Appendix I

Paleontological Resources Assessment

Central Coast Blue Project

Paleontological Resources Assessment

prepared for

City of Pismo Beach
Planning Division
760 Mattie Road
Pismo Beach, California 93449
Contact: Matthew Downing, AICP, Planning Manager

prepared by

Rincon Consultants, Inc.
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April 2020

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RINCON CONSULTANTS, INC.
Environmental Scientists | Planners | Engineers
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Carson, M., J. DeBusk, and D. Daitch

2020. *Central Coast Blue Project Paleontological Resources Assessment Report*. Rincon Consultants Project No. 15-01882. Report on file with City of Pismo Beach Planning Division.

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Executive Summary

Purpose and Scope

Rincon Consultants, Inc. was retained by the City of Pismo Beach to conduct a paleontological resources assessment for the Central Coast Blue Project (herein referred to as "project") located in San Luis Obispo County, California. The proposed project consists of an advanced treatment facility (ATF) complex (including an advanced purified water storage tank, an equalization tank, and a pump station), water distribution and agricultural irrigation pipelines, injection wells, monitoring wells, and one new production well. As the Lead Agency under the California Environmental Quality Act (CEQA), the City of Pismo Beach is required to evaluate the potential for negative impacts to paleontological resources that may be caused by implementation of the project. This study has been completed in accordance with the requirements of a CEQA-Plus investigation and includes compliance with federal and state regulations in the case a federal nexus is established during the course of project execution. This technical report presents the results of the paleontological resources assessment, discusses potential impacts to known or unknown paleontological resources, and provides recommended mitigation measures to reduce potential impacts to paleontological resources to less-than-significant levels, pursuant to federal, state, and local regulations.

Results of Investigation

The project area includes nine (9) geologic units mapped at the surface: late Holocene Stream Channel Deposits (Qhc); late Holocene alluvial flood-plain deposits (Qa); late Holocene beach sand (Qb); late Holocene dune sand; Holocene to Pleistocene young eolian deposits (Qye), Holocene to late Pleistocene young alluvial valley deposits, Unit 1 (Qay_1) and Unit 2 (Qya_2); late Pleistocene old eolian deposits (Qoe); and early Pliocene to late Miocene Pismo Formation Squire Member (Tps) (Wiegers 2011 and 2013; Holland 2013).

Late Holocene stream channel deposits (Qhc), late Holocene alluvial flood-plain deposits (Qa), late Holocene beach sand (Qb) and late Holocene dune sand (Qd) are too young to contain paleontological resources. In addition, Holocene to Pleistocene young eolian deposits (Qye) and Holocene to late Pleistocene young alluvial valley deposits are generally too young at the surface to contain paleontological resources. Eolian deposits are wind-derived and, as such, lack a taphonomy that would support substantial accumulations of paleontological resources; however, older eolian deposits can support important trace fossils in rare instances.

Holocene to Pleistocene alluvial deposits have the potential for paleontological resources to be present at unknown depths where the unit exceeds 5,000 years in age. According to Hall (1973), these deposits may have a maximum thickness of 25 to 100 feet, and sediments exceeding 5,000 years in age are unlikely to occur at depths of less than 25 feet.

The early Pliocene to late Miocene Pismo Formation, Squire Member (Tps) have the potential to yield significant paleontological resources. Ground-disturbing activities associated with project construction is not anticipated to impact geologic units of high paleontological sensitivity both at the surface and at depth.

Impacts Assessment

No work is proposed in any areas with high paleontological sensitivity at the surface, and ground disturbing activity is unlikely to disturb geologic units of moderate or high paleontological sensitivity. Ground-disturbing activities, such as grading, excavation, and trenching, to a maximum depth of 20 feet below ground surface for the ATF complex, water distribution/agricultural irrigation pipelines, and other project activities are unlikely to result in negative impacts to scientifically significant paleontological resources. Furthermore, with adherence to Policy CO-6 in the City's General Plan and Local Coastal Program (2014), which specifies management protocols for unanticipated paleontological resources, significant impacts to paleontological resources are not expected.

Recommendations

Impacts to paleontological resources would be less than significant. Further paleontological resources mitigation is not recommended at this time.

1 Introduction

Rincon Consultants, Inc. (Rincon) was retained by the City of Pismo Beach (City) to conduct a paleontological resources assessment for the Central Coast Blue Project (herein referred to as “project”) located in San Luis Obispo County, California (Figure 1). The paleontological resources assessment consisted of a desktop analysis of geologic maps, a review of published literature and online fossil locality databases, and review of museum locality records. As the Lead Agency under the California Environmental Quality Act (CEQA), the City is required to evaluate the potential for negative impacts to paleontological resources that may be caused by the implementation of the project. This study has been completed in accordance with the requirements of a CEQA-Plus investigation and includes compliance with federal and state regulations in the case a federal nexus is established during the course of project execution. This technical report presents the results of the paleontological resources assessment, discusses potential impacts to known or unknown paleontological resources, and provides recommended mitigation measures to reduce potential impacts to paleontological resources to less-than-significant levels, pursuant to federal, state, and local regulations.

1.1 Project Location

The project area is situated approximately seven miles south of the city of San Luis Obispo and is regionally accessible from U.S. Highway 101 and locally accessible from California State Route (SR) 1. The project area extends from West Grand Avenue in Grover Beach in the north to unincorporated San Luis Obispo County, including Oceano, in the south. The total project area measures approximately 3.5 miles north to south. See Figure 1 for a map of the project location in a regional context.

1.2 Project Description

The proposed project consists of an advanced treatment facility (ATF) complex (including an advanced purified water storage tank, an equalization tank, and a pump station), water distribution pipelines, agricultural irrigation pipelines, injection wells, monitoring wells, and one new production well. The project would also alter the pumping regime of existing, operational production wells in the project area. At this time, the locations of all project components except the new production well and agricultural irrigation pipelines are known; however, the new production well would likely be located in Grover Beach and the agricultural irrigation pipelines would proceed generally from the ATF complex to the agricultural lands south of Oceano. See Figure 1 for a map of the project area in a regional context and Figure 2 for a map of the known locations of project components. Each of the project components is described below.

