Resources** are fossils and fossiliferous deposits, here defined as consisting of identifiable vertebrate fossils, large or small; uncommon invertebrate, plant, and trace fossils; and other data that provide taphonomic, taxonomic, phylogenetic, paleoecologic, stratigraphic, and/or biochronologic information. Paleontological resources are considered to be older than recorded human history and/or older than middle Holocene (i.e., older than approximately 5,000 radiocarbon years) (SVP, 2010).
- A **Significant Fossiliferous Deposit** is a rock unit or formation that contains significant nonrenewable paleontological resources, here defined as comprising one or more identifiable vertebrate fossils, large or small; and any associated invertebrate and plant fossils, traces, and other data that provide taphonomic, taxonomic, phylogenetic, ecologic, and stratigraphic information (ichnites and trace fossils generated by vertebrate animals, e.g., trackways or nests

and middens, which provide datable material and climatic information). Paleontological resources are considered to be older than recorded history and/or older than 5,000 years BP (SVP, 2005).

Generally, scientifically significant paleontological resources are identified sites or geological deposits containing individual fossils or assemblages of fossils that are unique or unusual, diagnostically or stratigraphically important, and add to the existing body of knowledge in specific areas, stratigraphically, taxonomically, or regionally (SVP, 1995). Particularly important are fossils found in situ (undisturbed) in primary context (e.g., fossils that have not been subjected to disturbance subsequent to their burial and fossilization). As such, they aid in stratigraphic correlation, particularly those offering data for the interpretation of tectonic events, geomorphologic evolution, paleoclimatology, the relationships between aquatic and terrestrial species, and evolution in general. Discovery of in situ fossil-bearing deposits is rare for many species, especially vertebrates. Terrestrial vertebrate fossils are often assigned greater significance than other fossils because they are rarer than other types of fossils. This is primarily due to the fact that the best conditions for fossil preservation include little or no disturbance after death and quick burial in oxygen-depleted, fine-grained, sediments. While these conditions often exist in marine settings, they are relatively rare in terrestrial settings. This has ramifications with regard to the amount of scientific study needed to characterize an individual species adequately and therefore affects how relative sensitivities are assigned to formations and rock units.

In their Model Curation Program, Eisentraut and Cooper (2002) developed a useful analysis for judging whether fossils are scientifically significant. Using their analysis method, fossils can be judged scientifically significant if they meet any of the following criteria within the following categories:

- **Taxonomy:** Assemblages that contain rare or unknown taxa, such as defining new (previously unknown to science) species or that represent a species that is the first or has very limited occurrence within the area or formation.
- **Evolution:** Fossils that represent important stages or links in evolutionary relationships or that fill gaps or enhance underrepresented intervals in the stratigraphic record.
- **Biostratigraphy:** Fossils that are important for determining or confining relative geologic (stratigraphic) ages or for use in defining regional to interregional stratigraphic associations. These fossils are often known as biostratigraphic markers and represent plants or animals that existed for only a short and restricted period in the geologic past.
- **Paleoecology:** Fossils that are important for reconstructing ancient organism community structure and interpretation of ancient sedimentary environments. Depending on which fossils are found, much can be learned about the ancient environment from water depth, temperature, and salinity to what the substrate was like (muddy, sandy, or rocky) to even whether the area was in a high energy location like a beach or low-energy location like a bay. Even terrestrial animals can contain information about the ancient environment. For example, an abundance of grazing animals such as horse, bison, and mammoth suggest more of a grassland environment, while an abundance of browsing animals such as deer, mastodon, and camel suggest more of a brushy environment. Preserved parts of plants can also lend insight into what was growing in the area at a particular time. In addition, by studying the ratios of different species to each other's population densities, relationships between predator and prey can be determined.

There is a complex but vital interrelationship among evolution, biostratigraphy, and paleoecology: biostratigraphy (the record of fossil succession and progression) is the expression of evolution (change in populations of organisms through time), which in turn is driven by natural selection pressures exerted by changing environments (paleoecology).

- **Taphonomy:** Fossils that are exceptionally well or unusually/uniquely preserved or are relatively rare in the fossil record. This could include preservation of soft tissues such as hair, skin, or feathers from animals or the leaves/stems of plants that are not commonly fossilized.

2.2 SUMMARY OF SIGNIFICANCE

All vertebrate fossils that can be related to a stratigraphic context are scientifically significant and are considered a scientifically significant nonrenewable paleontological resource. Invertebrate and plant fossils as well as other environmental indicators associated with vertebrate fossils are considered scientifically significant. Certain invertebrate and plant fossils that are regionally rare or uncommon, or help to define stratigraphy, age, or taxonomic relationships, are considered scientifically significant.

3.0 SENSITIVITY

3.1 DEFINITION OF SENSITIVITY

Sensitivity is often stated "potential" since decisions about how to manage paleontological resources must be based on "potential," as the actual situation cannot be known until construction excavation for the project is underway. In accordance with the Caltrans SER guide for paleontology (Caltrans, 2012), the sensitivity of rock units and formations that may contain paleontological resources is assessed on the basis of High, Low, or No potential for paleontological resources:

- **High Potential:** Rock units which, based on previous studies, contain or are likely to contain significant vertebrate, significant invertebrate, or significant plant fossils. These units include, but are not limited to, sedimentary formations that contain significant nonrenewable paleontological resources anywhere within their geographical extent, and sedimentary rock units temporally or lithologically suitable for the preservation of fossils. These units may also include some volcanic and low-grade metamorphic rock units. Fossiliferous deposits with very limited geographic extent or an uncommon origin (e.g., tar pits and caves) are given special consideration and ranked as highly sensitive. High sensitivity includes the potential for containing (1) abundant vertebrate fossils; (2) a few significant fossils (large or small vertebrate, invertebrate, or plant fossils) that may provide new and significant taxonomic, phylogenetic, ecologic, and/or stratigraphic data; (3) areas that may contain datable organic remains older than Recent, including *Neotoma* (sp.) middens; and/or (4) areas that may contain unique new vertebrate deposits, traces, and/or trackways. Areas with a High potential for containing significant paleontological resources require monitoring and mitigation.
- **Low Potential:** This category includes sedimentary rock units that (1) are potentially fossiliferous, but have not yielded significant fossils in the past; (2) have not yet yielded fossils, but possess a potential for containing fossil remains; or (3) contain common and/or widespread invertebrate fossils if the taxonomy, phylogeny, and ecology of the species contained in the rock are well understood. Sedimentary rocks expected to contain vertebrate fossils are not placed in this category because vertebrates are generally rare and found in more localized stratum. Rock units designated as Low potential generally do not require monitoring and mitigation. However, as excavation for construction gets underway, it is possible that new and unanticipated paleontological resources might be encountered. If this occurs, a Construction Change Order (CCO) must be prepared in order to have a qualified Principal Paleontologist evaluate the resource. If the resource is determined to be significant, monitoring and mitigation are required.
- **No Potential:** Rock units of intrusive igneous origin, most extrusive igneous rocks, and moderately to highly metamorphosed rocks are classified as having No potential for containing significant paleontological resources. For projects encountering only these types of rock units, paleontological resources can generally be eliminated as a concern when the Preliminary Environmental Analysis Report (PEAR) is prepared, and no further action is taken.

According to the SVP (2010), protection of paleontological resources includes: (a) assessment of the potential for the area to contain significant paleontological resources that could be directly or

indirectly impacted, damaged, or destroyed by the proposed development, and (b) formulation and implementation of measures to mitigate these adverse impacts, including permanent preservation of the site and/or permanent preservation of salvaged fossils along with all contextual data in established institutions.

According to the SVP (2010), paleontological potential is the potential for the presence of significant nonrenewable paleontological resources. All sedimentary rocks, some volcanic rocks, and some metamorphic rocks have potential for the presence of significant nonrenewable paleontological resources, and review of available literature may further refine the potential of each rock unit, formation, or facies. The SVP has four categories of potential, or sensitivity: High, Low, None, and Undetermined. If a geographic area or geological unit is classified as having Undetermined potential for paleontological resources, studies must be undertaken to determine whether that rock unit has a sensitivity of either High, Low, or None. These categories are described in more detail below.

3.1.1 High Potential

Rock units from which vertebrate or significant invertebrate, plant, or trace fossils have been recovered are considered to have a High potential for containing additional significant paleontological resources. Rocks units classified as having High potential for producing paleontological resources include, but are not limited to, sedimentary formations and some volcaniclastic formations (e.g., ashes or tephras), some low-grade metamorphic rocks that contain significant paleontological resources anywhere within their geographical extent, and sedimentary rock units temporally or lithologically suitable for the preservation of fossils (e.g., middle Holocene and older, fine-grained fluvial sandstones, argillaceous and carbonate-rich paleosols, cross-bedded point bar sandstones, fine-grained marine sandstones). Paleontological potential consists of both (a) the potential for yielding abundant or significant vertebrate fossils or for yielding a few significant fossils, large or small, vertebrate, invertebrate, plant, or trace fossils, and (b) the importance of recovered evidence for new and significant taxonomic, phylogenetic, paleoecologic, taphonomic, biochronologic, or stratigraphic data. Rock units that contain potentially datable organic remains older than late Holocene, including deposits associated with animal nests or middens, and rock units which may contain new vertebrate deposits, traces, or trackways, are also classified as having High potential.

3.1.2 Low Potential

Reports in the paleontological literature or field surveys by a qualified professional paleontologist may allow determination that some rock units have a Low potential for yielding significant fossils. Such rock units will be poorly represented by fossil specimens in institutional collections, or based on general scientific consensus, fossils are only preserved in rare circumstances; the presence of fossils is the exception, not the rule (e.g., basalt flows or Recent colluvium). Rock units with Low potential typically will not require impact mitigation measures to protect fossils.

3.1.3 No Potential

Some rock units have No potential to contain significant paleontological resources (e.g., high-grade metamorphic rocks [such as gneisses and schists] and plutonic igneous rocks [such as granites and

diorites]). Rock units with No potential require no protection nor impact mitigation measures relative to paleontological resources.

3.1.4 Undetermined Potential

Rock units for which little information is available concerning their paleontological content, geologic age, and depositional environment are considered to have Undetermined potential. Further study is necessary to determine whether these rock units have High or Low potential to contain significant paleontological resources. A field survey by a qualified professional to specifically determine the paleontological resource potential of these rock units is required before a Paleontological Resource Impact Mitigation Program (PRIMP) can be developed. In cases where no subsurface data are available, paleontological potential can sometimes be determined by strategically located excavations into subsurface stratigraphy.

Given the range of criteria that may be used, assessments of significance should be based on the recommendations of a professional Principal Paleontologist with expertise in the region under study and the resources found in that region. An evaluation of a particular rock unit's significance rests on the known importance of specific fossils. Often this significance is reflected as a sensitivity ranking of the rock unit relative to other rock units in the same region. Regardless of the format used by a paleontologist to rank formations, the importance of any rock unit must be explicitly stated in terms of specific fossils known or suspected to be present (and if the latter, why such fossils are suspected), and why these fossils are of paleontological importance. Some land-managing agencies may require the use of specific guidelines to assess significance, whereas others may defer to the expertise of local paleontologists and provide little guidance. Because each situation may differ, it is important that there is a clear understanding among project staff (Caltrans or local), consultants, and personnel from other agencies as to exactly what criteria will be used to assess the significance of fossils that have the potential to be within each rock unit that will be encountered over the course of the project.

If a paleontological resource is determined to be significant, of High sensitivity, or of scientific importance, a mitigation program must be developed and implemented. Mitigation can be initiated prior to and/or during construction. The former is more common for Caltrans projects. It should be pointed out that mitigating during construction poses a greater risk of construction delays. Mitigation is an eligible federal project cost, in accordance with 23 United States Code (USC) 305, only if significance documentation acceptable to the Federal Highway Administration (FHWA) is submitted. Thus, coordination among Caltrans, FHWA, and all jurisdictional agencies is critical to formally establishing the significance of a resource.

As a practical matter, no consideration is generally afforded paleontological sites for which scientific importance cannot be demonstrated. If a paleontological resource assessment results in a determination that the site is insignificant or of Low sensitivity, this conclusion should be documented in a PER and in the project's environmental document to demonstrate compliance with applicable statutory requirements.

3.2 SUMMARY OF SENSITIVITY

A formation or rock unit has paleontological sensitivity or the potential for scientifically 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, certain extrusive volcanic rocks, and mildly metamorphosed rocks are considered to have potential for paleontological resources.

4.0 METHODS

To ensure that research was comprehensive, the paleontological resources "Research Area" was expanded beyond the study area. A Research Area boundary of up to several miles on either side of the project study area was used. 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 the Natural History Museum of Los Angeles County (LACM).

