Appendix E

Paleontological Resources Assessment

Public Version

IBC MULTI-USE TRAIL CREEKWALK SEGMENT PROJECT

Paleontological Resources Assessment Report

Prepared for
BKF Engineers

November 2024

ESA

Public Version

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Paleontological Resources Assessment Report

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BKF Engineers

November 2024

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Project Location:
Tustin (CA) USGS 7.5-minute Topographic Quad
Township 5 & 6 South, Range 9 West, Unsectioned

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CONTENTS

IBC Multi-Use Trail Creekwalk Segment Project–Paleontological Resources Assessment Report

EXECUTIVE SUMMARY

Environmental Science Associates (ESA) has been retained by BKF Engineers to prepare a Paleontological Resources Assessment in support of an Initial Study/Mitigated Negative Declaration for the Irvine Business Complex (IBC) Multi-Use Trail Creekwalk Segment Project (Project). The Project would include the construction and operation of an approximately 1.75-mile multi-use paved trail along the western edge of the San Diego Creek and Peters Canyon Wash, extending from Coronado in the south to Warner Avenue in the north in Irvine, California (Project Site). The City of Irvine (City) is the lead agency responsible for compliance with the California Environmental Quality Act (CEQA).

Geological mapping of surficial deposits by Bedrossian et al. (2012) shows that the Project is entirely underlain by young alluvial valley deposits (Qya). Adjacent units include younger (Qyf) and older (Qof) alluvial fan deposits. Older bedrock is exposed south of the Project and is unlikely to be impacted.

A database search from the Natural History Museum of Los Angeles County (LACM) for records of fossil localities (Bell, 2023) noted that there are no records of fossils previously identified within the Project Site. Fossils have been recovered near the Project Site, but from units not anticipated to be disturbed during excavation activity.

Ground disturbing activities associated with the Project should not impact fossil resources as the units at the surface are too young to host fossils. It is possible that deep excavations may encounter Pleistocene fan deposits which are of an age to potentially host significant fossils. To best mitigate against unanticipated fossils, the following measures are recommended: the retention of a qualified paleontologist, paleontological resources sensitivity training, and inadvertent discovery protocols. Details of these recommendations can be found in the *Conclusions and Recommendation* section at the close of this report.

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IBC MULTI-USE TRAIL CREEKWALK SEGMENT PROJECT

Paleontological Resources Assessment Report

Introduction

Environmental Science Associates (ESA) has been retained by the BKF Engineers to prepare a Paleontological Resources Assessment in support of an Initial Study/Mitigated Negative Declaration for the Irvine Business Complex (IBC) Multi-Use Trail Creekwalk Segment Project (Project). The Project would include the construction and operation of an approximately 1.75-mile multi-use paved trail along the western edge of the San Diego Creek and Peters Canyon Wash, extending from Coronado in the south to Warner Avenue in the north in Irvine, California (Project Site). The City of Irvine is the lead agency responsible for compliance with the California Environmental Quality Act (CEQA).

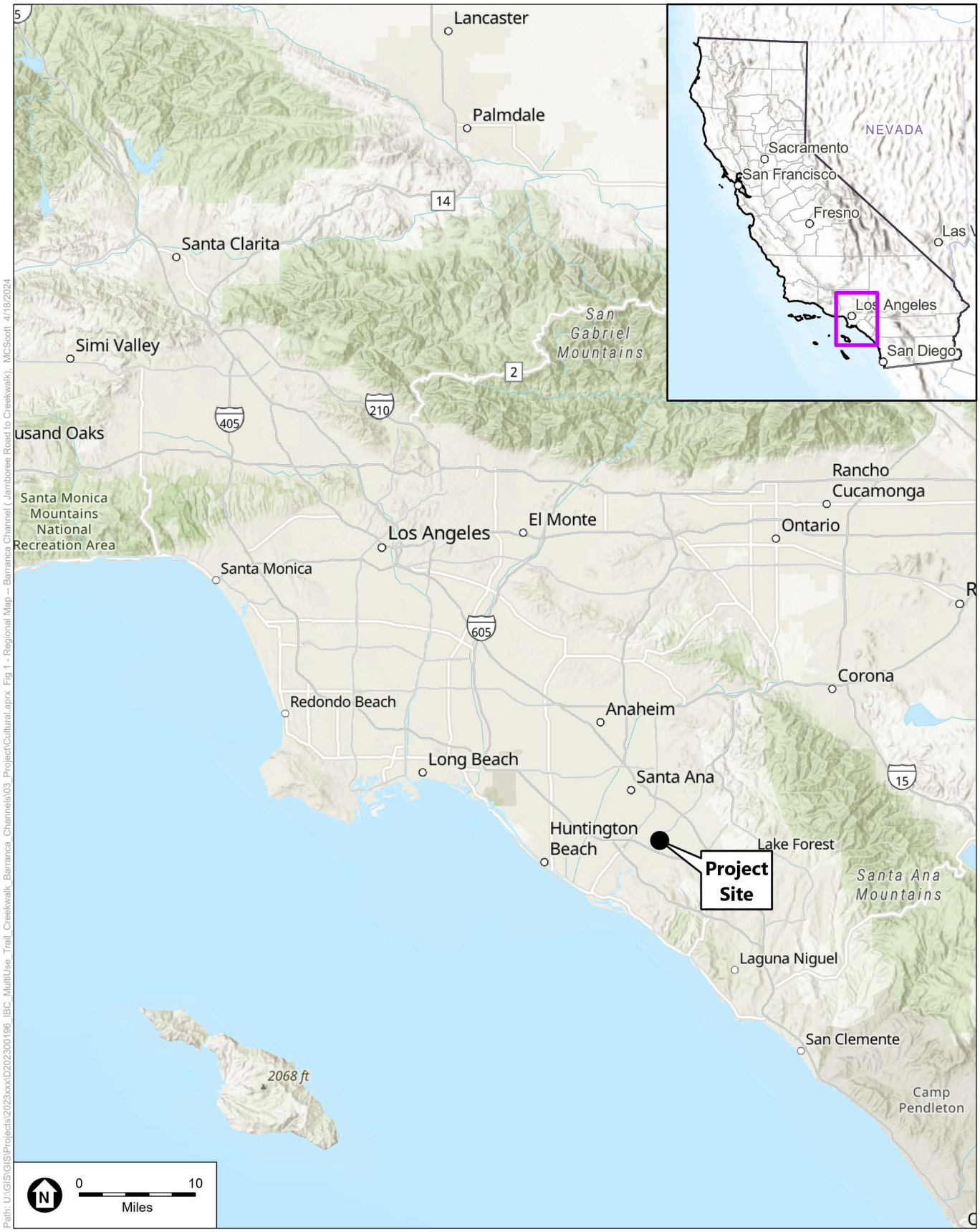
ESA personnel involved in the preparation of this report are as follows: Kyle Garcia, M.A., RPA, Project Manager; Russell Shapiro, Ph.D., Principal Investigator of paleontology and report author; Fatima Clark, B.A., report author; and Chance Scott, GIS specialist. Resumes of key personnel are included in **Appendix A**.

