

## MEMORANDUM

**DATE:** March 1, 2024

**TO:** Rick Yee, PE, Deputy Director of Public Works, City of Yorba Linda

**FROM:** Kelly Vreeland, M.Sc., Senior Paleontologist, and Jacob Biewer, M.Sc., Paleontologist, LSA

**SUBJECT:** Paleontological Resources Memorandum of the Proposed Yorba Linda Boulevard Improvements Project (Imperial Highway to Lakeview Avenue), Yorba Linda, California (LSA Project No. 20231457)

## INTRODUCTION

This memorandum was prepared to ensure that the Yorba Linda Boulevard Improvements Project (Imperial Highway to Lakeview Avenue) (project) in Yorba Linda, Orange County, California, is in compliance with all applicable State and City of Yorba Linda (City) regulations and requirements regarding paleontological resources. These regulations and requirements include the California Environmental Quality Act (CEQA): Public Resources Code (PRC) Division 13, Chapter 2.6; the *State CEQA Guidelines*: California Code of Regulations, Title 14, Chapter 3, Appendix G; PRC 5097.5; and the Historic Resources Element of the City General Plan (City of Yorba Linda, 2016; all references provided in Attachment A). This memorandum also follows industry best practices as documented by the Society of Vertebrate Paleontology (SVP, 2010). It addresses the potential for the project to impact paleontological resources and, if needed, includes mitigation measures and other recommendations to minimize these impacts. The City is the Lead Agency under CEQA.

## PROJECT LOCATION AND DESCRIPTION

The project site runs from the intersection of Yorba Linda Boulevard and Imperial Highway to the intersection of Yorba Linda Boulevard and Lakeview Avenue. The project site is depicted on the United States Geological Survey (USGS) *Yorba Linda, California* 7.5-minute topographic quadrangle map in Township 3 South, Range 9 West, in unsectioned land of the *Cañon De Santa Ana Land Grant*, San Bernardino Baseline and Meridian (USGS, 1981; Figure 1 [all figures provided in Attachment B]).

The objective of the proposed project is to address the existing and future congestion and operation at these intersections through improvements including widening, restriping, median improvements, and traffic signal modifications. Specific improvements at each of these intersections are described further below.

### **Yorba Linda Boulevard and Imperial Highway Intersection**

The project improvements for the intersection widening at the intersections of Yorba Linda Boulevard and Imperial Highway include:

- Convert the eastbound single left-turn lane on Yorba Linda Boulevard at the intersection with Imperial Highway to dual left-turn lanes.
- Add an eastbound right-turn lane on Yorba Linda Boulevard at the intersection with Imperial Highway.
- Convert the single left-turn lane on Yorba Linda Boulevard at the intersection with Imperial Highway to dual left-turn lanes. These lanes will also be extended.
- Modify the northern and southern curb lines and curb returns and the median on the west leg of Yorba Linda Boulevard at the intersection with Imperial Highway to accommodate two additional lanes.
- Modify the southerly curb line and curb return and the median on the east leg of Yorba Linda Boulevard at the intersection with Imperial Highway to accommodate an additional lane.
- Modify the traffic signals.
- Utility relocations will be necessary due to the road widening and potentially for the foundations for the traffic signal modifications.
- Restripe Yorba Linda Boulevard to modify lane designations.
- Construct the retaining wall on eastbound Yorba Linda Boulevard near the Imperial Highway intersection due to the presence of an underground parking garage along the southern portion of the roadway. In the existing condition, an embankment with a short retaining wall is in place to separate the difference in grade between the back of the sidewalk and the floor of the underground parking garage. The proposed retaining wall would be 6.5 feet from the existing face of the parking structure.

### **Yorba Linda Boulevard and Lakeview Avenue Intersection**

The project improvements for the intersection widening at the intersections of Yorba Linda Boulevard and Imperial Highway include:

- Convert the eastbound single left-turn lane on Yorba Linda Boulevard at the intersection with Lakeview Avenue to dual left-turn lanes.
- Convert the westbound single left-turn lane on Yorba Linda Boulevard at the intersection with Lakeview Avenue to dual left-turn lanes.

