

3.2.4 Paleontology

This section identifies and evaluates the potential for impacts caused by the proposed project on significant paleontological resources in the study area.

Regulatory Setting

Paleontology is a natural science focused on the study of ancient animal and plant life as it is preserved in the geologic record as fossils.

Federal Laws and Regulations

A number of federal statutes specifically address paleontological resources, their treatment, and funding for mitigation as a part of federally authorized projects. The proposed project is subject to the federal laws listed below because federal funds administered by the Federal Highway Administration (FHWA) are involved.

16 United States Code (U.S.C.) 431- 433 (the “Antiquities Act”) prohibits appropriating, excavating, injuring, or destroying any object of antiquity situated on federal land without the permission of the Secretary of the Department of Government having jurisdiction over the land. Fossils are considered “objects of antiquity” by the Bureau of Land Management (BLM), the National Park Service, the Forest Service, and other federal agencies. Permits to collect fossils on lands administered by federal agencies are authorized under this Act. Therefore, projects involving federal lands will require permits for both paleontological resource evaluation and mitigation efforts.

16 U.S.C. 461- 467 (the National Registry of Natural Landmarks) establishes the National Natural Landmarks (NNL) program. Under this program, property owners agree to protect biological and geological resources such as paleontological features. Federal agencies and their agents must consider the existence and location of designated NNLs, and of areas found to meet the criteria for national significance, in assessing the effects of their activities on the environment under the National Environmental Policy Act (NEPA).

16 U.S.C. 470aaa (the Paleontological Resources Preservation Act) prohibits the excavation, removal, or damage of any paleontological resources located on federal land under the jurisdiction of the Secretaries of the Interior or Agriculture without first obtaining an appropriate permit. The statute establishes criminal and civil penalties for fossil theft and vandalism on federal lands. The BLM is part of the Department of the Interior (DOI), and there are BLM-administered lands within the project limits; therefore, a BLM permit is necessary if paleontological resources are anticipated to be encountered.

23 U.S.C. 1.9(a) requires that the use of federal-aid funds must be in conformity with federal and state law.

23 U.S.C. 305 authorizes the appropriation and use of federal highway funds for paleontological salvage as necessary by the highway department of any state, in compliance with 16 U.S.C. 431-433 above and state law.

42 USC 4321-4347 (the National Environmental Policy Act) mandates the protection of important historic, cultural, and natural aspects of our national heritage within its general policy for environmental protection. Consideration of paleontological resources may be required under NEPA when a project is proposed for development on federal land, or land under federal jurisdiction or when federal funds are used.

State Laws and Regulations

Under California law, paleontological resources are protected by the California Environmental Quality Act (CEQA). If paleontological resources are identified during the paleontological assessment as being within the project area, the sponsoring agency must take those resources into consideration when evaluating project effects. The level of consideration may vary with the importance of the resource.

California Public Resources Code (PRC) protects paleontological resources under Section 5097.5, which prohibits the “knowing and willful” excavation, removal, destruction, injury, or defacement of any paleontological feature on public lands (i.e., lands under state, county, city, district, or public authority jurisdiction of a public corporation), except where the public agency with jurisdiction over the lands has granted express permission. Section 30244 of the PRC also requires reasonable mitigation for impacts on paleontological resources, as identified by the State Historic Preservation Officer (SHPO), that occur as a result of development on public lands.

Local Laws and Regulations

Caltrans is not required to comply with local laws and ordinances, however it endeavors to do so to the extent practicable.

Los Angeles County General Plan (Sections 5.9.1 and 5.9.4), in agreement with CEQA, has a policy to protect paleontological resources where feasible.

The County of San Bernardino Development Code (Section 82.20) defines requirements for project paleontological mitigation programs, including criteria for qualified paleontologist(s) who will supervise all paleontological work. A paleontological mitigation program will include, but not be limited to field survey before grading, monitoring during grading, preparation of recovered specimens, identification and curation of specimens into the San Bernardino County Museum, and a preparation of a report of findings with an inventory of specimens.