Project Location

The Project Site is located within the western portion of the City in Orange County, California (**Figure 1**). The Project Site is located along the western edge of the San Diego Creek, spanning from Coronado to just south of Barranca Parkway, and continues northward along the western edge of the Peters Canyon Wash, between Barranca Parkway to Warner Avenue. The Project Site is situated within an unsectioned portion of Township 5 and 6 South, Range 9 West of the Tustin, CA U.S. Geological Survey (USGS) 7.5-minute topographic quadrangle (**Figure 2**).

The land uses surrounding the Project Site are comprised of urban and built-up land. Commercial uses are located to the west of the creek and multi-family residential uses are located to the east. The eastern side of the creek also includes commercial uses in the southern portion and recreation uses in the central and northern portion, including San Marco Park and the Bill Barber Memorial Park. Creekside High School is also located east of the creek, located north of Barranca Parkway.

The existing San Diego Creek Trail (also known as the Mountains-to-the-Sea Trail and Bikeway) is located on the opposite bank from the Project Site along the easterly side of the San Diego Creek. The San Diego Creek Trail continues north and connects with the existing Peters Canyon Trail, which is located on the opposite bank from the Project Site along the easterly side of the Peters Canyon Wash.

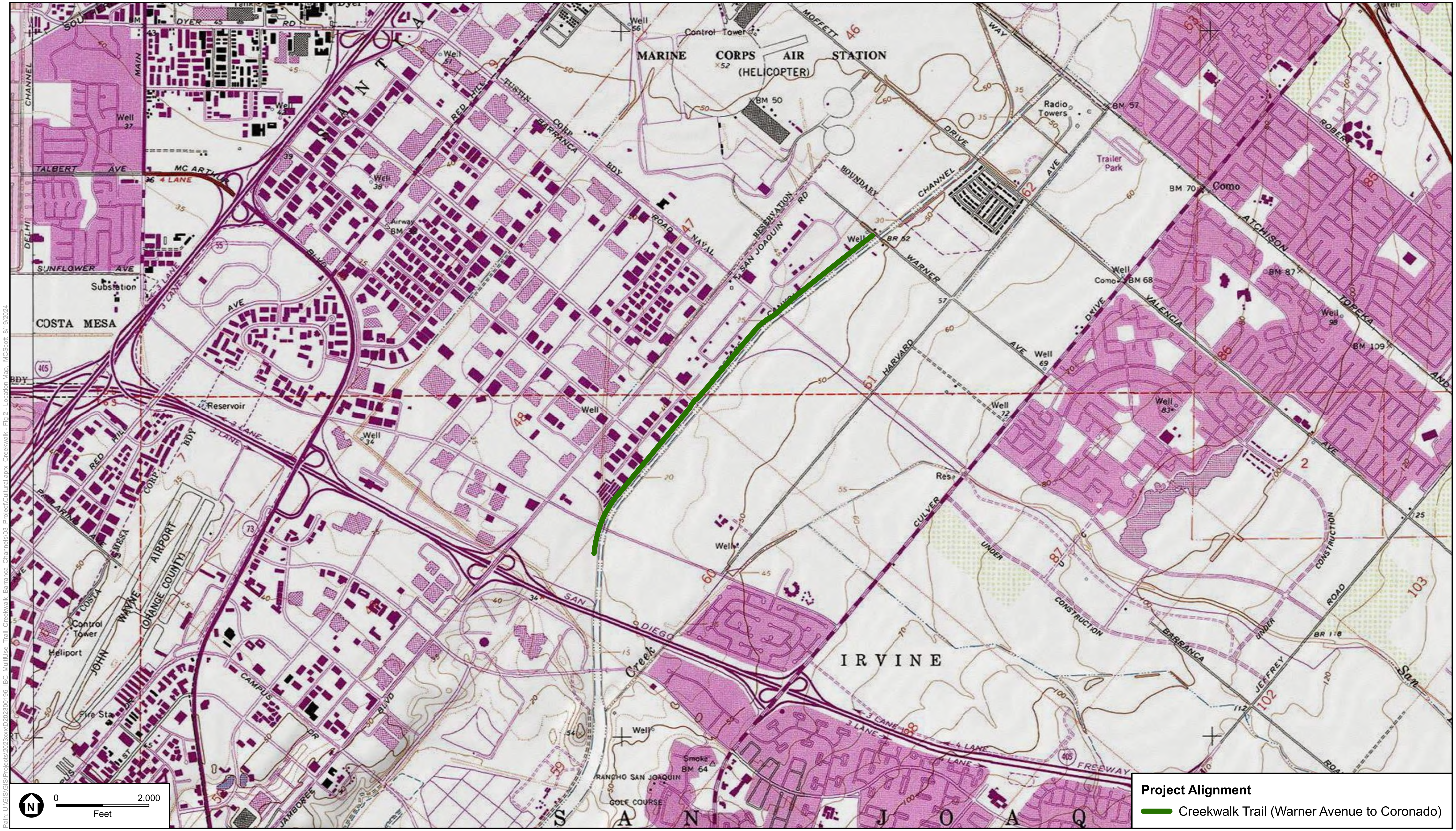


SOURCE: ESA, 2024

IBC Multi-Use Trail Creekwalk and Barranca Channel Segments Project

Figure 1
Regional Map

ESA



SOURCE: Bedrossian et al, 2012; ESA, 2024

IBC Multi-Use Trail Creekwalk and Barranca Channel Segments Project

Figure 2
Location Map

Project Description

The Project Site currently consists of an existing maintenance road on top of the western bank of the channel, owned by the Orange County Flood Control District (OCFCD). The OCFCD maintenance road is approximately 20-feet wide without noticeable slope, except at under crossings. The maintenance road is bound by a chain-linked fence on the west and the channel bank on the east. The banks of the water channel are generally armored with large stone riprap, with banks at under crossings armored with concrete. The OCFCD maintenance road is graded with crushed gravel throughout, except for underpasses which are paved with concrete under Alton Parkway, Barranca Parkway, and Warner Avenue. The maintenance road connects with each street crossing through on-street fenced driveways at Coronado, Main Street, Alton Parkway, Barranca Parkway, and Warner Avenue.

