Appendix G.2

Paleontological Report
SWCA, 2021

Travertine SPA
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Technical Appendices

October 2023

Supplemental Paleontological Resources Assessment for the Travertine Development, City of La Quinta, Riverside County, California

NOVEMBER 2021

PREPARED FOR

Hofmann Land Development Company

PREPARED BY

SWCA Environmental Consultants

SUPPLEMENTAL PALEONTOLOGICAL RESOURCES ASSESSMENT FOR THE TRAVERTINE DEVELOPMENT, CITY OF LA QUINTA, RIVERSIDE COUNTY, CALIFORNIA

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SWCA Project No. 44489

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MANAGEMENT SUMMARY

Purpose and Scope: SWCA Environmental Consultants (SWCA) was retained by Hofmann Land Development Company (Hofmann) to provide an updated paleontological resources assessment in support of the proposed Travertine development project (Project) in the City of La Quinta, Riverside County, California. Hofmann proposes the development of the Travertine master planned resort community (Travertine) located on the southern edge of Coachella Valley at the base of the Santa Rosa Mountains. This study is intended to identify and describe paleontological resources that could be affected by ground-disturbing activities associated with the Project. The proposed Project is located on approximately 969.40 acres generally located between Avenue 60 to the north, Avenue 64 to the south, Coachella Valley Water District (CVWD) Dike No. 4 to the east, and Jefferson Street to the west (here, referred to as the "Travertine Area of Potential Effect" or "Travertine APE"). Possible locations for the CVWD well field and prospective IID substation area are also assessed (here, referred to as the "IID/CVWD Study Area"), which is located east of the Travertine APE on approximately 595.197 acres generally located between Avenue 58 to the north, Avenue 62 on the south, Calhoun Street on the east, and Almonte Drive and Monroe Street on the west. The Travertine APE and IID/CVWD Study Area make up the overall Project area. The depth of pre-construction ground-disturbances within the Project area consists of cut-fill grading to maximum depths of 50 feet below ground surface, with 5 feet of over-excavation throughout the central portion of the Project area and 4 feet of removal along the southern and western portions of the Project area. The following report documents the methods and results of an updated records search by the Natural History Museum of Los Angeles County (LACM) and an updated review of the scientific literature and geologic mapping of the Project area. As this updated desktop analysis indicates that the surficial sediments within the expanded area of the Project area have low paleontological potential, an additional field survey is not necessary for completion of this update to the paleontological resources assessment.

Regulatory Setting: The Project area is located on private land and lands managed by the Bureau of Reclamation (BOR) and the Bureau of Land Management (BLM), which constitutes a federal nexus; the BOR is the lead federal agency. This supplemental paleontological resources assessment was prepared pursuant to federal, state, and local regulations.

Dates of Investigation: The initial paleontological resources assessment, including field survey, was conducted by SWCA in 2007 (SWCA 2007). The updated museum records search results were received from the LACM on October 16, 2020.

Summary of Findings: Geologic mapping shows that the surficial geology of the Project area crosses multiple geologic units: alluvium, alluvial fans gravels, landslide deposits, and quartz diorite, as well as unmapped Lake Cahuilla beds underlying alluvial deposits at shallow depth. This study assessed the paleontological sensitivity of these units and assigned them BLM Potential Fossil Yield Classification (PFYC) rankings as follows: alluvium has PFYC 2 (Low) to PFYC 4 (High), increasing with depth; alluvial fan gravels have PFYC 2 (Low) to PFYC 3 (Moderate), increasing with depth; landslide deposits have PFYC 2 (Low); Lake Cahuilla Beds have PFYC 4 (High); and quartz diorite has PFYC 1 (Very Low).

Recommendations: Project-related ground-disturbing activities in the Project area will impact sediments to maximum depths of 50 feet below ground surface. While the surficial geology has low paleontological sensitivity, lacustrine sediments from Lake Cahuilla, which have a high paleontological sensitivity, are present in the subsurface at shallow depths. Disturbance or destruction of paleontological resources in the subsurface would constitute an adverse impact under both CEQA and NEPA. Therefore, this report contains measures designed to reduce potential impacts to less than significant levels in areas with high paleontological sensitivity. These measures include the following: retaining a qualified paleontologist to prepare and implement a Paleontological Monitoring and Mitigation Program that includes full-time paleontological monitoring of all excavations in previously undisturbed sediments with moderate or high paleontological sensitivity, implementing a Worker Environmental Awareness Program, and the salvage and museum curation of any significant fossils encountered during Project activities. If sediments observed during monitoring are not conducive to fossil preservation or have not yielded paleontological resources after half of the proposed earthwork has been completed, then full-time monitoring can be reduced to part-time inspections or ceased entirely if determined adequate by the Project Paleontologist. Regulatory compliance and adherence to these measures will reduce impacts of the Project to paleontological resources to a less than significant level.

Disposition of Data: This report will be on file with the Project applicant and SWCA's Pasadena Office.

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INTRODUCTION

SWCA Environmental Consultants (SWCA) was retained by Hofmann Land Development Company (Hofmann) to provide an updated paleontological resources assessment in support of the proposed Travertine development project (Project) in the City of La Quinta (City), Riverside County, California (Figure 1). This paleontological resources study is intended to characterize and describe the potential of the geologic units present at the surface and in the subsurface of the proposed Project to preserve paleontological resources that could be affected by ground-disturbing activities associated with the proposed Project. Hofmann proposes the development of the Travertine master planned resort community (Travertine) located on the southern edge of Coachella Valley at the base of the Santa Rosa Mountains. The proposed Project is located on approximately 969.40 acres generally located between Avenue 60 to the north, Avenue 64 to the south, Coachella Valley Water District (CVWD) Dike No. 4 to the east, and Jefferson Street to the west (here, referred to as the “Travertine Area of Potential Effect” or “Travertine APE”). Possible locations for the CVWD well field and prospective IID substation area are also assessed (here, referred to as the “IID/CVWD Study Area”), which is located east of the Travertine APE on approximately 595.197 acres generally located between Avenue 58 to the north, Avenue 62 on the south, Calhoun Street on the east, and Almonte Drive and Monroe Street on the west. The Travertine APE and IID/CVWD Study Area make up the overall Project area (Figure 2).

The Project area is located on private land and lands managed by the Bureau of Reclamation (BOR) and the Bureau of Land Management (BLM). This study was conducted pursuant to the National Environmental Policy Act of 1969, the Paleontological Resources Preservation Act of 2009, the Federal Land Policy and Management Act of 1976, and the National Historic Preservation Act of 1966. Additionally, the current study was conducted in compliance with the California Environmental Quality Act (CEQA), Public Resources Code (PRC) Division 5, Chapter 1.7, Section 5097.5, and Division 20, Chapter 3, Section 30244, and in compliance with the provisions established in the City of La Quinta and Riverside County General Plans.

This report documents the methods and results of an updated records search by the Natural History Museum of Los Angeles County (LACM) and an updated review of the scientific literature and geologic mapping of the Project area. As this updated desktop analysis indicates that the surficial sediments within the expanded area of the Project area have low paleontological potential, an additional field survey is not necessary for completion of this update to the paleontological resources assessment. This assessment conforms to the standards set by the BLM (2009) and the Society of Vertebrate Paleontology (SVP) (2010).

