APPENDIX F

Paleontological Resources Report

ANTELOPE VALLEY LINE CAPACITY AND SERVICE IMPROVEMENTS PROGRAM

PALEONTOLOGICAL RESOURCES TECHNICAL REPORT

Prepared For:

Metro™

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ACRONYMS AND ABBREVIATIONS

Af	Artificial fill
AVL	Antelope Valley Line
Bgs	Below ground surface
BLM	Bureau of Land management
Caltrans	California Department of Transportation
CEQA	California Environmental Quality Act
CPUC	California Public Utilities Commission
EIR	Environmental Impact Report
I-210	Interstate 210
I-5	Interstate 5
LACM	Los Angeles County Museum
LAUS	Los Angeles Union Station
LOS	Level of Service
Metro	Los Angeles County Metropolitan Transportation Authority
MM	Mitigation Measure
mph	miles per hour
MPO	Metropolitan Planning Organizations
NHMLA	Natural History Museum of Los Angeles County
OPR	Office of Planning and Resources
PBDB	Paleobiology Database
PFYC	Potential Fossil Yield Classification
PRC	Public Resources Code
PRIMP	Paleontological Resources Impact Mitigation Plan
Qa	Alluvial gravel and clay of valley areas
Qf	Modern alluvial fan deposits
Qg	Gravel and sand of major stream channels
Qls	Landslide debris

Qoa	Low terrace remnants of alluvial gravel and sand
Qog	Alluvial fan and high terrace deposits of gravel and sand
QTs	Saugus Formation, conglomerate and sandstone
Qyfc	Younger alluvial fan deposits
Qyp	Younger playa deposits
ROW	Right-of-Way
RTP	Regional Transportation Plan
SB	Senate Bill
SCORE	Southern California Optimized Rail Expansion
SCRRA	Southern California Regional Rail Authority
SCS	Sustainable Communities Strategies
SR-14	State Route 14
SRP	State Rail Plan
Tp	Pico Formation, micaceous siltstone-claystone
Tps	Pico Formation, sandstone
Ts	Saugus Formation, similar to QTs
Tsr	Saugus Formation, Sunshine Ranch Member
Ttoc	Towsley Formation, micaceous silty claystone and siltstone
Ttos	Towsley Formation, sandstone
UCMP	University of California Museum of Paleontology
UPRR	Union Pacific Railroad
VMT	Vehicle Mile Traveled

1. Introduction

The Los Angeles County Metropolitan Transportation Authority (Metro) is initiating the Antelope Valley Line (AVL) Capacity and Service Improvements Program (Proposed Project) which involves the construction of three capital improvements which would provide the capacity required to allow commuter rail service to increase along the AVL to 30-minute bi-directional headways between Los Angeles Union Station and Santa Clarita Valley and up to 60-minute bi-directional headways to Lancaster Terminal by the year 2028. A Draft Environmental Impact Report (EIR) is being prepared for the following purposes:

- To satisfy the requirements of the California Environmental Quality Act (CEQA) (Public Resources Code (PRC) Section 21000, et seq.) and the CEQA Guidelines (California Code of Regulations, Title 14, Chapter 3, Section 15000, et seq.).
- To inform public agency decision makers and the public of the significant environmental effects of the Proposed Project, as well as possible ways to minimize those significant effects, and reasonable alternatives to the Proposed Project that would avoid or minimize those significant effects.
- To enable Metro to consider environmental consequences when deciding whether to approve the Proposed Project.

The AVL is an existing 76.6-mile rail corridor that runs from Los Angeles Union Station (LAUS) in the City of Los Angeles to the Lancaster Terminal in the City of Lancaster within the County of Los Angeles. The Proposed Project would construct three capital improvements along the existing AVL rail corridor to provide operational flexibility and facilitate increased and more reliable Metrolink service along the corridor.

This Paleontological Resources Technical Report is comprised of the following sections:

1. Introduction
2. Project Description
3. Regulatory Framework
4. Existing Setting
5. Significance Thresholds and Methodology
6. Impact Analysis
7. References
8. List of Preparers

2. Project Description

The Proposed Project would construct three capital improvements along the existing AVL rail corridor to provide operational flexibility and facilitate increased and more reliable Metrolink service along the corridor. The AVL right of way (ROW) is owned by Metro and used by the Southern California Regional Rail Authority (SCRRA), which operates Metrolink commuter rail service. The AVL is an existing 76.6-mile rail corridor that runs from LAUS in the City of Los Angeles to the Lancaster Terminal in the City of Lancaster within the County of Los Angeles. The corridor consists of the former Southern Pacific Valley Line and parallels the Interstate 5 (I-5) freeway from Los Angeles to Santa Clarita, turns east, then north, to parallel State Route 14 (SR-14) to the City of Lancaster.

The route is Federal Railroad Administration Track Class 4, with a maximum speed of 79 miles per hour (mph). The Union Pacific Railroad (UPRR) operates Class 1 freight service along the corridor as well. There are up to 30 Metrolink commuter trains and five UPRR freight trains per day on the AVL.

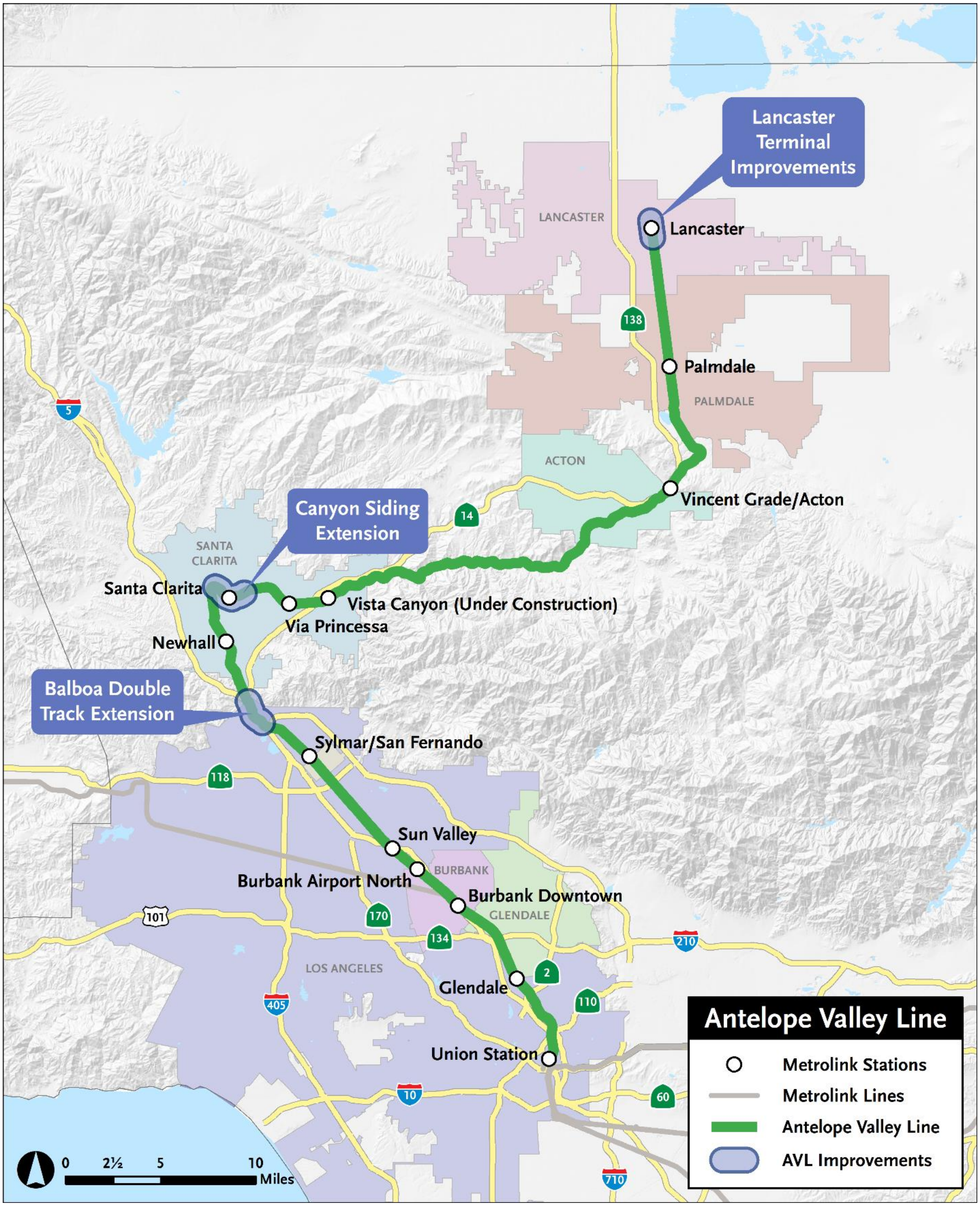
Figure 1 shows the regional context of the Project corridor and the location of the proposed capital improvements.

2.1 PROJECT OBJECTIVES

The AVL plays a critical role in connecting communities in North Los Angeles County to LAUS and the cities in between. Consistent with the State Rail Plan and Metrolink's Southern California Optimized Rail Expansion (SCORE) program, and in anticipation of substantial population and employment growth in the North Los Angeles County region over the next 20 years, Metro seeks to improve rail service on the AVL to realize its full potential as a regional mobility enhancement and not just a peak-hour commuter service. Accordingly, the AVL Capacity and Service Enhancement Improvement Program seeks to:

- Provide regular and more frequent Metrolink services to improve regional connectivity and accessibility through the enabling of 30-minute bi-directional passenger rail service to the Santa Clarita Valley, as well as 60-minute bi-directional service to Lancaster along the AVL corridor.
- Improve passenger service reliability and efficiency on the AVL rail corridor.
- Provide necessary infrastructure improvements to enhance operational flexibility and reliability along the AVL corridor.
- Support the vision and goals for rail service in the region consistent with the California State Rail 2040 Plan and Metrolink's SCORE program.

Figure 1: Regional Context of the Study Corridor



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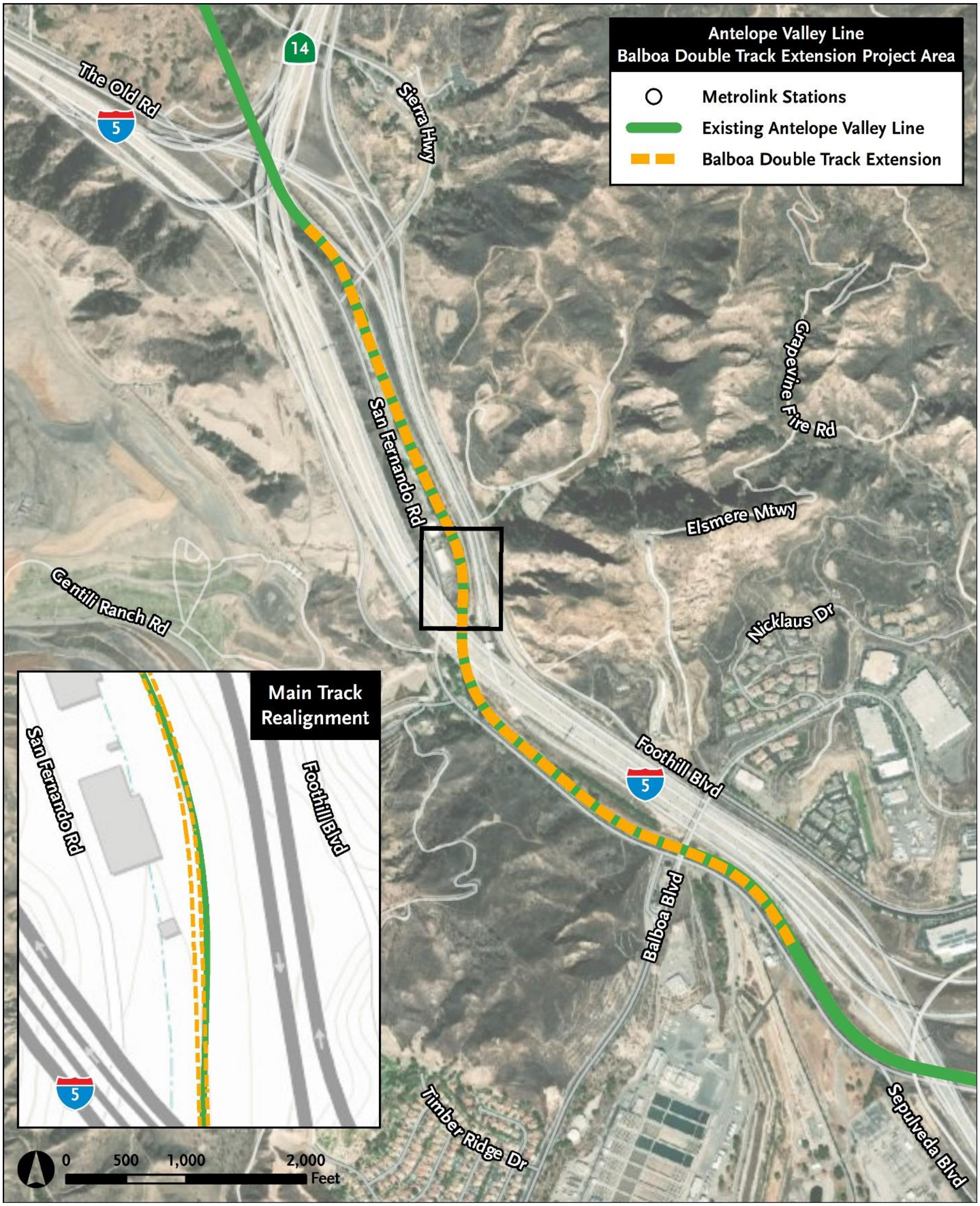
2.2 PROPOSED PROJECT

