

3.11 PALEONTOLOGY

The information in this section is based on the *Paleontological Resources Identification and Evaluation Report* (October 2011).

3.11.1 REGULATORY SETTING

Paleontology is the study of life in past geologic time based on fossil plants and animals. A number of Federal statutes specifically address paleontological resources, their treatment, and funding for mitigation as a part of Federally authorized or funded projects (e.g., Antiquities Act of 1906 [16 USC 431-433], Federal-Aid Highway Act of 1960 [23 USC 305]), and the Omnibus Public Land Management Act of 2009 [16 USC 470aaa]). Under California law, paleontological resources are protected by the California Environmental Quality Act (CEQA).

3.11.2 AFFECTED ENVIRONMENT

Paleontological resources (fossils) are defined as any trace of a past life form. While wood, bones, teeth, and shells are the most common fossils, under certain conditions soft tissues, tracts, and trails may be preserved as fossils. Fossils are most commonly found in sedimentary rock layers.

The Interstate 710 (I-710) Corridor Project is located at the northern end of the Peninsular Ranges geomorphic province, a 900-mile-long northwest-southeast-trending structural block that extends from the tip of Baja California to the Transverse Ranges and includes the Los Angeles Basin. The total width of the province is approximately 225 miles, with a maximum landbound width of 65 miles. The province contains extensive pre-Cretaceous (more than 65 million years ago) igneous and metamorphic rocks covered by limited exposures of post-Cretaceous sedimentary deposits.

The I-710 Corridor Project runs along the course of the Los Angeles River, crossing the Los Angeles Basin from north to south. The Study Area is typified by a low-lying topography with slight hills or mesas rising above the basin floor.

The area surveyed for paleontological resources included areas of the I-710 Corridor Project where excavation is proposed, including the horizontal and vertical extents of anticipated ground-disturbing activities and consisted of approximately 1,977 acres. The surveyed area included all areas of proposed and existing right-of-way, utility relocations, lay-down areas, construction staging, and construction easements.

Geologic mapping indicates that sediments from the latest Quaternary period occur within the Study Area. Table 3.11-1 lists the ages for the formations and units exposed within the Study Area. These units are described below.

Table 3.11-1 Geologic Time Periods and Units within the I-710 Corridor Project Study Area

Epoch	Age (years ago)	Geologic Formation/Unit	Map Symbol
Quaternary Period			
Holocene	Less than 100	Artificial Fill	af
Holocene	Less than 10,000	Young Alluvium	Qyf
Holocene	Less than 10,000	Young Alluvium, sand	Qyfa
Holocene	Less than 10,000	Young Alluvium, silt	Qyfs
Pleistocene/Holocene	10,000	Fan Deposits	Qf
Pleistocene	10,000–1.8 million	Old Alluvial Fan and Valley Deposits	Qof
Pleistocene	10,000–1.8 million	Old Paralic Deposits, silt	Qops

Source: *Final Paleontological Resources Identification and Evaluation Report*, October 2011.

I-710 = Interstate 710

3.11.2.1 ARTIFICIAL FILL

Artificial fill is mapped throughout the Study Area. This is consistent with the fact that the I-710 Corridor Project is located in a developed area that has been substantially altered by human activity. Artificial fill consists of sediments that have been removed from one location and transported to another by humans. The transportation distance can range from a few feet to dozens of miles. Composition of artificial fill is dependent on its source. When it is compacted and dense, it is known as “engineered fill,” but it can be unconsolidated and loosely compacted. Artificial fill will sometimes contain modern debris such as asphalt, wood, bricks, concrete, metal, glass, plastic, and even plant material. Depending on the area, thickness can be less than one foot or several hundred feet.

3.11.2.2 YOUNG ALLUVIUM

Young alluvium, also known as recent alluvium, can range in age from Recent to Latest Pleistocene. It is similar to older alluvium but is usually located closer to an active stream channel. These deposits consist of loosely consolidated gravel, sand, and silt ranging from poorly sorted to well-sorted and composed of mainly quartz but also containing feldspar and biotite. The sand grains are generally subangular to subrounded, while the gravels and cobbles are rounded to well-rounded. The color of sediment is usually yellow-brown to gray-brown, depending on the nearby or upstream geology. These sediments cover the majority of the Study Area.

3.11.23 FAN DEPOSITS

Fan deposits are considered transitional between the Pleistocene and Holocene epochs and are found in the northern part of the Study Area along the western Puente Hills. These sediments were deposited as sheet flow off of these surrounding uplifts deposited alluvial fans into the Los Angeles Basin. Their composition is dependent on the source rocks from which they weathered.