SWCA Cultural Resources Project Manager Mandi Martinez, M.A., Registered Professional Archaeologist, managed the Project. Paleontological Principal Investigator Alyssa Bell, Ph.D., and Paleontology Project Manager Mathew Carson, M.S., conducted the paleontological resources assessment and authored this report. This report was reviewed for quality assurance/quality control by Paleontological Principal Investigator Russell Shapiro, Ph.D. SWCA geographic information system specialist Marty Kooistra created all the figures. Copies of this report are on file with SWCA’s Pasadena Office.

REGULATORY SETTING

Paleontological resources are limited, nonrenewable resources of scientific, cultural, and educational value and are afforded protection under federal and state laws and regulations. This study satisfies Project requirements in accordance with federal, state, and local regulations, and was conducted as a means of characterizing the existing conditions in the Project area. This analysis also complies with guidelines and criteria specified by the SVP (2010) and the BLM (2009, 2016).

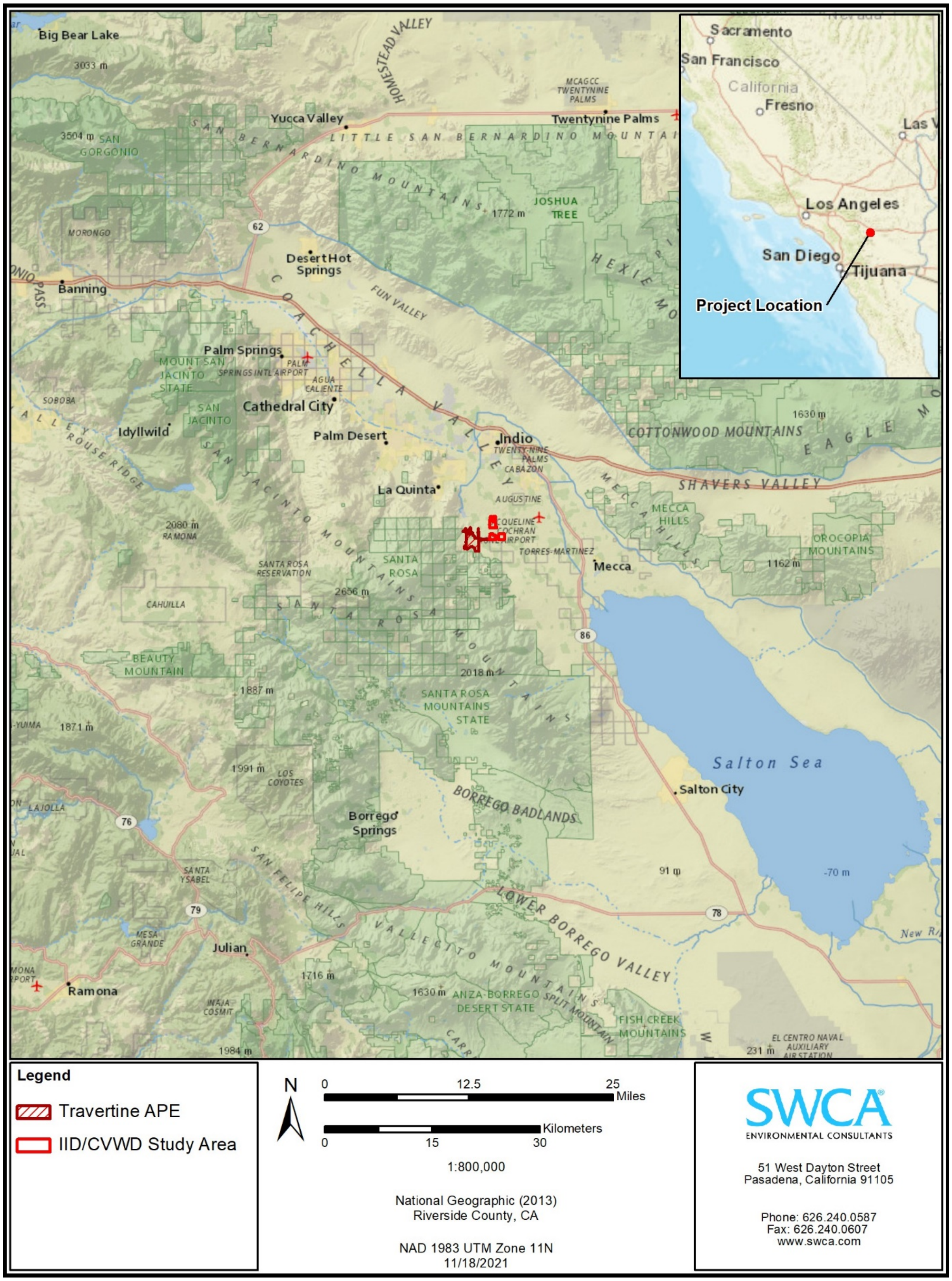

Figure 1. Project vicinity.