Advanced Treatment Facility Complex

The ATF complex would purify secondary treated wastewater flows from the Pismo Beach and the South San Luis Obispo County Sanitation District (SSLOCSD) Wastewater Treatment Plants (WWTPs). Treatment steps would include microfiltration/ultrafiltration, reverse osmosis, and ultraviolet

Figure 1 Regional Location

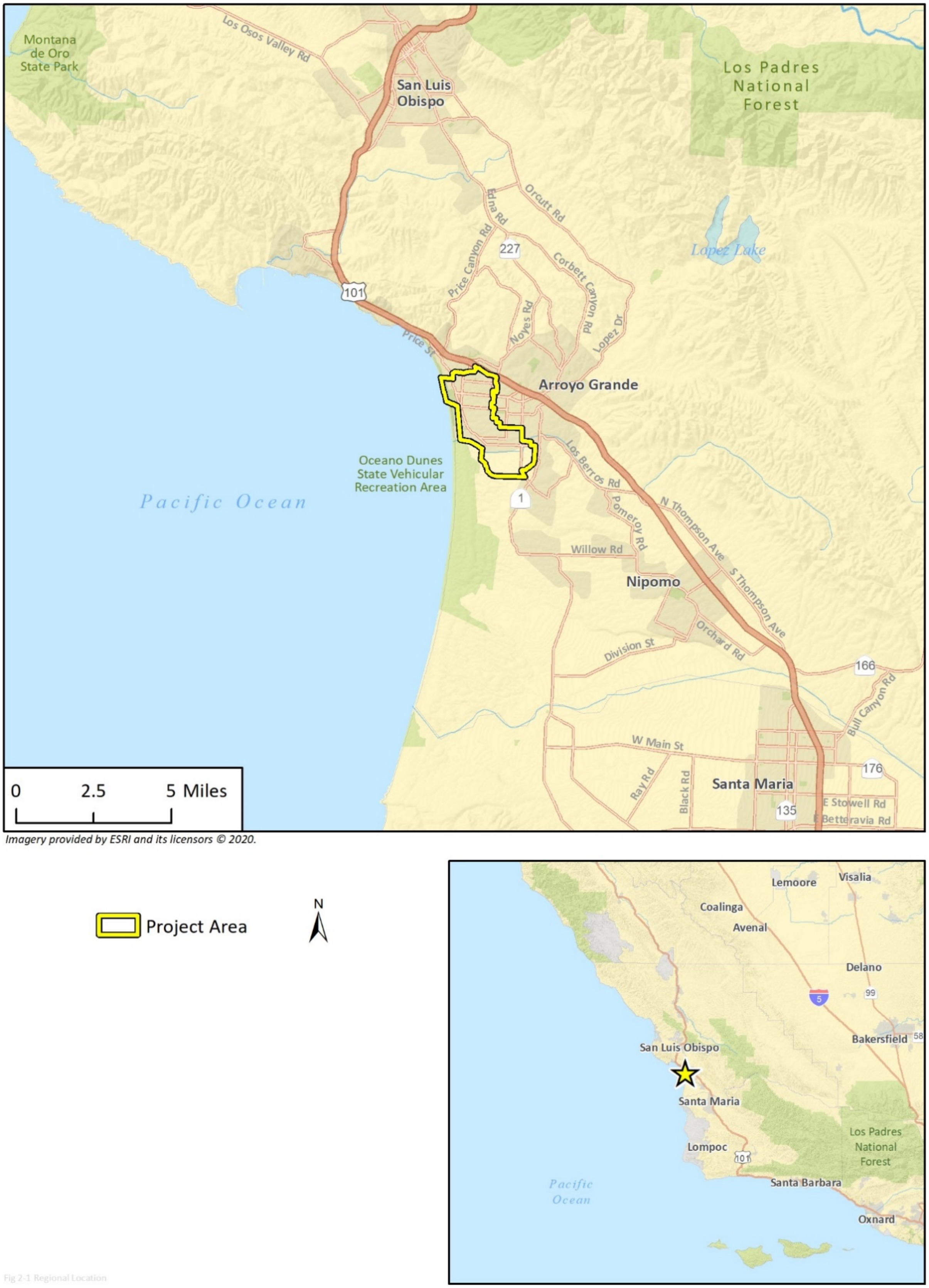

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Figure 2 Project Components with Known Locations

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disinfection with advanced oxidation. The ATF complex would include staff support facilities that may include office space, a locker room, restrooms, file storage, a break room and kitchen, chemical storage and feed facilities, and an emergency power generator. The ATF would occupy approximately 0.85 acre, and the support facilities would occupy approximately 0.14 acre.

Several appurtenant structures would be constructed as part of the ATF complex to support the ATF processes. An equalization storage basin would be constructed to provide greater capacity and operational flexibility to the ATF by addressing fluctuations in flow from the WWTPs without impacting the flow rate to the ATF. The storage basin would occupy approximately 7,500 square feet of area. Following advanced purification in the ATF, water would travel to the proposed 538,632-gallon advanced purified water storage tank and then to the pump station, where advanced purified water would be pumped to the injection wells. The storage tank would be located below ground adjacent to the ATF as part of the ATF complex. The pump station would occupy approximately 0.03 acre and would be located above the storage tank and adjacent to the ATF as part of the ATF complex. Ground disturbance associated with the ATF storage tank is expected to reach 20 feet in depth.

Water Distribution Pipelines

Water distribution pipelines would be installed along the alignments shown in Figure 2. These pipelines would accomplish four purposes: 1) convey secondary treated effluent from the Pismo Beach WWTP from the existing ocean outfall pipeline to the proposed ATF; 2) convey secondary treated effluent from the SSLOCSD WWTP to the proposed ATF; 3) convey advanced purified water from the proposed ATF to the injection wells; and 4) convey concentrate from the proposed ATF to the existing ocean outfall pipeline. The pipelines would range in size from approximately 6 to 24 inches. Ground disturbance associated with the water distribution pipelines is expected to reach six feet in depth.