3.11.24 OLD PARALIC AND OLD ALLUVIAL FAN AND VALLEY DEPOSITS

Paralic deposits are marine or nonmarine-derived sediments that came from an estuarine or swamp environment. Older alluvium is an alluvial deposit older than 10,000 years and is often called a nonmarine terrace deposit, as it is often the sediment contained within the stream terraces that are above, and flank the active stream channel. However, these deposits can also be found at depths below the active stream channel. These deposits consist of interbedded silt, clayey sand, and conglomeratic coarse-grained sands. The colors can vary from light yellows to browns and reds. Within the Study Area, these deposits are well-formed along the Los Angeles River.

3.11.25 FOSSIL LOCALITIES

Generally, scientifically significant paleontological resources are geologic sites or sedimentary deposits containing individual fossils or assemblages of fossils that are unique or unusual, are stratigraphically important, and add to the existing body of knowledge in specific areas stratigraphically, taxonomically, or regionally. All vertebrate fossils are classified as “significant.” Those fossils found undisturbed and not subjected to disturbance after their initial burial and fossilization are particularly important as they provide information for interpretation of tectonic events, past climates, the relationship between aquatic and terrestrial species, and evolution in general. In addition to the vertebrate fossils, invertebrate and plant fossils, as well as other environmental indicators associated with vertebrate fossils, are also considered significant. Certain invertebrate and plant fossils that are regionally rare or uncommon, or that help to define stratigraphy, age, or taxonomic relationships, are considered significant.

ARTIFICIAL FILL. Artificial fill can contain fossils, but these fossils have been removed from their original location and are therefore out of context. They are not considered important for scientific study.

YOUNG ALLUVIUM. Young alluvium can contain remains of once-living things such as bones, shells, and plants that are usually less than 10,000 years old, which is not enough time for the remains to be mineralized. Therefore, remains found in young alluvium are not considered to be “fossils.” Most of the remains that are found are similar to modern species. Occasionally, fossils from older upstream formations are eroded out and transported to a new location. However, it is usually impossible to determine where the fossils originally came from.

FAN DEPOSITS. Fossils have been recovered from similar deposits during construction of roads, housing developments, and other infrastructure. Remains of Pleistocene mammals have been found in these sediments. The potential exists to encounter similar fossils in all Pleistocene (older) fan deposits.

OLD PARALIC AND OLD ALLUVIAL FAN AND VALLEY DEPOSITS. Fossils have been found in similar deposits from excavations for roads, housing developments, retention basins, and quarries in the Los Angeles Basin and its vicinity. Remains of Rancholabrean animals, including elephant, horse, bison, camel, saber-toothed cat, and sloth from these localities. The potential exists to encounter similar fossils in all Pleistocene alluvium.

Across the Los Angeles Basin, a layer of Holocene sediments often overlies older, Pleistocene sediments. Occasionally, fossils from older upstream formations are eroded out, transported to a new location, and deposited as part of young alluvium. However, it is usually impossible to determine where the fossils originally came from and, therefore, they do not have scientific value.

3.11.2.6 PALEONTOLOGICAL SENSITIVITY

A formation or rock unit has paleontological sensitivity if it previously has produced or has characteristics conducive to the preservation of vertebrate fossils, has environmental indicators associated with vertebrate fossils, or has produced regionally uncommon invertebrate and plant fossils. All sedimentary rocks and certain volcanic and mildly metamorphosed rocks are considered to have sensitivity for paleontological resources.

As discussed above, formations with potential paleontological resources are located within the Study Area. The significance of a resource is often stated as “sensitivity” or “potential.” In most cases, decisions about how to manage paleontological resources must be based on this potential because the actual situation cannot be known until construction excavation for the project is underway. Paleontological significance may also be stated for a particular rock unit, predicated on the research potential of fossils suspected to occur in that unit. The California Department of Transportation (Caltrans) uses the following scale:

- **HIGH POTENTIAL:** Rock units that, based on previous studies, contain or are likely to contain significant vertebrate, significant invertebrate, or significant plant fossils. These units include, but are not limited to: sedimentary formations that contain significant nonrenewable paleontological resources anywhere within their geographical extent and sedimentary rock units temporally or lithologically suitable for the preservation of fossils. Areas with a high potential for containing significant paleontological resources require monitoring and mitigation.