4.1 LITERATURE REVIEW AND LOCALITY SEARCH

The locality search included a review of area geology and any fossil resources recovered within similar sediments to those that will be encountered during the 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 study 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 of the area can be made of the potential effects of the proposed project on paleontological resources, 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 October 2012, a locality search was completed through LACM and records maintained at LSA. The locality search included the current study area within the SR-74 Safety Project. The results letter from Dr. Samuel McLeod, Curator of Vertebrate Paleontology at the LACM, is provided in Appendix A.

4.2 FIELD INSPECTION

4.2.1 Survey

A pedestrian survey of the study area was conducted by Phil Fulton on September 7 and October 17, 2012. All areas containing what appeared to be intact or potentially intact ground surfaces were surveyed. These areas were surveyed by walking single transects parallel to SR-74. The majority of the Area of Potential Disturbance (APD) consists of extensive cut slopes and fill slopes as this portion of SR-74 traverses an area of ridges and canyons south of San Juan Creek.

The purpose of a pedestrian survey is to confirm the accuracy of the geologic mapping and to identify whether there are any unrecorded paleontological resources exposed on the surface of the APD. In this way, a determination can be made for the existence of paleontological material prior to the beginning of ground-disturbing activities, and areas can be located within the project area that might contain paleontological resources.

4.3 PERSONNEL

Brooks R. Smith prepared this PIR/PER. Mr. Smith (Appendix B) is an Associate at LSA and a County of Orange Certified Paleontologist. Mr. Smith has 20 years of experience with paleontological salvage programs and has extensive experience collecting paleontological resources, as well as writing paleontological assessment reports and paleontological mitigation programs; surveying for paleontological resources; salvaging large fossil specimens; fossil identification and curation; and final mitigation monitoring reports at the conclusion of construction projects.

Phil Fulton conducted the pedestrian survey for this project. Since 1986, Mr. Fulton (Appendix B) has worked as an archaeologist in Southern California and the western United States. As a Senior Cultural Resources Manager at LSA, Mr. Fulton is responsible for preparing and conducting records and archival searches, directing and participating in archaeological monitoring, field excavation, conducting archaeological and paleontological surveys, and report writing. Mr. Fulton meets Caltrans Cultural Resource Professional Qualification Standards for a Co-Principal Investigator—Prehistory and Historical Archaeology.

This document was reviewed by Steven W. Conkling, Principal of the LSA Cultural Resources Group and County of Orange Certified Paleontologist. Mr. Conkling (Appendix B) has been with LSA for 19 years and has extensive experience with paleontological resources and developing paleontological mitigation and salvage programs. He is either a research associate or a member of several local museums and scientific societies, including the Orange County Natural History Museum, LACM, and the San Bernardino County Museum.

5.0 RESULTS

5.1 LOCALITY SEARCH

5.1.1 Geology

The project area is located at the northern end of the Peninsular Ranges Geomorphic Province of Southern California (California Geologic Survey, 2002). The Peninsular Range Geomorphic Province is a 900 mi 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). This Province is characterized by mountains and valleys that trend in a northwest–southeast direction that roughly parallels the San Andreas Fault. The total width of the province is approximately 225 mi, with a maximum landbound width of 65 mi (Sharp, 1976). The Peninsular Ranges contain extensive Cretaceous (more than 65 million years ago [mya]) and pre-Cretaceous igneous and metamorphic rock covered by limited exposures of post-Cretaceous sedimentary deposits. Within Orange County, these post-Cretaceous sedimentary deposits are believed to be some of the most important Tertiary marine fossil-producing areas in the world due to the completeness of the geologic record and general abundance of the fossils (Raschke, 1984). Belyea and Minch (1989) report that the Santa Ana Mountains contain exposures of the most complete section of Late Mesozoic and Cenozoic (approximately 150 mya to the present) stratigraphy in the entire Peninsular Ranges.

Specifically, the project is located on the southwestern flank of the Santa Ana Mountains on the southern bank of San Juan Creek. Geologic formations in this area consist of both terrestrial and marine sediments. According to the geology map prepared by Morton and Miller (2006), various geological units and formations have the potential to be encountered while excavating for this project. The formations and units that have the potential to be encountered include: Young (Holocene) Axial Channel Deposits; Old (Middle to Late Pleistocene) Axial Channel Deposits (not mapped, but likely occur at depth in some areas); Very Old (Early to Middle Pleistocene) Axial Channel Deposits the Middle Miocene San Onofre Breccia, and Eocene Santiago Formation. In addition, although not mapped by Morton and Miller (2006), Artificial Fill also occurs within the study area and was observed during the pedestrian survey. Each of these units is described briefly, and the location where each, except for the Artificial Fill, may be encountered is depicted on Figure 2. Table A contains a summary of each unit's age.

Artificial Fill (AF). Artificial Fill is not mapped within the study area on the geologic map by Morton and Miller (2006), but it was observed during the pedestrian survey. This is consistent with the fact that Artificial Fill needed to be placed during the construction of SR-74. Artificial Fill consists of sediments that have been removed from one location and transported to another by humans. The transportation distance can range from a few feet to dozens of miles. Composition is dependent on the source. When it is compacted and dense, it is known as "engineered fill," but it can be unconsolidated and loosely compacted. Artificial Fill will sometimes contain modern debris such as asphalt, wood, bricks, concrete, metal, glass, plastic, and even plant material. Depending on the area, thickness can be less than 1 ft or several hundred feet.

Table A: Geologic Time Periods and Geologic Units within the SR-74 Safety Project Study Area

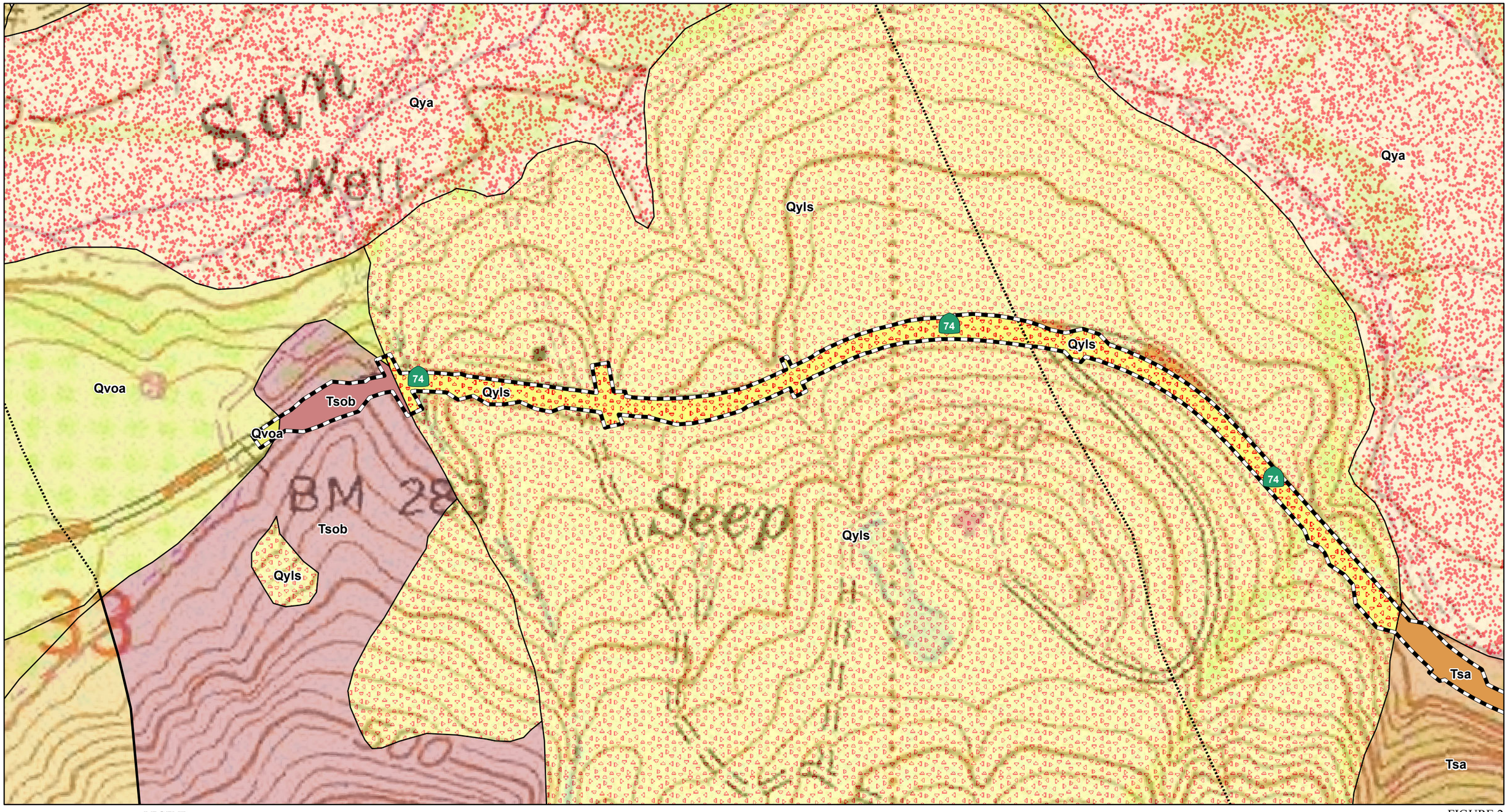
Epoch	Age (years ago)	Geologic Formation/Unit	Map Symbol
Quaternary Period			
Holocene	Less than 100	Artificial Fill	AF (not mapped on Figure 2, but is present in some areas of the project)
Holocene	Less than 11,700	Young Axial Channel Deposits	Qya
Holocene	Less than 11,700	Young Landslide Deposits	Qyls
Middle to Late Pleistocene	300,000 to 11,700	Old Axial Channel Deposits	Qoa (Not mapped on Figure 2, but may exist in subsurface)
Early to middle Pleistocene	2 million to 300,000	Very Old Axial Channel Deposits	Qvoa
Tertiary Period			
Middle Miocene	15 to 12 million	San Onofre Breccia	Tsob
Eocene	48 to 40 million	Santiago Formation	Tsa

SR-74 = State Route 74

Young Axial Channel Deposits (Qya). Young Axial Channel Deposits represent relatively recently fluvial deposits on valley floors. These deposits are also known as Holocene Alluvium. These sediments are primarily found within or close to the active depositional and/or erosional area of a stream channel. By definition, they were deposited during the Holocene and can range in age from several hundred to 11,700 years old. These deposits consist of loosely consolidated mixtures of gravel, sand, and silt, ranging from poorly sorted to well-sorted. The sand grains are generally subangular to subrounded, while the gravels and cobbles are rounded to well-rounded. Color is usually gray to yellow-brown to gray-brown, and is usually dependent on the nearby, or upstream, geology.

Young Landslide Deposits (Qyls). These landslides formed during the last 11,700 years as canyon cutting and aqueous erosion caused slope failure. These areas consist of blocks and flows of the underlying sediments, can range in size from a few square feet to tens of acres, and have depths as shallow as a few feet up to hundreds of feet. Their composition is dependent on the underlying sediments; however, sediments that have higher silt sand clay content are usually more prone to landslides. Within the project area, these deposits all appear to originate within the San Onofre Breccia or the Santiago Formation.

Old Axial Channel Deposits (Qoa). Old Axial Channel Deposits are not mapped on the surface of the study area by Morton and Miller (2006), but they likely exist beneath the Young Axial Channel Deposits, described above. These sediments will be similar to younger sediments described above, but will generally be more consolidated and may be darker in color. The depth at which these sediments are encountered can vary widely from several feet to tens of feet. However, it is often assumed that these sediments may begin to be encountered once a depth of 10 ft below the surface of the Young Axial Channel Deposits is reached.