- Modify the southern curb line and curb return and the median on the east leg of Yorba Linda Boulevard at the intersection with Lakeview Avenue to accommodate an additional lane.
- Modify the southern curb line and curb return and the median on the west leg of Yorba Linda Boulevard at the intersection with Lakeview Avenue to accommodate an additional lane.
- Remove the gap in the median on the east leg of Yorba Linda Boulevard at the intersection with Lakeview Ave that was used to enter the Firestone Village shopping center.
- Modify the traffic signals.
- Utility relocations will be necessary due to the road widening and potentially for the foundations for the traffic signal modifications.
- Restripe Yorba Linda Boulevard to modify lane designations.

### Utility Relocations

Utility relocations will be necessary due to the road widening. Additional utilities may need to be relocated for the proposed traffic signal pole foundations. The utilities that may need to be relocated include, but are not limited to:

- The transformer on the north side of Yorba Linda Boulevard west of Imperial Highway in the grassy area south of Mimi's Café
- Streetlights along Yorba Linda Boulevard
- Irrigation controllers and irrigation lines along Yorba Linda Boulevard
- The catch basin on the north side of Yorba Linda Boulevard west of Imperial Highway in front of the Chili's restaurant
- The traffic signal poles and their associated pull boxes, cabinets, and lines at the northwest, southwest, and southeast corners of the intersection of Yorba Linda Boulevard and Imperial Highway and at the southwest and southeast corners of the intersection of Yorba Linda Boulevard and Lakeview Avenue
- The fire hydrant, water valves, and water meters on the south side of Yorba Linda Boulevard west of Imperial Highway in front of the Chili's restaurant
- The underground backflow preventer on the south side of the Yorba Linda Boulevard west of Imperial Highway in the grassy area in front of the Chili's restaurant
- The junction box on the south side of Yorba Linda Boulevard east of Imperial Highway in front of the El Pollo Loco drive-through

- The Southern California Edison vault on the south side of Yorba Linda Boulevard east of Imperial Highway in front of the Galleria de Yorba sign
- The fire hydrant on the south side of Yorba Linda Boulevard in between Imperial Highway and Lakeview Avenue on the west side of the driveway into the Galleria de Yorba shopping center
- The electrical vault on the south side of Yorba Linda Boulevard west of Lakeview Avenue in front of the T-Mobile
- The Southern California Edison vault on the south side of Yorba Linda Boulevard east of Lakeview Avenue and west of the driveway into the Firestone Shopping Center
- The Yorba Linda Water District water enclosure and valve on the south side of Yorba Linda Boulevard east of the driveway to the Firestone Shopping Center
- The Signal Box Cabinet on the south side of Yorba Linda Boulevard east of the driveway to the Firestone Shopping Center
- Two Southern California Edison transformers on the south side of Yorba Linda Boulevard east of Lakeview Avenue in front of the Yorba Linda Palms Apartments
- The fire hydrant and the water meter on the south side of Yorba Linda Boulevard east of Lakeview Avenue in front of the Yorba Linda Palms Apartments
- The Southern California Edison enclosures on the south side of Yorba Linda Boulevard east of Lakeview Avenue in front of the Yorba Linda Palms Apartments

### Retaining Wall and Bridge

To add the right turn lane on eastbound Yorba Linda Boulevard at the intersection with Imperial Highway a retaining wall will be needed due to the existence of an underground parking garage along the southerly portion of the roadway. In existing condition, an embankment with a short retaining wall is in place to separate the difference in grade between the back of the sidewalk and the floor of the underground parking garage. The proposed retaining wall would be located 6.5 feet from the existing face of the parking structure. The intent would be not to impact the existing retaining wall located at the bottom of the embankment. Cast-in-drilled-hole piles or spread footings may be used. The bridge connecting the driveway to the upper deck of the parking structure will need to be dismantled; this includes the two retaining walls that are on each side of the bridge. A new bridge would be needed from the existing structure to the new soil.

### Excavation Information

Development of the project will involve removal of existing improvements, grading, utility relocations, signing and striping, street lighting, traffic signal modifications, streetscaping, and landscaping. The deepest excavation associated with the project is expected to be for the new bridge structure, which will extend to a maximum depth of 32 feet (personal communication, BKF

Engineers, January 22, 2024). Table A, below, lists the excavation depths of the various project components.