Trail Characteristics

As discussed earlier, the Project would include the construction and operation of a multi-use paved trail along the western edge of the San Diego Creek and Peters Canyon Wash, extending from Coronado in the south to Warner Avenue in the north. The proposed trail would total approximately 1.75 miles.

The proposed trail would include a two-foot wide paved shoulder nearest to the channel, an eight-foot wide paved path for pedestrians and cyclists, and a five-foot wide decomposed granite (DG) path for equestrian use. A two-foot wide bio-swale would be located on the western side of the path. The eastern side of the path would include an approximately 42-inch high steel safety railing with concrete footing. The proposed trail would also include white led unidirectional flush-mount in-pavement markers for superior visibility improving pedestrian and cyclists' safety. The total depth of ground disturbance for the Project would reach a depth of up to 12 inches for the trail construction.

Intersection Improvements

The proposed trail would follow the existing path of the OCFCD maintenance road. The proposed trail would begin at Coronado and continue north, through the intersections of Main Street, Alton Parkway, Barranca Parkway, and end at Warner Avenue. Each street crossing and entrance to the trail would include in-pavement lighting, signage, and landscaping.

Regulatory Framework

Paleontological resources are limited, nonrenewable resources of scientific, cultural, and educational value that are afforded protection under state laws and regulations. The following section summarizes the applicable state laws and regulations, as well as professional standards provided by the Society of Vertebrate Paleontology (SVP, 2010).

State Regulations

California Environmental Quality Act

The CEQA Guidelines (Title 14, Chapter 3 of the California Code of Regulations, Section 15000 *et seq*.), are prescribed by the Secretary of Resources to be followed by state and local agencies in California in their implementation of the CEQA. Appendix G of the CEQA Guidelines includes an Environmental Checklist Form with questions that may be used by public agencies in their assessment of impacts on the

environment. The question within Appendix G that relates to paleontological resources states: "Will the proposed project directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?" The City of Irvine uses this question as its threshold of significance for determining whether impacts of paleontological resources are significant. CEQA protects paleontological resources by requiring an assessment of a project's potential paleontological impacts.

Public Resources Code Section 5097.5 and Section 30244

Other state requirements for paleontological resource management are included in PRC Section 5097.5 and Section 30244. These statutes prohibit the removal of any paleontological site or feature from public lands without permission of the jurisdictional agency, define the removal of paleontological sites or features as a misdemeanor, and require reasonable mitigation of adverse impacts to paleontological resources from developments on public (state, county, city, district) lands.

Society for Vertebrate Paleontology

The SVP has established standard guidelines (SVP, 2010) that outline professional protocols and practices for conducting paleontological resource assessments and surveys, monitoring and mitigation, data and fossil recovery, sampling procedures, and specimen preparation, identification, analysis, and curation. Most practicing professional vertebrate paleontologists adhere closely to the SVP's assessment, mitigation, and monitoring requirements as specifically provided in its standard guidelines. Most state regulatory agencies with paleontological resource-specific Laws, Ordinances, Regulations, and Standards (LORS) accept and use the professional standards set forth by the SVP.

As defined by the SVP (2010:11), significant nonrenewable 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 about 5,000 radiocarbon years).*

Based on the significance definitions of the SVP (2010), all identifiable vertebrate fossils are considered to have significant scientific value. This position is adhered to because vertebrate fossils are relatively uncommon, and only rarely will a fossil locality yield a statistically significant number of specimens of the same genus. Therefore, every vertebrate fossil found has the potential to provide significant new information on the taxon it represents, its paleoenvironment, and/or its distribution. Furthermore, all geologic units in which vertebrate fossils have previously been found are considered to have high sensitivity. Identifiable plant and invertebrate fossils are considered significant if found in association with vertebrate fossils or if defined as significant by project paleontologists, specialists, or local government agencies.

A geologic unit known to contain significant fossils is considered to be "sensitive" to adverse impacts if there is a high probability that earth-moving or ground-disturbing activities in that rock unit will either directly or indirectly disturb or destroy fossil remains. Paleontological sites indicate that the containing

sedimentary rock unit or formation is fossiliferous. The limits of the entire rock formation, both areal and stratigraphic, therefore define the scope of the paleontological potential in each case (SVP, 2010).

Fossils are contained within surficial sediments or bedrock, and are therefore not observable or detectable unless exposed by erosion or human activity. Therefore, without natural erosion or human-caused exposure, paleontologists cannot know either the quality or quantity of fossils. As a result, even in the absence of surface fossils, it is necessary to assess the sensitivity of rock units based on their known potential to produce significant fossils elsewhere within the same geologic unit (both within and outside of the study area), a similar geologic unit, or based on whether the unit in question was deposited in a type of environment that is known to be favorable for fossil preservation. Monitoring by experienced paleontologists greatly increases the probability that fossils will be discovered during ground-disturbing activities and that, if the fossils are significant, that successful mitigation and salvage efforts may be undertaken.

Paleontological Sensitivity

Paleontological sensitivity is defined as the potential for a geologic unit to produce scientifically significant fossils. This is determined by rock type, past history of the geologic unit in producing significant fossils, and fossil localities recorded from that unit. Paleontological sensitivity is derived from the known fossil data collected from the entire geologic unit, not just from a specific survey. In its "Standard Guidelines for the Assessment and Mitigation of Adverse Impacts to Non-renewable Paleontologic Resources," the SVP (2010:1-2) defines four categories of paleontological sensitivity (potential) for rock units: high, low, undetermined, and no potential:

- **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), and some low-grade metamorphic rocks which 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, etc.).
- **Low Potential.** Reports in the paleontological literature or field surveys by a qualified professional paleontologist may allow determination that some rock units have 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 only preserve fossils in rare circumstances and 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.
- **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 if these rock units have high or low potential to contain significant paleontological resources. A field survey by a qualified professional paleontologist to specifically determine the paleontological resource potential of these rock units is required before a paleontological resource impact mitigation program can be developed. In cases

where no subsurface data are available, paleontological potential can sometimes be determined by strategically located excavations into subsurface stratigraphy.

- **No Potential.** Some rock units have no potential to contain significant paleontological resources, for instance 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.

For geologic units with high potential, full-time monitoring is generally recommended during any Project-related ground disturbance. For geologic units with low potential, protection or salvage efforts will not generally be required. For geologic units with undetermined potential, field surveys by a qualified vertebrate paleontologist should be conducted to specifically determine the paleontologic potential of the rock units present within the study area.