LEGEND

Project Location

Geology

(Qya) Young axial-channel deposits

(Qyls) Young landslide deposits

(Qvoa) Very old axial-channel deposits

(Tsob) San Onofre Breccia

(Tsa) Santiago Formation

Contact, approx. located

Contact, certain

Fault, certain

Fault, concealed

N

0 150 300

FEET

SOURCE: USGS 7.5' QUAD - CANADA GOBERNADORA (1988); Morton & Miller (2006)

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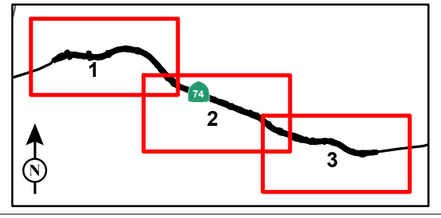


FIGURE 2

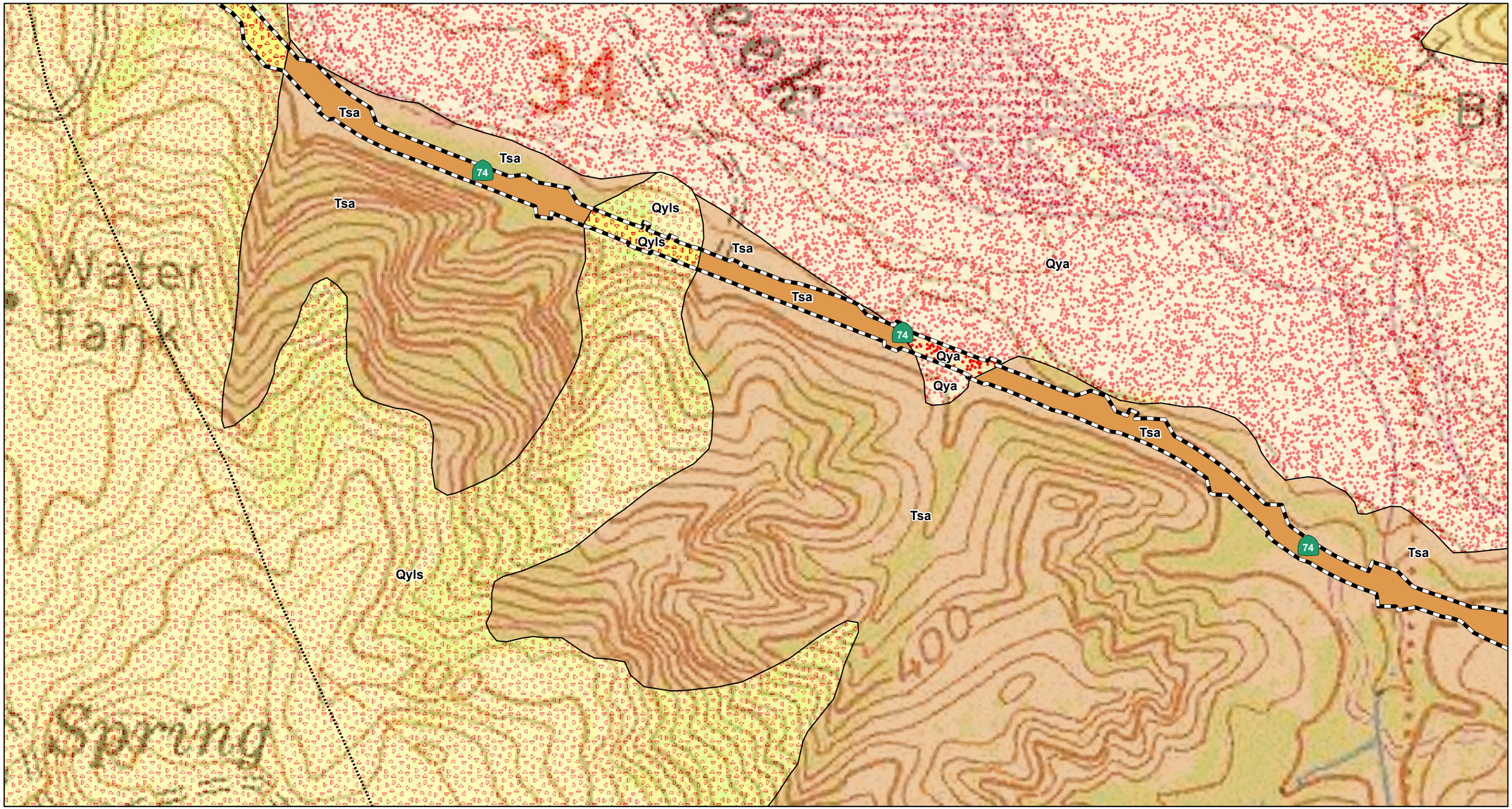
Sheet 1 of 3

SR-74 Safety Project

Geology

EA 0L7200/1200020180

12-ORA-74, PM 2.93/5.06



LEGEND

Project Location

Geology

(Qya) Young axial-channel deposits

(Qyls) Young landslide deposits

(Qvoa) Very old axial-channel deposits

(Tsob) San Onofre Breccia

(Tsa) Santiago Formation

Contact, approx. located

Contact, certain

Fault, certain

Fault, concealed

N

0 150 300
FEET

SOURCE: USGS 7.5' QUAD - CANADA GOBERNADORA (1988); Morton & Miller (2006)

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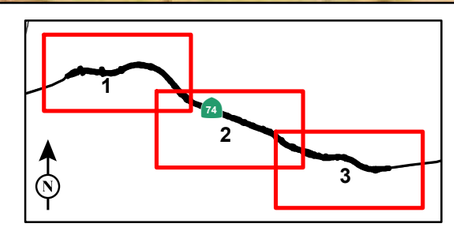

FIGURE 2
Sheet 2 of 3

SR-74 Safety Project

Geology

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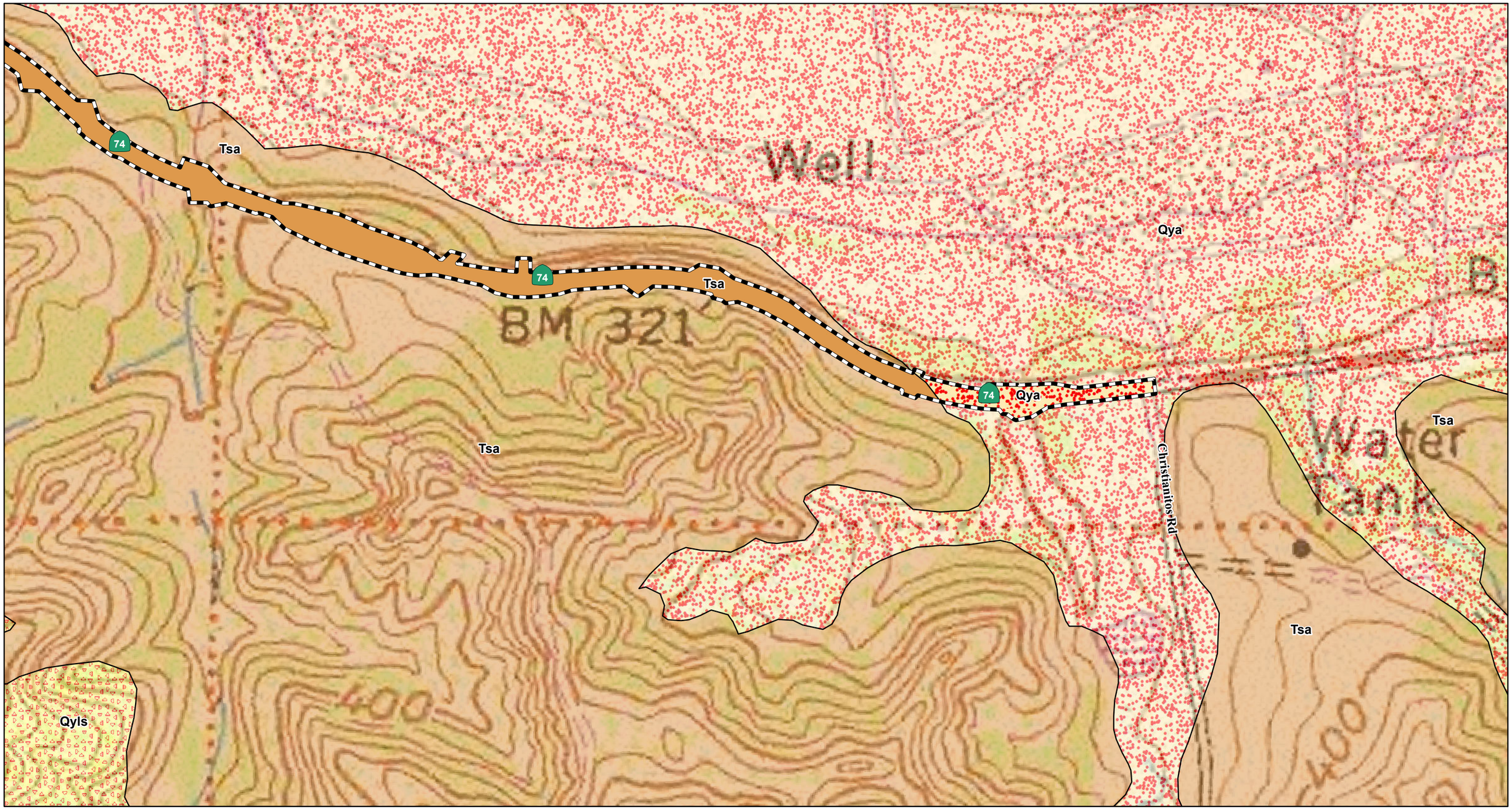
12-ORA-74, PM 2.93/5.06



LEGEND

Project Location

Geology

(Qya) Young axial-channel deposits

(Qyls) Young landslide deposits

(Qvoa) Very old axial-channel deposits

(Tsob) San Onofre Breccia

(Tsa) Santiago Formation

Contact, approx. located

Contact, certain

Fault, certain

Fault, concealed

N

0 150 300
FEET

SOURCE: USGS 7.5' QUAD - CANADA GOBERNADORA (1988); Morton & Miller (2006)

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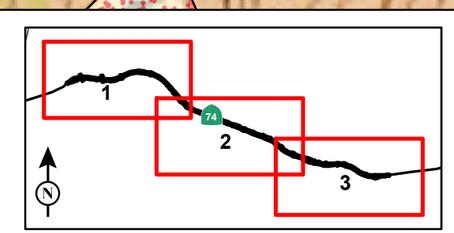


FIGURE 2

Sheet 3 of 3

SR-74 Safety Project

Geology

EA 0L7200/1200020180

12-ORA-74, PM 2.93/5.06

Very Old Axial Channel Deposits (Qvoa). Very Old Axial Channel Deposits are also known as Very Old Alluvial Deposits, or Very Old Non-Marine Terrace Deposits. These sediments were deposited by streams and rivers and can be located close to the central portion of a river or stream valley, on elevated terraces above the active stream channel, or at depth beneath the active stream channel. These sediments were likely deposited during the early to middle Pleistocene (2 million to 300,000 years ago. These Very Old Axial Channel Deposits are composed mixtures of coarse-grained cobbles and gravel, fine to coarse-grained sand, silt, and clay. These deposits are generally moderately to well consolidated, and when exposed on the surface, they usually have been dissected by erosional gulleys and have some soil development. Colors are variable, but are usually shades of orangish to reddish brown.

San Onofre Breccia (Tsob). The early to middle Miocene San Onofre Breccia consists of marine to locally nonmarine sediments of subaerial to sub-marine landslides, alluvial fans, and debris flows and was first described by Woodford (1925). It is a red-brown, yellow-brown, gray breccia supported in a matrix that can range from clay to coarse sand. It also contains interbeds of conglomerate, sandstone, siltstone, mudstone, shale, and tuff clasts that are mostly angular to subangular with occasional subangular to subrounded cobbles and pebbles, and boulders as large as 12 ft in maximum dimension. Sand grains are angular to subrounded. It is generally massive to crudely bedded, with the sandstone interbeds exhibiting graded bedding and sometimes local cross bedding, with the breccia units being locally inversely graded and commonly lenticular. The breccia and sandstone units are usually well cemented and resistant, while the siltstone and mudstone units are commonly poorly cemented and less resistant. Most clasts are schists such as amphibolite schist, quartzo-amphibole schist, knotted albite schist, also saussurite gabbro and minor quartzite, serpentine and limestone. These rock types are unusual, with most requiring high pressure and relatively low temperature to form. The sediment source for the San Onofre Breccia is believed to be a western basement complex of rocks: the Catalina Schist. The clasts are similar to the basement rocks exposed on Santa Catalina Island, located approximately 45 mi to the southwest.

Maximum thickness of the San Onofre Breccia is 2,610 ft in South Laguna, and rapidly thins as the Formation moves inland, to the east (Woodford, 1925). It unconformably overlies the Topanga, Sespe, and Vaqueros Formations. It is unconformably overlain, but locally gradational and interfingering with the Monterey Formation and the Los Trancos and Paularino Members of the Topanga Formation. In Orange County, it is exposed from Dana Point to Newport Bay and does not extend farther than 9 mi from the coast. There are also extensive exposures in San Diego County from just south of the Orange/San Diego County line to south of Oceanside, within 6 mi of the coast.

Santiago Formation. The middle-Eocene Santiago Formation is composed of marine to nonmarine sediments up to 2,690 ft thick (Morton, 1974). It conformably overlies the Silverado Formation and is in turn conformably overlain by the Sespe Formation. In general, the lower beds appear to be nonmarine to possibly marine in origin, while the upper beds are marine in origin; however, this can vary depending on the outcrop region.

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. Morton (1974) states that the lower beds may be up to 2,000 ft thick.

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 (1974) states that the apparent thickness of the upper beds is up to 1,200 ft. 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. South an east of the project area, Morton (1974) reports the presence of *Ostrea stewartii* in the upper beds, suggesting that this upper unit may correlate with marine beds of this formation in San Diego County.