**Table A: Anticipated Maximum Excavation Depths for Components of Yorba Linda Boulevard/Imperial Highway Improvements Project**

Project Component	Depth
Road widening	2.5 feet
Utility relocations	1–8 feet
Traffic signal modifications	6-15 feet
Retaining walls	12 feet
New bridge structure	32 feet
Curb and Gutter	6 inches
Sidewalk	4 inches
2-foot Landscape Wall	2 feet
Driveways	6 inches
Crosswalk Pavers	1 foot

Source: BKF Engineers (January 2024).

## METHODS

LSA examined geologic maps of the project site and reviewed relevant geological and paleontological literature to determine which geologic units are present in the project site and whether fossils have been recovered in the project site or from similar geologic units elsewhere in the region. Additionally, a fossil locality search was conducted through the Natural History Museum of Los Angeles County (NHMLAC) to determine the status and extent of previously recorded paleontological resources within and surrounding the project site.

## RESULTS

### Literature Review

The project site is in the Peninsular Ranges Geomorphic Province, a 900-mile-long northwest-southeast trending structural block with similarly trending faults, which extends from the Transverse Ranges in the north to the tip of Baja California in the south and includes the Los Angeles Basin (California Geological Survey, 2002; Norris and Webb, 1976). The total width of this province is 225 miles, extending from the Colorado Desert in the east, across the continental shelf, to the southern Channel Islands (Santa Barbara, San Nicolas, Santa Catalina, and San Clemente) in the west (Sharp, 1976). This province is characterized by a series of mountain ranges and valleys that trend in a northwest-southeast direction roughly parallel to the San Andreas Fault Zone (Norris and Webb, 1976; Sharp, 1976). It contains extensive pre-Cenozoic (more than 66 million years ago [Ma]) igneous and metamorphic rocks covered by Cenozoic (less than 66 Ma) sedimentary deposits (Norris and Webb, 1976).

Geologic mapping by Morton and Miller (2006) indicates that the project site contains Young Alluvial Fan Deposits and Very Old Alluvial Fan Deposits. Artificial Fill was noted at the surface to depths of up to 13 feet in the *Geotechnical Evaluation* report prepared for this project (Ninyo & Moore, 2023).

These geologic units and their relative paleontological sensitivities are described in more detail below. The dates for the geologic time intervals are based on the *International Chronostratigraphic Chart* prepared by the International Commission on Stratigraphy (Cohen et al., 2023).

### *Artificial Fill*

Artificial Fill consists of sediments that have been removed from one location and transported to another location by human activity, rather than by natural means. The transportation distance can vary from a few feet to many miles, and composition is dependent on the source and purpose. Artificial Fill will sometimes contain modern debris such as asphalt, wood, bricks, concrete, metal, glass, plastic, and even plant material. The *Geotechnical Evaluation* prepared for this project noted fill from the surface to depths of up to 13 ft within the project site (Ninyo & Moore, 2023).

While Artificial Fill may contain fossils, these fossils have been removed from their original location and are thus out of stratigraphic context. Therefore, they are not considered important for scientific study. As such, Artificial Fill has no paleontological sensitivity.

### *Young Alluvial Fan Deposits*

The Young Alluvial Fan Deposits are Holocene to late Pleistocene in age (less than 129,000 years ago) and consist of unconsolidated silt, sand, and gravel (Morton and Miller 2006). Cobble- and boulder-size clasts are also present and become more abundant closer to the hills and mountains (Morton and Miller 2006). These sediments were eroded from higher elevations, carried by flooding streams and debris flows, and deposited in a fan or lobe shape at the base of the hills. They show slight to moderate dissection by erosional gullies (Morton and Miller 2006).

Holocene (less than 11,700 years ago) deposits can contain remains of plants and animals, only those from the middle to early Holocene (4,200 to 11,700 years ago) are considered scientifically important (SVP, 2010). The Pleistocene sediments in this unit have produced scientifically important fossils elsewhere in the region (Jefferson, 1991a, 1991b; Miller, 1971; Reynolds and Reynolds, 1991; Springer et al., 2009). These older, Pleistocene deposits span the end of the Rancholabrean North American Land Mammal Age (NALMA), which dates from 11,000 to 240,000 years ago (Sanders et al., 2009) and was named for the Rancho La Brea fossil site in central Los Angeles. The presence of *Bison* defines the beginning of the Rancholabrean NALMA (Bell et al., 2004), but fossils from this time also include other large and small mammals, reptiles, fish, invertebrates, and plants (Jefferson, 1991a, 1991b; Miller, 1971; Reynolds and Reynolds, 1991; Springer et al., 2009). There is a potential to find these types of fossils in the older sediments of this geologic unit, which may be encountered below a depth of approximately 10 feet. Therefore, these deposits are assigned a low paleontological sensitivity above a depth of 10 feet and a high sensitivity below that mark.