The City of Palmdale 1993 General Plan requires paleontological mitigation measures to avoid adverse effects on paleontological resources when their occurrence is strongly substantiated by background study. Under the Environmental Resources Element of the general plan, Goal ER7.1 protects “historic and culturally significant resources that contribute to the community’s sense of history.” Objective ER7.1 promotes “the identification and preservation of historic structures, historic sites, archaeological sites, and paleontological resources in the city.” Policy ER7.1.3 requires new development to “protect significant historic, paleontological, or archaeological resources or provide for other appropriate mitigation.

Affected Environment

Information contained in this section is summarized from the Combined Paleontological Identification and Evaluation Report (PIR/PER) for the High Desert Corridor Freeway, Los Angeles and San Bernardino Counties, California, 07-LA and 08-SBD (PM: SR-14 to SR-18/I-15), EA 116720; Project ID No. 0712000035. Caltrans. August 2014.

Regional Geology

The project study area (PSA) lies within the Mojave Desert Geomorphic Province which consists of fault bounded isolated mountain ranges and large expanses of desert. Most of the project lies north of the San Andreas Fault Zone and east of the Garlock Fault Zone, both of which impact the alignment of the nearby mountain ranges. The Mojave Desert (also locally called the “High Desert”) has a closed drainage system which results in thick alluvial fans and numerous playas. Figure 3.2.4-1 presents the geologic map of the project study area.

Stratigraphy

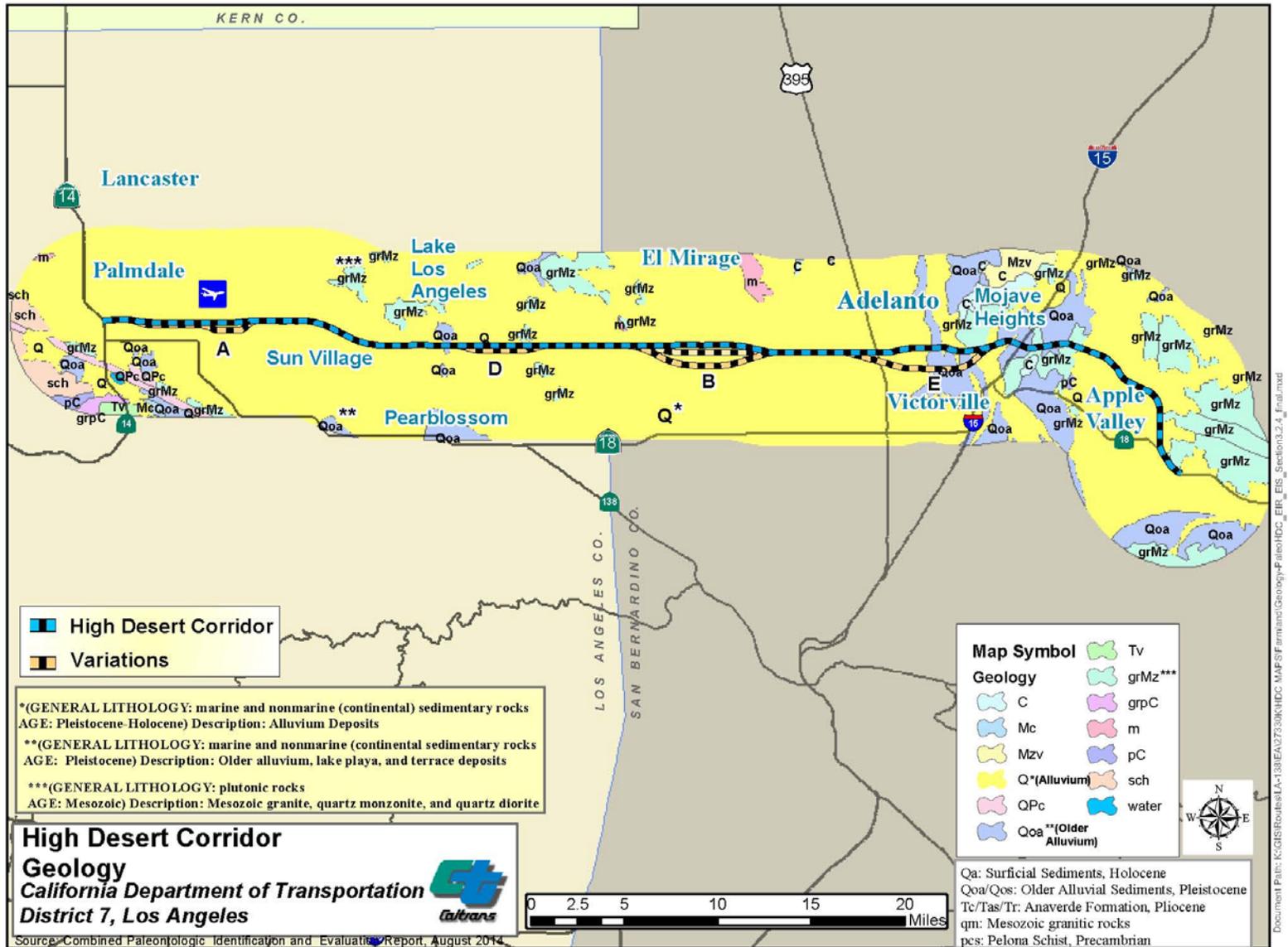
The majority of the PSA is mapped as Quaternary alluvium derived from the San Gabriel and San Bernardino mountains to the south. Additional Quaternary units include dune sands, playa and river deposits. Quaternary older alluvium and Quaternary older schist gravels, the Pliocene Anaverde Formation, Mesozoic plutonic rocks, and Paleozoic metasedimentary rocks are also in the areas that may also be impacted.