5.2 FIELD INSPECTION

5.2.1 Survey Results

The majority of the APD consists of extensive cut slopes or fill as this portion of SR-74 traverses an area of ridges and canyons south of San Juan Creek. Ground visibility in the areas systematically surveyed was generally fair to good, approximating 60 percent. No paleontological resources were observed during the surveys; however, the observed geology is generally consistent with the geologic mapping my Morton and Miller (2006). Artificial Fill was confirmed to be present on the surface of the project in several areas, although this is not mapped by Morton and Miller (2006).

5.3 RECORDS SEARCH AND LITERATURE REVIEW

5.3.1 Locality Search Results

The LACM states that the project crosses exposures of several sediment types, including Quaternary terrace deposits and the San Onofre Breccia on the western portion of the project, Quaternary landslide deposits in the central portion and younger Quaternary Alluvium, and the Eocene Santiago Formation on the eastern portion of the project. The LACM does not know of any vertebrate localities that lie directly within the project area; however, the LACM knows of several localities from similar geologic units located in other areas. The LACM believes that only some of the units within the project have sensitivity for paleontological resources; these include the Quaternary terrace deposits exposed on the surface as well as possibly in the subsurface and the Santiago Formation based on the record of these sediments for producing paleontological resources elsewhere. Because of its primary composition as a massive conglomerate, the San Onofre Breccia is unlikely to contain significant vertebrate remains, as any resources would have been mostly destroyed prior to fossilization. Both the Quaternary landslide deposits and the young Quaternary alluvium are too young to produce paleontological resources; however, at depth (beneath the Quaternary alluvium sediments that are old enough), resources may be encountered that will have paleontological sensitivity.

Located outside the study area, but within the same, or similar, older Quaternary alluvial sediments that outcrop within the study area, is LACM-1115, which contained a fossil Columbian mammoth (*Mammuthus columbi*), located approximately 6.5 mi to the southwest of the current project in Salt Creek in Quaternary terrace deposits. The LACM does not have any known vertebrate fossil localities within the San Onofre Breccia. For the Santiago Formation, the LACM does not know of any vertebrate fossil localities within Orange County; however, it knows of several in San Diego County. The closest locality in San Diego is LACM-5347, located south–southeast of the proposed project in the areas of San Onofre Canyon where a fossil of a rodent (*Sespedectes* sp.) was found. The LACM also has numerous localities in the Carlsbad area of San Diego, including LACM-3881, -3883-3828, -3971, -4022, -5346-5347, -6926, and -68102, which produced a suite of animals, including turtles, crocodiles, birds, and mammals (see the results letter in Appendix A for a comprehensive list of specimens).

The LACM believes that excavations in the San Onofre Breccia are unlikely to encounter significant vertebrate fossils. The LACM believes that very shallow (less than several feet) excavations in the Young Quaternary Alluvial Deposits that occur primarily on the eastern portion of the project and shallow excavations (likely less than 10 ft) within the areas mapped as Quaternary landslide deposits on the western of the project are unlikely uncover any significant vertebrate fossils. However, the LACM believes that deeper excavations in the younger Quaternary alluvial deposits may encounter older units or formations that may contain significant resources. The LACM believes that any excavations into the exposures of the older Quaternary Terrace Deposits (Very Old Axial Channel Deposits) and the Santiago Formation have a good chance for encountering significant vertebrate fossils. Therefore, the LACM believes that any substantial excavation within these older deposits should be monitored by a paleontologist to quickly and professionally recover any fossils that may be encountered while not impeding development during grading within the project area. Any recovered fossils should be placed into an accredited 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 report (Appendix A).

5.3.2 Literature Search Results

Artificial Fill. Artificial Fill can contain fossils, but these fossils have been removed from their original location and are thus out of context. They are not considered to be important for scientific study.

Young Landslide Deposits. There is a potential for fossils within these sediments if the rock unit that slid contained fossils. However, the movement of these deposits has them out of context, and they are generally not considered to be scientifically significant. In some rare cases, these deposits may contain organisms caught within the slide material, if the slide happened quickly; these Quaternary fossils would be very rare and scientifically valuable. However, these deposits are considered to have a Low paleontological sensitivity.

Young Axial Channel Deposits. Young Axial Channel Deposits, sometimes referred to as Recent Alluvium or Holocene Alluvium, is defined as having been deposited during the Holocene, and is

younger than 11,700 years old. Although Young Axial Channel Deposits 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 scientifically significant. It should be noted that although an area may be mapped with Younger Alluvium on the surface, deposits of Older Alluvium are often encountered as shallowly as 5–10 ft below the surface, and these older sediments can and do contain fossils (see Pleistocene Alluvium section below).

Pleistocene Alluvium. Pleistocene Alluvium, which includes Old Axial Channel Deposits and Very Old Axial Channel Deposits, that may be encountered within the study area, is defined as having been deposited during the Pleistocene (2.58 million to 11,700 years ago). Fossils are known in similar deposits from excavations for roads, housing developments, and quarries within the Southern California area (Lander, 2003; Morgan and Raschke, 1997; Conkling, 1997 and 1988; Jefferson, 1991 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 Age (NALMA) that spans the period between 2.58 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 or so. There is a potential for these types of fossils whenever Pleistocene alluvial sediments are exposed. Within the surface of the project area, Morton and Miller (2006) have mapped these sediments as being on the older end of the spectrum, ranging in age from the middle to early Pleistocene (2 million to 300,000 years ago), but sediments from the middle to late Pleistocene (300,000 to 11,700 years ago) may be encountered during excavation that extends deeper than 10 ft in areas mapped as Young Axial Channel Deposits.

The Old Alluvium beneath the Young Axial Channel Deposits will likely contain fossils from the Rancholabrean NALMA, while the Very Old Axial Channel Deposits that are exposed on the surface of the study area will likely contain fossils from the Irvington NALMA. There is a potential for these types of fossils in all Pleistocene alluvial sediments.

San Onofre Breccia. San Onofre Breccia is primarily a coarse-grained conglomerate and is generally not conducive to the preservation of fossils. A few shell fragments are known from some areas, especially closer to the coast, but they are rare. Eisentraut and Cooper (2002) report that this formation has only produced a few specimens of highly fragmented vertebrate remains.

Santiago Formation. According to Morton (1974), the Santiago Formation has produced fossils of late Eocene mollusks and foraminifera as well as silicified wood. Eisentraut and Cooper (2002) state that the Santiago Formation produced a rich suite of vertebrate fossils in the Talega area of San Clemente, located to the south of the current project, which is also contains fossilized wood such as avocado, suggesting a coastal lowland paleoenvironment. Within San Diego County, the Santiago Formation has produced a diverse collection of fossils consisting of marine, estuarine, and terrestrial fossils and fossil assemblages (Stephenson, et al., 2009). The marine and estuarine fossils include shells of mollusks (e.g., clams, oysters, and snails), crustaceans (e.g., ghost shrimp, mantis shrimp, and crabs), and echinoderms (e.g., sea urchins). The terrestrial fossils consist of teeth and/or bones of

reptiles (e.g., tortoise, lizard, and snake), birds (e.g., bathornithids and pelagornithids), and mammals (e.g., opossums, insectivores, bats, prosimian primates, miacid and creodont carnivores, tapirs, brontotheres, amynodonts, protoreodonts, and leptoreodonts). Terrestrial plant fossils include stem and/or leaf impressions of horsetail reeds, fan palms, tropical hardwood trees, tropical vines, and broadleaf trees.

5.3.3 Records Search and Literature Search Conclusions

The specific sensitivities for units within the study area are listed in Table B. This table lists the Paleontological Potential Sensitivity Scale used by the SVP. Sensitivities (and potential) for the Old Axial Channel Deposits, Very Old Axial Channel Deposits, and the Santiago Formation are High based on the presence of scientifically 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 SR-74 Safety Project. The San Onofre Breccia is primarily a coarse-grained deposit with many large boulders and cobbles, making this formation not favorable to the preservation of fossils; in fact, only a few very fragmented vertebrate fossils have been recovered in this formation, and as such it is assigned a Low Paleontological sensitivity. Artificial Fill is usually assigned a sensitivity of "Low" in the event that excavation extends below the fill to the underlying formation or unit. The Young Axial Channel Deposits and the Young Landslide Deposits are generally not conducive for the preservation of paleontological resources, as they are too young. Like the Artificial Fill, the Young Axial Channel Deposits are assigned a Low sensitivity rating in case these deposits are shallow and the underlying sediments that might have a High sensitivity rating are encountered. For this project, once a depth of 10 ft or more is reached, it will be assumed that areas mapped as Young Axial Channel Deposits will change to a sensitivity rating of High as Old Axial Channel Deposits from the Pleistocene may be encountered. For the Young Landslide Deposits, the depth of these deposits likely extends well below any project-related excavation, and they will retain their Low sensitivity rating to all excavation depths.

The Paleontological Resources Sensitivity Map (Figure 3) graphically presents a summary of the project study area and the underlying formations with paleontological sensitivity, presented as sensitivity polygons.

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 nonfossiliferous sediments covering fossil-rich Pleistocene sediments. An area mapped as granite may be covered by a Pleistocene soil horizon that contains fossils. The actual sensitivity must be determined by a records search and field inspection.

Table B: Geologic Units and Paleontological Sensitivity within the SR-74 Widening Project Study Area

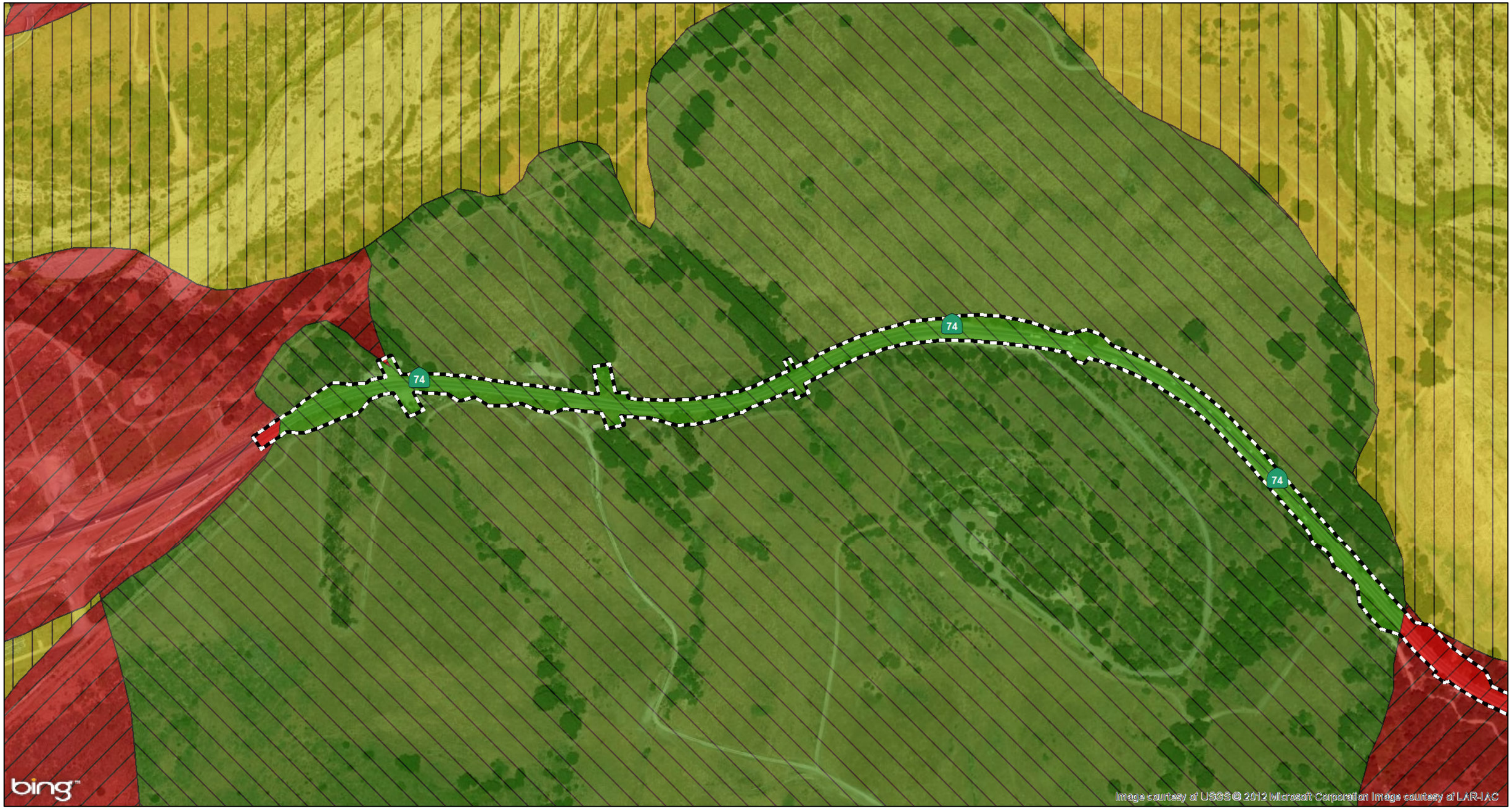
Geologic Unit	Paleontological Sensitivity[1]
Artificial Fill	Low[2]
Young Axial Channel Deposits	Low[3]
Young Landslide Deposits	Low
Old Alluvium[4]	High
Very Old Axial Channel Deposits	High
San Onofre Breccia	Low
Santiago Formation	High

Source: Society of Vertebrate Paleontology and California Department of Transportation Guidelines.
[1] Also known as Paleontological Potential.
[2] From surface to whenever underlying sediment is encountered; then, whatever the underlying sediment's sensitivity is.
[3] From surface to 10 feet below the surface, then "High"
[4] Not exposed on the surface, but likely exists below the Young Axial Channel Deposits
SR-74 = State Route 74

Figure 3 shows that portions of the 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.