### *Very Old Alluvial Fan Deposits*

The Very Old Alluvial Fan Deposits formed during the middle to early Pleistocene (129,000 years ago to 2.58 Ma) and consist of a mixture of silt, sand, gravel, and conglomerate (Morton and Miller, 2006). They are moderately to well consolidated, have been dissected by erosional gullies, and show some soil development (Morton and Miller, 2006). They formed as sediments were eroded from the mountains and carried to lower elevations by rivers and streams and deposited in a fan or lobe shape.

The Very Old Alluvial Fan Deposits formed during an interval that spans three NALMAs: the Rancholabrean, the Irvingtonian (240,000–1.8 Ma), and the Blancan (1.8–4.75 Ma) (Bell et al., 2004; Sanders et al., 2009). Fossils are known in similar Rancholabrean, Irvingtonian, and Blancan deposits from excavations for roads, housing developments, and quarries, as well as scientific investigations within the Southern California area (Bell et al., 2004; Miller, 1971; Pajak et al., 1996). These fossils include mammoths, mastodons, horses, camels, saber-toothed cats, coyotes, deer, peccaries, and sloths, as well as smaller animals like rodents, rabbits, birds, reptiles, and fish. As such, these deposits are considered to have high paleontological sensitivity.

### **Fossil Locality Search**

According to the fossil locality search conducted by the NHMLAC, there are no known fossil localities within the boundaries of the project site. However, this search noted a number of records of fossil localities nearby from Pleistocene-age sediments similar to those within the project site (i.e., the Young Alluvial Fan Deposits and Very Old Alluvial Fan Deposits). LACM VP 3291, in the nearby town of Richfield, yielded remains of elephant clade (Proboscidea) from unknown Pleistocene age deposits. LACM VP 4185-4201, in Coyote Creek adjacent to Ralph B. Clark Regional Park, were found within sediments of the La Habra Formation, which is a geologic unit named for outcrops near La Habra, California that have a similar Pleistocene age and terrestrial depositional environment to the Young Alluvial Fan Deposits and Very Old Alluvial Fan Deposits and are mapped nearby. These localities produced remains of bison (*Bison*), camel (*Camelops*), horse (*Equus*), mammoth (*Mammuthus*), mastodon (*Mamut*), elephant clade (Proboscidea), dire wolf (*Canis dirus*), Coyote (*Canis latrans*), deer (*Odocoileus*), dwarf pronghorn (*Capromeryx*), unidentified artiodactyl; and sea duck (*Chendytes*). A copy of the fossil locality search results from the NHMLAC is provided in Attachment C.

### **RECOMMENDATIONS**

The project site contains Artificial Fill, which has no paleontological sensitivity; Young Alluvial Fan Deposits, which have low paleontological sensitivity from the surface to a depth of 10 feet and high sensitivity below that depth; and Very Old Alluvial Fan Deposits, which have high paleontological sensitivity. Excavation is expected to reach a depth of 32 feet within sediments of both the Young Alluvial Fan Deposits and Very Old Alluvial Fan Deposits. Development of this project is thus expected to extend into paleontologically sensitive sediments and has the potential to impact scientifically significant paleontological resources. Therefore, to mitigate potential impacts to these resources, LSA recommends the following mitigation measures:

- PALEO-1** A paleontologist who meets the qualifications established by the Society of Vertebrate Paleontology (SVP) shall be retained to develop a Paleontological Resources Impact Mitigation Program (PRIMP) for this project. The PRIMP shall be consistent with the standards of the SVP and include the methods that will be used to protect paleontological resources that may exist within the project site, as well as procedures for monitoring, fossil preparation and identification, curation into a repository, and preparation of a report at the conclusion of grading.
- PALEO-2** Excavation and grading activities in deposits with high paleontological sensitivity (i.e., Young Alluvial Fan Deposits below a depth of 10 feet and Very Old Alluvial Fan Deposits) shall be monitored by a qualified paleontological monitor following a PRIMP. No monitoring is required for excavations in deposits with no paleontological sensitivity (i.e., Artificial Fill). If paleontological resources are encountered during the course of ground disturbance, the paleontological monitor shall have the authority to temporarily redirect construction away from the area of the find. In the event that paleontological resources are encountered when a paleontological monitor is not present, work in the immediate area of the find shall be redirected, and the paleontologist or paleontological monitor shall be contacted to assess the find for scientific significance. If determined to be scientifically significant, the fossil shall be collected from the field.
- PALEO-3** Collected resources shall be prepared to the point of identification, identified to the lowest taxonomic level possible, cataloged, and curated into the permanent collections of a museum repository. At the conclusion of the monitoring program, a report of findings shall be prepared to document the results of the monitoring program.

Implementation of Mitigation Measures PALEO-1 through PALEO-3 will ensure that project impacts on paleontological resources will be reduced to a level that is less than significant.

- Attachments:
- A: References
  - B: Figure 1: Project Location  
Figure 2: Geology Map
  - C: Fossil Locality Search Results from the Natural History Museum of Los Angeles County



## ATTACHMENT A

### REFERENCES

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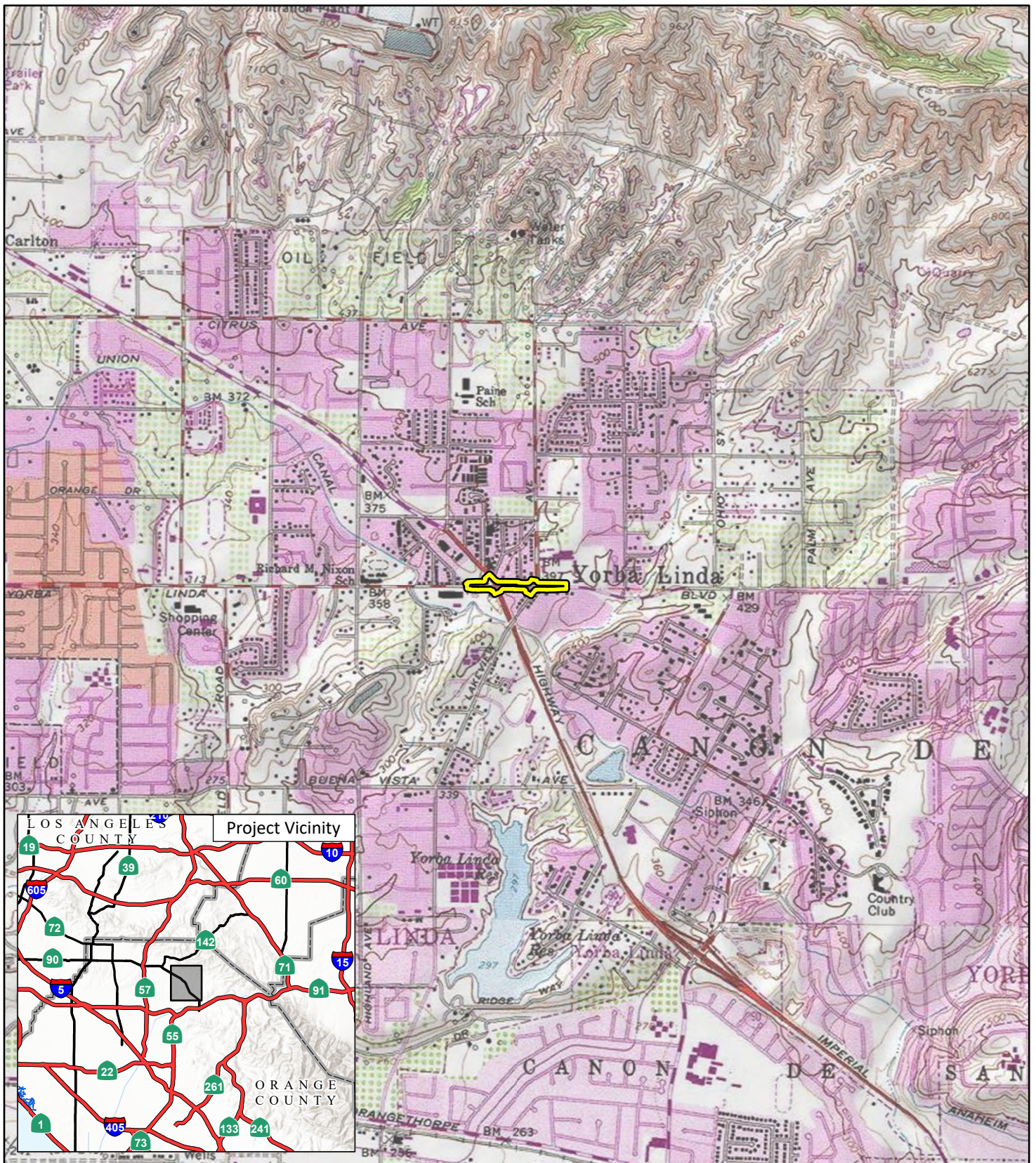
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## ATTACHMENT B

