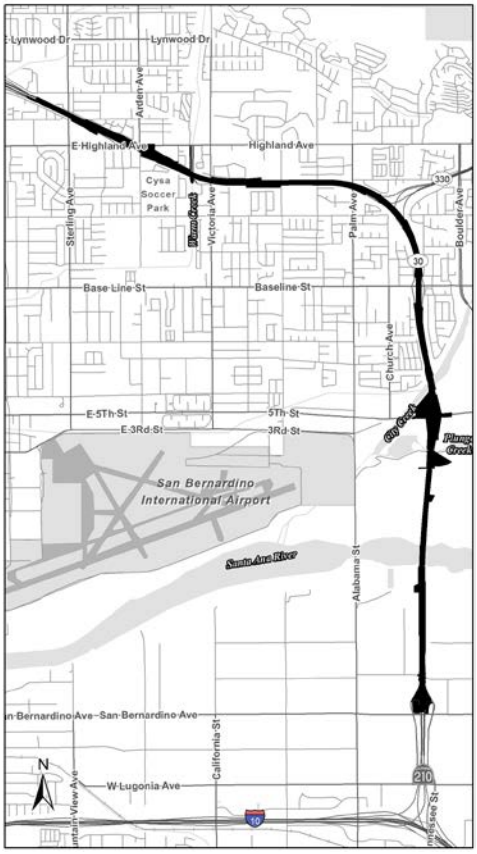
State Route 210 Mixed Flow Lane Addition from Highland Avenue to San Bernardino Avenue

CITIES OF HIGHLAND, SAN BERNARDINO, AND REDLANDS,
SAN BERNARDINO COUNTY, CALIFORNIA
DISTRICT 8–SBD–210 (PM R25.0/R33.2)
EA 0C700/PN 0812000164

Combined Paleontological Identification Report/ Paleontological Evaluation Report



Submitted to: Kurt Heidleberg, Branch Chief
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June 2014

Caltrans

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COMBINED PALEONTOLOGICAL IDENTIFICATION REPORT/ PALEONTOLOGICAL EVALUATION REPORT

State Route 210 Mixed Flow Lane Addition from Highland Avenue to San Bernardino Avenue

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June 2014

USGS 7.5-minute Harrison Mountain, Township 1 North, Range 3 West, Sections 30, 31, 32, and 33, and Redlands, Township 1 South, Range 3 West, Sections 4,9, 16, and 21, San Bernardino Base and Meridian.

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Acronyms and Abbreviations

APE	area of potential effect
BLM	Bureau of Land Management
BMP	best management practice
Caltrans	California Department of Transportation
FS	Forest Service
gg	age unknown
LACM	Museum of Los Angeles County
LACM	Los Angeles County Museum
LOD	limits of disturbance
NEPA	National Environmental Policy Act
NPS	National Park Service
PER	Paleontological Evaluation Report
PIR	Paleontological Identification Report
PM	post miles
PMP	Paleontological Mitigation Plan
PS&E	Plans, Specifications, and Estimate
Qof3	Pleistocene old alluvial deposits
R	Revised
SANBAG	San Bernardino Associated Governments
SBCM	San Bernardino County Museum
SBCM	San Bernardino County Museum
SDNHM	San Diego Natural History Museum
SDNHM	San Diego Natural History Museum
SVP	Society of Vertebrate Paleontology
TCE	Temporary Construction Easements
TCEs	temporary construction easements

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Executive Summary

The San Bernardino Associated Governments (SANBAG), in cooperation with the California Department of Transportation (Caltrans), District 8 and the City of Highland, propose to widen SR-210 from Sterling Avenue to San Bernardino Avenue in the cities of Highland, San Bernardino and Redlands and the County of San Bernardino, California (herein referred to as the "proposed project"). The widening would occur between post miles (PM) Revised (R) 26.3 and R32.4, for a distance of 6.1 miles. The total length of the proposed project limits is approximately 8.2 miles (PM R25.0 to R33.2), which includes transition striping and signage. In general, all work is anticipated to occur within the existing Caltrans right-of-way and temporary construction easements. This Paleontological Identification Report (PIR)/Paleontological Evaluation Report (PER) has been prepared to provide an assessment of the paleontological resources potential within the proposed project's limit of disturbance. This PIR/PER was prepared for the Caltrans, District 8, in conformance with the format set forth in Caltrans' *Environmental Handbook*, Volume I, Chapter 8, Paleontological Resources.