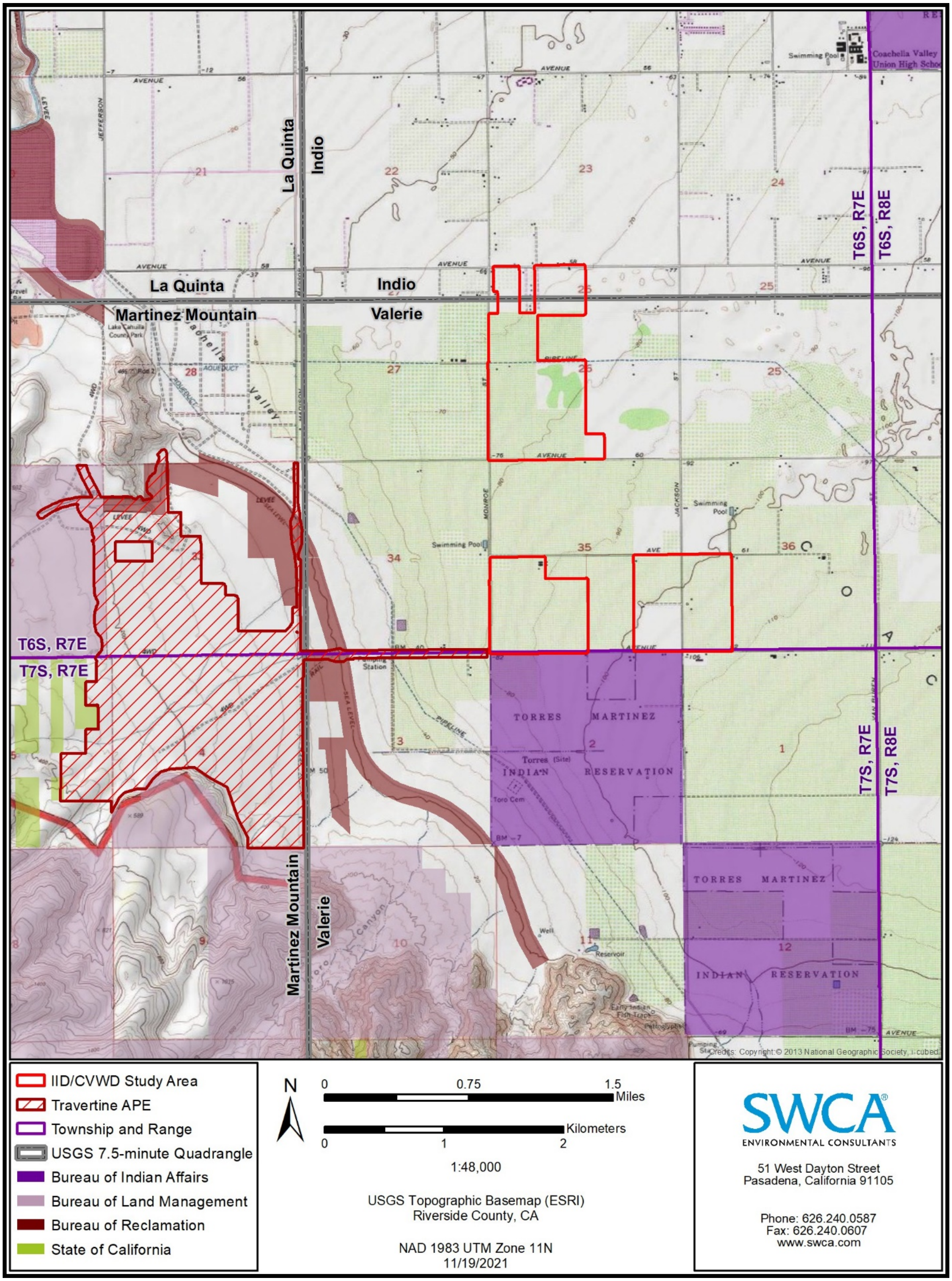

Figure 2. Project location.

Federal Regulations

Paleontological Resources Preservation Act, Public Law 111-011, Title VI, Subtitle D, 2009

This legislation directs the Secretaries of the U.S. Department of the Interior (USDI) and U.S. Department of Agriculture (USDA) to manage and protect paleontological resources on federal land using "scientific principles and expertise." To formulate a consistent paleontological resources management framework, the Paleontological Resources Preservation Act (PRPA) incorporates most of the recommendations from the report of the Secretary of the Interior titled "Assessment of Fossil Management on Federal and Indian Lands" (USDI 2000). In passing the PRPA, Congress officially recognized the scientific importance of paleontological resources on some federal lands by declaring that fossils from these lands are federal property that must be preserved and protected. The PRPA codifies existing policies of the BLM, National Park Service, U.S. Forest Service, BOR, and U.S. Fish and Wildlife Service, and provides the following:

- uniform criminal and civil penalties for illegal sale and transport and theft and vandalism of fossils from federal lands
- uniform minimum requirements for paleontological resource–use permit issuance (terms, conditions, and qualifications of applicants)
- uniform definitions for "paleontological resources" and "casual collecting"
- uniform requirements for curation of federal fossils in approved repositories

Federal Land Policy and Management Act of 1976

The Federal Land Policy and Management Act (FLPMA) of 1976 (43 United States Code [USC] 1712[c], 1732[b]); sec. 2, Federal Land Management and Policy Act of 1962 [30 USC 611]; Subpart 3631.0 et seq.), Federal Register Vol. 47, No. 159, 1982, does not refer specifically to fossils. However, "significant fossils" are understood and recognized in policy as scientific resources. Permits, which authorize the collection of significant fossils for scientific purposes, are issued under the authority of FLPMA. Under FLPMA, federal agencies are charged to:

- manage public lands in a manner that protects the quality of scientific, scenic, historical, ecological, environmental, air and atmospheric, archaeological, and water resources, and, where appropriate, preserve and protect certain public lands in their natural condition (Section 102 [a][8] [11]);
- periodically inventory public lands so that the data can be used to make informed land-use decisions (Section 102[a][2]); and
- regulate the use and development of public lands and resources through easements, licenses, and permits (Section 302[b]).

The National Environmental Policy Act of 1969

The National Environmental Policy Act of 1969, as amended (Public Law [PL] 91-190, 42 USC 4321–4347, January 1, 1970, as amended by PL 94-52, July 3, 1975, PL 94-83, August 9, 1975, and PL 97-258 4(b), Sept. 13, 1982) recognizes the continuing responsibility of the federal government to "preserve important historic, cultural, and natural aspects of our national heritage…" (Sec. 101 [42 USC 4321]) (#382). The passage of the PRPA in 2009 made paleontological resources a significant resource, and it is therefore now standard practice to include paleontological resources in NEPA studies in all instances where there is a possible impact.

National Historic Preservation Act of 1966

The National Historic Preservation Act of 1966, as amended through 1992 (PL 91-243, PL 93-54, PL 94-422, PL 94-458, PL 96-199, PL 96-244, PL 96-515, PL 98-483, PL 99-514, PL 100-127, and PL 102-575), establishes that the federal government shall partner with states, local governments, Indian tribes, and private organizations and individuals to protect and manage both federally and non-federally owned historic and prehistoric resources.

Antiquities Act of 1906

The Antiquities Act of 1906 (16 USC 431-433) states, in part:

> That any person who shall appropriate, excavate, injure or destroy any historic or prehistoric ruin or monument, or any object of antiquity, situated on lands owned or controlled by the Government of the United States, without the permission of the Secretary of the Department of the Government having jurisdiction over the lands on which said antiquities are situated, shall upon conviction, be fined in a sum of not more than five hundred dollars or be imprisoned for a period of not more than ninety days, or shall suffer both fine and imprisonment, in the discretion of the court.

Although there is no specific mention of natural or paleontological resources in the Act itself, or in the Act's uniform rules and regulations (Title 43 Part 3, Code of Federal Regulations), the term "objects of antiquity" has been interpreted to include fossils by the National Park Service, BLM, U.S. Forest Service, and other federal agencies. Permits to collect fossils on lands administered by federal agencies are authorized under this Act. However, due to the large gray areas left open to interpretation due to the imprecision of the wording, agencies are hesitant to interpret this act as governing paleontological resources.

State Regulations

California Environmental Quality Act (CEQA)

CEQA is the principal statute governing environmental review of projects occurring in the state and is codified at Public Resources Code (PRC) Section 21000 et seq. CEQA requires lead agencies to determine if a proposed project would have a significant effect on the environment, including significant effects on paleontological resources. Guidelines for the Implementation of CEQA, as amended December 1, 2016 (Title 14, Chapter 3, California Code of Regulations 15000 et seq.), define procedures, types of activities, persons, and public agencies required to comply with CEQA. Section VII(f) of the Environmental Checklist asks whether a project would directly or indirectly destroy a unique paleontological resource and result in impacts to the environment.

Public Resources Code (PRC) Section 5097.5

Requirements for paleontological resource management are included in the PRC Division 5, Chapter 1.7, Section 5097.5, and Division 20, Chapter 3, Section 30244, which states:

> 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.

These statutes prohibit the removal, without permission, of any paleontological site or feature from lands under the jurisdiction of the state or any city, county, district, authority, or public corporation, or any agency thereof. Consequently, local agencies are required to comply with PRC 5097.5 for their own activities, including construction and maintenance, as well as for permit actions (e.g., encroachment permits) undertaken by others. PRC Section 5097.5 also establishes the removal of paleontological resources as a misdemeanor and requires reasonable mitigation of adverse impacts to paleontological resources from developments on public (state, county, city, and district) lands.