### FIGURES

Figure 1: Project Location and Vicinity

Figure 2: Geology Map



LSA


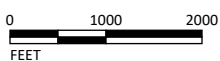
 Project Location

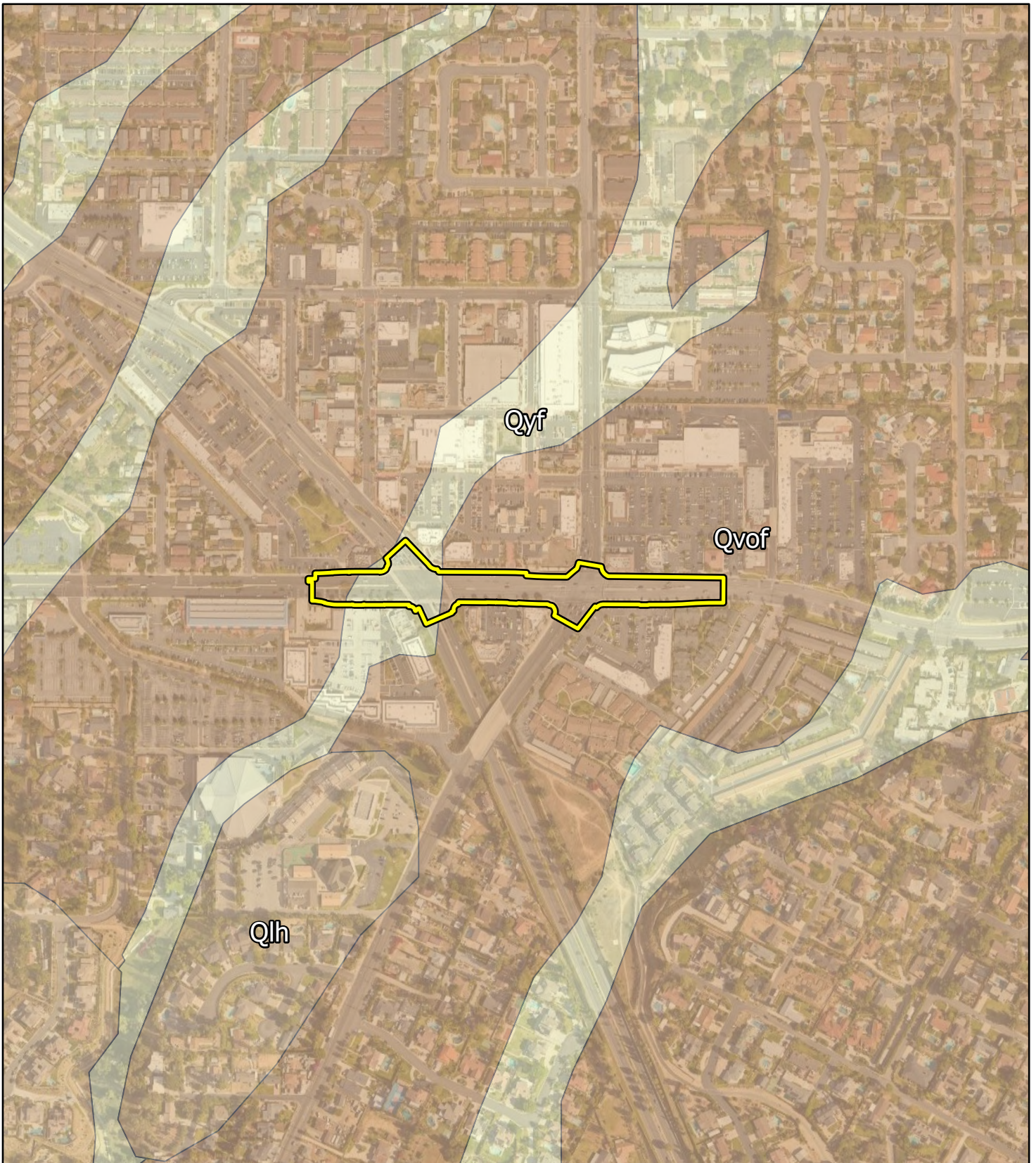
FIGURE 1



SOURCE: USGS 7.5' Quad - Yorba Linda (1981) and Orange (1981), CA

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

Yorba Linda Blvd Project  
Project Location and Vicinity



LSA

 Project Location

Geologic Unit

-  Qyf Young Alluvial Fan Deposits
-  Qvof Very Old Alluvial Fan Deposits
-  Qlh La Habra Formation

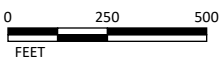


FIGURE 2

Yorba Linda Blvd Project  
Geology Map

SOURCE: Morton and Miller (2006); Google Maps (2023)

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## ATTACHMENT C

# FOSSIL LOCALITY SEARCH RESULTS FROM THE NATURAL HISTORY MUSEUM OF LOS ANGELES COUNTY

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

tel 213.763.DINO  
www.nhm.org

Research & Collections

e-mail: [paleorecords@nhm.org](mailto:paleorecords@nhm.org)

November 26, 2023

LSA Associates, Inc.  
Attn: Jacob Biewer

re: Paleontological resources for the Yorba Linda Boulevard/Imperial Highway Improvements Project  
(LSA project number 20231457)

Dear Jacob:

I have conducted a thorough search of our paleontology collection records for the locality and specimen data for proposed development at the Yorba Linda Boulevard/Imperial Highway Improvements project area as outlined on the portion of the Yorba Linda USGS topographic quadrangle map that you sent to me via e-mail on November 17, 2023. We do not have any fossil localities that lie directly within the proposed project area, but we do have fossil localities nearby from the same sedimentary deposits that occur in the proposed project area, either at the surface or at depth.