5.4 RESULTS SUMMARY

The SR-74 Safety Project is mapped as crossing five geologic units by Morton and Miller (2006): Young Axial Channel Deposits, Very Old Axial Channel Deposits, Young Landslide Deposits, the San Onofre Breccia, and the Santiago Formation. In addition, at least two additional units may be encountered as well that are not mapped by Morton and Miller (2006): Artificial Fill and Old Axial Channel Deposits. Literature searches indicate that no paleontological localities are known to be within the project boundaries; and numerous fossil localities are known from other areas within the Old Axial Channel Deposits, the Very Old Axial Channel Deposits, and the Santiago Formation that outcrop within the study area. As such, the Old Axial Channel Deposits, the Very Old Axial Channel Deposits, and the Santiago Formation all have the potential to contain paleontological resources and are considered to have a High paleontological sensitivity rating. The Artificial Fill, Young Axial Channel Deposits, Young Landslide Deposits, and the San Onofre Breccia do not have records for consistently producing significant paleontological resources and are considered to have a Low paleontological sensitivity rating. As there are sediments within the project area that have a High paleontological sensitivity rating, it is recommended that a PMP be prepared for this project following Caltrans SER guidelines. Once the PMP has been prepared, the paleontological resource impact minimization measures within it shall be incorporated into the plans, specifications, and estimates for the project.



LEGEND

Project Location

Paleontological Sensitivities

Low

Low on surface (0-10 feet), High below a depth of 10 feet

High

N

0 150 300

FEET

SOURCE: Bing (c. 2009); Morton & Miller (2006); SVP (2010)

I:\CDT1121\GIS\PaleoSensitivities.mxd (11/30/2012)

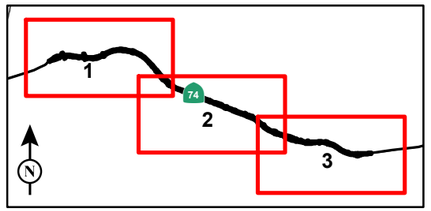


FIGURE 3

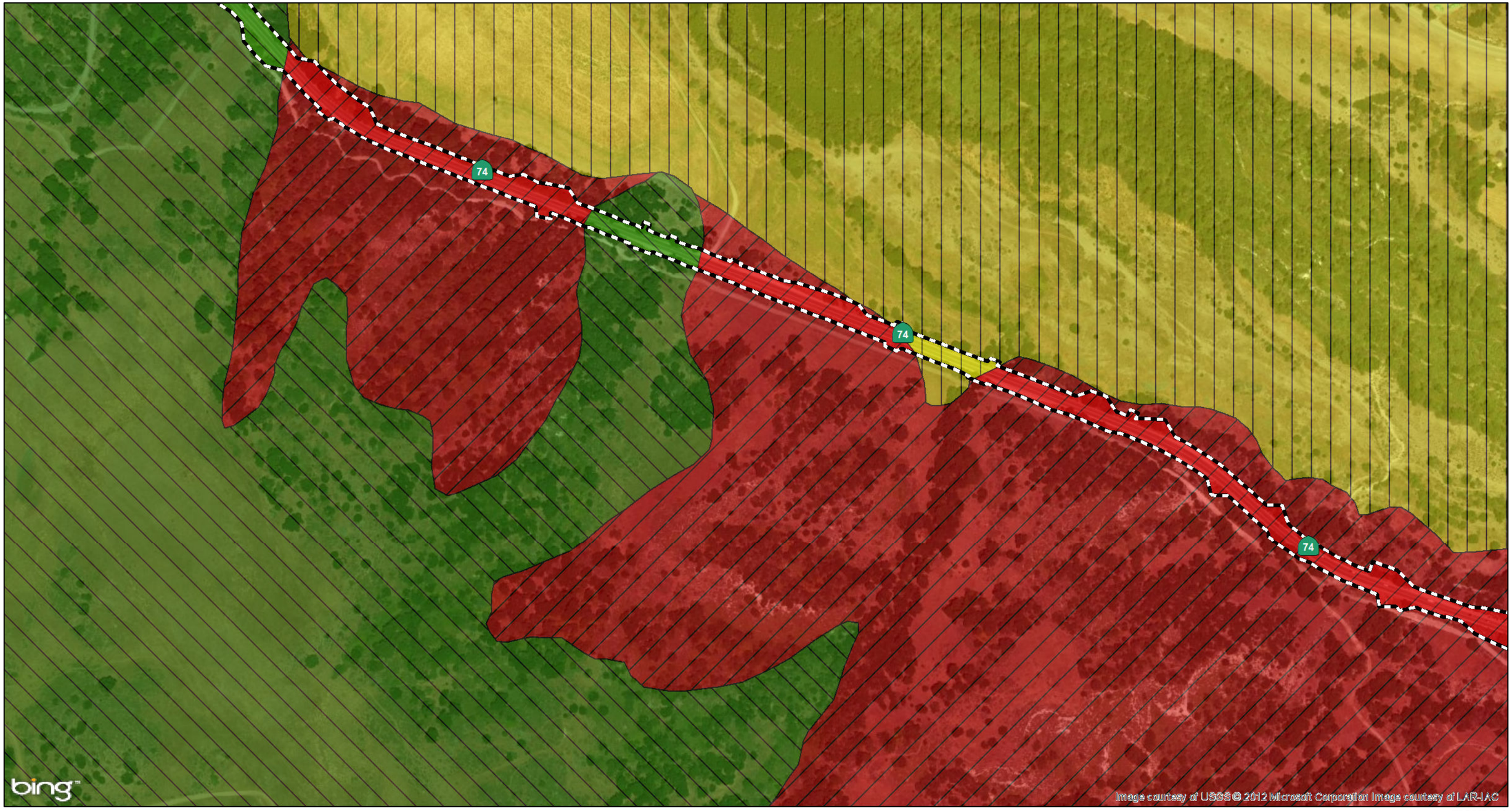
Sheet 1 of 3

SR-74 Safety Project

Paleontological Sensitivities

EA 0L7200/1200020180

12-ORA-74, PM 2.93/5.06



LEGEND

Project Location

Paleontological Sensitivities

Low

Low on surface (0-10 feet), High below a depth of 10 feet

High

0 150 300
FEET

SOURCE: Bing (c. 2009); Morton & Miller (2006); SVP (2010)

I:\CDT1121\GIS\PaleoSensitivities.mxd (11/30/2012)

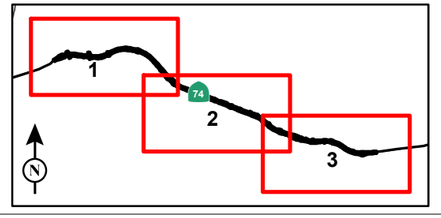
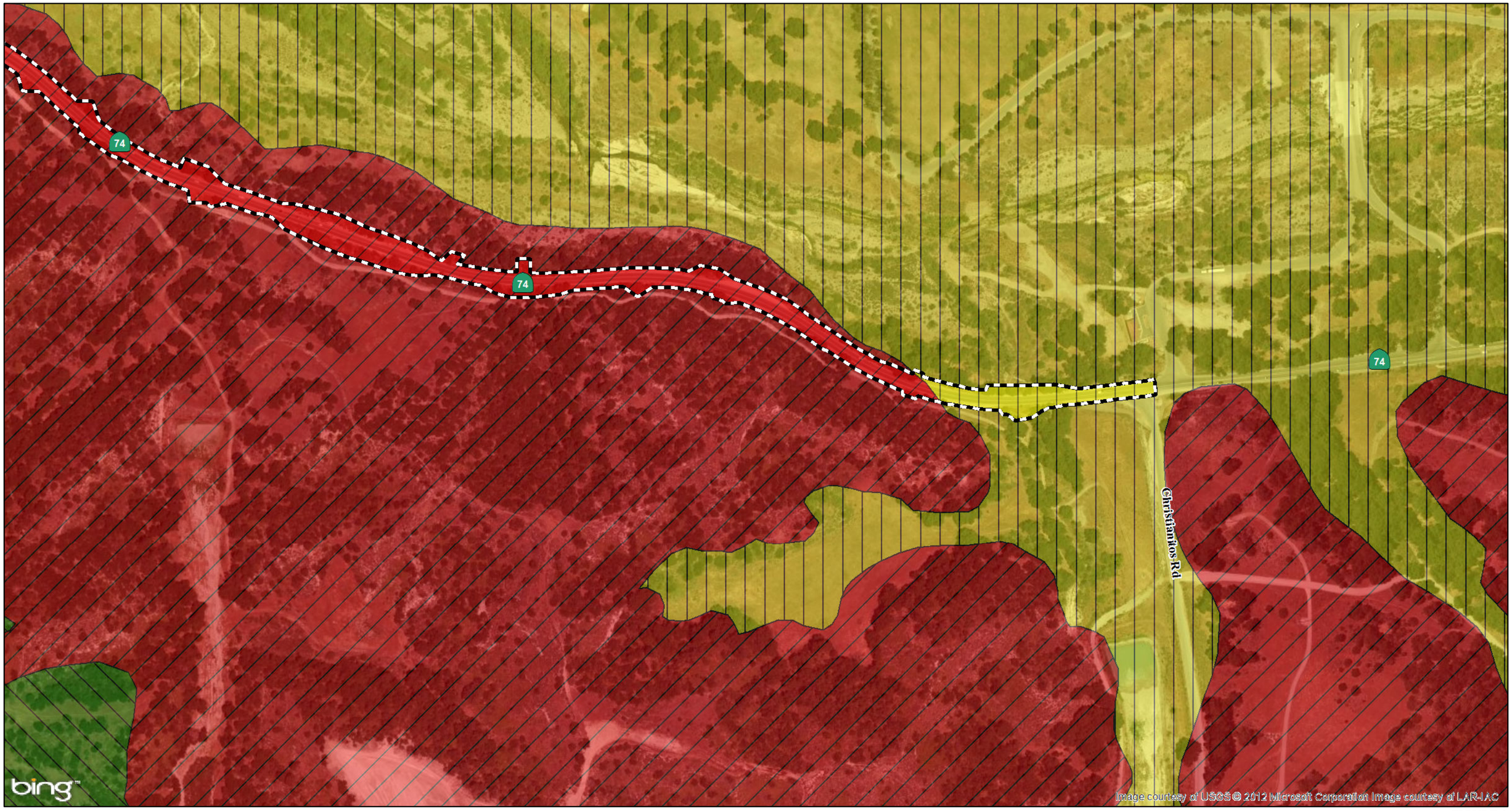


FIGURE 3
Sheet 2 of 3

SR-74 Safety Project

Paleontological Sensitivities

EA 0L7200/1200020180
12-ORA-74, PM 2.93/5.06



LEGEND

Project Location

Paleontological Sensitivities

Low

Low on surface (0-10 feet), High below a depth of 10 feet

High

N

0 150 300
FEET

SOURCE: Bing (c. 2009); Morton & Miller (2006); SVP (2010)

I:\CDT1121\GIS\PaleoSensitivities.mxd (11/30/2012)

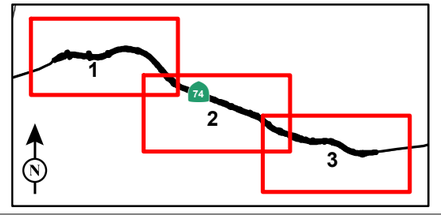


FIGURE 3
Sheet 3 of 3

SR-74 Safety Project

Paleontological Sensitivities

EA 0L7200/1200020180
12-ORA-74, PM 2.93/5.06

6.0 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.