Groundwater Injection and Monitoring Wells

Seven injection wells would be installed at the locations shown in Figure 2. The injection wells would be located generally within one-half mile of the coast and would each require approximately 3,000 square feet of land.[1] Each injection well would be capable of injecting approximately 200 to 300 acre-feet per year (AFY). The advanced purified water would be injected at a depth of approximately 200 to 600 feet below ground surface. The injection well network would be accompanied by a network of nested monitoring wells, each approximately 25 square feet in size, at ten locations throughout the project area. Monitoring wells would be equipped to measure and monitor water level and water quality. Injection wells would include aboveground piping and infrastructure, such as electrical pads, control panels, and storage facilities. Monitoring wells would be flush-mounted. Injection well IW-4 and monitoring well MW-4A/4B will be initially constructed as test wells to conduct a preliminary investigation of the physical and technological constraints and opportunities in the project area. These wells were determined by the City to be categorically exempt from CEQA under CEQA Guidelines Section 15306.

Production Wells

Several existing production wells would be available for extraction of the injected advanced purified water. The project would involve increased pumping at these wells but would not involve

[1] This is a conservative assumption of the footprint of each injection well.

modification of these existing production wells or any associated ground disturbance. One new production well would be constructed to optimize the system, but the precise location of that new well has not been determined at this time. The new production well likely would be located in Grover Beach, likely on land leased or acquired by the City, and would require approximately 3,000 square feet of land.[2] The characteristics of the new production well, which would be approximately 14 inches in diameter and 300 to 600 feet in depth, would be similar to those of the City's existing production wells.

Agricultural Irrigation

A portion of the advanced purified water may be used for agricultural irrigation. Potential agricultural irrigation areas include agricultural lands located generally south of Oceano. If agricultural irrigation is included in the proposed project, additional distribution pipelines would be constructed to carry advanced purified water from the ATF complex to the irrigated lands.

Construction Activities

Project construction would occur in two main phases. Phase I would include construction of five injection wells (IW-1, IW-2A, IW-3, IW-4, and IW-5A), the water distribution pipelines, and the ATF complex with its initial capacity designed to treat flows from the Pismo Beach WWTP. Phase II would include construction of the remaining two injection wells (IW-2B and IW-5B), installation of approximately 40 feet of additional water distribution pipelines to connect these injection wells to the water distribution pipelines constructed under Phase I, construction of the agricultural irrigation pipelines, and expansion upgrades to equipment within the ATF complex to accommodate flows from the SSLOCSD WWTP. Construction of the project components with known locations is anticipated to last approximately 24 months.

Earthwork activities associated with the project would include drilling, trenching, grading, and excavation to various depths up to 20 feet. Wells would be drilled up to a depth of approximately 600 feet. Construction methods for the proposed water distribution pipelines would predominantly involve open trenching, with augur boring or horizontal directional drilling methods used as needed. Trenches would be excavated to approximately six feet in depth and would be backfilled after pipeline installation. To accommodate the ATF complex, the existing pavement and fencing at the location of the ATF complex would be removed. In addition, the location of the ATF complex would likely need to be graded to provide a level base for the ATF and appurtenant structures, to provide site access, and to provide appropriate stormwater drainage. It is assumed a moderate amount of existing soil would be excavated and exported and a moderate amount of clean engineered fill or another suitable substrate would be imported to provide geotechnical stability for the ATF complex. Excavation depth is not anticipated to exceed 20 feet at any locations.

[2] This is a conservative assumption of the footprint of the production well.

2 Regulations

This study has been completed in accordance with the requirements of CEQA and includes compliance with federal and state regulations in the case a federal nexus is established during the course of project execution. A federal nexus may be established if federal funding is acquired and/or federal permitting is necessary. Compliance with both sets of regulations allows the lead agency to apply the results of this technical study should a federal nexus be established at a later time. Federal, state, and local regulations applicable to potential paleontological resources in the project area are summarized below.

2.1 Federal

A variety of federal statutes address paleontological resources specifically. They are applicable to all projects occurring on federal lands and may be applicable to specific projects if the project involves a federal agency license, permit, approval, or funding.

National Environmental Policy Act

The National Environmental Policy Act (United States Code Section 4321 et seq.; 40 Code of Federal Regulations Section 1502.25), as amended, directs federal agencies to "preserve important historic, cultural, and natural aspects of our national heritage (Section 101[b][(4])." The current interpretation of this language includes scientifically important paleontological resources among those resources that may require preservation.

Paleontological Resources Preservation Act

The Paleontological Resources Preservation Act (PRPA) is part of the Omnibus Public Land Management Act of 2009 (Public Law 111-011 Subtitle D). The PRPA directs the Secretary of the Interior or the Secretary of Agriculture to manage and protect paleontological resources on federal land and develop plans for inventorying, monitoring, and deriving the scientific and educational use of such resources. The PRPA prohibits the removal of paleontological resources from federal land without a permit, establishes penalties for violations, and establishes a program to increase public awareness about such resources. While specific to activity that occurs on federal lands, some federal agencies may require adherence to the directives outlined in the PRPA for projects on non-federal lands if federal funding is involved or if the project includes federal oversight.

2.2 State

California Environmental Quality Act

Paleontological resources are protected under CEQA, which states in part that a project will "normally" have a significant effect on the environment if it, among other things, will directly or indirectly destroy a unique paleontological resource or site or unique geologic feature (Section VII[f] of Appendix G of the State CEQA Guidelines).