The Proposed Project is intended to enable improved service along the AVL by constructing three capital improvements at three locations strategically selected along the AVL corridor to provide the most operational flexibility possible for the level of investment available. These three capital improvements are the Balboa Double Track Extension in the City of Los Angeles, the Canyon Siding Extension in the City of Santa Clarita, and the Lancaster Terminal Improvement in the City of Lancaster.

2.2.1 Balboa Double Track Extension

The Balboa Double Track Extension would extend the existing Sylmar siding approximately 6,300 feet north from Balboa Boulevard to Sierra Highway. It is anticipated that the existing railroad ROW would accommodate most of the Balboa Double Track Extension. In addition to installation of the proposed double track extension, the improvement would require realignment of the existing Main Track through portions of the site to accommodate the second track and the required clearance to existing structures. The proposed double track would be positioned to the east of the existing AVL Main Track and would tie-in at the existing Sylmar siding terminus on the south end of the site and reconnect with the existing Main Track at the north end just south of the Sierra Highway road bridge. **Figure 2** presents the location of the proposed improvement and its surroundings.

Figure 2: Balboa Double Track Extension Vicinity



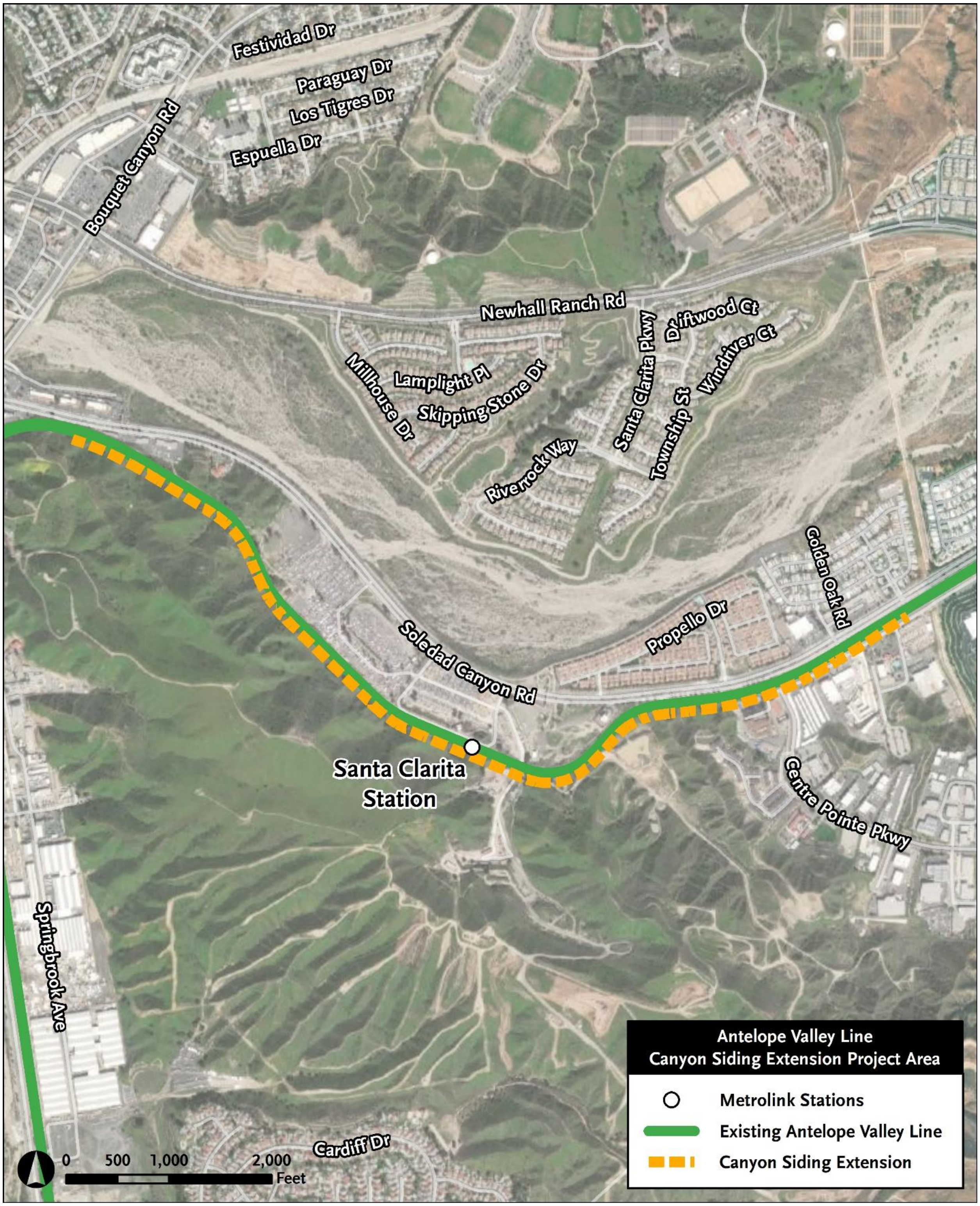
2.2.2 Canyon Siding Extension

The Canyon Siding Extension would improve the existing Saugus Siding by adding approximately 8,400 feet of new track between Bouquet Canyon Road and Golden Oak Road. The Canyon Siding Extension would not require realignment of the Main Track as there is adequate horizontal clearance for both tracks within the existing ROW. The proposed Canyon Siding Extension would include a second side-platform at the existing Santa Clarita Metrolink Station. A new crossover track south of the Santa Clarita Station would be provided to facilitate turnback of Metrolink trains at Santa Clarita Station and improve operational flexibility and reliability. **Figure 3** provides the location of the proposed Canyon Siding Extension and its surroundings.

Platform to Platform Pedestrian Undercrossing Design Option
An option to use a grade separated pedestrian undercrossing at Santa Clarita Station has been considered to connect the existing platform to the new second platform.

Island Platform with Platform to Parking Lot Pedestrian Undercrossing Design Option
An option to provide a new island platform (with two platform faces) has been considered and would include a grade separated pedestrian undercrossing connecting the Santa Clarita Metrolink Station parking area to the new island platform.

Figure 3: Canyon Siding Extension Vicinity



2.2.3 Lancaster Terminal Improvements

The Lancaster Terminal Improvements would include the expansion of the existing train layover facilities by adding one new 1,000-foot-long and two 500-foot-long train storage tracks of Lancaster Boulevard. The train storage track design may require an operating easement within the UPRR ROW subject to further design refinements. The proposed layover facility would accommodate up to four 5-car trains. **Figure 4** provides the location of the proposed improvement and its surroundings.

Island Platform with Pedestrian Undercrossing Design Option

An option has been developed to provide an island platform with two platform faces at Lancaster Station. The island platform would be constructed within the footprint of the existing station platform and parking lot at Lancaster Station. A grade separated pedestrian undercrossing to the island platform would be constructed in the middle of the new island platform with ramps for access to the proposed island platform.

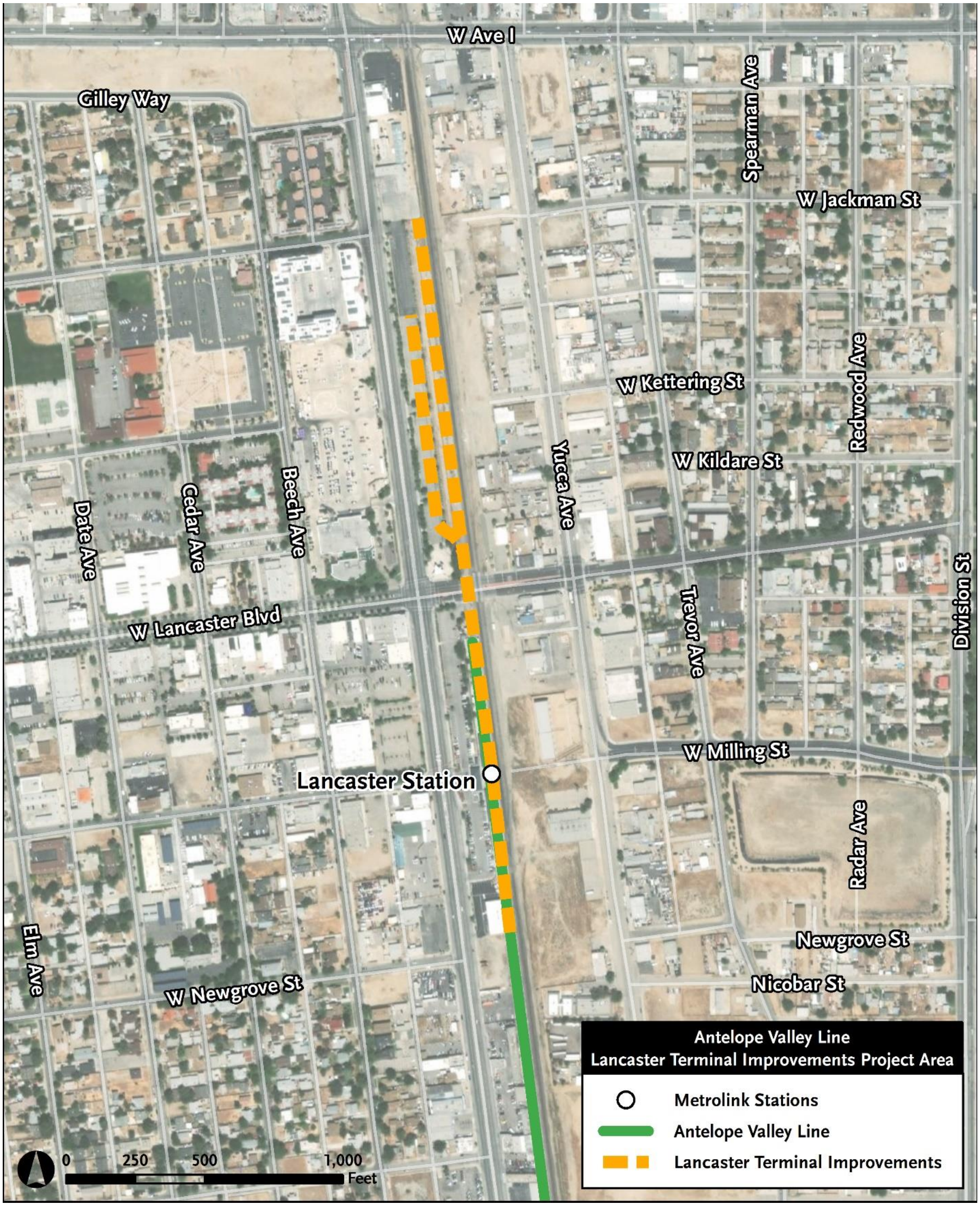
Island Platform with Pedestrian Overcrossing Design Option

Similar to the previous option (Island Platform with Pedestrian Undercrossing Design Option), the Island Platform with Pedestrian Overcrossing Design Option would have generally the same track and station configuration and would use a grade separated pedestrian overcrossing to access the island platform. The pedestrian overcrossing would be constructed on the north end of the island platform with stairs and an elevator to go up and over the railroad track. Pedestrians would access the ground level in the station parking lot near the existing Lancaster Metrolink Station building.