Local Regulations

City of La Quinta General Plan

The Natural Resources Element of the City of La Quinta 2035 General Plan (City of La Quinta 2013) contains one goal pertinent to the protection of paleontological resources with the City of La Quinta's Sphere of Influence. Goal CUL-1 requires the protection of significant archaeological, historic, and paleontological resources which occur in the City. Within Goal CUL-1, three policies ensure the consideration of paleontological resources:

- **Policy CUL-1.3:** Educate the public about the City's history and paleontology.
  - **Program CUL-1.3.b:** Continue to support efforts at curation and exhibition of the City's history.
  - **Program CUL-1.3.c:** Consider expanding collections to include paleontological resources.
  - **Program CUL-1.3.d:** Encourage the Desert Sands and Coachella Unified School Districts to include local history and paleontology in their curricula.
- **Policy CUL-1.4:** Make all reasonable efforts to identify paleontological resources in the City.
  - **Program CUL-1.4.a:** Any development application for a vacant site located on soils identified as Lake Cahuilla Beds or Pleistocene shall be accompanied by a Phase I paleontological analysis conducted by a qualified geologist or paleontologist.
  - **Program CUL-1.4.b:** As part of the geotechnical analysis conducted for grading and building permits, soil borings shall be examined by a qualified geologist or paleontologist to assure that no Pleistocene or older soils occur at depth in areas to be excavated. Monitoring shall be required if Pleistocene or older soils will be impacted by excavations.
- **Policy CUL-1.5:** All reasonable efforts should be made to preserve paleontological resources in the City.
  - **Program CUL-1.5.a:** Significant paleontological resources identified on a site shall be professionally collected, catalogued, and deposited with a recognized repository.

City of La Quinta Municipal Code

Title 7 of the Historical Preservation of the La Quinta Municipal Code, Ordinance 238, Chapter 7.06: Historic Resources, Historic Landmarks and Historic Districts establishes that City Council shall establish and maintain a historic resources inventory according to the requirements of the State Historic Preservation Office. Criteria for inclusion in the history resources inventory includes archaeological, paleontological, botanical, geological, topographical, ecological, and geographical sites that have the potential to yield information of scientific value (City of La Quinta 1993).

METHODS

The following section presents an overview of the methodology used to identify the potential for paleontological resources within the Project area. This report is based on a desktop review of available scientific literature, geologic maps, a records search from the LACM, and a review of the University of California Museum of Paleontology's (UCMP) online collections database. A paleontological pedestrian field survey was conducted in 2007 by SWCA; therefore, the results of a new paleontological pedestrian field survey was not included as part of this assessment. This report conforms to industry standards as developed by the SVP (2010) and the BLM (2009, 2016) and as described in Murphey et al. (2019). The purpose of this analysis is to 1) determine whether any previously recorded fossil localities occur in the Project area; 2) assess the potential for disturbance of any such localities during construction; and 3) evaluate the paleontological sensitivity of all geologic units present in the Project area.

Definition and Significance of Paleontological Resources

Paleontology is a multidisciplinary science that combines elements of geology, biology, chemistry, and physics in an effort to understand the history of life on earth. Paleontological resources, or fossils, are the remains, imprints, or traces of once-living organisms preserved in rocks and sediments. These include mineralized, partially mineralized, or un-mineralized bones and teeth, soft tissues, shells, wood, leaf impressions, footprints, burrows, and microscopic remains. Paleontological resources include not only the fossils themselves, but also the physical characteristics of the fossils' associated sedimentary matrix.

The loss of any identifiable fossil that could yield information important to prehistory, or that embodies the distinctive characteristics of a type of organism, environment, period of time, or geographic region, would be a significant environmental impact. Direct impacts on paleontological resources primarily concern the potential destruction of nonrenewable paleontological resources and the loss of information associated with these resources. This includes the unauthorized collection of fossil remains. If potentially fossiliferous bedrock or surficial sediments are disturbed, the disturbance could result in the destruction of paleontological resources and subsequent loss of information (a significant impact). At the project-specific level, direct impacts can be reduced to a less than significant level through the implementation of paleontological mitigation.

Numerous paleontological studies have developed criteria for the assessment of significance for fossil discoveries (e.g., Eisentraut and Cooper 2002; Murphey et al. 2019; Scott and Springer 2003). 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.

Professional Standards

Both the SVP (2010) and the BLM (2009, 2016) have established standard guidelines 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 laws, ordinances, regulations, and standards accept and use the professional standards set forth by the SVP to meet the requirements of CEQA. The BLM's paleontological guidelines are designed to meet the requirements of NEPA and the FLPMA and are in general only relevant to projects on BLM land or under the oversight of the BLM.

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

As defined by the BLM (2009:19), significant paleontological resources are:

> …any paleontological resource that is considered to be of scientific interest, including most vertebrate fossil remains and traces, and certain rare or unusual invertebrate and plant fossils. A significant paleontological resource is considered to be scientifically important because it is a rare or previously unknown species, it is of high quality and well-preserved, it preserves a previously unknown anatomical or other characteristic, provides new information about the history of life on earth, or has identified educational or recreational value. Paleontological resources that may be considered to not have paleontological significance include those that lack provenience or context, lack physical integrity because of decay or natural erosion, or that are overly redundant or are otherwise not useful for research. Vertebrate fossil remains and traces include bone, scales, scutes, skin impressions, burrows, tracks, tail drag marks, vertebrate coprolites (feces), gastroliths (stomach stones), or other physical evidence of past vertebrate life or activities.

These definitions of significant resources are similar in that both recognize that any type of fossil (invertebrate, vertebrate, plant, or trace fossils) can be scientifically significant if it is identifiable or well preserved and contributes scientifically valuable data.

A geologic unit known to contain significant fossils is considered sensitive to adverse impacts if there is a high probability that earth-moving or ground-disturbing activities in that rock unit will either disturb or destroy fossil remains directly or indirectly. This definition of sensitivity differs fundamentally from the definition for archaeological resources as follows:

> It is extremely important to distinguish between archaeological and paleontological resources when discussing the paleontological potential of rock units. The boundaries of an archaeological resource site define the areal/geographic extent of an archaeological resource, which is generally independent from the rock unit on which it sits. However, paleontological sites indicate that the containing rock unit or formation is fossiliferous.

> Therefore, the limits of the entire rock unit, both areal and stratigraphic, define the extent of paleontological potential (SVP 2010).

Many archaeological sites contain features that are visually detectable on the surface. In contrast, fossils are often contained within surficial sediments or bedrock and are therefore not observable or detectable unless exposed by erosion or human activity.

In summary, paleontologists cannot know either the quality or quantity of fossils prior to natural erosion or human-caused exposure. As a result, even in the absence of fossils on the surface, 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 the study area) or 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 these remains are significant, successful mitigation and salvage efforts may be undertaken in order to prevent adverse impacts to these resources.