CEQA does not define "a unique paleontological resource or site." However, the Society of Vertebrate Paleontology (SVP) has defined a "significant paleontological resource" in the context of environmental review as follows:

> 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). (SVP 2010)

The loss of paleontological resources meeting the criteria outlined above (i.e., a significant paleontological resource) would be a significant impact under CEQA. The CEQA lead agency is responsible for ensuring that impacts to paleontological resources are mitigated, where practicable, in compliance with CEQA and other applicable statutes.

California Public Resources Code

Section 5097.5 of the Public Resources Code 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.

Here "public lands" means those owned by, or under the jurisdiction of, the state or any city, county, district, authority, or public corporation, or any agency thereof. Consequently, public agencies are required to comply with Public Resources Code Section 5097.5 for their own activities, including construction and maintenance activities, and for permit actions undertaken by others (e.g., encroachment and land use permits).

2.3 Regional and Local

County of San Luis Obispo

The County of San Luis Obispo General Plan Conservation and Open Space Element (County of San Luis Obispo 2010) contains one goal, one policy, and two implementation strategies pertaining to paleontological mitigation. They are as follows:

- **Goal CR 4:** The county's known and potential Native American, archaeological and paleontological resources will be preserved and protected.
  - **Policy CR 4.5.** Protect paleontological resources from the effects of development by avoiding disturbance where feasible.
    - **Implementation Strategy CR 4.5.1 Paleontological Studies.** Require a paleontological resource assessment and mitigation plan to 1) identify the extent and potential significance of the resources that may exist within the proposed development and 2) provide mitigation measures to reduce potential impacts when existing information indicates that a site proposed for development may contain biological, paleontological, or other scientific resources.
    - **Implementation Strategy CR 4.5.2 Paleontological Monitoring.** Require a paleontologist and/or registered geologist to monitor site-grading activities when paleontological resources are known or likely to occur. The monitor will have the

authority to halt grading to determine the appropriate protection or mitigation measures. Measures may include collection of paleontological resources, curation of any resources collected with an appropriate repository, and documentation with the County.

Additionally, Section 11.04.060(b) of the San Luis Obispo County Code (2014) states that it is unlawful for any person to engage in the following acts within any county park or facility without prior written authorization from the director or designee:

1) Remove, cut, dig, or disfigure any soil, rock, or fossil
2) Dig up, pick, remove, mutilate, injure, or collect any historical or archaeological artifact or object
3) Disturb, deface, disfigure, mark on, or destroy any cave, rock formation, or any other naturally occurring feature
4) Deposit any earth, sand, rock, stone, or other substance or dig such materials from any area

City of Pismo Beach

Although project construction activities would occur in Grover Beach and Oceano, the City, as the lead agency and one of the project sponsors, and its contractor(s) would abide by its own policies related to paleontological resources. The City's General Plan and Local Coastal Program (2014) contains the following policy pertaining to paleontological resources:

- **CO-6 Construction Suspension.** Should archaeological and paleontological resources be disclosed during any construction activity, all activity that could damage or destroy the resource shall be suspended until a qualified archaeologist has examined the site. Construction shall not resume until mitigation measures have been developed and carried out to address the impacts of the project on these resources.

City of Grover Beach

The City of Grover Beach General Plan (2010) does not contain policies applicable to the preservation or mitigation of paleontological resources. The City of Grover Beach Local Coastal Program (2014) contains one policy recommendation pertaining to paleontological resources:

- **Policy:** Where development would adversely impact archaeological or paleontological resources as identified by the State Historic Preservation Officer, reasonable mitigation measures shall be required by the City Planning Commission and/or City Council.

3 Resource Assessment Guidelines

3.1 Significance Criteria

Fossils represent the only direct evidence of past life from Earth's history. Fossils are thus a foundational data source for research on a wide variety of topics that fall under the broad umbrella of "evolutionary pattern and process" including taphonomy, phylogeny, paleoecology, stratigraphy, biochronology, taxonomy, and cladistics.

Significant paleontological resources are determined to be fossils or assemblages of fossils that meet one or more of the following criteria:

- Unique;
- Unusual;
- Rare;
- Diagnostically important;
- Common but have the potential to provide valuable scientific information for evaluating evolutionary patterns and processes; and/or
- Could improve our understanding of paleochronology, paleoecology, paleophylogeography, or depositional histories.

New or unique specimens can provide new insights into evolutionary history; however, additional specimens of even well represented lineages can be equally important for studying evolutionary pattern and process, evolutionary rates, and paleophylogeography. Even unidentifiable material can provide useful data for dating geologic units if radiometric dating is possible. As such, common fossils (especially vertebrates) may be scientifically important and therefore considered significant.

3.2 Paleontological Sensitivity Criteria

The SVP (2010) describes sedimentary rock units as having high, low, undetermined, or no potential for containing significant nonrenewable paleontological resources. This criterion is based on rock units in which significant fossils have been determined by previous studies to be present or likely to be present. While these standards were written specifically to protect vertebrate paleontological resources, all fields of paleontology have adopted these guidelines, which are given here verbatim:

> **I. High Potential (Sensitivity).** Rock units from which significant vertebrate or significant invertebrate fossils or significant suites of plant fossils have been recovered have a high potential for containing significant non-renewable fossiliferous resources. These units include but are not limited to, sedimentary formations and some volcanic formations which contain significant nonrenewable paleontological resources anywhere within their geographical extent, and sedimentary rock units temporally or lithologically suitable for the preservation of fossils. Sensitivity comprises both (a) the potential for yielding abundant or significant vertebrate fossils or for yielding a few significant fossils, large or small, vertebrate, invertebrate, or botanical and (b) the importance of recovered evidence for new and significant taxonomic, phylogenetic, ecologic, or stratigraphic data. Areas which contain potentially datable organic remains older

than the Holocene epoch, including deposits associated with nests or middens, and areas which may contain new vertebrate deposits, traces, or trackways are also classified as significant.