Island Platform with Pedestrian At-Grade Crossing Design Option

Similar to the previous two options (Island Platform with Pedestrian Undercrossing Design Option and Island Platform with Pedestrian Overcrossing Design Option), the Island Platform with Pedestrian At-Grade Design Option would have generally the same track and station configuration and would use an at-grade pedestrian crossing to access the island platform. The pedestrian at-grade crossings would be constructed on the north and south ends of the island platform. Pedestrians would access the crossing via existing or new sidewalks in the station parking lot.

Figure 4: Lancaster Terminal Improvements Vicinity Map



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2.3 OPERATIONAL CHARACTERISTICS

The Proposed Project is intended to enable the increase in Metrolink service to 30-minute bi-directional service from LAUS to the Santa Clarita Valley and 60-minute bi-directional services to Lancaster. As of 2019, Metrolink operates 30 weekday trains, 12 Saturday trains, and 12 Sunday trains with an end-to-end trip time of approximately two hours and 15 minutes. Peak service operates roughly every 30 to 60 minutes, with most of the trains making all stops and one train providing express service. Non-peak direction service operates from every 45 minutes to over two hours and does not serve all the northern-most stations (Vincent Grade/Acton, Palmdale and Lancaster). Train speeds along the AVL range from approximately 30 to 70 mph depending on topography, track geometry, and whether there is a single track or double track configuration.

2.4 CONSTRUCTION

The Proposed Project would almost entirely be constructed within existing rail or street ROW. Minor acquisitions, easements, or temporary construction easements may be necessary at select locations mainly to accommodate construction staging and laydown areas and to accommodate the required grading activities associated with the proposed capital improvements. Generally, construction activities associated with each Capital Improvement would include site clearing, grading and retaining wall installation, utility relocation and installation, and track and systems installation and station platform construction.

Construction equipment anticipated to be used for the Proposed Project include track installation equipment, front-end loaders, dump and haul trucks, excavators, medium to large rams for braking rock, small/medium scrapers, drills for tiebacks/rock bolts, construction forklifts, crane, concrete pump trucks, concrete haul trucks, rail-mounted drill rig (for pier protection wall installation) and utility/service vehicles.

The construction duration of the Proposed Project is expected to last approximately 24 months per Capital Improvement. For safety reasons and to limit disruptions to rail service, Project specific work windows would be required for much of the construction work. Similarly, certain activities that could disrupt rail service may require nighttime and weekend construction to minimize disruption. The overall Project schedule anticipates construction commencing beginning 2024 and completion in 2028.

3. Regulatory Framework

3.1 STATE REGULATIONS

3.1.1 California Environmental Quality Act

The procedures, types of activities, persons, and public agencies required to comply with CEQA are defined in the Guidelines for Implementation of CEQA (State CEQA Guidelines), as amended on March 18, 2010 (Title 14, Section 15000 et seq. of the California Code of Regulations and further amended January 4, 2013, and December 28, 2018). One of the questions listed in the CEQA Environmental Checklist is: “Would the project directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?” (State CEQA Guidelines Appendix G, Section VII, Part F).

3.1.2 California Public Resources Code

The California PRC (Chapter 1.7), Sections 5097 and 30244, includes additional state level requirements for the assessment and management of paleontological resources. These statutes require reasonable mitigation of adverse impacts to paleontological resources resulting from development on state lands, and define the excavation, destruction, or removal of paleontological “sites” or “features” from public lands without the express permission of the jurisdictional agency as a misdemeanor. As used in Section 5097, “state lands” refers to lands owned by, or under the jurisdiction of, the state or any state agency. “Public lands” is defined as lands owned by, or under the jurisdiction of, the state, or any city, county, district, authority, or public corporation, or any agency thereof.

3.2 LOCAL REGULATIONS

The Proposed Project only has potential to encounter paleontological resources in areas where ground disturbances are proposed. Accordingly, local regulations that are applicable to the Proposed Project are those in the jurisdictions where the three capital improvements would be constructed.

3.2.1 Los Angeles County

The Conservation and Natural Resources Element of the County of Los Angeles General Plan (County of Los Angeles, 2015) recognizes paleontological resources as non-renewable and irreplaceable resources that are an important part of the County’s identity. Relevant Conservation and Natural Resources Element policies related to paleontological resource are shown in **Table 1.**

Table 1: County of Los Angeles General Plan

Policy	Description
C/NR 14.1	Mitigate all impacts from new development on or adjacent to historic, cultural, and paleontological resources to the greatest extent feasible.
C/NR 14.2	Support an inter-jurisdictional collaborative system that protects and enhances historic, cultural, and paleontological resources.
C/NR 14.5	Promote public awareness of historic, cultural, and paleontological resources.
C/NR 14.6	Ensure proper notification and recovery processes are carried out for development on or near historic, cultural, and paleontological resources.

SOURCE: County of Los Angeles, *Los Angeles County General Plan*, 2015.

3.2.2 City of Los Angeles

The City of Los Angeles' General Plan is a comprehensive, long-range declaration of purposes, policies, and programs. The Conservation Element of the General Plan identifies paleontological resources in the City of Los Angeles and contains resource management objectives and policies. Relevant Conservation Element objectives and policies related to paleontological resource are shown in **Table 2**.

Table 2: City of Los Angeles Conservation Element of the General Plan

Objective/Policy	Description
Objective	Protect the city's archaeological and paleontological resources for historical, cultural, research and/or educational purposes.
Policy 1	Continue to identify and protect significant archaeological and paleontological sites and/or resources known to exist or that are identified during land development, demolition or property modification activities.

SOURCE: City of Los Angeles, *Conservation Element of the Los Angeles General Plan*, 2001.

3.2.3 City of Santa Clarita

The City of Santa Clarita General Plan (2011) does not contain any goals, objectives, or policies pertaining to paleontological resources.

3.2.4 City of Lancaster

The City of Lancaster General Plan (2006) is a comprehensive, long-range declaration of purposes, policies, and programs. The Plan for Active Living of the General Plan contains resource management objectives and policies. Relevant Plan for Active Living objectives and policies related to paleontological resource are shown in **Table 3**.

Table 3: City of Lancaster Plan for Active Living Element of the General Plan

Objective/Policy	Description
Objective 12.1	Identify and preserve and/or restore those features of cultural, historical, or architectural significance.
Policy 12.1.1	Preserve features and sites of significant historical and cultural value consistent with their intrinsic and scientific values.
Policy 12.1.1(a)	As part of the CEQA review process, require site-specific historical, archaeological, and/or paleontological studies when there exists a possibility that significant environmental impacts might result or when there is a lack of sufficient documentation on which to determine potential impacts.

SOURCE: City of Lancaster, *Plan for Active Living of the Lancaster General Plan*, 2006.

4. Existing Setting

4.1 GEOLOGIC SETTING

The Project Area is located within the Peninsular Ranges Geomorphic Province (Harden, 2004). A geomorphic province is a geographical area of distinct landscape character, with related geophysical features, including relief, landforms, orientations of valleys and mountains, type of vegetation, and other geomorphic attributes (Harden, 2004). Attributes of the Peninsular Ranges Geomorphic Province consist of northwest-southeast-trending, fault-bounded discrete blocks, with mountain ranges, broad intervening valleys, and low-lying coast plains (Yerkes et al., 1965; Norris and Webb, 1990). Within California, the province extends approximately 125 miles from the Transverse Ranges and the Los Angeles Basin south to the Mexican border, extending southward approximately 775 miles toward to the tip of Baja California, and it is bound on the east by the right-slip San Andreas Fault Zone, the Eastern Transverse Ranges, and the Colorado Desert (Norris and Webb, 1990; Hall, 2007). Most of the geomorphic province is located offshore and includes the Santa Catalina and San Clemente islands (Hall, 2007). Topographically on the mainland, the Peninsular Ranges are steeper on the eastern slopes, where they are truncated by normal faults like the Elsinore or San Jacinto faults, and are more gradual on their western slopes toward the Pacific Ocean, similar to the topography of the Sierra Nevada (Norris and Webb, 1990; Prothero, 2017). Within the province, the highest elevations are found in the eastern-most block, with San Jacinto Peak reaching approximately 10,805 feet in elevation and various summits of the Santa Rosa Mountains averaging 6,000 feet in elevation (Norris and Webb, 1990). Westward toward the coast, elevations are less dramatic.

The pre-Phanerozoic history of the Peninsular Ranges is not represented within the province, and few locations contain rocks older than the Mesozoic (Norris and Webb, 1990), and sparse Paleozoic strata within the Peninsular Ranges is in stark contrast to the Sierra Nevada, which contains thick sections of Paleozoic rocks. The oldest pre-batholithic rocks in the Peninsular Ranges are Paleozoic in age and consist of metamorphosed remnants of a stable carbonate platform (now marble and schist) on a passive continental margin that existed along western North America at that time (Harden, 2004). Moreover, late Paleozoic limestone is present near Riverside (Norris and Webb, 1990), further supporting the presence of a shallow marine environment prior to the Mesozoic. Most of the geologic history of the Peninsular Ranges is represented by Mesozoic-age plutonic rocks and Cenozoic-age uplift, erosion, and sedimentary deposition in basins (Sylvester and O’Black Gans, 2016).

During the Triassic and Jurassic, marine sedimentary rocks composed of sandstone and shale were deposited in turbidite sequences along a submarine fan (Harden, 2004). Throughout the Jurassic and Cretaceous, the continental margin became active as the Farallon Plate, which ferried old island arcs, subducted beneath the North American Plate, creating a large pluton complex (i.e., batholith) beneath the surface that rose into the upper crust and intruded into Paleozoic and Mesozoic sedimentary and volcanic rocks (Harden, 2004; Sylvester and O’Black Gans, 2016). The large complex of batholiths resulted in the formation of the San Marcos

Gabbro, Bonsall Tonalite, and Woodson Mountain Granodiorite among others in the Peninsular Ranges (Norris and Webb, 1990). Contact metamorphism from the plutons metamorphosed older sedimentary and volcanic rocks into marble, slate, schist, quartzite, gneiss, and metavolcanic rocks (Sylvester and O'Black Gans, 2016). The timing of the Peninsular Ranges Batholith is similar to that of the Sierra Nevada, ranging in age from 70 to 120 million years ago (Norris and Webb, 1990). The batholith complex originally formed south of the Mexican border but has since moved along the right-slip San Andreas Fault over the past 40 million years (Prothero, 2017). During the Late Cretaceous through the Paleogene, the Peninsular Ranges Batholith was uplifted and eroded into a broad plain, where fluvial systems transported sediments westward across the plain and onto the seafloor (Sylvester and O'Black Gans, 2016). Sedimentary rocks were deposited in a forearc basin by turbidity currents representing both deep and shallow marine and nonmarine environments, including the marine Williams, Ladd, and Rosario formations and the nonmarine Trabuco Formation, with extensive exposures in the western flank of the Santa Ana Mountains (Norris and Webb, 1990; Harden, 2004).