6.1.1 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). An update was prepared in 2010 (SVP, 2010). According to the SVP (2010), 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:

1. An intensive field survey and surface salvage prior to earthmoving, if applicable
2. Monitoring by a qualified paleontological resource monitor of excavations in previously undisturbed rock units
3. Salvage of unearthed fossil remains and/or traces (e.g., tracks, trails, burrows)
4. Screen washing to recover small specimens, if applicable
5. Preparation of salvaged fossils to a point of being ready for curation (i.e., removal of enclosing matrix, stabilization and repair of specimens, and construction of reinforced support cradles where appropriate)
6. Identification, cataloging, curation, and provision for repository storage of prepared fossil specimens
7. A final report of the finds and their significance

All phases of mitigation must be supervised by a qualified professional paleontologist who maintains the necessary paleontological collecting permits and repository agreements. All field teams will be supervised by a paleontologist qualified to deal with the significant resources that might be encountered. The Lead Agency must ensure compliance with the measures developed to mitigate impacts of excavation. To ensure compliance at the start of the project, a statement that confirms the site's paleontological potential, confirms the repository agreement with an established public institution, and describes the program for impact mitigation must be deposited with the Lead Agency and contractor(s) before any ground disturbance begins. In many cases, it will be necessary to conduct a salvage program prior to grading to prevent damage to known paleontological resources and to avoid delays to construction schedules. The impact mitigation program must include preparation, identification, cataloging, and curation of any salvaged specimens. All field notes, photographs, stratigraphic sections, and other data associated with the recovery of the specimens must be deposited

with the institution receiving the specimens. Since it is not professionally acceptable to salvage specimens without preparation and curation of specimens and associated data, costs for this phase of the program must be included in the project budget. The mitigation program must be reviewed and accepted by the Lead Agency. If a mitigation program is initiated early during the course of project planning, construction delays due to paleontological salvage activities can be minimized or even completely avoided.

6.1.2 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.

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).

Environmentally Sensitive Areas. A related strategy creates Environmentally Sensitive Areas (ESAs) around paleontological localities. 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 necessarily called for. 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.

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 PMP, 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, 2012). 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 study area.

- **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 PMP, 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; water washing; 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.

7.0 SUMMARY

The SR-74 Safety Project is located along San Juan Creek in the Santa Ana Mountains area of the Peninsular Ranges Geomorphic Province and crosses up to three fossiliferous Eocene to Pleistocene sediments (Old Axial Channel Deposits, Very Old Axial Channel Deposits, and the Santiago Formation) deposited between 48 million to approximately 11,700 years ago. Four other sediments (Artificial Fill, Young Axial Channel Deposits, Young Landslide Deposits, and the San Onofre Breccia) are also present within the project area, and they have a Low sensitivity for paleontological resources, at least in the upper portions of where the Artificial Fill and the Young Axial Channel Deposits are mapped. Of the three fossiliferous sediments crossed by the project, both the Santiago Formation and the Very Old Axial Channel Deposits are exposed on the surface; the Old Axial Channel Deposits are likely present at depths beginning as shallowly as 10 ft beneath the surface in the areas mapped as Young Axial Channel Deposits. In addition, any of the sediments with paleontological sensitivity may be encountered beneath Artificial Fill and Young Axial Channel Deposits during excavation associated with the project. This study presents definitions of paleontological significance and sensitivity, the results of records search requests, and reviews of geological and paleontological literature.

This study does not anticipate special paleontological situations that would require project redesign to avoid critical localities or strata. However, since there are areas of High paleontological sensitivity within the project study 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 specifically tailored to the resources and sedimentary formations that will be encountered during excavation within the SR-74 Safety Project study area. It is possible that as project details such as proposed excavation depths are better refined, it may be determined that areas identified as having High sensitivity will in fact not require monitoring during excavation, as ground disturbance will not extend deep enough below the surface to encounter paleontological resources, or excavation may not occur in areas currently within the study area.

This study recommends that the section of the PMP describing the excavation monitoring for the proposed project, at a minimum, include the following:

- Recommendations for a qualified paleontologist or representative to attend the pregrade conference. At this meeting, the paleontologist will explain the likelihood for encountering paleontological resources, what resources may be discovered, and the methods of recovery that will be employed.
- Recommendations for 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.
- 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.

- 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 cy, or 6,000 pounds) shall be collected and processed through 1/20-inch mesh screens to recover additional fossils.
- 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.
- 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).

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

LOCALITY SEARCH RESULTS

Natural History Museum
of Los Angeles County
900 Exposition Boulevard
Los Angeles, CA 90007

tel 213.763.DINO
www.nhm.org

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

5 October 2012

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

Attn: Brooks Smith, Associate

re: Paleontological Resources Records Search for the proposed Upper State Route 74 Safety Project, LSA Project # CDT1121, near San Juan Capistrano, Orange County, project area

Dear Brooks:

I have thoroughly searched our paleontology collection records for the locality and specimen data for the proposed Upper State Route 74 Safety Project, LSA Project # CDT1121, near San Juan Capistrano, Orange County, project area as outlined on the portion of the Cañada Gobernadora USGS topographic quadrangle map that you sent to me via e-mail on 2 October 2012. We do not have any vertebrate fossil localities that lie within the project boundaries, but we do have localities nearby from the same sedimentary units that occur in the proposed project area.

At the western end of the proposed project area there are exposures of Quaternary terrace deposits and the late Miocene San Onofre Breccia. We have no vertebrate fossil localities from the San Onofre Breccia and, as a massive conglomeratic rock unit, it almost certainly will not contain significant vertebrate fossils. Our closest vertebrate fossil locality from similar Quaternary terrace deposits is LACM 1115, just south of west of the proposed project area in Salt Creek south of Laguna Niguel and west of San Juan Capistrano, that produced fossil specimens of Columbian mammoth, *Mammuthus columbi*.

The surface material on the large knoll near the western end of the proposed project area is composed of landslide sediments. These landslide sediments are probably from the San

Onofre Breccia and, if so, they will not contain significant vertebrate fossils, but at depth beneath the landslide sediments there may be in-place rocks of the marine middle Miocene Topanga Formation or the marine late Miocene Monterey Formation. Our closest vertebrate fossil locality from the Topanga Formation is LACM 6064, north-northwest of the proposed project area on the ridge between Oso Creek and Arroyo Trabuco, that produced a fossil specimen of the four-legged marine mammal *Paleoparadoxia* published in the scientific literature by A. I. Panofsky (1998. Stanford Paleoparadoxia Fossil Skeleton Mounting. Stanford Linear Accelerator Center Publication, 7829:1-143). Our closest vertebrate fossil locality from the Monterey Formation is probably LACM 6905, west-northwest of the proposed project area between La Paz Road and Alicia Parkway, that produced fossil specimens of sea lion, *Pithanotaria*, and a rare fossil specimen of beaked whale, Ziphiidae.

At the eastern terminus of the proposed project area, there are surface deposits of younger Quaternary Alluvium, derived both from the drainage of Trampas Canyon as well as from San Juan Creek that is adjacent to the north of the proposed project area. These younger Quaternary alluvial deposits typically do not contain significant vertebrate fossils, at least in the uppermost layers, and we have no fossil localities anywhere nearby from such deposits.

Most of the proposed project area though, in the eastern portion along the steeper and more elevated terrain, has exposures of the middle Eocene Santiago Formation. We have no fossil vertebrate localities from the Santiago Formation in Orange County, but we have several localities from this rock unit in San Diego County. Our closest vertebrate fossil locality from the Santiago Formation is LACM 5347, south-southeast of the proposed project area in San Onofre Canyon east of Interstate 5, that produced fossil specimens of the insectivore *Sespedectes.* Our other Santiago Formation vertebrate fossil localities include LACM 3881, 3883-3884, 3979, 4022, 5346-5347, 6926 and 68102, clustered around Carlsbad, that produced a composite fauna (see appendix). David J. Golz (1976 1976. Eocene Artiodactyla of Southern California. Los Angeles County Museum Science Bulletin, 26:1-85) published on the LACM specimens of the protoceratid artiodactyl *Leptoreodon leptolophus* and the camels *Protylopus petersoni* and *Protylopus stocki* from our Santiago Formation locality LACM 68102.

Excavations in the coarse conglomerate of the San Onofre Breccia exposed in the western portion of the proposed project area are highly unlikely to encounter significant vertebrate fossils. Shallow excavations in the western portion of the proposed project area covered by landslide sediments, probably from the San Onofre Breccia, are also highly unlikely to encounter significant vertebrate fossils. Grading or shallow excavations in the younger Quaternary Alluvium exposed in the eastern-most portions of the proposed project area sites are unlikely to uncover significant fossil vertebrate remains. Deeper excavations in the those areas below the landslide sediment or upper layers of younger Quaternary Alluvium that extend down into older Quaternary deposits or deposits of the Topanga Formation or the Monterey Formation, if present, however, as well as any excavations in the exposures of the Quaternary terrace deposits or the Santiago Formation, may well encounter significant fossil vertebrate remains. Any substantial excavations in the finer-grained sediments in the proposed project area, therefore, should be

monitored closely to quickly and professionally recover any fossil remains discovered while not impeding development. Any fossil materials uncovered during mitigation activities should be deposited in an accredited and permanent scientific institution for the benefit of current and future generations.

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

Sincerely,

Samuel A. McLeod

Samuel A. McLeod, Ph.D.
Vertebrate Paleontology

enclosures: appendix; invoice

Composite Santiago Formation fossil fauna based on specimens in the LACM collections

- Reptilia
  - Chelonia
    - Testudinidae
    - Trionychidae
  - Crocodilia

- Aves

- Mammalia
  - Artiodactyla
    - Camelidae
      - *Protylopus* *petersoni*
      - *Protylopus* *stocki*
    - Protoceratidae
      - *Leptoreodon* *leptolophus*
  - Dinocerata
    - Uintatheriidae
  - Insectivora
    - Dormaaliidae
      - *Proterixoides*
      - *Sespedectes*
  - Perissodactyla
    - Amynodontidae
      - *Amynodon* *intermedius*
    - Brontotheriidae
  - Rodentia
    - Aplodontidae
      - *Eohaplomys*
    - Geomyidae
      - *Griphomys*
    - Paramyidae
      - *Microparamys*

APPENDIX B

RESUMES

STEVEN W. CONKLING

PRINCIPAL/DIRECTOR, ARCHAEOLOGY/PALEONTOLOGY

LSA

EXPERTISE

Paleontology Resource Assessment/Mitigation

Cultural Resource Management and Mitigation

Fossil Identification

Specimen Curation

EDUCATION

North Texas State University, Denton, B.A., Biological Sciences, 1985.

ACCREDITATION

County of Orange, Certified Paleontologist, 1989

PROFESSIONAL AFFILIATIONS

Society for California Archaeology

Sigma Xi, Scientific Research Society

Society of Vertebrate Paleontology

Society of Economic Paleontology and Mineralogy

Southern California Academy of Science

American Association of Mammalogists

Buena Park Rotary Club, President 1989–1990

PROFESSIONAL RESPONSIBILITIES

Mr. Conkling conducts paleontological resource projects with responsibilities that include paleontological resource evaluation for Environmental Impact Reports; covering field surveys, literature reviews, and mitigation measures; directing field monitoring and salvage operations; collecting geologic data; fossil analyses; and report preparation.

He directs the Direct Cultural Resource Mitigation Group for LSA, including directing archaeological field activities, overseeing budgets, and coordinating Section 106 compliance with the United States Army Corps of Engineers. He also reviews all cultural resources reports.

PROJECT EXPERIENCE

I-5 HOV Lane Extension
San Clemente and San Juan Capistrano, California
Caltrans is proposing to add HOV lanes to I-5 between San Clemente and San Juan Capistrano. LSA prepared the overall environmental document for the project and conducted the cultural and paleontological resources studies in support of technical reports for the project. A historic adobe and several potential historic resources were identified through the study and addressed. Mr. Conkling served as the Cultural/Paleontological Resources Task Manager.

Interstate 710 (I-710) Corridor EIR/EIS
Los Angeles, California
Mr. Conkling is acting as the paleontological resource task manager for paleontological resource clearance for expansion of the I-710 facilities between the Port of Los Angeles and SR-91. Review includes paleontological locality searches and pedestrian surveys of the project area. Work will be completed during late 2010 and early 2011.

South of Interstate 10 (I-10) On-Call Environmental Services (Contract No. 07A1893)
Los Angeles, California
Mr. Conkling acted as the Project Manager for historical review of the I-5 Widening Project north of Orange County. As a mitigation measure, Caltrans required a Phase 1 study to conduct a historical review of the project area to determine whether historical uses of some properties could be considered potential origins for hazardous materials. The analysis was also intended to help direct the Environmental Assessment team in looking at properties that were not flagged through existing databases.

PROFESSIONAL EXPERIENCE

Principal, Director of Cultural and Paleontological Division, LSA Associates, Inc., Irvine, California, 1993–present.