II. Low Potential (Sensitivity). Sedimentary rock units that are potentially fossiliferous but have not yielded fossils in the past or contain common and/or widespread invertebrate fossils of well documented and understood taphonomic, phylogenetic species and habitat ecology. Reports in the paleontological literature or field surveys by a qualified vertebrate paleontologist may allow determination that some areas or units have low potentials for yielding significant fossils prior to the start of construction. Generally, these units will be poorly represented by specimens in institutional collections and will not require protection or salvage operations. However, as excavation for construction gets underway it is possible that significant and unanticipated paleontological resources might be encountered and require a change of classification from Low to High Potential and, thus, require monitoring and mitigation if the resources are found to be significant.

III. Undetermined Potential (Sensitivity). Specific areas underlain by sedimentary rock units for which little information is available have undetermined fossiliferous potentials. Field surveys by a qualified vertebrate paleontologist to specifically determine the potentials of the rock units are required before programs of impact mitigation for such areas may be developed.

IV. No Potential. Rock units of metamorphic or igneous origin are commonly classified as having no potential for containing significant paleontological resources.

4 Methods

Rincon evaluated the paleontological sensitivity of the geologic units which underlie the project area using the results of the museum locality search and review of existing information in the scientific literature concerning known fossils in those geologic units. For the purpose of this analysis, the project area is defined as Oceano and Grover Beach, which are the locations of known project components and the locations in which the remaining project components would most likely be constructed. Rincon submitted a request to the Natural History Museum of Los Angeles County (NHMLAC) for a list of known fossil localities from the project area and immediate vicinity (i.e., localities recorded on the United States Geological Survey *Oceano*, California 7.5-minute topographic quadrangle), reviewed geologic maps, and reviewed primary literature and online databases.

Rincon assigned paleontological sensitivities to the geologic units in the project area. The potential for impacts to significant paleontological resources is based on the potential for ground disturbance to directly impact paleontologically-sensitive geologic units.

5 Description of Resources

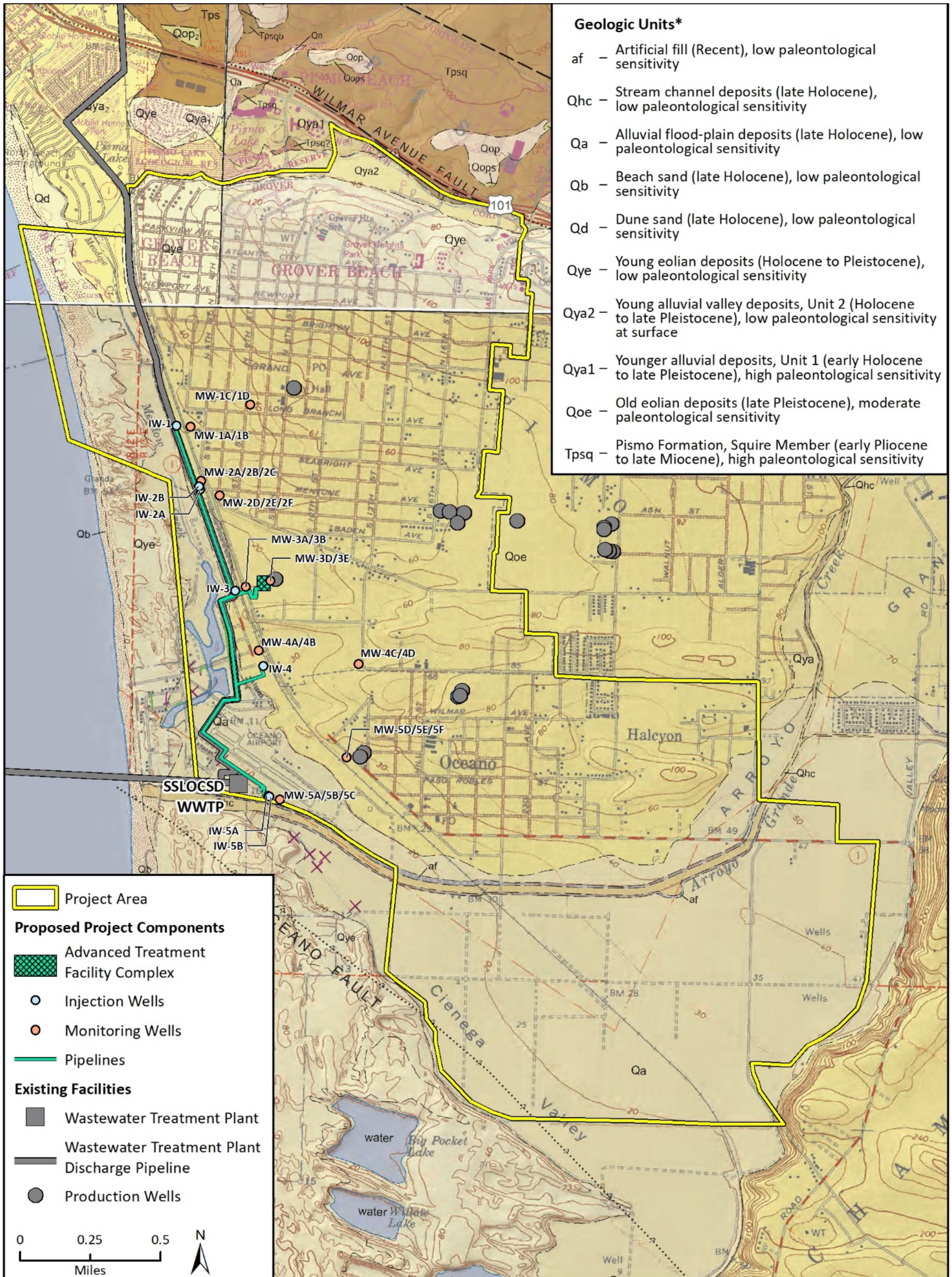
5.1 Geologic Setting

The project area is situated in the Coast Ranges, one of twelve major geomorphic provinces in California (California Geological Survey 2002). A geomorphic province is a region of unique topography and geology that is distinguished from other regions based on its landforms and geologic history. The Coast Ranges extend about 600 miles from the Oregon border south to the Santa Ynez River in Santa Barbara County and are characterized by numerous north-south–trending peaks and valleys that range in elevation from approximately 500 feet above mean sea level (amsl) to 7,581 feet amsl at the highest summit (Norris and Webb 1990). Dominant geologic features of the Coast Ranges near the project area include the San Luis Range, Guadalupe-Nipomo Dunes, Arroyo Grande Creek, the north-west-trending Oceano fault, and the Nine Sisters Miocene volcanic peaks (Holland 2013; Lettis and Hall 1994; Lettis et al. 1994; Surdham and Stanley 1984).