Throughout the Cenozoic, thick sections of sedimentary rocks were deposited in large basins, such as the Los Angeles, Imperial, and offshore basins, due to erosion (Norris and Webb, 1990). Most exposures of early Tertiary strata are restricted to the coastal margins, with a maximum thickness of approximately 4,500 feet in the Santa Ana Mountains (Norris and Webb, 1990). Most Cenozoic strata represent nonmarine depositional environments; however, approximately 600 feet of marine sediments are present near San Diego (Norris and Webb, 1990). Thick nonmarine deposits formed during the Oligocene, followed by a pause of sedimentation at the end of the Oligocene due to tectonic uplift (Norris and Webb, 1990). By the beginning of the Miocene, most of the Farallon Plate had been subducted beneath the North American Plate, and the Pacific Plate came into contact with the North American Plate (Sylvester and O'Black Gans, 2016). As the Pacific Plate slid northwest along the North American Plate, a section of forearc basin was rafted, rotated clockwise approximately 110 degrees, and carried north approximately 130 miles; while carried northward, the forearc basin was compressed and formed the Transverse Ranges located immediately north of the Peninsular Ranges (Sylvester and O'Black Gans, 2016). Additionally, movement along the San Jacinto Fault Zone, which bifurcates from the San Andreas Fault Zone in an area north of the Peninsular Ranges, occurred in the middle to late Tertiary through the Quaternary, with a right-slip and vertical motion resulting in approximately 18 miles of lateral displacement (Norris and Webb, 1990). During this time, thick accumulations of nonmarine sediments filled basins, as well as coastal and offshore areas, in the northern Peninsular Ranges during the Pliocene, with up to 7,000-foot-thick sections of siltstone, sandstone, and conglomerate in the Mount Eden and San Timoteo canyons (Norris and Webb, 1990). Despite widespread volcanism elsewhere in southern California during the late Tertiary, little volcanism occurred within the Peninsular Ranges during this time (Norris and Webb, 1990). Throughout the Quaternary, fluvial and lacustrine sediments continued to fill basins within the province, with restricted volcanic and marine terrace deposits along the coast (Norris and Webb, 1990).

4.2 LITERATURE SEARCH

Geologic mapping indicates that the Balboa Double Track Extension area is underlain by Holocene-age alluvial gravel, sand, and clay of valley and floodplain areas (Qa), Pleistocene- to Pliocene-age Saugus Formation, conglomerate and sandstone (QTs), Pleistocene- to Pliocene-age Saugus Formation, Sunshine Ranch Member (Tsr), Pliocene-age Pico Formation, sandstone (Tps), Pliocene-age Pico Formation, micaceous siltstone-claystone (Tp), and early Pliocene- to late Miocene-age Towsley Formation, sandstone (Ttos) (Dibblee and Ehrenspeck, 1991, 1992) (**Figure 5**); the Canyon Siding Extension area is underlain by Holocene-age gravel and sand of major stream channels (Qg), Holocene-age alluvial gravel, and clay of valley areas (Qa), Holocene- to Pleistocene-age alluvial fan and high terrace deposits of gravel and sand (Qog), and Pleistocene- to Pliocene-age Saugus Formation, conglomerate and sandstone (QTs) (Dibblee and Ehrenspeck, 1996) (**Figure 6**); and the Lancaster Terminal Improvements area is underlain by Holocene-age modern alluvial fan deposits (Qf) and Holocene- to late Pleistocene-age younger alluvial fan deposits (Qyfc) (Hernandez, 2010) (**Figure 7**).

Geologic units mapped within a half-mile buffer of the Project Area are artificial fill (af), Holocene-age landslide debris (Qls), Pleistocene- to Pliocene-age Saugus Formation, similar to QTs (Ts), and late Miocene-age Towsley Formation, micaceous silty claystone and siltstone (Ttoc) in the Balboa Double Track Extension area; Holocene- to Pleistocene-age low terrace remnants of alluvial gravel and sand (Qoa) in the Canyon Siding Extension area; and Holocene- to late Pleistocene-age younger playa deposits (Qyp) in the Lancaster Terminal Improvements area. While these formations are mapped within the half-mile buffer, they are not anticipated to be impacted by Project construction and are therefore not discussed in detail with the exception of artificial fill (af) and Holocene- to Pleistocene-age low terrace remnants of alluvial gravel and sand (Qoa).

4.2.1 Artificial Fill (af)

Artificial fill (af) comprises recent deposits of previously disturbed sediments emplaced by construction operations and are found in areas where recent construction has taken place. Color is highly variable, and sediments are mottled in appearance. These sediments are not mapped within the boundaries of the Project Area but are likely to be encountered within previously disturbed portions of the Project. Scientifically significant fossils are generally not known from artificial fill (af) since any discovered resource would lack stratigraphic context. Therefore, artificial fill (af) has a low paleontological potential (Potential Fossil Yield Classification [PFYC] 2) using Bureau of Land Management (BLM) (2016) guidelines.

4.2.2 Younger Sedimentary Deposits (Qa, Qg, Qf, Qyfc)

Younger surficial sedimentary deposits are Holocene-age (less than 11,000 years old) and include alluvium (Qa), stream channel deposits (Qg), alluvial fan deposits (Qf), and younger alluvial fan deposits (Qyfc) within the Project Area. Alluvium within the Project Area consists of unconsolidated deposits of clay, sand, and gravel of valley and floodplain areas (Qa) (Dibblee and Ehrenspeck, 1991, 1992, 1996). Stream channel deposits (Qg) are composed of sand and gravel of major stream channels (Dibblee and Ehrenspeck, 1996). Alluvial fan deposits (Qf) consist of unconsolidated to weakly consolidated, poorly sorted, rubble, gravel, sand, and silt deposits forming active undissected alluvial fans (Hernandez, 2010). Younger alluvial fan deposits, clay rich (Qyfc) are composed of consolidated dark yellowish-brown, silty, fine arkosic sand with clay and calcium carbonate content (Hernandez, 2010). Holocene-age sediments are typically too young to contain fossilized material, but they may overlie sensitive older (e.g., Pleistocene-age) deposits at variable depth. Holocene-age younger sedimentary deposits (Qa, Qg, Qf, Qyfc) are therefore considered to have a low paleontological potential (PFYC 2) using BLM (2016) guidelines.

4.2.3 Older Sedimentary Deposits (Qoa, Qog)

Pleistocene-age older sedimentary deposits were deposited between approximately 11,000 years to 2.51 million years ago and comprise variable amounts of silt, sand, and gravel that were deposited in ancient terrestrial environments. Pleistocene-age units mapped within the Project Area and half-mile buffer include low terrace remnants of alluvial gravel and sand (Qoa) and alluvial fan and high terrace deposits of gravel and sand (Qog) (Dibblee and Ehrenspeck, 1996).

Ice Age taxa have been recovered from Pleistocene-age deposits of Los Angeles County and adjacent areas of Kern County, including over 180 localities on Edwards Air Force Base. Specimens include:

- frog (cf. *Rana* sp.)
- tortoise (*Emys marmorata*)
- scaled reptile (Squamata)
- snake (Serpentes)
- pheasant (*Parapavo californicus*)
- quail (Callipepla)
- shearwater (*Ardenna grisea*)
- western grebe (*Aechmophorus occidentalis*)
- loon (*Gavia* sp.)
- duck (Anatidae)
- diving goose (*Chendytes lawi*)
- ray-finned fish (Teleostei)
- eagle ray (*Myliobatis sp.*)
- shark (Chondrichthyes)
- white shark (*Carcharodon* sp.)
- perch (*Rhacochilus vacca*)
- speckled sanddab (*Citharichthys* sp.)
- white croaker (*Genyonemus lineatus*, *Merluccius productus*)
- rodent (*Neotoma* sp., *Thomomys* sp., *Dipodomys* cf. *agilis*, *Microtus californicus*, *Peromyscus* sp., *Notiosorex crawfordi*)
- rabbit (*Lepus californicus*, *Sylvilagus* sp.)

- horse (*Equus* sp., *Equus simplicidens*)
- tapir (*Tapirus haysii*, *Tapirus* cf. *californicus*)
- cat (Felinae)
- black bear (*Ursus americanus*)
- bison (*Bison* sp.)
- mammoth (*Mammuthus primigenius*, *Mammuthus* cf. *columbi*)
- mastodon (*Mammut pacificus*)
- ground sloth (Megalonychidae, *Megalonyx* sp., *Paramylodon harlani*)
- camel (*Camelops* sp., *Camelops* cf. *hesternus*, *Hemiauchenia* sp.)
- deer (*Odocoileus* cf. *hemionus*)
- dire wolf (*Canis* cf. *dirus*)
- coyote (*Canis* cf. *latrans*)
- lynx (*Lynx rufus*)
- saber-toothed cat (*Smilodon* sp.)
- whale (Cetacea)
- sea otter (*Enhydra* sp.)
- seal (Otariidae, Phocidae)
- sea lion (*Phoca* cf. *vitulina*, *Zalophus* sp.)
- dolphin (*Lissodelphis* sp.)
- bivalves (Bivalvia), and
- gastropod (Gastropoda)
- (Paleobiology Database [PBDB], 2021; University of California Museum of Paleontology [UCMP], 2021; **Table 4**).

Additional localities recorded from Pleistocene-age sedimentary deposits throughout southern California have produced specimens including mammoth (*Mammuthus* sp.), mastodon (*Mammut* sp.), camel (Camelidae), horse (Equidae), bison (*Bison* sp.), giant ground sloth (*Megatherium* sp.), peccary (Tayassuidae), cheetah (*Acinonyx* sp.), lion (*Panthera* sp.), saber-toothed cat (*Smilodon* sp.), capybara (*Hydrochoerus* sp.), dire wolf (*Canis dirus*), and numerous taxa of smaller mammals (Rodentia) (Cooper and Eisentraut, 2002; Jahns, 1954; Jefferson, 1991; **Table 4**). Pleistocene older sedimentary deposits (Qoa, Qog) are considered to have moderate paleontological potential (PFYC 3) using BLM (2016) guidelines.

4.2.4 Saugus Formation (QTs, Tsr)

The Saugus Formation was described by Kew (1924) for nonmarine to shallow marine, Pleistocene- to Pliocene-age (approximately 11,000 to 5.3 million years old) deposits in the eastern Ventura Basin, in Soledad Canyon. The formation has a total stratigraphic thickness of more than 6,000 feet and lies above and interfingers with the Pliocene-age Pico Formation (Winterer and Durham, 1962). Sediments consist of interbedded gray colored, coarse-grained to pebbly, friable sandstone and gray to greenish-gray colored, very fine-grained sandstone, silty sandstone, and sandy siltstone (Winterer and Durham, 1962). The Saugus Formation mapped within the Balboa Double Track Extension area includes conglomerate, sandstone, and lesser amounts of siltstone/claystone (QTs; Dibblee and Ehrenpeck, 1992, 1996), cobble conglomerate, sandstone, and claystone (QTs; Dibblee and Ehrenpeck, 1991), and Sunshine Ranch Member (Tsr; Dibblee and Ehrenspeck, 1991, 1992).

The Saugus Formation has yielded numerous Pleistocene- and Pliocene-age vertebrate fossils, including:

- turtle and tortoise (Chelonia)
- alligator lizard (*Gerrhonotus* sp.)
- rabbit (Leporidae)
- cottontail (*Sylvilagus* sp.)
- pocket gopher (*Thomomys* sp.)
- pocket mouse (*Perognathus* sp.)
- kangaroo rat (*Dipodomys* sp.)
- harvest mouse (*Reithrodontomys* sp.)
- woodrat (*Neotoma* sp.)
- pine mouse (*Pitymys meadensis*)
- elephant (Proboscidea)
- horse (*Pliohippus* sp.*, Equus* sp.)
- peccary (Tayassuidae)
- camel (Camelidae)
- deer (Cervidae)
- mammoth (*Mammuthus* sp.)
- mastodon (*Mammut* sp.)
- bison (*Bison* sp.)
- horse (*Equus occidentalis*), and
- llama (*Hemiauchenia macrocephala*) (Oakeshott, 1958; Jefferson, 1989; Squires and White, 1983; Winterer and Durham, 1962; **Table 4**).