This segment of SR-210 currently has two mixed flow lanes in each direction but three mixed flow lanes in each direction to the west and four mixed flow lanes in each direction to the east. The reduction in the number of lanes within this segment of the freeway restricts capacity and creates poor operating conditions.

Two alternatives are being considered, the Build Alternative and the No-Build Alternative. Under the Build Alternative, certain project excavations (e.g., excavations for bridge extension, auxiliary lane additions, sound wall construction) could encounter sedimentary rocks that could contain nonrenewable paleontological resources. As defined here, paleontological resources (i.e., fossils) are the remains and/or traces of prehistoric plant and animal life. Typically, it is assumed that fossils must be older than approximately 10,000 years (i.e., the generally accepted end of the last glacial interval of the Pleistocene epoch); however, organic remains of early Holocene age can also be considered fossils because they are part of the record of past life. Fossil remains such as bones, teeth, shells, leaves, and wood are found in the geologic deposits (sedimentary rock units) within which they were originally buried. For the purposes of this report, paleontological resources can be thought of as not only the actual fossil remains but also the collecting localities and the geologic formations containing those localities.

This PIR/PER provides an assessment of paleontological resource potential within the area of potential effect (APE), which is also referred to as the limits of disturbance (LOD). Specifically, it summarizes the proposed project and describes the assumed project footprint, identifies the data sources that were consulted, documents the results of a vehicular survey, identifies specific geologic formations and fossils that may be encountered, assesses potential impacts on paleontologically sensitive geologic formations, evaluates the significance and sensitivity of documented paleontological resources, and provides a recommended course of action related to such paleontological resources.

The scientific literature review conducted by the Department of PaleoServices at the San Diego Natural History Museum (SDNHM) and the vehicular field survey conducted on April 18, 2013, indicate that construction of the proposed project (e.g., excavation as well as grading on either

side of the freeway for retaining walls, a bridge extension, and drainage improvements) between a point approximately 300 feet east of Victoria Ave and a point approximately 0.25 mile south of Base Line (at approximately Norwood Street) could result in negative impacts on deposits with a high paleontological resource sensitivity rating (i.e., Pleistocene old alluvial deposits [Qof_3]). To reduce such impacts to a level below significance, it is recommended that a Paleontological Mitigation Plan (PMP) be developed and implemented prior to the commencement of project construction. The PMP should follow the guidelines of Caltrans and the recommendations of the Society of Vertebrate Paleontology (SVP), which include:

- Having the qualified paleontologist attend the preconstruction meeting to consult with the grading and excavation contractors.
- Providing a paleontological monitor on-site to inspect paleontological resources on a full-time basis during the original cutting of previously undisturbed deposits of high or moderate paleontological resource potential and on a part-time basis during the original cutting of previously undisturbed deposits of low paleontological resource potential.
- Having the qualified paleontologist or paleontological monitor salvage and recover paleontological resources.
- Collecting stratigraphic data (by the qualified paleontologist and/or paleontological monitor) to provide a stratigraphic context for recovered paleontological resources.
- Preparing (i.e., repairing and cleaning), sorting, and cataloging recovered paleontological resources.
- Donating prepared fossils, field notes, photographs, and maps to a scientific institution with permanent paleontological collections, such as the San Bernardino County Museum (SBCM).
- Completing a final summary report that outlines the results of the mitigation program.

Chapter 1 Project Description

1.1 Project Description

This section describes the proposed project and the design alternative that was developed by a multi-disciplinary team to achieve the project purpose and need while avoiding or minimizing environmental impacts. For the proposed project, one Build Alternative and a No Build Alternative are being considered.

SANBAG, in cooperation with Caltrans, District 8 and the City of Highland, propose to widen SR-210 from Sterling Avenue to San Bernardino Avenue in the cities of Highland, San Bernardino and Redlands and the County of San Bernardino, California (herein referred to as the "proposed project"). The widening would occur between PM R26.3 and R32.4, for a distance of 6.1 miles. The total length of the proposed project limits is approximately 8.2 miles (PM R25.0 to R33.2), which includes transition striping and signage.