The basement rocks of the Coast Ranges include the plutonic Salinian Block and the Jurassic to Cretaceous metasedimentary and metavolcanic rocks of the Franciscan Assemblage. During the Mesozoic Era and into the Cenozoic Era, the area of the present-day Coast Ranges was covered by seawater and a thick deposit of marine to nonmarine shale, sandstone, and conglomerate accumulated on the Franciscan basement rock (Barron 1989; Bartow and Nilsen 1990; Graymer et al. 1996). Later, in the late Miocene to Pliocene epochs, a mountain-building episode occurred near the present-day Coast Ranges, resulting in their uplift above sea level. Subsequently, from the late Pliocene to Pleistocene epochs, extensive deposits of terrestrial alluvial fan and fluvial sediments were deposited in the Coast Ranges (Norris and Webb 1990), with the Pleistocene marked by glacially-controlled sea level fluctuations and tectonic uplift during which the shoreline advanced and retreated as much as 30 miles across the continental shelf (Hall 2007). Sea level advance cut a system of marine terraces, 12 of which are exposed in the Point San Luis area eight to nine miles southwest of the city of San Luis Obispo. These terraces range in age from 83,000 to 49,000 years and reach elevations of 79 feet above modern sea level. The formations that compose these terraces are the most paleontologically productive in the region (City of San Luis Obispo 2014).

As shown in Figure 3, the project area includes nine geologic units mapped at the surface: late Holocene Stream Channel Deposits (Qhc); late Holocene alluvial flood-plain deposits (Qa); late Holocene beach sand (Qb); late Holocene dune sand; Holocene to Pleistocene young eolian deposits (Qye); Holocene to late Pleistocene young alluvial valley deposits, Unit 1 (Qay1) and Unit 2 (Qya2); late Pleistocene old eolian deposits (Qoe); and early Pliocene to late Miocene Pismo Formation Squire Member (Tps) (Wiegers 2011 and 2013; Holland 2013). Additionally, these geologic units may be underlain at shallow or unknown depths within the project area by Pleistocene-, Pliocene-, and/or Miocene-age geologic units mapped at the surface outside of the project area but exposed at the surface within the project vicinity.

Figure 3 Project Geology and Paleontological Sensitivity



Geologic maps provided by Arroyo Grande Quadrandgle Geologic Map, Wiegers, M, 2013;
Oceano Quadrandgle Geologic Map, Holland, P, 2013; Pismo Beach Quadrandgle Geologic Map, Wiegers, M, 2011.
*Only geologic units mapped at the surface of the project area are noted in the legend.

Paleo 3 Geologic Units of the Project Site - Updated 20200107

5.2 Geologic Formations

Late Holocene Stream Channel Deposits (Qhc)

Stream channel deposits of late Holocene age occur only within the Arroyo Grande Creek channel. The active and recently active floodplain deposits consist of unconsolidated sandy, silty, and clay-bearing alluvium (Holland 2013).

Late Holocene Alluvial Flood-plain Deposits (Qa)

Late Holocene alluvial flood-plain deposits (Qa) consist of active and recently active flood-plain deposits composed of unconsolidated sandy, silty, and clay-bearing alluvium (Holland 2013). This geologic unit may be comparable or partially equivalent to Holocene to late Pleistocene young alluvial valley deposits, Unit 2 (Qya2) of Wiegers (2011 and 2013) based on the geologic contacts of these two units that can be traced among Holland (2013) and Wiegers (2011 and 2013) (see Section 5.2.3). Alluvial flood-plain deposits (Qa) are mapped by Holland (2013) immediately west of the existing SSLOCSD WWTP discharge pipeline right-of-way between the residential areas of Grover Beach/Oceano and the coast. If considered partially equivalent to Holocene to late Pleistocene young alluvial valley deposits, Unit 2 (Qya2) of Wiegers (2011 and 2013), then alluvial flood-plain deposits may extend north and inland along Pismo Creek. According to Hall (1973), the maximum thickness of these alluvial deposits is approximately 90 feet.

Late Holocene Beach Sand (Qb)

Late Holocene beach sand (Qb) consists of unconsolidated beach deposits consisting mostly of fine- to medium-grained well sorted sand (Holland 2013). Beach sand is mapped along the coast in the vicinity of the project area from Pismo State Beach in the north to Point Sal State Beach in the south (Wiegers 2011; Holland 2013). The maximum thickness of beach sand may reach 90 feet (Hall 1973).

Late Holocene Dune Sand (Qd)

Dune sand of late Holocene age is mapped inland of beach sand in the northern extent of the project area (Wiegers 2011). The deposits consist of unconsolidated, well-sorted white to brown windblown sand that forms active dunes behind modern beaches. The unit is similar to young eolian deposits (Qye), and Holland (2013) has mapped these same units as Qye to the south of Qd units mapped by Wiegers (2011).

Holocene to Pleistocene Young Eolian Deposits (Qye)

Holocene to Pleistocene young eolian deposits (Qye) consist of vegetated and stationary or active dune deposits behind modern beaches, composed of well-sorted white to brown windblown sand (Wiegers 2011 and 2013; Holland 2013). Holland (2013) states that the inception of dune sheet occurred at approximately 3,500 to 4,300 years ago[3]. Young eolian deposits are also mapped in the residential area of Grover Beach west of the existing SSLOCSD WWTP pipeline right-of-way by

[3] Note the discrepancy in geologic mapping between Wiegers (2011 and 2013), which maps these deposits as Holocene to Pleistocene young eolian deposits (Qye), and Holland (2013), which maps these deposits as late Pleistocene old eolian deposits (Qoe). See Section 5.2.5 for a discussion of late Pleistocene old eolian deposits (Qoe). Based on this discrepancy, young eolian deposits (Qye) may span the Holocene to the Pleistocene epochs.