Paleontological Resources Significance Criteria

Numerous paleontological studies have developed criteria for the assessment of significance for fossil discoveries (e.g. Eisentraut and Cooper, 2002; Murphey and Daitch, 2007; Scott and Springer, 2003, etc.). In general, these studies assess fossils as significant if one or more of the following criteria apply:

1. The fossils provide information on the evolutionary relationships and developmental trends among organisms, living or extinct;

2. The fossils provide data useful in determining the age(s) of the rock unit or sedimentary stratum, including data important in determining the depositional history of the region and the timing of geologic events therein;

3. The fossils provide data regarding the development of biological communities or interaction between paleobotanical and paleozoological biotas;

4. The fossils demonstrate unusual or spectacular circumstances in the history of life; or

5. The fossils are in short supply and/or in danger of being depleted or destroyed by the elements, vandalism, or commercial exploitation, and are not found in other geographic locations.

In summary, significant paleontological resources are determined to be fossils or assemblages of fossils that are unique, unusual, rare, uncommon, or diagnostically important (Eisentraut and Cooper, 2002; Murphey and Daitch, 2007; Scott and Springer, 2003). Significant fossils can include remains of large to very small aquatic and terrestrial vertebrates or remains of plants and animals previously not represented in certain portions of the stratigraphy. Assemblages of fossils that might aid stratigraphic correlation, particularly those offering data for the interpretation of tectonic events, geomorphologic evolution, and paleoclimatology are also critically important (Scott and Springer, 2003; Scott et al., 2004).

Methods and Results

The Project Site was the subject of thorough background research and analysis to assess its paleontological sensitivity. The research included geologic map review, a paleontological resources

database search conducted by the Natural History Museum of Los Angeles County (LACM), as well as a paleontological resources sensitivity analysis conducted by ESA Principal Paleontologist, Russell Shapiro, Ph.D.

Geologic Setting

The Project Site lies within a broad valley directly north of the Peninsular Ranges in the southern Los Angeles basin (Yerkes et al., 1965). This largely northwest-trending basin started forming in the Late Cretaceous but ramped up tectonic movement in the Miocene (Sylvester and O-Black Gans, 2016). As the surrounding mountain ranges rose up (Peninsular Ranges and Transverse Ranges), the basin floor was infilled with detritus eroded from the adjacent uplands.

Geologic Map Review

Based on the detailed surficial geological map of Bedrossian et al. (2012; scale 1:100,000), the Project Site lies entirely upon young, alluvial valley deposits (Qya) (**Figure 3, Table 1**). This facies of young alluvium lies upon either young alluvial fans (Holocene, Qyf) or older fan deposits (Qof). The alluvium is to be expected as the Project occupies the ancestral confluence of several drainages before exiting the sea at present Newport Bay. While older, fossiliferous units are exposed in the hills to the south of the Project Site, those units are anticipated to be quite deep in the Project Site. Furthermore, it has been shown that the Project Site itself has been modified and is largely underlain by imported gravel fill (CGS, 2024).

The units found in the Project Site or anticipated to be encountered at depth are too young to host significant paleontological resources. Therefore, no literature review was undertaken.

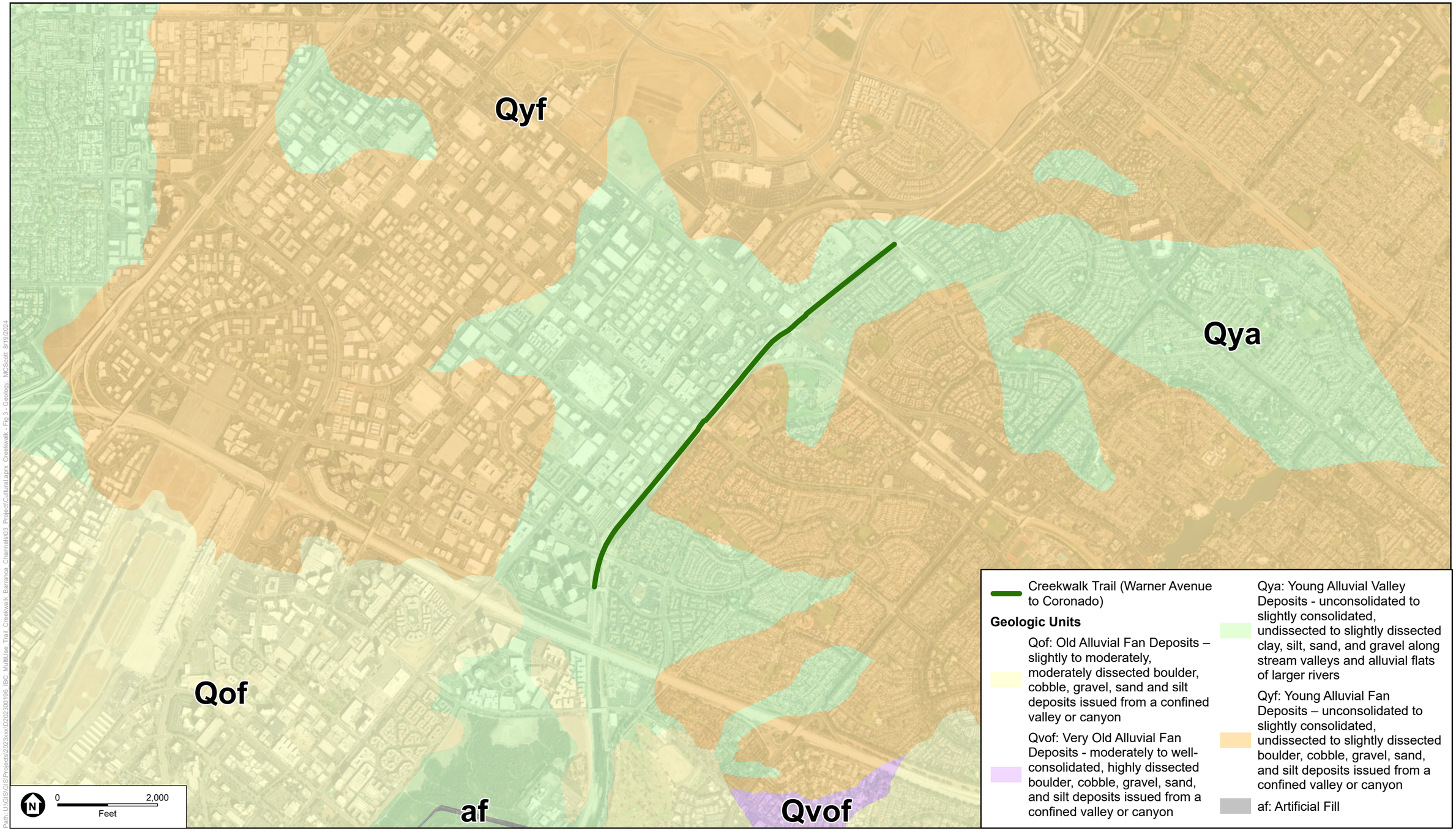
Young Alluvial Valley Deposits (Qya): The entire Project Site lies upon young alluvial fan deposits. As mapped by Bedrossian et al. (2012), this unit is concentrated in the valley floor in regions where there are active drainages. The lack of dissection and unconsolidated sediments attest to their young age.