BLM Potential Fossil Yield Classification

The Potential Fossil Yield Classification (PFYC) system was developed to provide baseline guidance for assessing paleontological resources and allow BLM employees to make initial assessments of paleontological resources. The presence of paleontological resources is correlated with mapped geologic units, and the PFYC was based on available geologic maps. The system assigns a class value to each geological unit, representing the potential abundance and significance of paleontological resources that occur in that geological unit. A complete discussion of the background and context for the PFYC system is provided in the BLM (2016) IM2016-124 document. The following descriptions of paleontological sensitivity class rankings pertinent to this project and drawn directly from the BLM Guidelines are provided here:

> **Class 1–Very Low**. Geologic units that are not likely to contain recognizable paleontological resources. Units assigned to Class 1 typically have one or more of the following characteristics:
>
> - Geologic units are igneous or metamorphic, excluding air-fall and reworked volcanic ash units.
> - Geologic Units are Precambrian in age.
>
>   (1) Management concerns for paleontological resources in Class 1 units are usually negligible or not applicable.
>
>   (2) Paleontological mitigation is unlikely to be necessary except in very rare or isolated circumstances that result in the unanticipated presence of paleontological resources, such as unmapped geology contained within a mapped geologic unit. For example, young fissure-fill deposits often contain fossils but are too limited in extent to be represented on a geological map; a lava flow that preserves evidence of past life, or caves that contain important paleontological resources. Such exceptions are the reason that no geologic unit is assigned a Class 0.
>
>   Overall, the probability of impacting significant paleontological resources is very low and further assessment of paleontological resources is usually unnecessary. An assignment of Class 1 normally does not trigger further analysis unless paleontological resources are known or found to exist. However, standard stipulations should be put in place prior to authorizing any land use action in order to accommodate an unanticipated discovery.

Class 2–Low. Geologic units that are not likely to contain paleontological resources. Units assigned to Class 2 typically have one or more of the following characteristics:

- Field surveys have verified that significant paleontological resources are not present or are very rare.
- Units are generally younger than 10,000 years before present.
- Recent aeolian deposits.
- Sediments exhibit significant physical and chemical changes (i.e., diagenetic alteration) that make fossil preservation unlikely.

  (1) Except where paleontological resources are known or found to exist, management concerns for paleontological resources are generally low and further assessment is usually unnecessary except in occasional or isolated circumstances.

  (2) Paleontological mitigation is only necessary where paleontological resources are known or found to exist.

  The probability of impacting significant paleontological resources is low. Localities containing important paleontological resources may exist, but are occasional and should be managed on a case-by-case basis. An assignment of Class 2 may not trigger further analysis unless paleontological resources are known or found to exist. However, standard stipulations should be put in place prior to authorizing any land use action in order to accommodate unanticipated discoveries.

Class 3–Moderate. Sedimentary geologic units where fossil content varies in significance, abundance, and predictable occurrence. Units assigned to Class 3 have some of the following characteristics:

- Marine in origin with sporadic known occurrences of paleontological resources.
- Paleontological resources may occur intermittently, but abundance is known to be low.
- Units may contain significant paleontological resources, but these occurrences are widely scattered.
- The potential for an authorized land use to impact a significant paleontological resource is known to be low-to-moderate.

  (1) Management concerns for paleontological resources are moderate because the existence of significant paleontological resources is known to be low. Common invertebrate or plant fossils may be found in the area, and opportunities may exist for casual collecting.

  (2) Paleontological mitigation strategies will be proposed based on the nature of the proposed activity.

  This classification includes units of moderate or infrequent occurrence of paleontological resources. Management considerations cover a broad range of options that may include records searches, pre-disturbance surveys, monitoring, mitigation, or avoidance. Surface-disturbing activities may require assessment by a qualified paleontologist to determine whether significant paleontological resources occur in the area of a proposed action, and whether the action could affect the paleontological resources.

Class 4–High. Geologic units that are known to contain a high occurrence of paleontological resources. Units assigned to Class 4 typically have the following characteristics:

- Significant paleontological resources have been documented, but may vary in occurrence and predictability.

- Surface-disturbing activities may adversely affect paleontological resources.
- Rare or uncommon fossils, including nonvertebrate (such as soft body preservation) or unusual plant fossils, may be present.
- Illegal collecting activities may impact some areas.

  (1) Management concerns for paleontological resources in Class 4 are moderate to high, depending on the proposed action.

  (2) Paleontological mitigation strategies will depend on the nature of the proposed activity, but field assessment by a qualified paleontologist is normally needed to assess local conditions.

  The probability for impacting significant paleontological resources is moderate to high, and is dependent on the proposed action. Mitigation plans must consider the nature of the proposed disturbance, such as removal or penetration of protective surface alluvium or soils, potential for future accelerated erosion, or increased ease of access that could result in looting. Detailed field assessment is normally required, and on-site monitoring or spot-checking may be necessary during land-disturbing activities. In some cases, avoidance of known paleontological resources may be necessary.

Class 5–Very High. Highly fossiliferous geologic units that consistently and predictably produce significant paleontological resources. Units assigned to Class 5 have some or all of the following characteristics:

- Significant paleontological resources have been documented and occur consistently.
- Paleontological resources are highly susceptible to adverse impacts from surface-disturbing activities.
- Unit is frequently the focus of illegal collecting activities.

  (1) Management concerns for paleontological resources in Class 5 areas are high to very high.

  (2) A field survey by a qualified paleontologist is almost always needed. Paleontological mitigation may be necessary before or during surface-disturbing activities.

  The probability for impacting significant paleontological resources is high. The area should be assessed prior to land tenure adjustments. Pre-work surveys are usually needed, and on-site monitoring may be necessary during land use activities. Avoidance or resource preservation through controlled access, designation of areas of avoidance, or special management designations should be considered.

Class U–Unknown Potential. Geologic units that cannot receive an informed PFYC assignment. Characteristics of Class U may include:

- Geological units may exhibit features or preservational conditions that suggest significant paleontological resources could be present, but little information about the actual paleontological resources of the unit or area is known.
- Geological units represented on a map are based on lithologic character or basis of origin, but have not been studied in detail.
- Scientific literature does not exist or does not reveal the nature of paleontological resources.
- Reports of paleontological resources are anecdotal or have not been verified.
- Area or geologic unit is poorly or under-studied.

- BLM staff has not yet been able to assess the nature of the geologic unit.
  (1) Until a provisional assignment is made, geologic units that have an unknown potential have medium to high management concerns.
  (2) Lacking other information, field surveys are normally necessary, especially prior to authorizing a ground-disturbing activity.

  An assignment of “Unknown” may indicate the unit or area is poorly studied, and field surveys are needed to verify the presence or absence of paleontological resources. Literature searches or consultation with professional colleagues may allow an unknown unit to be provisionally assigned to another Class, but the geological unit should be formally assigned to a Class after adequate survey and research is performed to make an informed determination.

RESULTS

Geological Setting

The Project area is located along the southwestern margin of the Coachella Valley, west-northwest of the Salton Sea. The Coachella Valley is located at the northernmost extent of the Salton Trough, an active rift valley that extends to the southeast, including the Imperial Valley in California and the west half of the Mexicali Valley and the Colorado River delta in Mexico. Formed by rifting along the East Pacific Rise, the structure of the Salton Trough today is largely a product of ongoing tectonic activity within the San Andreas fault system (Alles 2004; Buckles et al. 2002). The strike-slip fault system runs from central to southern California and forms the eastern wall of the Salton Trough. The San Andreas fault system terminates at the Brawley seismic zone, a spreading center in the southeastern corner of the Salton Sea (Alles 2004). This spreading center accounts for all the active seismicity in the region, is responsible for a large number of young volcanic and geothermal features, and formed pull-apart basins on both sides of the international border (Norris and Webb 1990). The western wall of the Salton Trough is formed by the highly active San Jacinto fault zone and the Elsinore fault zone, which is historically much less active than either the San Andreas or San Jacinto fault zones.