Wiegers (2011 and 2013).[4] The maximum thickness of young eolian deposits varies but may be as much as 100+ feet (including late Pleistocene old eolian deposits, described below) (Hall 1973).

Holocene to Late Pleistocene Young Alluvial Valley Deposits, Units 1 and 2 (Qya_1 and Qya_2)

Units 1 (Qya_1) and 2 (Qya_2) of the young alluvial valley deposits consist of unconsolidated sand, silt, and clay-bearing alluvium deposited on floodplains and along valley floors (Wiegers 2011 and 2013; and Holland 2013). The units differ in that Unit 2 consists of undissected deposits, which lack soil development, whereas surfaces in older Unit 1 are slightly dissected and display weak soil development (Wiegers 2011 and 2013). Holland (2013) does not differentiate Unit 2 from the older, underlying Unit 1 and states that these undivided deposits were deposited approximately 4,300 to 11,000 years ago. Young alluvial valley deposits, Unit 2 (Qya_2) of Wiegers (2011 and 2013) may be partially equivalent to late Holocene alluvial flood-plain deposits (Qa) of Holland (2013) based on the comparable contacts for these geologic units on all three geologic maps. According to Hall (1973), these deposits may have a maximum thickness of 25 to 100 feet.

Late Pleistocene Old Eolian Deposits (Qoe)

According to geologic mapping by Holland (2013), late Pleistocene old eolian deposits (Qoe) consist of well sorted, dissected, red to brown windblown sand with weak soil development and dune morphology generally obscured. Old eolian deposits are mapped at the surface almost exclusively across the Nipomo Mesa situated southeast of the Arroyo Grande Valley, as well as north of the Arroyo Grande Valley to the Wilmar Avenue Fault. As indicated by geologic mapping by Wiegers (2011 and 2013), old eolian deposits (Qoe) may be overlain by younger eolian deposits[5]. Hall (1973) combines old eolian deposits with young eolian deposits and suggests the combined maximum thickness of the young and old eolian deposits is approximately 100 feet.

Early Pliocene to Late Miocene Pismo Formation, Squire Member (Tps)

According to geologic mapping by Wiegers (2011 and 2013), early Pliocene to late Miocene Pismo Formation (Tps) is present at the surface in the northernmost portion of the project area in the area of high topographic relief north of the Wilmar Avenue Fault. Three of the described members of the Pismo Formation are mapped at the surface within the project's vicinity, including the Squire Member, the Miguelito Member, and the Edna Member; however, only the Squire Member (Tps) is mapped at the surface within the bounds of the project area.

The Squire Member (Tps) is the youngest of the members within the Pismo Formation and consists of massive, white, calcareous, fine- to medium-grained, subangular to subrounded, quartzose to arkosic, silty sandstone (Wiegers 2011 and 2013). This member contains lenses of white, well-rounded pebbles and cobbles of the Monterey and Obispo formations north of the Edna Fault, basal conglomerate of rounded chert and basalt cobbles near the mouth of San Luis Obispo Creek, and bioturbated layers with greenish glauconitic sand coatings and clay and silt interbeds along the footwall block of the Wilmar Avenue Fault at Pismo Beach (Wiegers 2011 and 2013). The maximum

[4] Ibid.

[5] Note the discrepancy in geologic mapping between Wiegers (2011 and 2013), which maps these deposits as Holocene to Pleistocene young eolian deposits (Qye), and Holland (2013), which maps these deposits as late Pleistocene old eolian deposits (Qoe) – See Section 5.2.3 for a discussion of Holocene to Pleistocene young eolian deposits (Qye).

thickness of the Squire Member is approximately 550 feet and unconformably overlies the Miguelito Member (Hall 1973). [6]

5.3 Paleontological Resources

Late Holocene stream channel deposits (Qhc), late Holocene alluvial flood-plain deposits (Qa), late Holocene beach sand (Qb) and late Holocene dune sand (Qd) are too young to contain paleontological resources. Holocene to Pleistocene young eolian deposits (Qye) and Holocene to late Pleistocene young alluvial valley deposits are generally too young at the surface to contain paleontological resources.

Eolian deposits are wind-derived, and as such lack a taphonomy that would support substantial accumulations of paleontological resources; however, older eolian deposits can support important trace fossils in rare instances. Therefore, these units are considered to have moderate paleontological sensitivity.

Pleistocene aged alluvial deposits such as units of the Holocene to late Pleistocene young alluvial valley deposits that are over 5,000 years in age have the potential to yield scientifically significant paleontological resources (McLeod 2019). Jefferson et al. (1992) reported several vertebrate localities along the coast at Point San Luis. These localities occur in Pleistocene fluvial and marine terrace deposits and have yielded horse (*Equus* sp., *E*. *occidentalis*), camel (*Camelops* sp., *C*. *hesternus*), bison (*Bison antiquus*, *B*. *latifrons*), mammoth (*Mammuthus* sp.), mastodon (*Mammut* [*americanum*] *pacificus*), steller's sea cow (*Hydrodamalis* sp.), whale (Cetacea, Mysticeti), ground squirrel (Sciuridae), and gastropod (*Hipponix antiquatus*, *Acmaea mitra*). Other paleontological resources in San Luis Obispo County are noted as well (Jefferson et al. 1992; University of California Museum of Paleontology [UCMP] 2019). Similar Pleistocene sediments have a well-documented record of abundant and diverse vertebrate fauna throughout sedimentary basins and coastal deposits in California (Agenbroad 2003; Axelrod 1983; Bell et al. 2004; Jefferson 1989, 1991a and 1991b; Jefferson et al. 1992; Maguire and Holroyd 2016; Paleobiology Database 2019; Savage et al. 1954; Tomiya et al. 2011; UCMP 2019; Wilkerson et al. 2011).