Quaternary Deposits

The majority of the PSA is mapped as Holocene (less than 11,000 years old) alluvium (Qa). Sediments include unconsolidated sands, silts and gravels that increase in coarseness in relation to the location of the source. Much of the western and central portions of this project from Palmdale to Adelanto and the eastern portion of the project in Apple Valley consist of coarse- to fine grained alluvial fan deposits off the San Gabriel-San Bernardino mountains and the local hills.

Deposits of Holocene (less than 11,000 years old) dune sand, playa deposits, and river deposits are also present. Quaternary (Holocene) dune sand (Qs) consists of windblown deposits of unconsolidated sand. Quaternary (Holocene) playa deposits (Qc) are unconsolidated clays and silts deposited in a lake. Quaternary (Holocene) Mojave River deposits (Qg) are unconsolidated silts to boulder sized stream deposits of the current Mojave River.

Figure 3.2.4-1 Geologic map of HDC Study Area



Source: Combined Paleontologic Identification and Evaluation Report, August 2014.
 California Geological Survey-Geologic Map of California, 2010, Geologic Mapping Program
http://services.gis.ca.gov/arcgis/rest/services/GeoscientificInformation/CA_750K_Geology/MapServer

Map Created by Robert Wang 09/08/14 Division of Environmental Planning

Quaternary Older Deposits

Outcrops of Pleistocene (11,000 years to 2.6 million years old) older alluvium (Qoa) of the ancient Mojave River, dating to the Irvingtonian North American Land Mammal Age (780 to 350 thousand years) near the Southern California Logistics Airport are present in the Victorville area. These poorly to moderately consolidated, light grey to buff, silt to boulder sized stream deposits of the ancient Mojave River, boarder the modern river channel as terraces.

Pleistocene older schist cobble conglomerates (Qos) are derived from the Pelona Schist near the San Andreas Fault Zone. They grey to brown, schist-rich gravels are supported in a matrix of biotite-rich sands.

Pliocene Anaverde Formation

Outcrops of Pliocene (2.6 to 5.3 million years old) Anaverde Formation (Tas, Tac) are present in the southwestern portion of the PSA. The sandstone (Tas) is a grey-white to yellowish buff, fine to coarse grained commonly conglomeratic, arkosic sand. Deposited by large streams off of local granitic rock there are also occasional sections of thin bedded shale. A grey shale unit (Tac) is also present within the PSA. Primarily consisting of thin bedded, clayey to silty shale the unit also includes interbeds of fine grained arkosic sands.