Young Alluvial Fan Deposits (Qyf): This unit is not present in the Project Site; however, it is included here to build a clearer picture of the local geology. The Qyf represents young fans that overly the older fans (below). The Qyf is distinguished from alluvial valley deposits by a generally coarser nature and location relative to mountain valleys (Bedrossian et al. 2012).

Old Alluvial Fan Deposits (Qof): This unit also does not appear in the Project's boundaries but is included to develop the larger picture. While the Qof is sedimentologically similar to the Qyf, it is more consolidated, more dissected, and occupies slightly higher elevations adjacent to the mountain front (Bedrossian et al. 2012).

Paleontological Resources Record Search

A paleontological resources database search was conducted by the Natural History Museum of Los Angeles County (LACM) on August 13, 2023. The search entailed an examination of current geologic maps and known fossil localities within the Project Site and vicinity. The purpose of the records search was to: (1) determine whether any previously recorded fossil localities occur in the Project Site or vicinity; (2) assess the potential for disturbance of these localities during construction; and (3) assist in evaluating the paleontological sensitivity of the Project Site.



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SOURCE: Bedrossian et al, 2012; ESA, 2024

IBC Multi-Use Trail Creekwalk and Barranca Channel Segments Project

Figure 3
Geology Map

ESA

TABLE 1
SUMMARY OF GEOLOGIC UNITS WITHIN AND IMMEDIATELY ADJACENT TO PROJECT

Geologic Unit	Map Unit Symbol	Age	Description	Depth	Paleo Sensitivity
Young alluvial valley deposits	Qya	Holocene to late Pleistocene (recent to 15,000 years ago)	Unconsolidated to slightly consolidated, undissected to slightly dissected clay, silt, sand, and gravel along stream valleys and alluvial flats of larger rivers	Est. >25'.	Low
Young alluvial fan deposits	Qyf	Holocene to late Pleistocene (recent to 15,000 years ago)	Unconsolidated to slightly consolidated, undissected to slightly dissected boulder, cobble, sand, and silt deposits issued from from a confined valley or canyon.	(outside of Project)	Low
Old alluvial fan deposits	Qof	Late to Middle Pleistocene (~15,000-1,000,000 years ago)	Slightly to moderately consolidated, moderately dissected. boulder, cobble, sand, and silt deposits issued from from a confined valley or canyon.	(outside of Project)	High

SOURCE: Bedrossian et al., 2012

Results of the paleontological resources records search conducted by the LACM indicated that no fossil localities lie directly within the Project Site; however, several fossil localities were identified nearby from the same sedimentary deposits that occur near the Project Site (**Table 2**) (Bell, 2023).

TABLE 2
LACM FOSSIL LOCALITIES

Locality Number	Location	Formation	Taxa	Depth
LACM VP 6370, 6371	(confidential)	Terrace deposits (Pleistocene, silty sandstones)	Horse (*Equus*), other unspecified mammals; Invertebrates: clam (*Tivela*, *Donax*, *Lucinisca*), scaphopod (*Dentalum*, *Antalis*), marine gastropods (*Glossaulax*, *Chlorostoma*)	Unknown (found during grading for parking lot construction)
LACM IP 4695	(confidential)	Palos Verdes Sand	Invertebrates – clam (*Saxidomus*), bryozoan (Bryozoa indet., *Conopeum*)	unknown
LACM VP 7712, 7713	(confidential)	Vaqueros Formation (fine-grained siltstone)	Dugong clade (Dugongidae); Sloth (Mylodontidae?)	Unknown
LACM VP 4219; LACM IP 31322	(confidential)	Palos Verdes Sand (coarse poorly sorted friable sand)	Camel family (Camelidae), sea turtle (Cheloniidae); uncatalogued fish and birds; invertebrates (*Entobia, Lottia, Caesia, Volvania, Ala,* *Eulithidium, Chama, Glossaulax, Agathistoma, Sinum, Chlorostoma, Calianax, Ophidiodermella, Serpulorbis,* *Argopecten*, and others)	30 feet bgs

Locality Number	Location	Formation	Taxa	Depth
LACM VP 3977, 3978, 3986; LACM IP 5092, 5867	(confidential)	Fernando Formation (flat-lying; fine grained silty sand)	Turkey family (Meleagridae); Artiodactyla; Fish (*Seriphus, Squalus, Merluccius*, Cottidae, Moridae), invertebrate shell bed	Roadcut 11-25 feet above roadbed
LACM VP 3877	(confidential)	Palos Verdes Sand (silts and sands)	Toad (Bufo), pond frogs (Rana), tree frog (Hyla), whip snake (Masticophis), garter snake (Thamnophis), rattlesnake (Crotalus), kingsnake (Lampropeltis), salamander (Aneides), quail (Lophortyx), red-winged blackbird (Agelaius), crow (Corvus), hawk (Accipiter), duck (Aythya), bat (Antrozous), shrew (Notiosorex, Sorex), rabbit (Sylvilagus), pocket gopher (Thomomys), mice (Perognathus, Peromyscus, Reithrodontomys), kangaroo rat (Dipodomys), woodrat (Neotoma), vole (Microtus), skunk (Spilogale), horse (Equus), mastodon (Mammutidae)	Unknown

SOURCE: LACM, 2023

NOTES:

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

Fossil localities LACM VP 6370 and 6371 yielded fossil specimens of horse (*Equus*), unspecified mammals, invertebrates [clam (*Tivela, Donax, Lucinisca*)], scaphopod (*Dentalium, Antalis*), and marine gastropods (*Glossaulax, Chlorostoma*) within Pleistocene beach terrace deposits during grading for a parking lot at an unknown depth. Fossil locality LACM IP 4695 yielded fossil specimens of invertebrates, including clam (*Saxidomus*) and bryozoan (Bryozoa indet., *Conopeum*) within Palos Verdes Sand soils at an unknown depth. Fossil localities LACM VP 7712 and 7713 yielded fossil specimens of dugong clade (Dugongidae) and sloth (Mylodontidae?) within the Vaqueros Formation at an unknown depth.