The Squire Member of the early Pliocene to late Miocene Pismo Formation (Tps) has yielded numerous paleontological resources from the Pismo Beach and Avila Beach areas, as well as San Luis Obispo County in general. Fossils recovered from the Squire Member include whale (Odontoceti, *Albireo savage*, Mysticeti, Balaenopteridae), sea cow (*Hydrodamalis cuestae*), seal (Pinnipedia, Otariidae), horse (*Equus* sp.), bird (Aves, *Gavia concinna*), and bivalve (*Crassostrea titan*, *Lyropecten crassicardo*, *Nodipecten cerrosensis*) (Paleobiology Database 2019; UCMP 2019).

[6] The Belleview and Gragg members are not present locally.

6 Museum Records

The museum records search was conducted at the NHMLAC by Sam McLeod, Ph.D., who submitted a letter summarizing the results on December 24, 2019. According to the results of the museum records search, no paleontological resources have been recorded within the bounds of the project area, and younger (i.e., Holocene-age) surficial deposits are unlikely to contain paleontological resources in the uppermost layers but may be underlain by older (i.e., Pleistocene-age) deposits at relatively shallow depth. The closest fossil locality to the project area from Pleistocene-age deposits is LACM 4089, situated approximately nine miles southeast of the project area in Nipomo, which yielded a fossil mammoth (*Mammuthus columbi*). The depth of this fossil locality was not stated (McLeod 2019).

7 Evaluation, Impacts, and Recommendations

7.1 Paleontological Sensitivity Evaluation

In accordance with SVP (2010) guidelines, Rincon determined the paleontological sensitivity of the project area based on a review of geologic maps, published literature and online databases, and museum records. The results of this paleontological assessment indicate that the paleontological sensitivity of the project area and its vicinity have a low to high paleontological sensitivity, varying at the surface and at depth.

Late Holocene stream channel deposits (Qhc), late Holocene alluvial flood-plain deposits (Qa), late Holocene beach sand (Qb) and late Holocene dune sand (Qd) are too young to contain paleontological resources and are considered to have **low paleontological sensitivity**.

Holocene to Pleistocene young eolian deposits (Qye) are unlikely to support fossils based on the unit's taphonomy and are also considered to have **low paleontological sensitivity**.

Holocene to late Pleistocene young alluvial valley deposits, Unit 1 (Qya_1) and Unit 2 (Qya_2) are generally too young to contain paleontological resources at the surface but may contain significant paleontological resources at unknown depths where the units exceed 5,000 years in age. The depth at which these units reach early Holocene in age (i.e., greater than 5,000 years) is not documented in the area but is likely at depths near or over 100 feet (Hall 1973). These geologic units are considered to have a **high paleontological sensitivity** at depths below 100 feet.

Late Pleistocene old eolian deposits (Qoe) and early Pliocene to late Miocene Pismo Formation, Squire Member (Tps) have yielded numerous scientifically significant paleontological resources. Therefore, late Pleistocene old eolian deposits (Qoe) and early Pliocene to late Miocene Pismo Formation, Squire Member (Tps) are considered to have **high paleontological sensitivity**.

7.2 Impacts

Ground-disturbing activities associated with project construction are not expected to impact geologic units of high paleontological sensitivity, either at the surface or at depth for any project activity. The ATF complex, water distribution pipeline alignments, and agricultural irrigation pipeline alignments would be located in the western and southern portions of the project area in areas mapped as late Holocene stream channel deposits (Qhc), late Holocene alluvial flood-plain deposits (Qa), late Holocene beach sand (Qb), late Holocene dune sand (Qd), and Late Pleistocene old eolian deposits (Qoe). Ground-disturbing activities to a maximum depth of 20 feet below ground surface in these areas would be unlikely to negatively impact geologic units of high paleontological sensitivity, and thus, would not be likely to negatively impact significant paleontological resources.

Drilling activities associated with the installation of groundwater, monitoring, and production wells would involve drilling wells approximately 12 inches in diameter at a depth of up to 600 feet below ground surface. Because these wells may extend up to 600 feet below ground surface, older geologic units of high paleontological sensitivity, such as Pleistocene-age or older deposits, may be impacted at depths greater than 100 feet based on the thicknesses of Hall (1973). Due to constraints in paleontological monitoring during drilling activities and the quality of identifiable fossils exhumed from boreholes during drilling, a process which typically pulverizes sediments and removes the stratigraphic context of any fossil material. The narrow extent of drilling activity significantly reduces the potential for the activity to directly affect paleontological resources. In the unlikely event the drilling activity actually damages a fossil, it would be impossible to verify the impact or accurately assess the stratigraphic context of the fossils. Therefore, paleontological monitoring is not effective for assessing impacts and not recommended during drilling when the drilling diameter is less than three feet. This activity is considered unlikely to negatively impact significant paleontological resources.

No ground disturbing work is proposed in any areas with high paleontological sensitivity at the surface. Adherence to Policy CO-6 in the City's General Plan and Local Coastal Program (2014), which requires suspension of construction activity in the event that a paleontological resource is disclosed and retention of a qualified archaeologist/paleontologist to examine the site. Construction would not resume until mitigation measures have been developed and carried out to address the impacts of the project on these resources. Therefore, impacts to paleontological resources would be less than significant.

7.3 Recommendations

Further paleontological resources work is not recommended at this time. The City would abide by Policy CO-6 in its General Plan and Local Coastal Program (2014), which requires suspension of construction activity in the event that a paleontological resource is disclosed and retention of a qualified archaeologist/paleontologist to examine the site. Construction would not resume until mitigation measures have been developed and carried out to address the impacts of the project on these resources.

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