- **LOW POTENTIAL:** This category includes sedimentary rock units that (1) are potentially fossiliferous but have not yielded significant fossils in the past; (2) have not yet yielded fossils but possess a potential for containing fossil remains; or (3) contain common and/or widespread invertebrate fossils if the taxonomy, phylogeny, and ecology of the species contained in the rock are well understood. Sedimentary rocks expected to contain vertebrate fossils are not placed in this category. Rock units designated as low potential generally do not require mitigation monitoring.
- **NO POTENTIAL:** Rock units of intrusive igneous origin, most extrusive igneous rocks, and moderately to highly metamorphosed rocks are classified as having no potential for containing significant paleontological resources. Artificial fill falls into this category.

3.11.27 LITERATURE REVIEW AND RECORDS SEARCH

A paleontological literature review and records search was conducted for the I-710 Corridor Project using unpublished reports, paleontological assessment and monitoring reports, field notes, published literature, and maps. A paleontological resource records search was conducted through the Natural History Museum of Los Angeles County (LACM). Paleontological resource locality forms on file at the LACM record fossil localities in sediments equivalent in age to those within the Study Area. As geologic formations and units can be exposed over large geographic areas but contain similar lithologies and fossils, the literature review and fossil locality search includes areas well beyond the Study Area.

The LACM does not have any recorded vertebrate localities within the Study Area. However, the LACM has recorded 27 fossil localities near the Study Area from the same or similar sedimentary deposits as those that occur within the Study Area (old paralic and old alluvial fan and valley deposits). These localities have produced typical examples of Upper Pleistocene land mammals, including bison, mammoth, diminutive antelope, horse, and giant ground sloth. Project design refinements in 2011 did not extend beyond the locality search limits from the original LACM locality search and, therefore, an additional records search was not performed. Some localities south of Interstate 405 (I-405) are within 0.5 mile of the Study Area.

3.11.28 FIELD SURVEY

The pedestrian survey confirmed much of the geology as it has been mapped. In localized areas, artificial fill has been added and some limited exposures of subsurface bedrock are located within the Study Area south of State Route 91 (SR-91). An additional survey was conducted to address the design refinements during May 2011.

3.11.3 ENVIRONMENTAL CONSEQUENCES

3.11.3.1 PERMANENT IMPACTS

BUILD ALTERNATIVES. Fossils and their associated contextual data are significant nonrenewable scientific resources, and the loss of these resources resulting from construction of the I-710 Corridor Project would be the primary impact on paleontological resources. Earthmoving operations could result in the destruction of fossils and fossiliferous rock units within the construction disturbance limits. It is often not possible to completely eliminate impacts to fossil resources. It is understood that earthmoving activity could, unavoidably, destroy some fossils. These types of impacts can be mitigated by collecting and preserving a representative sample of the entire fossil assemblage and associated geological information in the areas disturbed by project construction.

Permanent impacts from the I-710 Corridor Project build alternatives on paleontological resources would include:

- Destruction of paleontological resources;
- Damage to paleontological resources during grading;
- Destruction of rock units that may contain paleontological resources;
- Loss of contextual data associated with paleontological resources; and
- Loss of associations between paleontological resources.

The I-710 Corridor Project would cross two fossiliferous Early to Late Pleistocene sediments deposited during the last 1.8 million years. These fossiliferous sediments crop out at the surface and may also be encountered below the surface of the I-710 Corridor Project.

Table 3.11-2 summarizes the specific sensitivities for units within the Study Area. This table lists the Paleontological Potential Sensitivity Scale used by Caltrans. Sensitivities (and potential) for the older alluvium and old paralic deposits are high to very high based on the presence of significant paleontological fossil remains that have been recovered from these units in other areas. The area where the artificial fill is located is assigned a sensitivity of “low” in the event that excavation extends below the fill to the underlying formation or unit. The young alluvium has no sensitivity as it is too young to contain paleontological resources; however, like the artificial fill, the area where the young alluvium occurs is assigned a sensitivity of “low” in case it is shallow and the underlying sediments are encountered.

Table 3.11-2: Geologic Units and Potential Paleontological Sensitivity within the I-710 Corridor Project Study Area

Geologic Unit	Paleontological Potential Sensitivity (Caltrans)
Artificial Fill	Low
Young Alluvium	Low
Fan Deposits	Low
Older Alluvial Fan and Valley Deposits	High
Paralic Deposits	High

Source: *Paleontological Identification and Evaluation Report*, October 2011.