Mesozoic Granitics

A Mesozoic (252 to 66 million year old), questionably Jurassic (201 to 145 million year old) quartz monzonite (qm), occurs throughout the PSA in small outcrops. This grey-white, medium grained, massive to rarely gneissoid rock forms the major batholith of the Western Mojave Desert. Along the San Andreas Fault Zone the quartz monzonite is intensely sheared.

Found in the eastern portion of the PSA as outcrops within the quartz monzonite, a black, medium to coarse grained, massive, Mesozoic hornblende diorite and gabbro (hdg) occurs to the north of Apple Valley.

A dark grey, medium grained, massive Mesozoic quartz diorite (qd) is found east of the Mojave River near Apple Valley.

Light grey to tan, fine to medium grained, massive, Mesozoic granite and quartz monzonite (gqm) is found to the northeast of Victorville.

Paleozoic Metasedimentary Rocks

A white to dark blue-grey, fine to coarsely crystalline, massive to bedded, Paleozoic (541 to 252 million year old), questionably Pennsylvanian (323 to 299 million year old) limestone (ml) is found east of the Mojave River near Apple Valley.

Fossil Localities

A paleontological records search for the project was conducted by the San Bernardino County Museum (SBCM). Prior records searches were also conducted at the University of California, Museum of Paleontology (UCMP) in Berkeley and at the Natural History Museum of Los Angeles County (LACM). Neither the UCMP nor the LACM had any records of fossils occurring within the PSA but the SBCM had four. An additional sixty three localities occur within one mile of the PSA.

In the Palmdale area are records of Quaternary reptiles and small mammals from thirty four localities. As these taxa occur both in the Holocene and Pleistocene, they are not temporally diagnostic of either time period, and may or may not be fossils. An additional locality from the Pliocene Anaverde Formation near the southwestern portion of the PSA has produced the remains of a mastodon.

No localities are known from the central portion of the PSA in the alluvial fan deposits from the San Gabriel and San Bernardino mountains. In the Adelanto-Victorville-Apple Valley area, Quaternary sediments of the ancestral Mojave River have produced another thirty two localities, four of which occur within the PSA. Along with numerous small mammals and reptiles, the remains of extinct animals including mammoth (*Mammuthus meridionalis*), giant ground sloth (*Paramylodon harlani*), horse (*Equus sp. cf. E. scotti*), and camels (*Hemiauchenia*, *Camelops hesternus*) have been recovered.

None of the Mesozoic or Paleozoic units have records of fossils.

Paleontological Sensitivity

Caltrans utilizes a tripartite scale to characterize paleontological sensitivity consisting of no potential, low potential and high potential (Caltrans 2012, Appendix C). A multilevel ranking system was developed by professional resource managers as a more practical tool, the Potential Fossil Yield Classification (PFYC) system (BLM 2009, Appendix C) which has a multi-level scale based on demonstrated yield of fossils. The PFYC system provides additional guidance regarding assessment and management for different fossil yield rankings and is therefore used here to complement the Caltrans scale.

Occurrences of fossil resources are closely tied to the geologic units (e.g., formations or members) that contain them. The probability for finding significant fossils in a project area can be broadly predicted from previous records of fossils recovered from the geologic units present in and/or adjacent to the study area.

Using the PFYC system, geologic units are classified based on the relative abundance of vertebrate fossils or scientifically significant invertebrate or plant fossils and their sensitivity to adverse impacts. This ranking is not designed to be applied to specific paleontological localities or small areas within units. Although significant localities may occasionally occur in a geologic unit, a few widely scattered important fossils or

localities do not necessarily indicate a higher PFYC value; instead, the relative abundance of localities is intended to be the major determinant for the value assignment. Geological setting and fossil localities were considered in determining paleontological sensitivity according to PFYC criteria.

Mesozoic plutonic rocks were assigned as Caltrans no sensitivity and PFYC 1. The Holocene deposits, Quaternary older schist cobble conglomerate, and the Paleozoic metasedimentary rocks were ranked low on both the Caltrans and PFYC (level 2) scales. As a limestone the Paleozoic deposits may include fossils and were ranked Caltrans low and PFYC 3b indicating moderate potential but undemonstrated yield.