The Saugus Formation (QTs, Tsr) is considered to have high paleontological potential (PFYC 4) using BLM (2016) guidelines.

4.2.5 Pico Formation (Tps, Tp)

The Pico Formation was described by Kew (1924) as deep marine, Pliocene-age (approximately 2.51 to 5.3 million years old) deposits in the vicinity of Pico Canyon in the Santa Susana Mountains. The formation lies below and interfingers with the Pleistocene- to Pliocene-age Saugus Formation (Winterer and Durham, 1962). The Pico Formation is subdivided into an upper sandstone and a lower siltstone-claystone member (Dibblee and Ehrenspeck, 1992). The Pico Formation mapped within the Balboa Double Track Extension area includes sandstone (Tps) and micaceous siltstone-claystone (Tp) (Dibblee and Ehrenspeck, 199l, 1992). The Pico Formation, sandstone (Tps) consists of mostly light gray to nearly white, friable cross-bedded medium to coarse grained sandstone and some pebble-cobble conglomerate of granitic detritus (Dibblee and Ehrenspeck, 1992). The Pico Formation, micaceous siltstone-claystone (Tp) consists of mostly gray micaceous siltstone-claystone, bedded to massive, and includes few thin sandstone layers (Dibblee and Ehrenspeck, 199l, 1992).

The Pico Formation has yielded numerous Pliocene-age marine microfossils (e.g., foraminifera) and invertebrate fossils, such as bivalves, gastropods, echinoderms, and brachiopods (Kew, 1924; Squires et al., 2006; Stewart and Stewart, 1930; Winterer and Durham, 1962). While vertebrate specimens are not well known they include fossil deep sea fish (*Homeomacrurus fernandensis*), eagle ray (*Myliobatis* sp.), bird (Aves), and baleen whale (*Nannocetus eremus*) (PBDB, 2021; UCMP, 2021; **Table 4**). The Pico Formation (Tps, Tp) is considered to have high paleontological potential (PFYC 4) using BLM (2016) guidelines.

4.2.6 Towsley Formation (Ttos)

The Towsley Formation was described by Winterer and Durham (1962) as marine, early Pliocene- to late Miocene-age (approximately 3.6 to 11.6 million years old) deposits consisting mainly of interfingering lenticular beds of sandstone, mudstone, and conglomerate. The formation has a total stratigraphic thickness of 4,000 feet, overlies and interfingers with the Modelo Formation and underlies the Pliocene-age Pico Formation. The Towsley Formation mapped within the Balboa Double Track Extension area consists of light gray to tan, coherent to semi-friable sandstone, medium grained to locally gritty and pebbly, bedded (Dibblee and Ehrenspeck, 1991, 1992).

The Towsley Formation has yielded numerous Pliocene- and Miocene-age marine microfossils (e.g., foraminifera) and invertebrate fossils, such as bivalves, brachiopods, gastropods, and echinoderms (Winterer and Durham, 1962; **Table 4**). Sparse vertebrate fossils include small cat (Felinae; Winterer and Durham, 1962; **Table 4**), baleen whale (*Nannocetus eremus*), dugong (*Dusisiren jordani*), walrus (*Imagotaria downs*), white shark (*Carcharodon hastalis*, *Carcharodon carcharias*), and megatoothed shark (*Otodus megalodon*) (PBDB, 2021; UCMP, 2021; **Table 4**). The Towsley Formation is considered to have high paleontological potential (PFYC 4) using BLM (2016) guidelines.

4.3 PALEONTOLOGICAL RECORD SEARCH RESULTS

A paleontological search of records maintained by the Natural History Museum of Los Angeles County (NHMLA) was completed on December 11, 2020. The museum reported that there is one fossil locality recorded from within the Balboa Double Track Extension area, and that additional localities have been recorded from sediments similar to those underlying the Project Area (Bell, 2020; Appendix A).

Locality LACM IP 21500 is partially located within the Balboa Double Track Extension area and produced invertebrate specimens from an unreported depth within Pliocene-age deposits (Bell, 2020; Appendix A; **Table 4**). North of the Balboa Double Track Extension area, localities LACM IP 4484 and 22533 produced specimens of invertebrates including sand dollar (*Dendraster gibbsii*) from directly above the Southern Pacific Railroad Tunnel within Pliocene-age Pico Formation (Bell, 2020; Appendix A; **Table 4**). LACM VP 7950 is located northeast of the Balboa Double Track Extension area, from the Sunshine Canyon Landfill, and produced specimens of seal (Pinnipedia) from an unreported depth within early Pliocene- and late Miocene-age Towsley Formation (Bell, 2020; Appendix A; **Table 4**). LACM VP 7421 is located south of the Balboa Double Track Extension area, a third of a mile south of the intersection of Foothill Boulevard and Sierra Highway, and produced specimens of baleen whale (Mysticeti) from the surface within early Pliocene- and late Miocene-age Towsley Formation (Bell, 2020; Appendix A; **Table 4**). LACM IP 15729, located north of the Balboa Double Track Extension area, a quarter mile south of the I-5 and SR 14 Interchange, produced specimens of invertebrates from an unreported depth within early Pliocene- and late Miocene-age Towsley Formation (Bell, 2020; Appendix A; **Table 4**). LACM VP 5745 located southeast of the Balboa Double Track Extension area, near the intersection of Pala Avenue and Excelsior Street, produced specimens of mastodon (*Mammut* sp.) and horse (*Equus* sp.) from an unreported depth within Pleistocene-age deposits (Bell, 2020; Appendix A; **Table 4**).

Locality LACM VP 6804 located west of the Canyon Siding Extension area, southeast of the intersection of Bouquet Canyon Road and Cinema Drive (Saugus Elementary School), produced specimens of horse (Equidae) from the surface within Pleistocene- and Pliocene-age Saugus Formation (Bell, 2020; Appendix A; **Table 4**). LACM IP 22017 located in the vicinity of the Canyon Siding Extension area, at Nadeau Canyon's confluence with the Santa Clarita River, produced invertebrate specimens from an unreported depth within early Pliocene- and late Miocene-age Towsley Formation (Bell, 2020; Appendix A; **Table 4**). LACM VP 7988 and 7989 are located east of the Canyon Siding Extension area, at the intersection of Golden Valley Road and Five Knolls Road, and produced specimens of bird (Aves) and rodent (Rodentia) from an unreported depth within Pleistocene- and Pliocene-age Saugus Formation (Bell, 2020; Appendix A; **Table 4**).

Locality LACM VP 7884 is located east of the Lancaster Terminal Improvements area, southeast of the intersection between East 3rd Street and East Avenue H-13, and produced specimens of camelid (*Camelops hesternus*) from a depth of 4 feet within Pleistocene-age deposits (Bell, 2020; Appendix A; **Table 4**). LACM VP 7853 is located northeast of the Lancaster Terminal Improvements area, at the Lancaster Landfill, produced specimens of fish (Osteichthyes), amphibians (Amphibia), small mammals (Mammalia), and camel (Camelidae) from a depth of 3 to 11 feet within Pleistocene-age deposits (Bell, 2020; Appendix A; **Table 4**). LACM VP 5946 and 5947 are located southeast of the Lancaster Terminal Improvements area, along East Avenue S between 90th Street East and 110th Street East, produced specimens of lizard (*Gambelia wislizenii*) and pocket gopher (*Thomomys* sp.) from a depth of 0 to feet 9 feet within an unknown Holocene-age deposit (Bell, 2020; Appendix A; **Table 4**).