Fossil localities LACM VP 4219 and LACM IP 31322 produced fossil specimens of the Camel family (Camelidae), sea turtle (Cheloniidae), uncatalogued fish and birds, and invertebrates (*Entobia, Lottia, Caesia, Volvania, Ala, Eulithidium, Chama, Glossaulax, Agathistoma, Sinum, Chlorostoma, Calianax, Ophidiodermella, Serpulorbis, Argopecten*) within Palos Verdes Sand deposits at 30 feet below ground surface (bgs). Fossil localities LACM VP 3977, 3978, 3986 and LACM IP 5092/5867 yielded fossil specimens of turkey family (Meleagridae), Artiodactyla, Fish (*Seriphus, Squalus, Merluccius*, Cottidae, Moridae), and an invertebrate shell bed within the Fernando Formation and within a roadcut at approximately 11 and 25 feet above a roadbed.

Fossil locality LACM VP 3877 produced fossil specimens of toad (Bufo), pond frogs (Rana), tree frog (Hyla), whip snake (Masticophis), garter snake (Thamnophis), rattlesnake (Crotalus), kingsnake (Lampropeltis), salamander (Aneides), quail (Lophortyx), red-winged blackbird (Agelaius), crow (Corvus), hawk (Accipiter), duck (Aythya), bat (Antrozous), shrew (Notiosorex, Sorex), rabbit (Sylvilagus), pocket gopher (Thomomys), mice (Perognathus, Peromyscus, Reithrodontomys), kangaroo

rat (Dipodomys), woodrat (Neotoma), vole (Microtus), skunk (Spilogale), horse (Equus), and mastodon (Mammutidae). All of these specimens were found within the Palos Verdes Sand at an unknown depth.

While these results shed light on the interesting interplay between marine and terrestrial deposits in the Miocene through Pleistocene, none of these formations are relevant to the Project as these units do not crop out in the area or would be found at substantial depth.

Paleontological Sensitivity Analysis

The geologic mapping review and the LACM records search results were used to assign paleontological sensitivity to the geologic units at surface and underlying the Project Site, following the guidelines of the SVP (2010):

Qya: Young alluvial valley deposits mantle the entire Project Site to an unknown depth. As alluvium in the valleys is likely less than 5,000 years old, the Qya is considered too young to contain fossils. Therefore, this unit is assigned a **Low Potential** to contain paleontological resources.

Qyf / Qof: Alluvial fan deposits of Pleistocene to Holocene age are not found directly in the Project Site but are found to the south and might be found at depth below the Qya. While alluvial fans typically do not host significant fossil resources, the older fan deposits are of the age to contain significant Ice Age fossils. Therefore, the Qyf / Qof is assigned a **Low Potential**, and the potential increases to High Potential at depth.

Conclusions and Recommendations

Based on the local geology—particularly the young age of the impacted sediments—excavation for the Project will not likely impact paleontological resources. If excavations exceed the thickness of the young alluvium, Pleistocene fan deposits may be encountered and they may contain fossils. However, the depth to the Pleistocene is currently unknown. Therefore, the following mitigation measures are recommended to reduce potential impacts to paleontological resources. These recommendations are based on the SVP (2010) procedural guidelines:

GEO-1: In the event an unanticipated fossil discovery is made during ground disturbing activities, construction activities shall halt in the immediate vicinity of the fossil, and the qualified professional paleontologist retained by the City shall be notified to evaluate the discovery, determine its significance, and evaluate whether additional mitigation or treatment is warranted. Work in the area of the discovery shall resume once the find is properly documented and authorization is given by the qualified paleontologist to resume construction work. Any significant paleontological resources found shall be prepared, identified, analyzed, and permanently curated in an approved regional museum repository. A final report shall be prepared by the qualified professional paleontologist that discusses fossil discoveries and will be submitted to the City of Irvine and the repository.

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Appendix A
Personnel

Kyle Garcia, M.A., RPA

Principal Archaeologist

EDUCATION

M.A., Anthropology (Archaeology Option), California State University Los Angeles,

B.A., Anthropology, (Physical/ Biological Emphasis), University of California, Santa Barbara

20 YEARS EXPERIENCE

CERTIFICATIONS/ REGISTRATION

Register of Professional Archaeologists

Riverside County Registered Archaeologist and Paleontologist

Orange County-Certified Archaeologist and Paleontologist

40-Hour HAZWOPER Training – Update, 2019

PROFESSIONAL AFFILIATIONS

Society for American Archaeology

Society for California Archaeology

Pacific Coast Archaeological Society

Kyle Garcia has 20 years of experience in the archaeology and prehistory of southern California, with a specialization in faunal analysis. During his career, he has authored or contributed to more than 900 projects subject to the requirements of the California Environmental Quality Act, the National Environmental Policy Act (NEPA), and regulations implementing Section 106 of the National Historic Preservation Act (Section 106 of the NHPA). He is well-versed in the archaeological resources of California's coastal, interior, and island settings. He is skilled in evaluation historic and prehistoric archaeological resources; agency and Native American consultation; pedestrian surveys, testing and evaluation excavations as well as archaeological and paleontological construction monitoring, and laboratory processing. During his tenure, he has authored or contributed to more than 500 technical reports and sections to support all levels of CEQA and NEPA documents. Kyle's portfolio of projects includes energy, water, and transportation infrastructure as well as residential, commercial, mixed-use, institutional, and urban redevelopment serving public and private sector clients. Kyle has conducted archaeological work throughout California and is a certified archaeologist and paleontologist in Riverside and Orange counties.

Representative Experience

Archaeological/Paleontological Monitoring. Kyle has managed more than 120 archaeological and/or paleontological construction monitoring projects in Los Angeles, Orange, Riverside, San Bernardino, and Ventura counties. His recent monitoring experience in Culver City for mixed-use development projects include Ivy Station, Culver Studios (9336 Washington Blvd), 8888 Washington Blvd, and 8777 Washington Bvld projects. His recent monitoring experience in the City of Los Angeles for mixed-use development projects include the Park Fifth Apartments (437 Hill St), Essex Hollywood (6250 Sunset Blvd), 6th and Virgil Project, 1500 Figueroa, 1340 Figueroa, and 10000 Santa Monica Blvd.

Paleontology. In addition to his archaeological work, Kyle has been cross-trained in paleontological mitigation monitoring and assisted in the excavations of a Miocene whale fossil near Irvine and a new species of extinct tuna in Laguna Niguel, California. Kyle has also managed or conducted more than 200 paleontological assessments and 40 paleontological monitoring projects throughout southern California. He has assisted ESA's paleontologists with the preparation of paleontological reports in compliance with CEQA and local paleontological guidelines, including guidelines for the Society for Vertebrate Paleontology.