Three geologic units were ranked as Caltrans high and PFYC 3a indicating moderate potential but unpredictable location of occurrence. These are the Quaternary older alluvium, and both units of the Anaverde Formation. No project rock units were ranked higher.

The paleontological sensitivity map is presented in the Combined PER/PER for the High Desert Corridor Freeway, Los Angeles and San Bernardino Counties, California, 07-LA and 08-SBD (PM: SR-14 to SR-18/I-15), EA 116720; Project ID No. 0712000035. Caltrans. August 2014, and is being kept on file at Caltrans.

Environmental Consequences

Only qualified, trained paleontologists with specific expertise in the type of fossils being evaluated can determine the scientific significance of paleontological resources. Fossils are considered to be 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;
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 (Scott and Springer 2003).

As so defined, significant paleontological resources are determined to be fossils or assemblages of fossils that are unique, unusual, rare, uncommon, or diagnostically important. Significant fossils can include remains of large to very small aquatic and terrestrial vertebrates or remains of plants and animals previously not represented in certain portions of the stratigraphy. Assemblages of fossils that might aid

stratigraphic correlation, particularly those offering data for the interpretation of tectonic events, geomorphologic evolution, and paleoclimatology are also critically important (Scott and Springer 2003; Scott et al. 2004).

No Build Alternative

The No Build Alternative would not create surface or subsurface impacts and thus would not create adverse impacts to potential paleontological resources.

Freeway/Highway and Freeway/Tollway Alternatives

These two alternatives would have the same construction footprint, and therefore impacts on paleontological resources would be the same. Since the footprint covered by various variations to the main corridor is located within the same locality, there would be no notable differences in the level of impacts between the main line and the variations.

The Quaternary older alluvium and Anaverde Formation have been demonstrated to be the only paleontologically sensitive sediments within the PSA that may be affected by project construction activities. These sediments will be encountered at the surface and may also be encountered in excavations at locations where they are overlain by younger non-fossiliferous deposits.

Grading, excavation and other subsurface excavation in defined areas of the proposed project have the potential to impact significant nonrenewable fossil resources of Pleistocene and Pliocene age. Vertical impacts of construction are at present unknown as the designs have yet to be completed, however are expected to be as much as 30 feet deep in bridge construction areas, approximately 30 to 40 feet for bents and other structural supports, and 5 to 10 feet for general grading. Due to the depth, these excavations have the potential to impact fossils in any of the areas mapped as Quaternary deposits. Even shallow excavations in areas mapped as Quaternary older alluvium (Qoa), particularly near the Mojave River, and the Anaverde Formation (Tac, Tas) have the potential to encounter significant paleontological resources.

The Combined PIR/PER for the HDC prepared for this project recommended that all excavations in areas mapped as Quaternary older alluvium (Qoa) and Anaverde Formation (Tac, Tas) have the potential to encounter significant paleontological resources be monitored full time. Excavations more than 10 feet in depth into Quaternary alluvial deposits (Qa, Qg, Qc, Qs) should be spot checked periodically for the presence of older, paleontologically sensitive sediments. Should sediments conducive to fossil preservation be encountered, monitoring should be implemented in those areas. Areas mapped as Paleozoic rock (ml) and Quaternary older schist cobble conglomerate (Qos) should be spot checked during construction and further evaluated for fossil potential as excavation proceeds.

Freeway/Highway and Freeway/Tollway with HSR Alternatives

These two alternatives would have the same construction footprint, and therefore impacts on paleontological resources would be the same. Since the footprint covered by various variations to the main corridor is located within the same locality, there would be no notable differences in the level of impacts between the main line and the variations.

Impacts to paleontological resources discussed under the Freeway/Highway and Freeway/Tollway alternatives would apply to the alternatives with HSR, with the exception that the alternatives with HSR would cover a larger footprint due to the required construction of the station connections in Palmdale and Victorville.

Avoidance, Minimization, and/or Mitigation Measures

Avoidance, minimization, and/or mitigation measures to minimize impacts to paleontological resources during project construction are provided in Section 3.6, Construction Impacts, Paleontology.

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