Clark Interpretive Center, County of Orange, Park Ranger/Paleontologist (Director of Museum), 1986–1993.

Orange County Natural History Museum, Curator, 1991–2006.

Los Angeles County Museum of Natural History, Research Associate, 1991–present.

San Bernardino County Museum, Research Associate, 1989–present.

Scientific Resource Surveys, Paleontological Consultant, 1989–1993.

Field Research Support Group, Board of Directors, 1990–present.

Mojave Desert Quaternary Research Society, Steering Committee Member, 1990–present.

Society of Vertebrate Paleontology, Ethics Committee Member, 1991–present.

RMW Paleontological Consultants, Paleontological Consultant, 1993.

Foundation for Field Research, Principal Investigator, Mud Hills Excavations, 1990, 1991.

Western Association of Vertebrate Paleontology, Meeting Host, 1990.

Foundation for Field Research, Co-Principal Investigator, Pleistocene Megafauna Project, 1989.

Fullerton Museum Center, Paleontological Consultant, 1989.

Knott's Berry Farm, Paleontological Consultant, Kingdom of the Dinosaurs Attraction, 1987.

PROJECT EXPERIENCE (CONTINUED)

State Route 710 (SR-710) Expansion Project
Los Angeles County, California
Mr. Conkling is acting as the paleontological resource task manager for paleontological resource clearance for expansion of the SR-710 facilities between the Los Angeles Port and SR-91. Review includes paleontological locality searches and pedestrian surveys of the project area. Work will be completed during late 2010 and early 2011.

Port Arthur Outdoor Education School
San Pedro, California
Mr. Conkling acted as the cultural and paleontological task manager for work associated with rehabilitation, demolition, and documentation of buildings associated with a National Register listed resource on Port Arthur. Work was done for the Los Angeles County Unified School District and included consultation on the effects of the project on the National Register property.

State Route 210 (SR-210) On-Call Services
San Bernardino, California
Since 2001, LSA has been providing a variety of on-call services to San Bernardino Associated Governments for the SR-210 (formerly Route 30) Freeway project. Services to date have included environmental permitting (Sections 404, 401, and 1601), Section 7 endangered species consultation services, construction monitoring (biological and paleontological), jurisdictional waters delineations, preconstruction trapping surveys for endangered San Bernardino kangaroo rat (SBKR), relocation of SBKR, focused surveys for the SBKR and the California gnatcatcher, and various CEQA/NEPA documentation. Mr. Conkling provided monitoring and a monitoring report of a bone fragment find during excavation in the Lytle Creek area.

Transportation Corridor Agencies, Community Education Program
South Orange County, California
LSA was retained by TCA to develop and execute a community education program for local schools and interest groups. The program focused primarily on the paleontology of the toll roads and Orange County. A secondary program on cultural resources was also developed and presented to local schools. Approximately 25,000 students have attended classes since the program's inception.

I-5 Widening Phase I Environmental Review, Technical Assistance
Los Angeles County, California.
Mr. Conkling acted as the Project Manager for historical review of the I-5 Widening project north of Orange County. As a mitigation measure, Caltrans required the Phase I Study to conduct a historical review of the project area to determine whether historical uses of some properties could be considered potential origins for hazardous materials. The

PROFESSIONAL EXPERIENCE (CONTINUED)

University of Kansas, Mammalogy Department, Curatorial Assistant, 1986.

Snow Entomology Museum, Curatorial Assistant, 1985.

Badlands National Park, Park Ranger/Paleontologist, 1984.

Texas A&M University, Agricultural Extension Center, Plant Taxonomist, 1983.

North Texas State University, Porphyrin Chemistry Laboratory Assistant, 1982.

Southern Methodist University, Shuler Museum of Paleontology, Curatorial Assistant, 1981, 1982.

Southern Methodist University, Shuler Museum of Paleontology, Field Assistant, 1981, 1982.

Southern Methodist University, Radiocarbon Laboratory, Laboratory Assistant, 1981, 1982.

Southern Methodist University, Geophysics Department, Seismograph Technician, 1980–1982.

Southern Methodist University, Biology Department, Field Assistant, Big Bend National Park, 1981.

Smithsonian Institution, Field worker, Lewisville Early Man Site, 1981.

EXHIBITS PREPARED

Orange County Courthouse Museum

Newport Nautical Museum

Transportation Corridor Agencies

Bowers Museum

Mesa Water District

City of Newport Beach

Fletcher Jones Motorcars

Los Angeles County Fair, Featured Exhibit, Gems & Minerals

PROJECT EXPERIENCE (CONTINUED)

analysis was also intended to help direct the Environmental Assessment team in looking at properties that were not flagged through existing databases.

Laguna Canyon Road (SR-133) Improvement Project
Orange County, California
LSA was retained by the County of Orange to provide historical/archaeological documentation of cultural resources along Laguna Canyon Road (SR-133) for its proposed widening between El Toro Road and Old Laguna Canyon Road. LSA produced a Historic Property Survey Report (HPSR) with an appended Archaeological Survey Report (ASR), Historic Study Report (HSR), Extended Phase I Survey Report, Research Design, and Archaeological Evaluation Report (AER). Mr. Conkling served as Paleontologist.

San Joaquin Hills Transportation Corridor/State Route 73 (SR-73)
Orange County, California
Mr. Conkling oversaw all elements of paleontological resource mitigation during the construction of 4.5 miles of this project. Activities included coordinating monitoring of up to 12 monitors on a 24-hour-a-day, 7-day-a-week schedule. He completed comprehensive measured sections for all sedimentary units along the project, placing all discoveries into this lithostratigraphic framework. After project completion, he also developed a public interpretive display at the Old County Courthouse Museum (Santa Ana, California), depicting the discoveries from the project.

Geysers Groundwater Replenishment Project
Santa Rosa, California
The Geysers project involved construction of a 72″ RCP pipeline from the City of Santa Rosa to the geothermal fields north of Calistoga. Mr. Conkling acted as the cultural/paleontological resource manager for all phases of project environmental documentation, Agency coordination, and development of project design features to minimize project impacts. He also coordinated staffing for field monitoring during construction and final project design changes.

South Orange County Transportation Infrastructure Improvement Project
San Clemente, California
From initial involvement conducting Native American consultation, coordinating project review on Camp Pendleton, and addressing geotechnical investigations for the project, LSA involvement increased to addressing all elements of cultural resource compliance for the project. Current efforts involve survey and evaluation of all resources on the alternatives. Subsequent services will include treatment of impacts to eligible resources.

EXHIBITS PREPARED (CONTINUED)

Irvine Park Nature Center

Fullerton Museum Center

Knott's Berry Farm, Discovery Center

Bircher Building Lobby Display

Orange County Fair, Rock and Mineral Building

Orange County Fair, Orange Building

Laguna Niguel Regional Park

Whiting Ranch Regional Park

Orange County Natural History Museum

Ralph B. Clark Interpretive Center

Orange County Courthouse Museum

TEACHING

Began and continued programs at the Clark Interpretive Center. Conducted tours for over 150,000 students, from kindergarten through college level (1986–1993).

Led seminars for:

- Environmental Planning – Cultural Resources (CSUF)
- Environmental Engineering – Cultural Resources (UCI)
- UCLA Environmental Program – Cultural Resource Mitigation
- Saddleback College – Paleontology Classes
- Paleontology (LTU)
- Identification of Bone from Archaeological Sites (CSULA)
- Fullerton College, Sciences Seminar
- Teacher Mentor Program, Earth Sciences (CSUF)
- Physical Anthropology, Irvine Valley College
- Paleoecology, California State University, Long Beach
- Geology of Texas (NTSU)
- Evolution (NTSU)
- Vertebrate Paleontology (SMU)
- Mammalian Biology (SMU)

PROJECT EXPERIENCE (CONTINUED)

Mid County Parkway
Hemet, California
Mr. Conkling acted as cultural resource task leader and Agency coordination specialist during environmental documentation of the 32-mile-long project. Initial surveys covered approximately 15,000 acres and identified over 200 cultural resource sites. LSA coordinated a team of LSA and outside specialists to evaluate the architectural history and archaeology of all alternatives. Evaluation of all identified sites within the project Area of Potential Effects (APE) was completed in 2005.

Santa Barbara County Reliability Project
Santa Barbara and Ventura County, California
Mr. Conkling developed a paleontological assessment report for the Santa Barbara County Reliability Project for Southern California Edison. The proposed project involves approximately 80 miles of new transmission lines and is intended to supplement energy transmission into the Santa Barbara/Carpinteria area.

Broco Development
Atascadero, California
Mr. Conkling completed a paleontological constraints analysis and assessment report for the Broco Development in Atascadero, California. This project had a very tight time frame, and Mr. Conkling was able to prepare the report within four days of the Notice to Proceed.

Great Park Balloon Attraction Construction Project
Irvine, California
Mr. Conkling provided paleontological and cultural resource clearance for construction of the Great Park Balloon Attraction.

Heritage Fields, District 8 Neighborhood Rough Grading Project
Irvine, California
LSA is under contract to Five Point Partners, Inc., to provide all cultural and paleontological monitoring during the mass grading of the various Districts within its development area. Work on District 8 is now concluding, with future work scheduled for infrastructure and future Districts. No resources that affected project delivery were encountered during monitoring.

SELECTED REPORTS

Vertebrate Remains from CA-SDI-10156/12599/H, MCAS Camp Pendleton, San Diego County, California, Abstract, Society for California Archaeology, 30th Annual Meeting Program, 1996.

Report on Continuing Investigations of the Sespe Formation (Oligocene/Miocene: Terrestrial) in the San Joaquin Hills of Orange County, California, Abstract, San Bernardino County Museum Association Quarterly, 43(2), 1996.

Use of Global Positioning Systems (GPS) and Global Information Systems (GIS) in Cultural and Paleontological Resource Mitigation, with J. Staight, Abstract, San Bernardino County Museum Association Quarterly, 43(2), 1996.

Vertebrate Remains from CA-ORA-196/H, Michelson Bridge Widening, City of Irvine, Orange County, California, 1996.

Paleontological Resource Impact Mitigation Program - Playa Vista (Phase I) Project, Los Angeles County, California, 1996.

Paleontology Assessment Report for Parcel Number 4687, in the Moorpark Area, Ventura County, California, 1996.

Cultural Resources Assessment for Ritter Ranch, Planning Area 1, Los Angeles, California, with D. McLean, B. Sturm, and I. Strudwick, 1996.

Cultural Resources Assessment for Amargosa Creek Improvement Project, Los Angeles County, California, with D. McLean, B. Sturm, and I. Strudwick, 1996.

Report on Paleontological Monitoring, Fox Studios, Galaxy Way Parking Structure, City of Los Angeles, Los Angeles County, California, 1996.

Results of Archaeological Significance Testing at Sites CA-ORA-478 (Locus C), ORA-1453 and ORA-1454, Hicks and East Hicks Canyons, Orange County, California, with D. McLean, B. Sturm, W. McCawley, and I. Strudwick, 1996.

Cultural Resources Assessment for Newport Coast Drive Extension, Off-Site Mitigation Areas, Orange County, California, with D. McLean, and I. Strudwick, 1996.

Results of Archaeological Significance Testing at Site CA-SDI-10156/12599/H MCAS Camp Pendleton, San Diego County, California, with D. McLean, B. Sturm, W. McCawley, D. Taylor, and I. Strudwick, 1996.

Scientific Resources Assessment - Planning Area 12, City of Irvine, Orange County, California, with B. Smith, 1995.

Scientific Resource Assessment - Ryan Oil Properties, Riverside County, California, with B. Smith, 1995.

Scientific Resource Assessment - Sea West Wind Farm, Riverside County, California, with B. Smith, 1995.

Scientific Resource Assessment - Tentative Tract 14232, City of Redlands, San Bernardino County, California, 1995.

Cultural Resources Assessment, Planning Area 22, City of Irvine, Orange County, California, with B. Sturm and D. Taylor, 1995.

Confidential Appendix A, Cultural Resources Assessment, Planning Area 22, City of Irvine, Orange County, California, with B. Sturm and D. Taylor, 1995.

National Register of Historic Places Evaluation for the Proposed Mount San Antonio Historic Mining District, Angeles National Forest, Los Angeles County, California, with B. Sturm, 1995.

Scientific Resources Assessment for the Kohl Ranch Property, Riverside County, California, 1995.

Scientific Resources Assessment for an APE extension of the San Joaquin Hills Transportation Corridor Between Stations 900+00 and 910+00, Orange County, California, 1995.

Scientific Resources Assessment - City of Garden Grove, Orange County California, with B. Smith, 1995.