The divergence along the East Pacific Rise that created the Gulf of California began in the late Miocene, between 5 and 10 million years ago (Ma). This activity coincided with an uplift of the Colorado Plateau, which strengthened the flow of the Colorado River, allowing it to carry more sediment. Throughout the Pliocene, the Colorado River carried more sediments, which resulted in formation of the Colorado River Delta. The subsequent delta dammed flow to the gulf during the Pleistocene, resulting in drainage into the Salton Trough. The trough was episodically inundated by marine water during the Pliocene and Pleistocene and fresh water during the Holocene, the last lake cycle of which formed Lake Cahuilla, believed to have existed intermittently from 470 years before present (BP) to approximately 6,000 years BP (Van de Kamp 1973; Waters 1983; Whistler et al. 1995). Around the margins of the Salton Trough, at approximately 40 feet above mean seal level, the ancient highstand shoreline of Lake Cahuilla is visible. At this elevation, the water depth of Lake Cahuilla would have been approximately 300 feet. The 40-foot level of Lake Cahuilla was most likely established by the crest of the Colorado River delta. Evidence for this lake level is visible at Travertine Rock on the western margin of the Salton Trough, where 30-inch-thick travertine deposits indicate that the 40-foot water level persisted for a long period of time. Older discontinuous terrace deposits within the Salton Trough indicate the existence of other large lakes that may have been connected to the Gulf of California prior to the existence of Lake Cahuilla. The Salton Sea, which occupies the center of the Salton Trough today, is not a remnant of Lake Cahuilla, but rather resulted from an irrigation canal accident that diverted the full flow of the Colorado River into the Salton Trough for two years between 1905 and 1907 (Alles 2004).

The Coachella Valley floor is made up of alluvium derived from the San Bernardino Mountains to the west, north, and northeast, and the San Jacinto Mountains and Santa Rosa Mountains to the southwest. These sediments date from the Holocene (recent to 11,700 years ago) and overlie the older lacustrine sediments from Lake Cahuilla and the other, older, lakes that occupied the Salton Trough.

Geology and Paleontology of the Project Area

The geology of the Project area has been mapped at a scale of 1:62,500 by Dibblee and Minch (2008), as shown in Figure 3. Four geologic units are mapped in the Project area at the surface, plus one geologic unit present (but unmapped) in the subsurface. These units and their paleontological sensitivity are described below and shown in Table 1.

Alluvium (Qa). The majority of the surface of the Project area consists of Quaternary alluvium of Holocene age (11,700 years BP to Recent). Alluvium is composed of gravel, sand, silt, and clay-sized sediments derived from the surrounding highlands. Locally, these sediments are associated with deposition along or above the ancient Lake Cahuilla shoreline. Based on SVP (2010) guidelines, deposits younger than 5,000 years BP are too young to contain fossils, although they may contain cultural and biological remains; however, they overlie older sediments that may preserve fossil resources.

While the exact depth at which the transition to older (greater than 5,000 years BP) sediments is not known, fossils have been discovered in unnamed and named Pleistocene older alluvial sediments within Riverside County, including in the Coachella Valley, at depths as shallow as 1.5 to 3 m (5–10 feet) below ground surface (Jefferson 1991a, 1991b; Miller 1971; Scott 2010; Scott and Cox 2008; University of California Museum of Paleontology 2021). The closest fossil localities to the Project area were discovered in Lake Cahuilla beds underlying younger alluvium at depths of 1.5 to 4 m approximately 3 km to the north-northwest of the Project area (see description below). Therefore, Holocene alluvium may immediately overlie Lake Cahuilla deposits in some areas and/or transition to late Pleistocene alluvium or older geologic units in other areas at depths as shallow as 1.5 m.

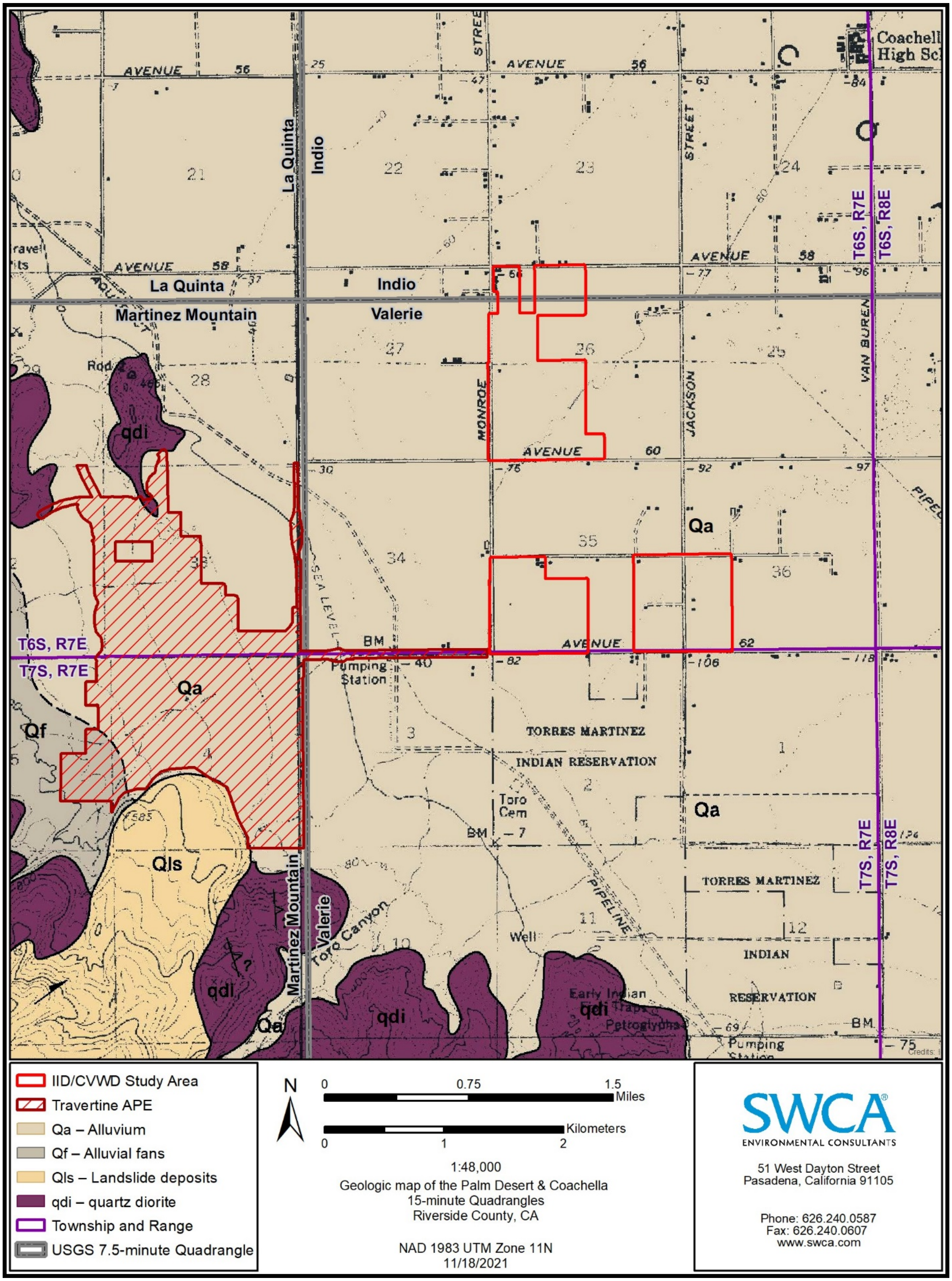

Figure 3. Geologic map of the Project area, after Dibblee and Minch (2008).