Figure 5: Balboa Double Track Extension Area Geology Map

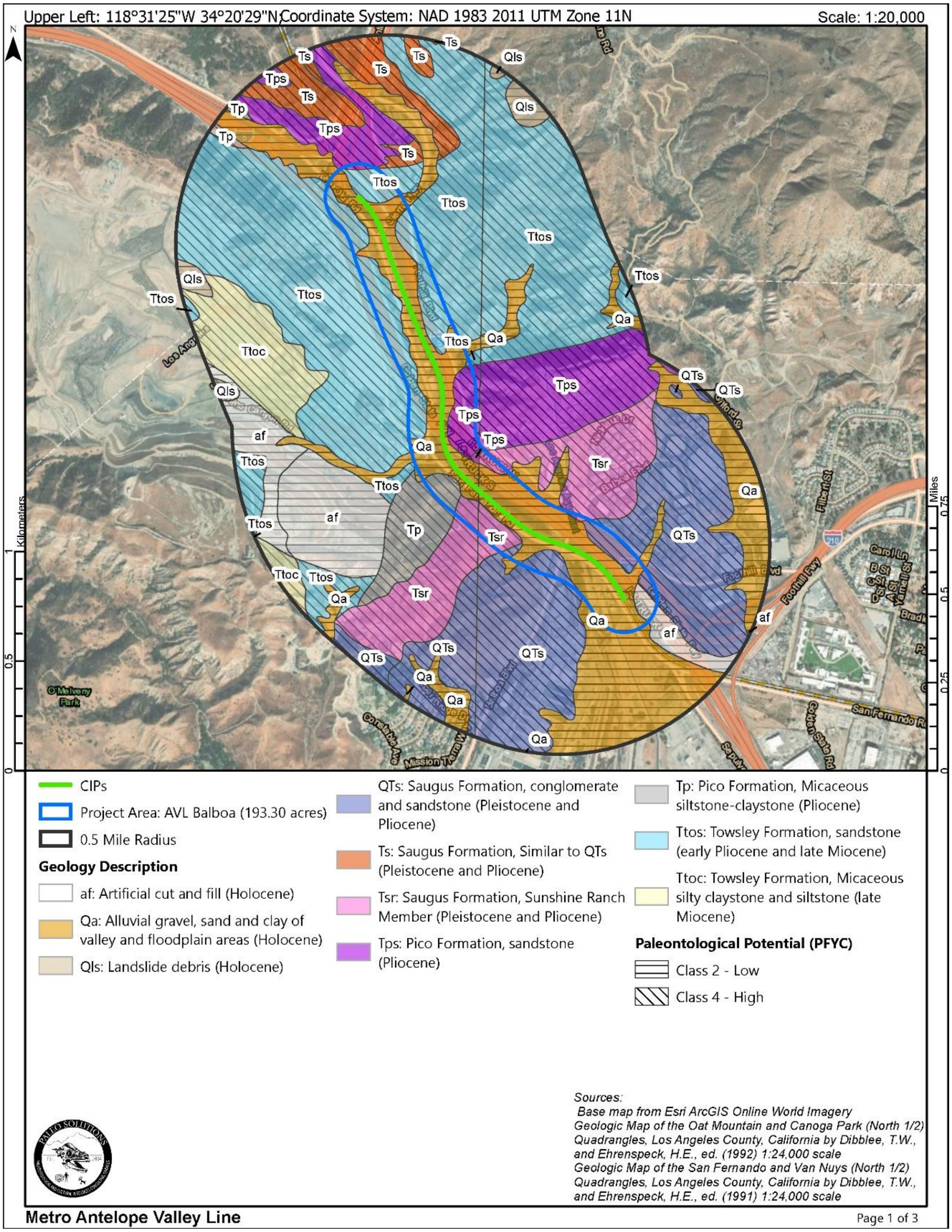


Figure 6: Canyon Siding Extension Area Geology Map

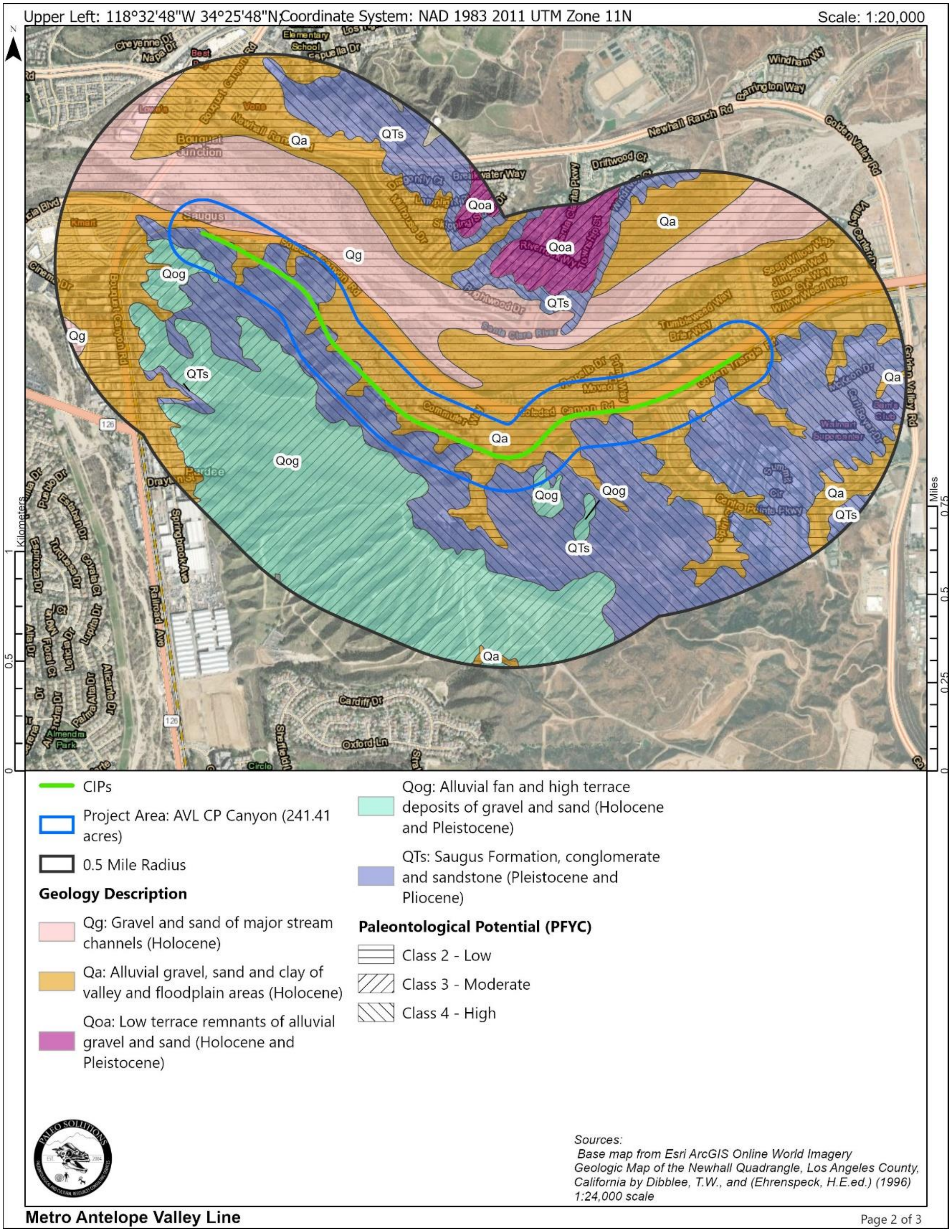


Figure 7: Lancaster Terminal Improvements Area Geology Map

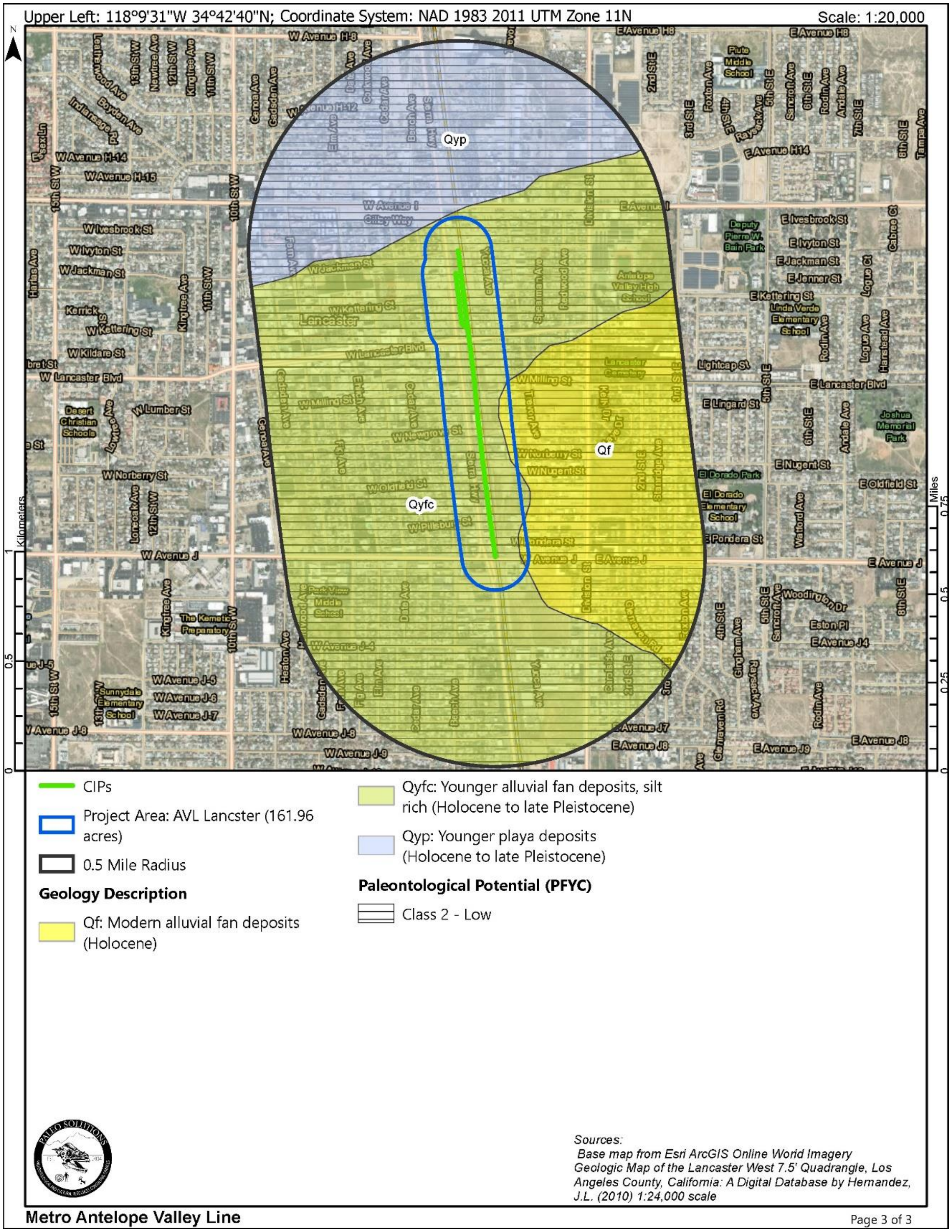


Table 4: Paleontological Literature and Record Search Summary

Locality Number/ Name	Geologic Unit	Taxon	Common Name	Location	Source
LACM IP 21500	Pliocene-age deposits	Invertebrata	invertebrate	within Balboa Double Track Extension area	Bell, 2020
LACM IP 4484, 22533	Pico Formation (Pliocene)	*Dendraster gibbsii*	sand dollar	above Southern Pacific Railroad Tunnel	Bell, 2020
LACM VP 7950	Towsley Formation (Pliocene to late Miocene)	Pinnipedia	seal	Sunshine Canyon Landfill	Bell, 2020
LACM VP 7421	Towsley Formation (Pliocene to late Miocene)	Mysticeti	baleen whale	Third of a mile south of the intersection of Foothill Boulevard and Sierra Highway	Bell, 2020
LACM IP 15729	Towsley Formation (Pliocene to late Miocene)	Invertebrata	invertebrate	quarter mile south of the I-5 and SR 14 Interchange	Bell, 2020
LACM VP 5745	Pleistocene-age deposits	*Mammut* sp. *Equus* sp.	mastodon horse	near the intersection of Pala Avenue and Excelsior Street	Bell, 2020
LACM VP 6804	Saugus Formation (Pleistocene to Pliocene)	*Equus* sp.	horse	intersection of Bouquet Canyon Road and Cinema Drive (Saugus Elementary School)	Bell, 2020
LACM IP 22017	Towsley Formation (Pliocene to late Miocene)	Invertebrata	invertebrate	Nadeau Canyon's confluence with the Santa Clarita River	Bell, 2020
LACM VP 7988 and 7989	Saugus Formation (Pleistocene to Pliocene)	Aves Rodentia	bird rodent	intersection of Golden Valley Road and Five Knolls Road	Bell, 2020

Locality Number/ Name	Geologic Unit	Taxon	Common Name	Location	Source
LACM VP 7884	Pleistocene-age deposits	*Camelops hesternus*	Camelid	southeast of the intersection between East 3rd Street and East Avenue H-13	Bell, 2020
LACM VP 7853	Pleistocene-age deposits	Osteichthyes Amphibia Mammalia Camelidae	fish amphibian small mammal camel	Lancaster Landfill	Bell, 2020
LACM VP 5946, 5947	Holocene-age deposits	*Gambelia wislizenii* *Thomomys* sp.	lizard pocket gopher	East Avenue S between 90th Street East and 110th Street East	Bell, 2020
UCMP IP2259, UCMP V-7004, UCMP V-70027, UCLA 1063.12, PBDB 73752	Older sedimentary deposits (Pleistocene)	Osteichthyes cf. *Rana* sp. Emydinae *Emys marmorata* Squamata Serpentes *Parapavo californicus* Callipepla *Ardenna grisea* Anatidae *Chendytes lawi* *Aechmophorus occidentalis* *Gavia* sp. Chondrichthyes *Carcharodon* sp. Teleostei *Rhacochilus vacca* *Citharichthys* sp. *Genyonemus lineatus* *Merluccius productus* *Microtus californicus* *Peromyscus* sp. *Neotoma* sp. *Thomomys* sp. *Dipodomys* cf. *agilis* *Chaetodipus* cf. *formosus* *Notiosorex crawfordi*	fish frog turtle tortoise scaled reptile snake pheasant quail shearwater duck diving goose western grebe loon cartilaginous fish white shark ray-finned fish perch speckled sanddab North Pacific hake white croaker rodent rodent woodrat pocket gopher kangaroo rat rodent	Los Angeles County	PBDB, 2021; UCMP, 2021

Locality Number/ Name	Geologic Unit	Taxon	Common Name	Location	Source
		Enhydra sp. *Lepus californicus* *Sylvilagus* sp. *Equus* sp. *Equus simplicidens* *Tapirus haysii* *Tapirus* cf. *californicus* Felinae *Ursus americanus* *Bison* sp. *Mammuthus primigenius* *Mammuthus* cf. *columbi* *Mammut pacificus* Megalonychidae *Megalonyx* sp. *Paramylodon harlani* *Odocoileus* cf. *hemionus* *Camelops* sp. *Camelops* cf. *hesternus* Hemiauchenia sp. *Canis* cf. *dirus* *Canis* cf. *latrans* *Lynx rufus* *Smilodon* sp. *Zalophus* sp. *Phoca* cf. *vitulina* Cetacea Otariidae Phocidae *Lissodelphis* sp.	rodent sea otter rabbit rabbit horse horse tapir tapir cat black bear bison mammoth mammoth mastodon ground sloth ground sloth ground sloth deer camel camel camel dire wolf coyote lynx saber-toothed cat sea lion sea lion whale seal seal dolphin		
Not reported	Older sedimentary deposits (Pleistocene)	*Mammuthus* sp. *Mammut* sp. Camelidae Equidae *Bison* sp. *Megatherium* sp. Tayassuidae *Acinonyx* sp. *Panthera* sp. *Smilodon* sp. *Hydrochoerus* sp.	mammoth mastodon camel horse bison giant ground sloth peccary cheetah lion saber-toothed cat capybara	Southern California	Blake 1991; Jahns 1954; Jefferson 1991