Within the limits of the proposed project, SR-210 is a four-lane divided freeway with two 12-foot-wide lanes in each direction, which are flanked by five-foot-wide left and right shoulders. The purpose of the proposed project is to reduce congestion and improve operational efficiency by providing lane continuity with existing segments of freeway west and east of the proposed project limits. The proposed project would not require the acquisition of new permanent right-of-way. In general, the majority of the proposed improvements would occur within the existing Caltrans right-of-way; however, temporary construction easements (TCEs) would likely be needed during the construction period for construction of sound walls and construction access. Figures 1-1 and 1-2 are the regional vicinity map and the project location map, respectively.

1.1.1 Build Alternative

The proposed Build Alternative would widen SR-210 from four mixed flow lanes (two lanes in each direction) to six mixed flow lanes (three lanes in each direction) from approximately Sterling Avenue to San Bernardino Avenue. It would accomplish this by adding a mixed flow lane in each direction within the existing median (see Figure 1-3, Build Alternative and Figure 1-4, Typical Cross Section).

The proposed Build Alternative includes the following design features and elements:

- The existing segment of SR-210 from Sterling Avenue to San Bernardino Avenue would be widened from four mixed flow lanes (two lanes in each direction) to six mixed flow lanes (three lanes in each direction) with the addition of one mixed flow lane in each direction. The third lane would be added within the existing SR-210 median. Each of the six resulting mainline lanes would be 12 feet in width. Both directions (eastbound and westbound) would have 10-foot-wide left and right shoulders.
- An auxiliary lane would be created in each direction between the Base Line and 5th Street interchanges.

- A deceleration lane would be constructed on eastbound SR-210 from Sterling Avenue undercrossing to the proposed two-lane exit at Highland Avenue. Proposed permanent striping would start from Del Rosa Avenue in the eastbound direction.
- A new acceleration lane would be added at the 5th Street eastbound on-ramp.
- The existing SR-210 median would be re-graded but would generally remain unpaved.
- The following existing bridges would be widened to accommodate the new mixed flow lanes: Highland Avenue/Arden Avenue, Sand Creek, Victoria Avenue, 5th Street/Greenspot Road, City Creek, Plunge Creek, Access Road, Santa Ana River, and Pioneer Avenue.
- The proposed project would not require the acquisition of new permanent right-of-way. Temporary Construction Easements (TCE) would likely be needed during the construction period for construction of sound walls and construction access.
- Scour and pier protection would be installed at drainages as needed to protect bridge foundations.
- Drainage system improvements would be constructed to carry runoff away from the travel lanes and into traditional drainage courses.
- Stormwater treatment best management practice (BMP) features would be included at select locations where identified benefits outweigh impacts. To the fullest extent possible, roadside swales and bio-filtration strips would be used to convey both stormwater quantity flows and peak flows.
- A new fiber optic backbone system would be constructed within the existing median, with branch connections linking the backbone system to existing traffic management system elements along the corridor, including wireless vehicle detection stations, ramp metering systems, and a changeable message sign.
- Ramp metering systems would be installed on the existing on-ramps at the 5th Street/Greenspot Road interchange.
- An existing weigh-in-motion system located approximately one-half mile north of San Bernardino Avenue would be reconstructed to accommodate the additional lanes on the freeway.
- Utilities would be relocated, as needed, to accommodate the widened facility.
- Retaining walls would be constructed as needed by changes in elevation that cannot be accommodated by regrading.

An existing sound wall between Base Line and 5th Street in the eastbound direction will be reconstructed to accommodate the proposed auxiliary lane. Additional sound walls would be constructed where noise abatement is required and where they are considered feasible and reasonable. The ultimate corridor for SR-210 within the proposed project limits would be an eight-lane freeway facility (six mixed flow lanes and two high-occupancy vehicle lanes). Improving the facility to six mixed flow lanes would be compatible with the Route Concept Fact Sheet planning and would not preclude future improvements or make such improvements more costly to implement.