Table 1. Geologic Units Underlying the Project Area

Formation	Abbreviation (Figure 3)	BLM PFYC	Presence in the Project Area
Alluvium	Qa	Low (PFYC 2) to High (PFYC 4), increasing with depth	Across the majority of the surface of the Project area
Alluvial Fan Gravels	Qf	Low (PFYC 2) to Moderate (PFYC 3), increasing with depth	Southwest Project area
Landslide Deposits	Qls	Low (PFYC 2)	Southern margin of the Project area
Lake Cahuilla Beds	-	High (PFYC 4)	Subsurface
Quartz Diorite	qdi	Very Low (PFYC 1)	Northwest Project area

The records of the LACM indicate numerous fossil localities are known from older alluvial deposits in the region, including three unspecified specimens collected from Thermal, approximately 11 km northeast of the Project area (LACM 2020); invertebrates collected from the vicinity of Mecca and 17 km south-east of the Project area. Additional localities are known from older units that may underlie the alluvium (Table 2).

Table 2. LACM Fossil Localities Nearest the Project Area

Locality Number	Location	Approximate Distance to Project Area	Formation	Taxa
LACM VP 6255, 6256; LACM IP 16830, 474	PGA West: Tom Weiskopf golf course	3 km N-NW	Lake Cahuilla Beds (Holocene)	Ostracods; fringe-toed lizard (*Uma*); rodents (*Ammospermophilus, Perognathus*); bighorn sheep (*Ovis canadensis*); invertebrates
LACM IP 17946	Northwest corner of Calhoun St. and Ave. 54	6 km NE	Lake Cahuilla Beds (Holocene)	Invertebrates
LACM IP 4776	Thermal, Coachella Valley	11 km NE	Unknown formation (Pleistocene)	Three species of vertebrates, unspecified
LACM IP 4770, 4775	3.2 km south of Mecca	17 km SE	Unknown formation (Pleistocene)	Invertebrates
LACM VP 6921	Box Canyon, Mecca Hills	24 km E	Unknown Formation (Middle Pleistocene, possible Palm Spring or Borrego Formations; coarse sandstone with interbedded grey silts and shales)	Unidentified vertebrates
LACM VP 1269	Near intersection of Varner Road and Edom Hill Road	35 km NW	Unknown formation (Pleistocene)	Unspecified vertebrates

Ice Age sediments like these have a rich fossil history in southern California (Hudson and Brattstrom 1977; Jefferson 1991a, 1991b; McDonald and Jefferson 2008; Miller 1971; Roth 1984; Scott 2010; Scott and Cox 2008; Springer et al. 2009). The most common Pleistocene terrestrial mammal fossils include the bones of mammoth, horse, bison, camel, and small mammals, but other taxa, including lion, cheetah, wolf, antelope, peccary, mastodon, capybara, and giant ground sloth, have been reported (Graham and Lundelius 1994), as well as birds, amphibians, and reptiles such as frogs, salamanders, snakes, and turtles (Hudson and Brattstrom 1977). In addition to illuminating the striking differences between southern

California in the Pleistocene and today, this abundant fossil record has been vital in studies of extinction (e.g., Sandom et al. 2014; Scott 2010), ecology (e.g., Connin et al. 1998), and climate change (e.g., Roy et al. 1996; Shapiro 2016).

An excellent example of the striking abundance and diversity of these Pleistocene sediments comes from Diamond Valley Lake near Hemet, where nearly 100,000 significant fossil specimens representing 105 vertebrate, invertebrate, and plant species were collected from more than 2,000 individual localities in a mix of older alluvial sediments and buried lacustrine sediments during the construction of the dam at Diamond Valley Lake (Springer et al. 2009) and are now housed at the Western Science Center in Hemet, California. This site represents the second largest late Pleistocene fossil assemblage known from the American Southwest, after the La Brea Tar Pits in Los Angeles (Springer et al. 2009). Other Ice Age fossils have been found throughout the inland valleys (Miller 1971; Reynolds and Reynolds 1991; Reynolds et al. 2012) and the Mojave Desert (Jefferson 1987, 1988; Scott et al. 2004; Scott et al. 2006; Scott and Cox 2008; Shapiro 2016). Therefore, alluvium is assigned Low (PFYC 2) to High (PFYC 4) sensitivity, increasing in depth.

Alluvial Fan Gravel (Qf). An alluvial fan is present in the southwestern portion of the Project area where Guadalupe Creek emerges from the mountains. Alluvial fans are semi-conical landforms with slopes of 2 to 20 degrees that form at the transition from highlands to lowlands through the deposition of sediments (Williams et al. 2006). The development of alluvial fans is controlled by an array of factors, including tectonic setting, climate, sediment availability, and hydrologic regimes, but in general fans fall on a spectrum from fans formed primarily from gravity-controlled debris flows to fans formed under primarily fluvial deposition, with many fans exhibiting a combination of these processes over time (Williams et al. 2006).

Alluvial fans trap the bulk of the coarse-grained, poorly sorted sediment that is eroded from the highlands, thus serving as buffers for lowland areas, limiting the sediment supply to fine-grained sediment (Harvey et al. 2005). Within the fan, grain size decreases downslope, such that the coarsest sediments are found at the apex of the fan near the channel in the highlands, with progressively finer sediments deposited toward the toe of the fan where it meets the basin or valley floor (Blair and McPherson 1994). Similarly, the cross-section of the fan will show fine sediments buried under coarser sediments, with the older fines deposited at what was the fan’s toe slope and later covered by increasingly coarse sediment as the fan prograded outward from the source. While the fan in the Project area is too young to preserve fossils at the surface, within the fan sediments increase in age and may be old enough to preserve fossil resources. The types of fossils that could be preserved within the fan sediments are the same as those described for older alluvium above. Therefore, alluvial fan sediments are assigned Low (PFYC 2) to Moderate (PFYC 3) sensitivity, increasing in depth.

Landslide Deposits (Qls). Landslide deposits are present along the southern margin of the Project area, emanating from the peak of Martinez Mountain to the southwest. Landslide deposits consist of rock rubble composed of quartz diorite clasts (see below) and other rock fragments, derived primarily from erosion of the neighboring highlands and transportation downslope via gravity-controlled debris flow. Landslide rubble tends to be heavily brecciated with a mixture of grain sizes due to the high energy in which such sediments are deposited. Unlike alluvial fans, landslide deposits often have a bouldery front near the head of the debris flow and a relatively finer-grained tail (Pánek 2021). The Project area is situated along the head of the former debris flow, with large boulders and rubble situated along the southern margin of the Project area. Therefore, landslide deposits are assigned a Low (PFYC 2) sensitivity.