Archaeological and Historical Investigations of the Cram School Site and Tentative Tracts 13551 and 15554, East Highlands, San Bernardino County, California, with B. Sturm, D. McLean, W. McCawley, and M.A. Pritchard-Parker, 1995.

Results of Paleontological Monitoring for the Northwood 5 Development (Tract 14540, Irvine, Orange County, California, with B. Smith, 1995.

Paleontology Assessment Report for Tentative Tract 26193, Corona South Quadrangle, Riverside County, California, 1995.

Paleontology Assessment Report for Tract 13551 and 15554, East Highland Ranch, Redlands Quadrangle, San Bernardino County, California, 1994.

Scientific Resources Assessment - Planning Area 10, City of Irvine, Orange County, California, 1994.

Cultural Resources Assessment - Ryan Oil Exchange Parcel, Riverside County, California, with B. Sturm, 1994.

Cultural Resources Assessment for five vacant lots and 42 Potentially Historic Buildings within the Northeast Anaheim Redevelopment Area, Orange County, California, with D. McLean and B. Sturm, 1994.

Paleontological Resource Assessment for five vacant lots within the Northeast Anaheim Redevelopment Area, Orange County, California, 1994.

Scientific Resources Assessment - Newport Coast Drive Extension, 1994.

Cultural Resources Assessment - Sea West Wind Energy Facility, Riverside County, California, with B. Sturm, 1994.

Paleoecology of Some Lower Pleistocene Habitats (San Pedro Formation) in Orange County, California, with D. Maurer, manuscript in preparation for submission to *Journal of Paleontology*, 1993.

Synecology and Origin of the Pawpaw Micromorph Fauna (Lower Cretaceous) of North-Central Texas, with D. Maurer, manuscript in preparation for submission to *Paleobiology*, 1993.

Identification of Fossil Sharks of Orange County, manuscript in preparation, 1993.

A New View of Coastal Southern California's Prehistory, with J. Mikalsky, manuscript in preparation for submission to *California Geology*, 1993.

New Geological Finds, Interpretations and Events form Orange County, California, Abstracts, *Journal of Vertebrate Paleontology* 12(3), p. 15A, September 1992.

The Geology and Paleontology of Orange County, California, Abstract, *San Bernardino County Museum Association Quarterly*, 39(2), summer 1992.

A Mechanical Screening System for Wet-Screening Large Quantities of Fossiliferous Matrix, and Its Adaptation for Field Work and Archaeological Studies, Abstract, *San Bernardino County Museum Association Quarterly*, with Forrest Michael Hudson, 39(2), summer 1992.

Report on a New Hemphillian (Miocene) Fauna from the El Toro Area of Orange County California, and a Comparison of It with Hemphillian Faunas from the Mojave Desert, Abstract, *San Bernardino County Museum Association Quarterly*, 38(2), summer 1991.

Geology and Paleontology Section, Interpretive Training, Upper Newport Bay, Prepared for the Environmental Management Agency Docent Training Program, Upper Newport Bay, 1991.

An Interpreter's Guide to the Fossils of Badlands National Park, Prepared and published for Badlands National Park, 1990.

Assessment of Archaeological and Paleontological Grading Monitoring for Tentative Tract 13214 of the Robinson Ranch Development Project, Trabuco Highlands, Orange County, California, *Scientific Resources Surveys*, 1989.

Assessment on Paleontological Grading Monitoring for Tentative Tract 13213 of the Robinson Ranch Development Project, Trabuco Highlands, Orange County, California, *Scientific Resources Surveys*, 1989.

Paleontological Resource Investigation of Two Road Alignments to Laguna Canyon Road, Village 34, Orange County, California, *Scientific Resources Surveys*, 1989.

Paleontological Resource Assessment of the Valley Vista Development, Orange County, California, *Scientific Resources Surveys*, 1989.

Report of Paleontological Survey of the Aliso and Wood Canyons Regional Park Access Road Improvement, September 15, 1989, *Environmental Management Agency, County of Orange*, 1989.

A Floral and Fauna Analysis of Clark Regional Park (La Habra Formation: Rancholabrean), Orange County California, Abstract, *San Bernardino County Museum Association Quarterly*, 36(2), summer 1989.

A Floral and Fauna Analysis of Clark Regional Park (La Habra Formation: Rancholabrean), Orange County California, Abstract, *Journal of Vertebrate Paleontology*, 8(3), p. 12A, September 1988.

The Function of the Mandibular Flange in Saber-tooth Carnivores, Abstract, *Journal of Vertebrate Paleontology*, 7(3), p. 14A, September 1987.

An Investigation of the Basicranial Anatomy of Certain Oligocene Sabertooth Cats (Nimravidae) and an Interpretation of Their Phylogenetic Relationship to Other Carnivora, Abstract, *Ter-Qua '85*, fall 1985.

A Dwarf Fauna from the Pawpaw Formation (Lower Cretaceous) of North-Central Texas: Its probable Origin and Synecology, Abstract, *Supplement to the 88th annual Program of the Texas Academy of Science*, 1985.

A New Species of Giant Fish, *Pachyrhizodus*, from the Upper Cretaceous of Texas, Abstract, *Supplement to the 85th Annual Program of the Texas Academy of Science*, fall 1982.

BROOKS SMITH
ASSOCIATE/PALEONTOLOGIST

LSA

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

As a project manager at LSA, Mr. Smith 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 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 Director or Co-Field Director during field surveys for paleontological and archaeological resources prior to grading 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

Plains All American Pipeline (PAAPL)
Los Angeles County, California
LSA was retained as a subconsultant to Stantec Consulting to provide cultural resource monitoring during repairs to several of PAAPL's 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 United States Forest Service (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 of Historic Places-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 was the project manager for these 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.

PROFESSIONAL AFFILIATIONS

San Diego Association of Geologists

UCSC Alumni Association

Society of Vertebrate Paleontology

PROFESSIONAL EXPERIENCE

Archaeological and Paleontological Surveyor, Monitor, Excavator, and Report Preparer; and Paleontological Field Director, 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 October 2012

County of Orange, Certified Paleontologist

City of San Diego Qualified Paleontologist

PROJECT EXPERIENCE (CONTINUED)

Southern California Gas Company (SCG)
Los Angeles County, California
LSA was retained by SCG to provide cultural resource monitoring for 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, it was necessary for LSA to apply for an Archaeological Resources Protection Act (ARPA) Permit for each line. LSA's role on these ongoing projects is to ensure that mitigation measures developed by the ANF to protect cultural resources are being implemented and followed.

These measures include: providing worker training for the identification and importance of cultural resources; protecting the National Register of Historic Places-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 ORR on a daily basis; and providing video documentation of the ORR both before and after the project is completed. Mr. Smith is the project manager for these three SCG projects and schedules up to three monitors per day at various locations, depending on daily construction needs; provides cumulative vehicle counts on a weekly basis to the ANF; and coordinates between the ANF archaeologist and SCG as needed.

Southern California Edison (SCE) On-Call
Los Angeles, Orange, Riverside, San Bernardino, and San Diego Counties, California
LSA performs archaeological resource assessments for SCE's pole replacement program. Assessments include record searches for previously recorded resources and studies; field surveys around poles; recordation 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.

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

PROJECT EXPERIENCE (CONTINUED)

- **Shadowridge-Meadowlark Tap: Rebuild TL 13811:** LSA provided a cultural resources assessment for an approximately 4-mile transmission line located in San Diego. The assessment included a cultural resources search through the South Central 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.

South Orange County Infrastructure Improvement Project, State Route 241 (SR-241)
Orange and San Diego Counties, California
The Transportation Corridor Agencies (TCA) proposes extending existing SR-241 from its current terminus at Oso Parkway south to Interstate 5 (I-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.

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.

San Joaquin Hills Transportation Corridor (SR-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.

SELECTED REPORTS

Paleontological Resources Analysis for the SR-55/Newport Boulevard Improvement Project, City of Costa Mesa, County of Orange, California. LSA project number TRT1101A. 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 number 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 number CDT1120. August 2012.

Paleontology Memo for the Towne Center Residential Project, City of Lake Forest County of Orange, California. LSA project number CLF1201. 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 number OSD1102. July 2012.

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 number RBF1104. May 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 number 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 number 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 number RCF1102. February 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 number KCY1102. 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 number 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 number RMN0802A. February 2012.

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 number URS1002. December 2011.

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 number 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 number RCN1002. December 2011.

Paleontological Resources Assessment for the Quail Brush Generation Project, San Diego County, California. Report prepared for Tetra Tech EC. LSA project number TTE1101. November 2011.

Paleontological Mitigation Plan for the Tippecanoe Avenue Interchange Improvement Project, Phase 1, Cities of Loma Linda and San Bernardino, San Bernardino County, California. Report prepared for the California Department of Transportation, District 8. LSA project number RMN0802A. 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 number HCR1103A. November 2011.

Paleontological Analysis for the State Route 125/State Route 94 Interchange Branch Connector Project, San Diego County, California. LSA project number 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 number 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 number 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 number 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 number 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 number 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 number SCE1105A. July 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 number 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 number SGE0905-T009B. May 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 number 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. Report prepared for Angeles National Forest, Supervisor's Office. LSA project numbers 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 number 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 number 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 number TLK1001. February 2011.

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 number 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 number 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, Californi*a. Letter report

prepared for the Angeles National Forest on behalf of Southern California Gas Company. LSA project number 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 number 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 number DMJ0602. October 2010.

Paleontological Assessment for the CVS Pharmacy Store, Huntington Beach, California. Letter Report prepared for KZ Development Company, LP. LSA project number 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 number 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 number 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 number 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 number SCG0602k. September 2010.

Results of Archaeological Resource Monitoring for Plains All American Pipeline Line-2000 Templin Highway 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 number SNS1002. September 2010.

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 number 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 number CDT1001. May 2010.

C*ultural 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 number 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 number 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 number 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 number 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 number HCR0803. January 2010.

Paleontological Resources Mitigation Plan for the Vail Lake Transmission Main and Pump Station Project, Riverside County, California. Report prepared for Kennedy/Jenks Consultants. LSA project number KJE0601. January 2010.

Draft Paleontological Identification and Evaluation Report for State Route 91 Westbound Widening (Northbound State Route 55 to the Westbound State Route 91 Connector through the Tustin Avenue Interchange), City of Anaheim, Orange County, California. Prepared for the California Department of Transportation, District 12. LSA project number CDT0806B. January 2010.

Paleontological Resources Assessment for the Imperial Valley Photovoltaic Project. Prepared for SDG&E Environmental Services. LSA project number SGE0905-T009B. December 2009.

Paleontological Resource Analysis of the Interstate 215/Washington Street Interchange Project, Cities of Colton and Grand Terrace, San Bernardino County, California. LSA project number SBA330. October 2009.

Cultural Resource Monitoring for the Del Obispo Street Undergrounding of Overhead Utilities and Widening, City of San Juan Capistrano, Orange County, California. (With Deborah McLean as primary author.) Prepared for the City of San Juan Capistrano. LSA project number CSJ0803. September 2009.

Paleontological Identification and Evaluation Report for I-215 High Occupancy Vehicle Gap Closure Project Cities of Colton, Grand Terrace, San Bernardino, San Bernardino County, and City of Riverside, Riverside County, California. Prepared for the California Department of Transportation, District 8. LSA project number SBA330. August 2009.

Results of Archaeological Resource Monitoring for Southern California Gas Company Line-85 Permanent Repairs 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 number SCG0801. August 2009.

Paleontological Mitigation Plan State Route 91 Eastbound Lane Addition Project Between State Route 241 and State Route 71, Orange County, California, and Riverside County, California. Prepared for the California Department of Transportation, District 12. LSA project number CDT0805. May 2009.

Paleontological Resources Letter Report for the Moro Ridge Radio Site Project, Orange County, California. Prepared for the County of Orange. LSA project number ORG0801. May 2009.

Paleontological Identification and Evaluation Report for I-10/Tippecanoe Avenue Interchange Project, Cities of Loma Linda and San Bernardino, San Bernardino County, California. Prepared for the California Department of Transportation, District 8. LSA project number RMN0802. April 2009.

Paleontological Resources Due Diligence for the Lazy W Ranch Project in Hot Springs Canyon, Orange County California. Memo Prepared for Erin Razban, LSA Associates, Inc. LSA project Number LZW0901. March 2009.

Paleontological Resources Assessment for the Hanford Municipal Airport Improvements Project, City of Hanford, Kings County, California. Prepared for Mead & Hunt, Inc. LSA project number MHN0801. February 2009.

Paleontological Resources Identification and Evaluation Report for SR-73 Basin Sedimentation Project Between Jamboree Road and I-5/SR-73 Interchange; Cities of Laguna Niguel, Aliso Viejo, Laguna Beach, Irvine, and Newport Beach; County of Orange, California. Prepared for the California Department of Transportation, District 12. LSA project number CDT0807. January 2009.