I-710 = Interstate 710

Caltrans = California Department of Transportation

All alternatives reconstruct the freeway on generally the same vertical alignment as the existing freeway. Excavation occurs at or next to previously excavated areas for the original roadways. The most significant excavations are for highway bridges. These entail excavations for pile caps, which vary in depth up to 15 feet. The lateral extent corresponds to the length and width of each bridge.

Alternatives 6A/B/C have more bridges than 5A; therefore, Alternatives 6A/B/C have more excavation than Alternative 5A. Depth of the excavation and the sensitivity areas are the same (i.e., same linearity for all I-710 Corridor Project build alternatives). There are 99 bridge locations for Alternative 5A and 163, 171, and 172 locations for Alternatives 6A/B/C Design Options 1/2/3, respectively.

Construction of the I-710 Corridor Project build alternatives is not anticipated to impact special paleontological situations that would require project redesign to avoid critical localities or strata. However, because there are areas of high paleontological sensitivity within the Study Area, a Paleontological Mitigation Plan (PMP) will be prepared.

NO BUILD ALTERNATIVE. Under Alternative 1, the permanent impacts to paleontological resources discussed above for the I-710 Corridor Project build alternatives would not occur.

3.11.3.2 PUBLIC HEALTH CONSIDERATIONS

No public health considerations were identified relative to project impacts on paleontological resources.

3.11.4 AVOIDANCE, MINIMIZATION, AND/OR MITIGATION MEASURES

Prior to completion of the final design, a PMP will be prepared to reduce impacts to paleontological resources. The PMP synthesizes guidelines provided by Caltrans and the Society of Vertebrate Paleontology (SVP) and will be specifically tailored to the resources and sedimentary formations that may be encountered during excavation within the Study Area. Mitigation to address impacts on paleontological resources that may be encountered during construction is required for all build alternatives. Measure PAL-1 addresses potential impacts to nonrenewable paleontological resources. The following measure would be required for all build alternatives. More project-specific measures may need to be developed during preparation of the PMP to refine these measures during final project design.

PAL-1 Prior to completion of the final design, the California Department of Transportation (Caltrans) and a qualified Principal Paleontologist shall prepare a Paleontological Mitigation Plan (PMP) that includes the following measures:

- A preconstruction field survey shall be conducted in areas identified as having high paleontological sensitivity after vegetation and paving have been removed, followed by salvage of any observed surface paleontological resources prior to the beginning of additional grading.
- A qualified paleontologist or representative shall attend the pregrade meeting. At this meeting, the paleontologist will explain the likelihood for encountering paleontological resources, what resources may be discovered, and the methods of recovery that will be employed.
- During construction excavation, a qualified vertebrate paleontological monitor shall initially be present on a full-time basis whenever excavation will occur within the sediments that have a high paleontological sensitivity rating and on a spot-check basis for excavation in sediments that have a low sensitivity rating. Monitoring may be reduced to a part-time basis if no resources are being discovered in sediments with a high sensitivity rating (monitoring reductions, when they occur, will be determined by the qualified Principal Paleontologist). With the resident engineer's approval, the monitor shall temporarily divert construction equipment away from the immediate area of the discovery. The monitor shall be equipped to rapidly stabilize and remove fossils to avoid prolonged delays to construction schedules. If large mammal fossils or large concentrations of fossils are encountered, Caltrans shall consider using heavy equipment on site to assist in the removal and collection of large materials.

- Localized concentrations of small (or micro-) vertebrates may be found in all native sediments. Therefore, these sediments occasionally spot-screened on site through one-eighth- to one-twentieth-inch mesh screens determines whether microfossils are present during monitoring. If microfossils are encountered, sediment samples (up to three cubic yards, or 6,000 pounds) shall be collected and processed through one-twentieth-inch mesh screens to recover additional fossils.
- Recovered specimens shall be prepared to the point of identification and permanent preservation. This includes the sorting of any washed mass samples to recover small invertebrate and vertebrate fossils, the removal of surplus sediment from around larger specimens to reduce the volume of storage for the repository and storage cost, and the addition of approved chemical hardeners/stabilizers to fragile specimens.
- Specimens shall be identified to the lowest taxonomic level possible and curated into an institutional repository with retrievable storage. The repository institution usually charge a one-time fee based on volume, so removing surplus sediment is important. The repository institution may be a local museum or university with a curator who can retrieve the specimens on request. Caltrans requires that a draft curation agreement be in place with an approved curation facility prior to the initiation of any paleontological monitoring or mitigation activities.
- A Paleontological Mitigation Report (PMR) documenting completion of the PMP for the Lead Agency (Caltrans) shall be prepared and submitted.

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