Locality Number/ Name	Geologic Unit	Taxon	Common Name	Location	Source
		Canis dirus Rodentia	dire wolf rodent		
Not reported	Saugus Formation (Pleistocene to Pliocene)	Chelonia *Gerrhonotus* sp. Leporidae *Sylvilagus* sp. *Thomomys* sp. *Perognathus* sp. *Dipodomys* sp. *Reithrodontomys* sp. *Neotoma* sp. *Pitymys meadensis* Proboscidea *Pliohippus* sp. *Equus* sp. *Equus occidentalis* Tayassuidae Camelidae Cervidae *Bison* sp. *Mammuthus* sp. *Mammut* sp. *Hemiauchenia macrocephala*	turtle and tortoise alligator lizard rabbit cottontail pocket gopher pocket mouse kangaroo rat harvest mouse pine mouse woodrat elephant horse horse horse peccary camel deer bison mammoth mastodon llama	Southern California	Oakeshott, 1958; Jefferson, 1989; Squires and White, 1983; Winterer and Durham, 1962
PBDB 214258; PBDB 203253; UCMP V2202	Pico Formation (Pliocene)	*Homeomacrurus fernandensis* *Myliobatis* sp. Aves *Nannocetus eremus*	deep sea fish eagle ray bird baleen whale	Los Angeles County	PBDB, 2021; UCMP, 2021
PBDB 45499; PBDB 97210; PBDB 97230; PBDB 97234; UCMP V3585	Towsley Formation (Pliocene to late Miocene)	*Nannocetus eremus* *Dusisiren jordani* *Imagotaria downs* *Carcharodon hastalis* *Carcharodon carcharias* *Otodus megalodon*	baleen whale dugong walrus white shark white shark megatoothed shark	Los Angeles County	PBDB, 2021; UCMP, 2021

4.4 FIELD SURVEY

Paleo Solutions' paleontologist Daniel Nolan, B.S., surveyed the Project Area on Thursday, January 14, 2021. The survey consisted of a pedestrian reconnaissance of the Project Area, safely inspecting the Project Area for exposures of the geologic units mapped by Dibblee and Ehrenspeck (1991, 1992, 1996) and Hernandez (2010).

The Balboa Double Track Extension starts at Balboa Boulevard and continues north to Sierra Highway in the City of Los Angeles; the Canyon Siding Extension follows Soledad Canyon Road from just south of Bouquet Canyon Road to Golden Oak Road in the City of Santa Clarita; and the Lancaster Terminal Improvements area follows Sierra Highway between East Avenue I and East Avenue J in the City of Lancaster. Each Project Area is developed and graded with little topographic relief (**Figures Figure** 8**, Figure** 9**, Figure** 10**, and**

Figure 11). However, on the southern side of the Canyon Siding Extension are hills of moderate topographic relief **(Figure 12**). Previous disturbances within the Project Area include paved and unpaved roads, train tracks, tunnels, bridges, and utilities (**Figures Figure** 8 **to Figure** 12). Due to existing disturbances, the survey was limited to graded slopes and nearby exposures.

The geological units observed consist of Pleistocene- to Pliocene-age Saugus Formation, conglomerate and sandstone (QTs), Pleistocene- to Pliocene-age Saugus Formation, Sunshine Ranch Member (Tsr), Pliocene-age Pico Formation, sandstone (Tps), Pliocene-age Pico Formation, micaceous siltstone-claystone (Tp), and early Pliocene- to late Miocene-age Towsley Formation, sandstone (Ttos). While not observed during the survey, the additional geologic units mapped by Dibblee and Ehrenspeck (1991, 1992, 1996) and Hernandez (2010), including Holocene-age modern alluvial fan deposits (Qf), Holocene-age alluvial gravel, and clay of valley areas (Qa), Holocene-age stream channel deposits (Qg), Holocene to late Pleistocene-age younger alluvial fan deposits (Qyfc), Holocene- to Pleistocene-age alluvial fan and high terrace deposits of gravel and sand (Qog), are likely present at shallow depth within the bounds of the Project Area where mapped.

Pleistocene- to Pliocene-age Saugus Formation, conglomerate and sandstone (QTs) consists of beige and very light gray weathering to light gray, very poorly to poorly sorted, moderately lithified, subangular to subrounded, fine- to very coarse-grained sand with granules and pebbles, and as massive conglomerate. Planar laminations and channel deposits are present throughout this geologic unit. Saugus Formation, conglomerate and sandstone (QTs) was observed to be 20 feet thick with no bottom contact exposed (**Figures Figure** 13 **and Figure** 14).

Pleistocene- to Pliocene-age Saugus Formation, Sunshine Ranch Member (Tsr) consists of reddish-orange weathering to grayish-brown, poorly sorted, poorly lithified, subangular to subrounded, medium- to very coarse-grained sand with granules, pebbles and cobbles, and massive sandy conglomerate. Saugus Formation, Sunshine Ranch Member (Tsr) was observed to be 15 feet thick with no bottom contact exposed (**Figures Figure** 15 **and Figure** 16).

Pliocene-age Pico Formation, sandstone (Tps) consists of grayish-brown weathering to light brown, well sorted, poorly to moderately lithified, subrounded, fine- to medium-grained massive sandstone. Pico Formation, sandstone (Tps) was observed to be 8 feet thick with no bottom contact exposed (**Figures Figure** 11 **and Figure** 17).

Pliocene-age Pico Formation, micaceous siltstone-claystone (Tp) consists of light gray weathering to light grayish-brown, well sorted, moderately lithified, subrounded to rounded, clay, silt, very fine- to medium-grained sand, fissile, platy, and massive claystone, siltstone, and sandstone. Planar laminations were present throughout this geologic unit. Pico Formation, micaceous siltstone-claystone (Tp) was observed to be 15 feet thick with no bottom contact exposed (**Figure Figure** 18).

Early Pliocene- to late Miocene-age Towsley Formation, sandstone (Ttos) consists of gray and reddish-orange, well sorted, moderately lithified, subangular, very fine- to coarse-grained sand, massive and fissile sandstone. Planar laminations and bedding are present throughout this geologic unit. Towsley Formation, sandstone (Ttos) was observed to be 10 feet thick with no bottom contact exposed (**Figures Figure** 19 **and Figure** 20).

No paleontological resources were observed or collected during the paleontological survey.

Figure 8: Overview of the Balboa Double Track Extension area, showing vegetation along the existing slopes and ridges. View northwest.

Figure 9: Overview of the Balboa Double Track Extension area, showing the existing rail trackway. View northwest.

Figure 10: Overview of the Lancaster Terminal Improvements area, showing the existing rail trackway. View north.

Figure 11: Exposed Pico Formation, sandstone (Tps) beneath the I-5 overpass in the Balboa Double Track Extension area. View southeast.

Figure 12: Overview of the Canyon Siding Extension area, showing the existing rail trackway. View east.

Figure 13: Exposed Saugus Formation, conglomerate and sandstone (QTs) in the Canyon Siding Extension area. Note the fine-grained beds. View south.

Figure 14: Plan view of Saugus Formation, conglomerate and sandstone (QTs) in the Balboa Double Track Extension area. Note the channel deposits.

Figure 15: Exposed Saugus Formation, Sunshine Ranch Member (Tsr) in the Balboa Double Track Extension area. View southwest.

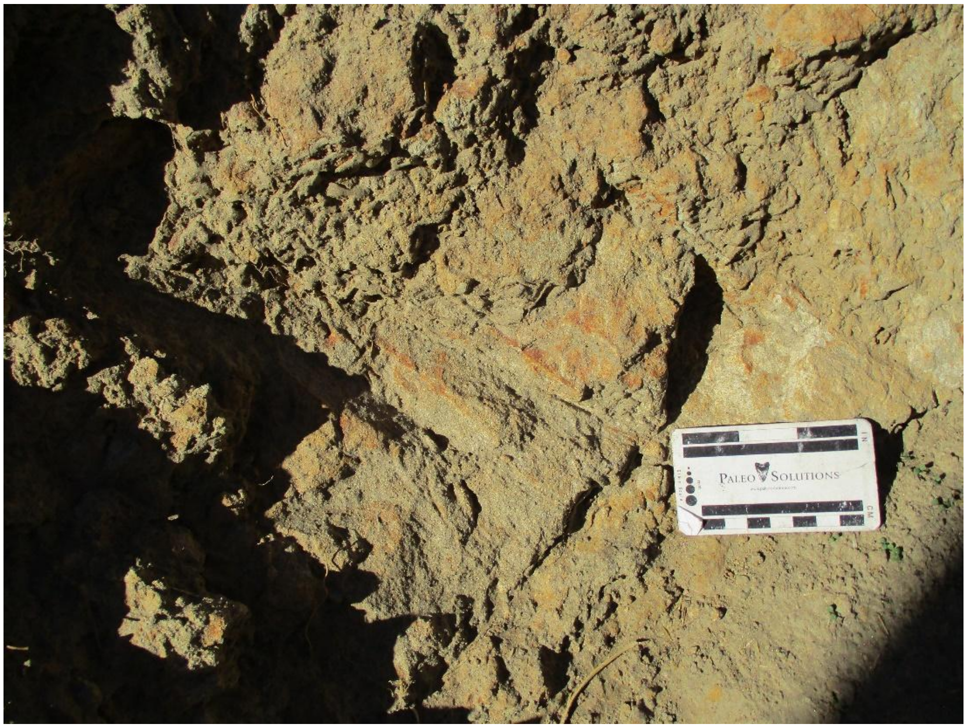
Figure 16: Plan view of Saugus Formation, Sunshine Ranch Member (Tsr) in the Balboa Double Track Extension area.

Figure 17: Exposed Pico Formation, sandstone (Tps) in the Balboa Double Track Extension area. View east.

Figure 18: Exposed Pliocene-age Pico Formation, micaceous siltstone-claystone (Tp) in the Balboa Double Track Extension area. Note bedding and planar laminations. View southwest.

Figure 19: Exposed Towsley Formation, sandstone (Ttos) in the Balboa Double Track Extension area. Note bedding. View west.

Figure 20: Plan view of Towsley Formation, sandstone (Ttos) in the Balboa Double Track Extension area.



5. Significance Thresholds and Methodology

5.1 SIGNIFICANCE THRESHOLDS

Appendix G of the State CEQA Guidelines provides screening questions to address impacts regarding built environment, archaeological, paleontological, cultural, and tribal cultural resources. The current report addresses paleontological resources only. Analysis pertaining to historical and archaeological resources are addressed separately.

In accordance with Appendix G of the State CEQA Guidelines, the Project would have a significant impact related to paleontological resources if it would:

- Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature.

5.2 METHODOLOGY

This paleontological analysis of existing data included a geologic map review, a literature search, and museum records search. The analysis of existing data was supplemented with a pedestrian field survey. The goal of this report is to evaluate the paleontological potential of the Project Area and make recommendations for the mitigation of adverse impacts on paleontological resources that may occur as a result of the Proposed Project.

Paleo Solutions will retain an archival copy of all paleontological Project information including field notes, maps, and other data.

5.2.1 Analysis of Existing Data

Paleo Solutions reviewed geologic mapping of the Project Area by Hernandez (2010) and Dibblee and Ehrespeck (1991, 1992, 1996). The literature reviewed included published and unpublished scientific papers. Paleontological museum records search results from the NHMLA were analyzed and incorporated into this paleontological investigation.

5.2.2 Field Survey

The field survey was conducted by Paleo Solutions' paleontologist Daniel Nolan, B.S. The paleontological survey was conducted to check for any exposures of native, previously undisturbed rock or sediments of the underlying geologic units, and if present, assess the potential for fossils. The Project Area and surrounding areas were documented and photographed, with photographed areas spatially referenced with a GPS unit.

5.3 CRITERIA FOR EVALUATING PALEONTOLOGICAL POTENTIAL

The PFYC system was developed by the BLM as a management tool for assessing paleontological resources by geological unit (BLM, 2016). Because of its demonstrated usefulness as a resource management tool, the PFYC has been utilized for many years for projects across the country, regardless of land ownership. It is a predictive resource management tool that classifies geologic units on their likelihood to contain paleontological resources on a scale of 1 (very low potential) to 5 (very high potential). This system is intended to aid in predicting, assessing, and mitigating paleontological resources. The PFYC ranking system is summarized in **Table 5**.