Lake Cahuilla Beds. Although not mapped at the surface within the Project area, early to middle Holocene age sediments of Lake Cahuilla may be present at relatively shallow depth near its ancient shoreline located along the eastern property boundary (Scott 2007). These fluvial and lacustrine Lake Cahuilla Beds comprise a thick sequence of tan and gray fossiliferous clay, silt, sand, and gravel in conjunction with alluvium (Morton 1966, 1977). The fluvial component of the Lake Cahuilla Beds was deposited during intervening lake lowstands (Whistler et al. 1995), and are generally composed of thinly bedded, poorly sorted, fine-grained, light grayish-brown, fluvial sandstone. The lacustrine mudstone is generally massive, poorly sorted sand and silt that is often highly bioturbated.

Paleosalinity data derived from fossil mollusk shells indicate that the last natural filling of Lake Cahuilla occurred around 1500 A.D. (Bowersox 1974). The most abundant molluscan taxa, *Tryonia protea, Fontelicella longinqua,* and *Physa humerosa,* are characteristic of shallow water lakes in the Colorado Desert with sandy and muddy bottoms and abundant aquatic vegetation (Bowersox 1974). Fossil remains of diatoms, land plants, sponges, ostracods, mollusks, fish, and small terrestrial vertebrates have been recovered from the Lake Cahuilla Beds (Whistler et al. 1995). In their study at La Quinta, Whistler et al. (1995) reported that the terrestrial vertebrate remains they collected include small desert animals very similar to the fauna that currently inhabit the Salton Trough. Species that required aquatic habitats, such as frogs, toads, aquatic turtles, watersnakes, waterfowl, or muskrats among others, were absent from the sample, suggesting that at that particular time, Lake Cahuilla did not persist long enough for these species to migrate to the lake from Colorado River habitats (Whistler et al. 1995).

The closest fossil localities to the Project area known to the LACM are at the PGA West Tom Weiskopf golf course, approximately 3 km north-northeast of the Project area, where four localities of invertebrates and vertebrates including rodents and a bighorn sheep (*Ovis canadensis*) were discovered from the Lake Cahuilla Beds during construction of the golf course (LACM 2020). Another Lake Cahuilla locality is approximately 6 km northeast of the Project area, where a variety of invertebrates were collected from an unknown depth in the Lake Cahuilla Beds (LACM 2020). Due to the abundant recovery of significant fossils from Lake Cahuilla Beds, the middle Holocene and older units of the Lake Cahuilla Beds (i.e., those over 5,000 years in age) present in the subsurface of the Project area are assigned High (PFYC 4) paleontological sensitivity.

Quartz diorite (qdi). The mountains to the west and north of the Project area are made of quartz diorite, a type of plutonic igneous rock that forms from the slow cooling and crystallization of magma within the earth’s crust. As such, these rocks have Very Low (PFYC 1) paleontological sensitivity.

CONCLUSION

While no previously recorded paleontological resources have been identified within the Project area, several are known within 5 km of the Project area from the Lake Cahuilla Beds and/or late Pleistocene alluvial deposits that likely underlie the Project area, possibly as shallow as 1.5 m. The alluvial deposits that are present at the surface within the Project area are too young to preserve fossils but increase in sensitivity in the subsurface. Project-related ground-disturbing activities within the Project area will impact sediments to maximum depths of 50 feet below ground surface, with substantial grading, excavating, and trenching for the construction of 1,200 dwelling units of varying types, a golf training facility, a 100-villa resort, a wellness spa, tourist recreational facilities (including restaurants, small shops, spas, lounge and activity rooms, outdoor areas, tennis courts, yoga areas, etc.), bike lanes, pedestrian walkways, the Travertine community trail, recreational open space areas, a staging area for construction, CVWD well sites, an off-site five-acre IID substation, a perimeter flood protection barrier, two off-site booster stations, and water/sewer/utility tie-ins. Grading within the Project site is anticipated to occur in two phases, with Phase A in the southern half and Phase B in the northern half. Ground-disturbing activities associated with the Project’s construction would have the potential to impact geologic units of Moderate (PFYC 3) or High (PFYC 4) paleontological sensitivity, which could result in the damage or destruction of fossil resources should they occur in the Project site near the surface or at depth. The implementation of appropriate mitigation measures will ensure that, should fossils be encountered, they are assessed for significance and, if significant, salvaged and curated with an accredited repository. This will reduce the impacts to fossil resources from the Project to less than significant under CEQA and NEPA.

Accordingly, to ensure that potential impacts to paleontological resources that may be present in the Project area are clearly less than significant, SWCA recommends the mitigation measures outlined below. The mitigation measures have been developed in accordance with, and incorporate the performance standards of, the SVP (2010), the BLM (2009, 2016), and industry best practices (Murphy et al. 2019). These measures will reduce impacts to paleontological resources to a less than significant level.

Pal-1: A Project Paleontologist who meets the standards of the SVP (2010) or BLM (2009) will prepare a Paleontological Resources Monitoring and Mitigation Plan. This plan will address specifics of monitoring and mitigation and comply with the recommendations of the SVP (2010). The Project Paleontologist will also prepare a report of the findings of the monitoring plan after construction is completed.

Pal-2: The Project Paleontologist will develop a Worker's Environmental Awareness Program to train the construction crew on the legal requirements for preserving fossil resources, as well as procedures to follow in the event of a fossil discovery. This training program will be provided to the crew before ground-disturbing work commences and will include handouts to be given to new workers as needed.

Pal-3: All ground disturbances in the Project area that occur in previously undisturbed geologic units with Moderate (PFYC 3; alluvial gravels) or High (PFYC 4; Lake Cahuilla Beds or older alluvium) paleontological potential, either at the surface or in the subsurface, will require monitoring. Within the Project area, full-time monitoring should be conducted for all ground disturbance over 1.5 m (5 feet) in depth, with the exception of areas mapped as landslide deposits and quartz diorite, which do not need to be monitored.

Monitoring will be conducted by a paleontological monitor who meets the standards of the SVP (2010) or BLM (2009) under the supervision of the Project Paleontologist. The Project Paleontologist may periodically inspect construction activities to adjust the level of monitoring in response to subsurface conditions. Full-time monitoring can be reduced to part-time inspections or ceased entirely if determined adequate by the Project Paleontologist. Paleontological monitoring will include inspection of exposed sedimentary units during active excavations within sensitive geologic sediments. The monitor will have authority to temporarily divert activity away from exposed fossils to evaluate the significance of the find and, should the fossils be determined significant, professionally and efficiently recover the fossil specimens and collect associated data. Paleontological monitors will record pertinent geologic data and collect appropriate sediment samples from any fossil localities.

Pal-5: In the event of a fossil discovery, whether by the paleontological monitor or a member of the construction crew, all work will cease within a 15-m (50-foot) radius of the find while the Project Paleontologist assesses the significance of the fossil and documents its discovery. Should the fossil be determined to be significant, it will be salvaged following the procedures and guidelines of the SVP (2010). Recovered fossils will be prepared to the point of curation, identified by qualified experts, listed in a database to facilitate analysis, and deposited in a designated paleontological curation facility.

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APPENDIX A

Natural History Museum of Los Angeles County Paleontological Records Search Results

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