Large-Scale Development Projects. Kyle directed the 1,400-acre field survey and the successful site recordation of over 150 prehistoric and historic archaeological resources per the Section 106 Process for a confidential project in

Riverside County; served as the Deputy Project Manager for the 240-acre Archaeological Treatment & Restoration Plan for The Cove project that was subject to Section 106, responsible for the field survey, Native American consultation, final report, and supervised the thorough recordation and documentation of over 350 significant artifacts. In Arizona, he led crews on a pedestrian survey and site recordation of more than 200 historic and prehistoric archaeological resources during a Class III Inventory on an 11,000-acre portion of the La Osa Ranch Project site in Pinal County.

Water Infrastructure. Kyle has performed the archaeological and paleontological resources surveys and assessments for a number of regional water infrastructure projects including the Reservoir No. 1 Reconstruction Project MND for Burbank; the Pasadena Groundwater Storage Program; and recycled water facilities projects for San Clemente, Pasadena, the Town of Rosamond, and Palmdale.

Transportation Infrastructure. Kyle is often sought after to conduct Peer Review services of controversial projects across southern California including the Needles Highway Safety Realignment Project for the County of San Bernardino, various infrastructure projects for Caltrans/San Bernardino Associated Governments, and the I-710 Corridor Project Environmental Impact Statement (EIS)/Environmental Impact Report (EIR) for the City of Commerce.

In addition to road projects, Kyle has provided archaeological and paleontological services—cultural resources assessments and monitoring—on and around the Los Angeles International Airport (LAX). Among these include the cultural resources assessment of the proposed concrete pad/apron area and staging area within the southwest portion of LAX, known as the Southwest Remain Overnight Apron Project/West Aircraft Maintenance Area Project. He was also the ESA PCR cultural resources task manager for the EIR and Archaeological/Paleontological Monitoring for the LAX Central Utility Plant Replacement Project. Finally, Kyle was the PCR project manager for the archaeological and paleontological monitoring services during earthmoving operations associated with the development of the Crossfield Taxiway project. Monitoring was in compliance with the mitigation measures outlined in the Master Plan EIS/EIR pursuant to CEQA, NEPA, and Section 106.

Energy Projects. Kyle is well-versed in the potential effects of energy production projects on Southern California Archaeology through his service as an on-call consultant to Southern California Edison (SCE), where he has served as the Project Director and Manager for over 100 SCE projects and managed SCE purchase order contracts in excess of $1.5 million. These projects were subject to requirements of CEQA, Section 106 of the NHPA, and other local ordinances. These projects included deteriorated pole replacements, conduit and vault installations, and distribution circuit installations (aboveground and underground) located throughout SCE's service area in Central and Southern California. Kyle not only managed the budgets and supervised the work for these projects but also conducted most of the record searches, surveys, report writing, site recordation, and client/agency coordination for these projects. In addition to his SCE work, Kyle was the project manager for a 150-acre ground-mounted solar

power project in San Bernardino County and assisted with a 245-acre confidential petroleum exploration project on California's Central Coast.

Education Facilities. Kyle's academic experience includes conducting cultural and paleontological records searches in support of an Initial Study/MND for the proposed John Thomas Dye School Improvement project in the Bel Air Community of the city of Los Angeles; the Long Beach Unified School District's District-Wide Cultural Resources Assessment; and the University High School Beautification project. In addition, Kyle has supervised ESA PCR staff paleontologists during paleontological monitoring services for the Stephen S. Wise Middle School Relocation project in the city of Los Angeles; he also supervised the subsequent fossil identification/analysis and final report preparation services for this project. These services have been conducted pursuant to a Mitigation Monitoring and Reporting Program that was established to implement the mitigation measures identified in the EIR for the project.

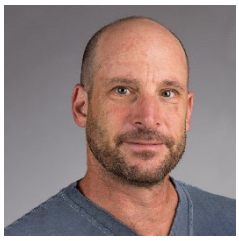
Cultural Resources Sensitivity Training. He is well-versed in conducting Cultural Resources Sensitivity Training Sessions to government staff, applicants, contractors, engineers, and construction personnel with regard to the procedures to implement in the event that archaeological or paleontological resources are encountered during construction.

Geographic Information Systems. Kyle has also gained valuable experience with recording historic and prehistoric archaeological sites with Garmin, Magellan, and sub-meter Trimble GeoXT Global Positioning System (GPS) units. He has worked with GIS software such as ArcPad, ArcGIS, and ArcView and developed methods for using these products to accurately and efficiently record archaeological sites.

Presentations. Kyle presented a paper at the 72nd Annual Meeting for the Society of American Archaeology Conference in Austin, Texas in 2007. The paper focused on prehistoric 'yoni' features encountered on a project site proposed to be developed in western Riverside County, California. The project was subject to requirements of CEQA and Section 106 of the NHPA. Kyle has also presented a poster at the Society of California Archaeology Conference in Fish Camp, California in 2016 titled *Urban Archaeology Strikes Again! - 250 Years of Los Angeles History and Archaeology Uncovered in One Downtown City Block*. Kyle also presented a paper on historic archaeology and CEQA at a 2015 workshop for the California Preservation Foundation in Los Angeles.

Russell S. Shapiro, PhD

Principal Investigator



EDUCATION

PhD, Geological Sciences, University of California, Santa Barbara

BS, Geology, Humboldt State University

25 YEARS' EXPERIENCE

CERTIFICATIONS/ REGISTRATION

U.S. Fish and Wildlife Cultural Resources Use Permit

U.S. Forest Service Cultural Resources Use Permit

Bureau of Land Management Cultural Resources Use Permit

Wilderness and Remote First Aid (Red Cross Certified)

PROFESSIONAL AFFILIATIONS

Geobiology Society; Treasurer

Society for Sedimentary Geology (SEPM); Vice-President

Society for Vertebrate Paleontology

As a principal investigator, Dr. Russell Shapiro has been involved in review of paleontological resource reports and evaluating proposed mitigation plans. Dr. Shapiro researches and prepares environmental impact reports regarding cultural resources (fossils), conducts field (geological and paleontological) surveys, and oversees ground disturbance at construction sites for Environmental Quality compliance (CEQA, NEPA, and the Paleontological Resources Preservation Act). As a Qualified Paleontologist, Dr. Shapiro has also reviewed resource planning documents for several counties in California and was the lead on the Bureau of Land Management's assessment of fossil resources of Northern California.

In his academic role as Professor of Geology, Dr. Shapiro teaches several paleontology courses including "Applied Paleontology" which is a modified "Cultural Resources" course, focusing on budgeting, CEQA and NEPA regulations, field surveys, GIS projections, fossil recovery, and curation. He also teaches in the annual Field Camp courses and manages the rock preparation lab and maintains the microscopes.