Table 5: Potential Fossil Yield Classification

BLM PFYC Designation	Assignment Criteria Guidelines and Management Summary (PFYC System)
1 = Very Low Potential	Geologic units are not likely to contain recognizable paleontological resources.
	Units are igneous or metamorphic, excluding air-fall and reworked volcanic ash units.
	Units are Precambrian in age.
	Management concern is usually negligible, and impact mitigation is unnecessary except in rare or isolated circumstances.
2 = Low Potential	Geologic units are not likely to contain paleontological resources.
	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 eolian deposits.
	Sediments exhibit significant physical and chemical changes (i.e., diagenetic alteration) that make fossil preservation unlikely.
	Management concern is generally low, and impact mitigation is usually unnecessary except in occasional or isolated circumstances.
3 = Moderate Potential	Sedimentary geologic units where fossil content varies in significance, abundance, and predictable occurrence.
	Marine in origin with sporadic known occurrences of paleontological resources.
	Paleontological resources may occur intermittently, but these occurrences are widely scattered.
	The potential for authorized land use to impact a significant paleontological resource is known to be low-to-moderate.
	Management concerns are moderate. Management options could include record searches, pre-disturbance surveys, monitoring, mitigation, or avoidance. Opportunities may exist for hobby collecting. Surface-disturbing activities may require sufficient assessment to determine whether significant paleontological resources occur in the area of a proposed action and whether the action could affect the paleontological resources.

BLM PFYC Designation	Assignment Criteria Guidelines and Management Summary (PFYC System)
4 = High Potential	Geologic units that are known to contain a high occurrence of paleontological resources.
	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.
	Management concern is moderate to high depending on the proposed action. A field survey by a qualified paleontologist is often needed to assess local conditions. On-site monitoring or spot-checking may be necessary during land disturbing activities. Avoidance of known paleontological resources may be necessary.
5 = Very High Potential	Highly fossiliferous geologic units that consistently and predictably produce significant paleontological resources.
	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.
	Management concern is high to very high. A field survey by a qualified paleontologist is almost always 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.
U = Unknown Potential	Geologic units that cannot receive an informed PFYC assignment.
	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.
	Geologic 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.
	Until a provisional assignment is made, geologic units with unknown potential have medium to high management concerns. Field surveys are normally necessary, especially prior to authorizing a ground-disturbing activity.

SOURCE: Bureau of Land Management, *Potential Fossil Yield Classification system*, 2016.

6. Impact Analysis

The following section includes the impact analysis, mitigation measures (if necessary), and significance after mitigation (if applicable). The potential for the Proposed Project to result in an impact to transportation is independent of the specific Project design options, unless stated otherwise. The following impact conclusions are valid for the Proposed Project and all associated design options.

Impact 1 Would the Proposed Project directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?

Excavations into areas containing Pleistocene- to Pliocene-age Saugus Formation, conglomerate and sandstone (QTs) (PFYC 4), Pleistocene- to Pliocene-age Saugus Formation, Sunshine Ranch Member (Tsr) (PFYC 4), Pliocene-age Pico Formation, sandstone (Tps) (PFYC 4), Pliocene-age Pico Formation, micaceous siltstone-claystone (Tp) (PFYC 4), early Pliocene- to late Miocene-age Towsley Formation, sandstone (Ttos) (PFYC 4), and Pleistocene-age older sedimentary deposits (Qog, Qoa) may encounter significant paleontological resources.

CONSTRUCTION

Less-Than-Significant Impact with Mitigation. Construction activities associated with the additional railroad track would be limited to minimal at-grade disturbance. Excavation activities would be limited to soils previously impacted during initial rail line construction. Widening of the track bed and the addition of drainage ditches at the Balboa Double Track Extension and Canyon Siding Extension locations require excavation of the existing cut slopes and retaining walls, where needed. The maximum height of the new cut slope will be approximately 36 feet. Localized excavation will extend to approximately 10 feet below ground surface (bgs).

The Lancaster Terminal Improvement excavations are localized to the existing station, the railroad, and city property north of Lancaster Boulevard. The construction will require excavation for building and platform foundations, utility relocations and base for new tracks. Excavation depths of the general site grading are expected to be approximately 4 feet to 6 feet bgs. Localized excavation will extend to approximately 10 feet bgs.

There is the possibility that previously undiscovered and undocumented resources could be adversely affected or otherwise altered by ground disturbing activities during construction of the Project. Disturbance of undocumented resources would be a potentially significant impact under CEQA without implementation of mitigation measures. Implementation of Mitigation Measures **PAL-1** and **PAL-2**, as presented below, would avoid or reduce potential impacts to paleontological resources to a level that is less than significant.

OPERATIONS

No. Impact. No operational impacts related to paleontological resources would occur.

MITIGATION MEASURES

PAL-1: Full-time paleontological monitoring shall be implemented when Saugus Formation (QTs, Tsr), Pico Formation (Tps, Tp), Towsley Formation (Ttos), or older sedimentary deposits (Qog, Qoa) are impacted. Excavations into artificial fill (af) and younger sedimentary deposits (Qf, Qyfc, Qa, Qg) shall be initially spot-checked during excavations that exceed depths of 5 feet to check for underlying, paleontologically sensitive older sedimentary deposits. If it is determined that only artificial fill (af), modern alluvial fan deposits (Qf), younger alluvial fan deposits (Qyfc), alluvial gravel, and clay of valley areas (Qa), or stream channel deposits (Qg) are impacted, the monitoring program may be reduced or suspended.

PAL-2: Prior to construction, a Paleontological Resources Impact Mitigation Program (PRIMP) shall be prepared that provides detailed recommended monitoring locations; a description of a paleontological resources worker environmental awareness program to inform construction personnel of the potential for fossil discoveries and of the types of fossils that may be encountered; detailed procedures for monitoring, fossil recovery, laboratory analysis, and museum curation; and notification procedures in the event of a fossil discovery by a paleontological monitor or other personnel. A curation agreement from the NHMLA, or another accredited repository, shall also be obtained prior to excavation in the event that paleontological resources are discovered during the construction phase of the Program.

SIGNIFICANCE OF IMPACTS AFTER MITIGATION

Implementation of Mitigation Measures **PAL-1** and **PAL-2** would mitigate inadvertent impacts to potential previously unidentified paleontological resources during construction activities. Therefore, with mitigation, the Proposed Project would result in a less-than-significant impact related to paleontological resources.

7. References

Bell, A., *Natural History Museum of Los Angeles County Records Search for the Mott Macdonald: Metro Antelope Valley Line Project*, dated December 11, 2020.

Blake, G.H., "Review of the Neogene Biostratigraphy and Stratigraphy of the Los Angeles Basin and Implications for Basin Evolution." In Biddle, K.T., ed., *Active Margin Basins: American Association of Petroleum Geologists*, Memoir 52, Chapter 4, p. 135-184, 1991.

Bureau of Land Management (BLM), *Potential Fossil Yield Classification system*, BLM Instruction Memorandum No. 2016-124 (PFYC revised from USFS, 2008), 2016.

City of Santa Clarita, *City of Santa Clarita General Plan*, https://www.codepublishing.com/CA/SantaClarita/html/SantaClaritaGP/SantaClaritaGP.html, adopted 2011.

City of Lancaster, 2006, *City of Lancaster General Plan: Plan for Active Living*, https://www.cityoflancasterca.org/home/showpublisheddocument?id=9323, adopted 2006.

City of Los Angeles, *City of Los Angeles General Plan: Conservation Element*, https://planning.lacity.org/odocument/28af7e21-ffdd-4f26-84e6-dfa967b2a1ee/Conservation_Element.pdf, adopted 2001.

County of Los Angeles, *Los Angeles County General Plan 2035*, http://planning.lacounty.gov/generalplan, adopted 2015.

Cooper, J. D. and Eisentraut, P.J., *Orange County Archaeo/Paleo Curation Draft Guidelines, Procedures and Policies - Draft Document*, Prepared for County of Orange, Board of Supervisors, 2002.

Dibblee, T.W. and Ehrenspeck, H.E., *Geologic Map of the San Fernando and North 1/2 Van Nuys Quadrangles, Los Angeles County, California*, Dibblee Geological Foundation, Map DF-33, scale 1:24,000, 1991.

Dibblee, T.W. and Ehrenspeck, H.E., *Geologic Map of the Oat Mountain and North 1/2 Canoga Park Quadrangles, Los Angeles County, California*, Dibblee Geological Foundation, Map DF-36, scale 1:24,000, 1992.

Dibblee, T.W. and Ehrenspeck, H.E., *Geologic Map of the Newhall Quadrangle, Los Angeles County, California*, Dibblee Geological Foundation, Map DF-56, scale 1:24,000, 1996.

Hall, C.A.H., Jr., *Introduction to the Geology of Southern California and Its Native Plants*, University of California Press, Berkeley, 493 p., 2007.

Harden, D.R., *California Geology*, Second Edition, Pearson Prentice Hall, Upper Saddle River, New Jersey, 552 p., 2004.

Hernandez, J.L., *Geologic Map of the Lancaster West 7.5' Quadrangle, Los Angeles County, California*, California Department of Conservation, California Geological Survey, scale 1:24,000, 2010.

Jahns, R.H., "Investigations and Problems of Southern California Geology." In Jahns, R.H., ed., *Geology of Southern California*, California Division of Mines and Geology, Bulletin v. 170, 1329 p., 1954.

Jefferson, G.T, *Late Cenozoic tapirs (Mammalia: Perissodactyla) of western North America*, Natural History Museum of Los Angeles County, Contributions in Science 406:1-21, 1989.

Jefferson, G.T., *A catalogue of late Quaternary vertebrates from California: Part Two, Mammals*, Natural History Museum of Los Angeles County, Technical Report 7, p. 1-129, 1991.

Kew, W.S.W., *Geology and oil resources of a part of Los Angeles and Ventura Counties, California*, United States Geological Survey, Bulletin 753, 202 p., 1924.

Norris, R.M. and R.W. Webb, R.W., *Geology of California*, Second Edition, John Wiley & Sons, New York, 541 p., 1990.

Oakeshott, G.B., *Geology and mineral deposits of the San Fernando quadrangle*, California Division of Mines and Geology; Bulletin 172, 1958.

Paleobiology Database (PBDB), Available: https://paleobiodb.org/, Accessed 2021.

Prothero, D.R., *California's Amazing Geology*, CRC Press Taylor & Francis Group, New York, 480 p., 2017.

Stewart, R.E., and Stewart, K.C., *Post-Miocene foraminifera from the Ventura Quadrangle, Ventura County, California*, Journal of Paleontology; vol. 4, no. 1, pp. 60-72, 1930.

Squires, R.L. and White, D.R., "Common Megafossils of the Lower Saugus Formation, Northern Simi Valley Area, California." In R.L. Squires and M.V. Filewicz (eds.) *Cenozoic Geology of the Simi Valley Area, Southern California*, Society for Sedimentary Geology (SEPM), Pacific Section, 1983.

Squires, R.L., Groves, L.T., and Smith, J.T., *New information on molluscan paleontology and depositional environments of the Upper Pliocene Pico Formation, Valencia Area, Los Angeles County, southern California*, Natural History Museum of Los Angeles County Contributions in Science; no. 511, pp. 1-24, 2006.

Sylvester, A.G. and O'Black Gans, E., *Roadside Geology of Southern California*, Mountain Press Publishing Company, Missoula, Montana, 389 p, 2016.

University of California Museum of Paleontology (UCMP), Available: https://ucmpdb.berkeley.edu/loc.html, Accessed 2021.

Winterer, E. L., and Durham, D.L., *Geology of southeastern Ventura Basin, Los Angeles County, California*, United States Geological Survey; Professional Paper 334-H, pp. 275-366, 1962.

Yerkes, R.F., McCulloh, T.H., Schoellhamer, J.E., and Vedder, J.G., *Geology of the Los Angeles Basin, California: An Introduction*, United States Geological Survey Professional Paper 420-A, 1965.

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