The following table shows the closest known localities in the collection of the Natural History Museum of Los Angeles County (NHMLA).

Locality Number	Location	Formation	Taxa	Depth
LACM VP 3292	Richfield, CA (south of Yorba Linda)	Terrace deposits (Pleistocene)	Elephant clade (Proboscidae)	Unknown
LACM VP 4185-4201	Coyote Creek, adjacent to Ralph B Clark Regional Park in West Coyote Hills	La Habra Formation (Pleistocene; sandy silt shot through with caliche)	Bison ( <i>Bison</i> ), camel ( <i>Camelops</i> ), horse ( <i>Equus</i> ), mammoth ( <i>Mammuthus</i> ), mastodon ( <i>Mamut</i> ), elephant clade (Proboscidea), dire wolf ( <i>Canis dirus</i> ), Coyote ( <i>C. latrans</i> ), deer ( <i>Odocoileus</i> ), dwarf pronghorn ( <i>Capromeryx</i> ), unidentified artiodactyl; sea duck ( <i>Chendytes</i> )	Surface, in creek bed

*VP, Vertebrate Paleontology; IP, Invertebrate Paleontology; bgs, below ground surface*

This records search covers only the records of the NHMLA. It is not intended as a paleontological assessment of the project area for the purposes of CEQA or NEPA. Potentially fossil-bearing units are present in the project area, either at the surface or in the subsurface. As such, NHMLA recommends that a full paleontological assessment of the project area be conducted by a paleontologist meeting Bureau of Land Management or Society of Vertebrate

Paleontology standards.

Sincerely,

A handwritten signature in black ink that reads "Alyssa Bell". The signature is written in a cursive style and is placed on a light beige rectangular background.

Alyssa Bell, Ph.D.  
Natural History Museum of Los Angeles County

enclosure: invoice