Relevant Experience

California Department of Water Resources, California Aqueduct Subsidence Program, Statewide, CA. *Paleontology.* The California Aqueduct Subsidence Program (CASP) is designed to rehabilitate and modernize this critical water infrastructure by addressing existing and future subsidence related effects on the Aqueduct in the SJFD and SLFD. Since 2019, ESA has been assisting DWR in developing and implementing strategies and compliance solutions supporting the continued operation of a reliable water conveyance infrastructure that is resilient to the effects of subsidence. Dr. Shapiro is providing oversight and review of paleontological resources analysis.

Cawelo Water District, Famoso Basin Pipeline Project CEQA and NEPA Compliance, Bakersfield, CA. *Paleontology.* The project involved constructing 2 miles of a buried intertie pipeline and a turnout at the Friant-Kern Canal. A key resource area for the project was the historical significance of the Friant-Kern Canal. Dr. Shapiro is providing oversight and review of paleontological resources analysis.

Rosedale-Rio Bravo Water Storage District and Irvine Ranch Water District, Kern Fan Groundwater Storage Project, Kern County, CA. *Paleontology*. ESA prepared the CEQA-Plus EIR for the Kern Fan Groundwater Storage Project located outside of Bakersfield in western Kern County. The project will be integrated into Rosedale's existing Conjunctive Use Program and will provide the Authority with additional recharge, storage capability and operational flexibility. The project has received a conditional award of funding through the California Water Commission's Water Storage Investment Program (WSIP), which is funded by the Proposition 1 Water Quality, Supply and Infrastructure Act of 2014. Pursuant to the award of funds under the WSIP, up to 25,000 AF of unallocated State Water Project Article 21 water would be stored for California Department of Water

Resources in an "Ecosystem Account" and would be used by the State of California to alleviate stress on endangered and threatened species in the Sacramento-San Joaquin River Delta. Dr. Shapiro provided oversight and review of paleontological resources analysis.

Santa Monica Mountains Conservancy, Topanga Lagoon Restoration Project EIR/EA, Santa Monica Mountains National Recreation Area, CA. *Paleontology.* The restoration planning for Topanga Lagoon included a review of existing data and additional data collection including hydrologic modeling, any technical studies/surveys needed to inform the restoration design; stakeholder engagement; and development of three integrated conceptual restoration design alternatives which addressed the ecological restoration of the lagoon, the alignment of a new PCH bridge, and enhanced visitor services in the project area. Dr. Shapiro is providing oversight and review of paleontological resources analysis.

Los Angeles Department of Water and Power, Operation NEXT and Hyperion 2035 Water Supply Program CEQA-Plus PEIR, Los Angeles County, CA. *Paleontology.* The City is proposing to implement a new recycled water infrastructure system that would maximize recycled water production at the Hyperion Water Reclamation Plant and construct new treatment, conveyance, storage, and distribution infrastructure to augment local water supplies by up to approximately a third of the city's water supply. ESA is currently preparing the Draft PEIR. The Operation NEXT and Hyperion 2035 Program PEIR is a CEQA-Plus document that has programmatic assessment of certain components. Dr. Shapiro provided oversight and review of paleontological resources analysis.

ReneSola Gentry Solar Project, Paleontological Resource Assessment Report, Lincoln, California. *Principal Investigator, Mapping*. Literature, geological map, and museum review for fossil resources. Field mapping of entire property. Final product included a mitigation and monitoring plan.

Paleontological Sensitivity Analysis Report, Elk Grove, California; Pacific Gas and Electric. *Principal Investigator*. Literature, geological map, and air photo archival report on the potential fossil yield for a proposed pipeline. Recommendations based on searches of museum collections of relevant geological formations. Deliverables consisted of a sensitivity report and appendix of known fossil occurrences by taxa and location.

Mojave Solar Project Cultural Services; San Bernardino County, California; CH2M Hill. *Principal Investigator.* Reviewed technical report; advised on scientific analyses.

El Camino Real Bridge Replacement Environmental Services; San Luis Obispo County, California, Quincy Engineering. *Principal Investigator*. Reviewed technical report for CEQA/NEPA documentation, technical studies, and permitting, for the replacement of the El Camino Real bridge over Santa Margarita Creek in Atascadero.

San Bernardino County General Plan Update: Paleontological Resources Technical Report. *Primary Reviewer***.** External reviewer for general plan update. Involved assessing all geological formations in San Bernardino County and museum records of significant fossils.

Recent Significant Excavations

Miocene Vertebrates of the Sheldon Wildlife National Refuge. Oversaw operations to conduct significant collection of Miocene-age fossils from volcanic sediments for the U.S. Fish and Wildlife Service. Duties included field collection and high-resolution GPS mapping, fossil preparation and identification, curation at the Gateway Science Museum.

Eocene Horses from Black Butte Lake Reservoir. Field jacketing and preparation of fossil horse skull material from the reservoir under the direction of the U.S. Army Corps of Engineers. Fossils were prepared, identified, and returned to the Army Corps for public display.

Russell S. Shapiro, PhD (Continued)

Principal Investigator

Pleistocene Camelid from Nevada. This project grew out of a paleontological resource assessment field survey. During the survey, a semi-articulated rear leg of a late Pleistocene camelid was collected and prepared. A manuscript was published in 2016.

Publications and Presentations

Shapiro, R. S., 2016, Camelid record of Mesquite Lake, California: impact of earliest Holocene climate change in Reynolds, R. E., ed., Going LOCO investigations along the Lower Colorado River, 2016 Desert Symposium Field Guide and Proceedings, p 41-47.

Shapiro, R. S. and Konhauser, K. O., 2014, Hematite-coated microfossils: Ecological fingerprint or taphonomic oddity of the Paleoproterozoic? Geobiology, v. 13, p. 209-224.

Shapiro, R. S. and Spangler, E., 2009, Bacterial fossil record in whale falls: relation of taphonomy and paleoecology to depositional environment: Palaeogeography, Palaeoclimatology, Palaeoecology, v. 274, p. 196-203.

Shapiro, R. S., Fricke, H., and Fox, K., 2009, Dinosaur-bearing oncoids from ephemeral lakes of the Lower Cretaceous Cedar Mountain Formation, Utah: PALAIOS, v. 24, p. 51-58.

Shapiro, R. S., and Rowland, S. M., 2002, Fossil collecting in southern Nevada in Rowland, S. M. and Orndorff, R. L., eds., Geology of the Southern Nevada Region: National Association of Geoscience Teachers, Far Western Section Spring Field Conference Guidebook, p. 96-99.

Shapiro, R. S., 1998, Paleogene-Early Neogene macrofossils of southwestern Santa Cruz Island in Weigand, P. W., ed., Contributions to the Geology of the Northern Channel Islands, Southern California: Pacific Section, American Association of Petroleum Geologists, MP-45, p. 123-132.