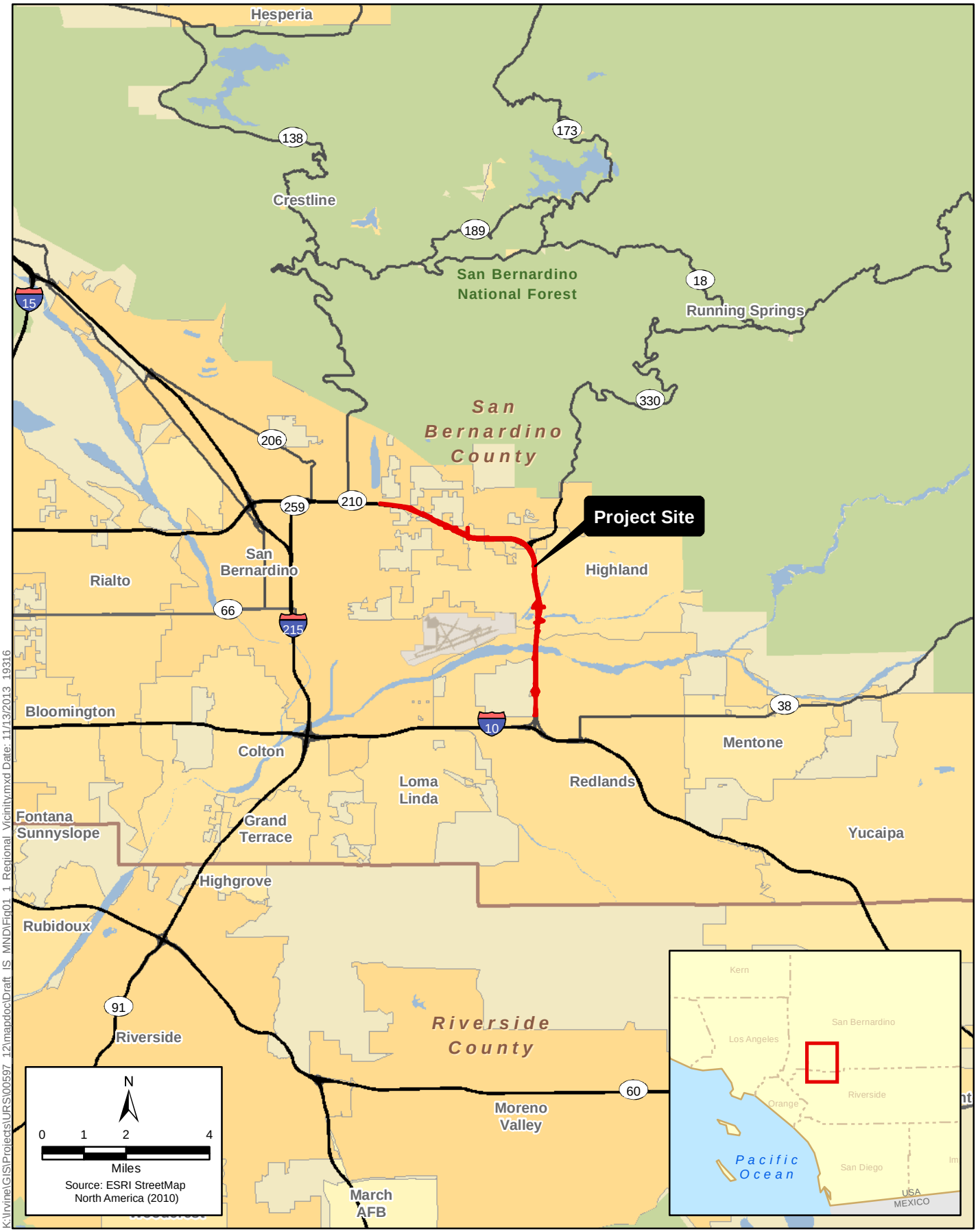

Figure 1-1
Regional Vicinity Map
State Route 210 Mixed Flow Lane Addition from Highland Avenue to San Bernardino Avenue

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Figure 1-2
Project Location Map
State Route 210 Mixed Flow Lane Addition from Highland Avenue to San Bernardino Avenue

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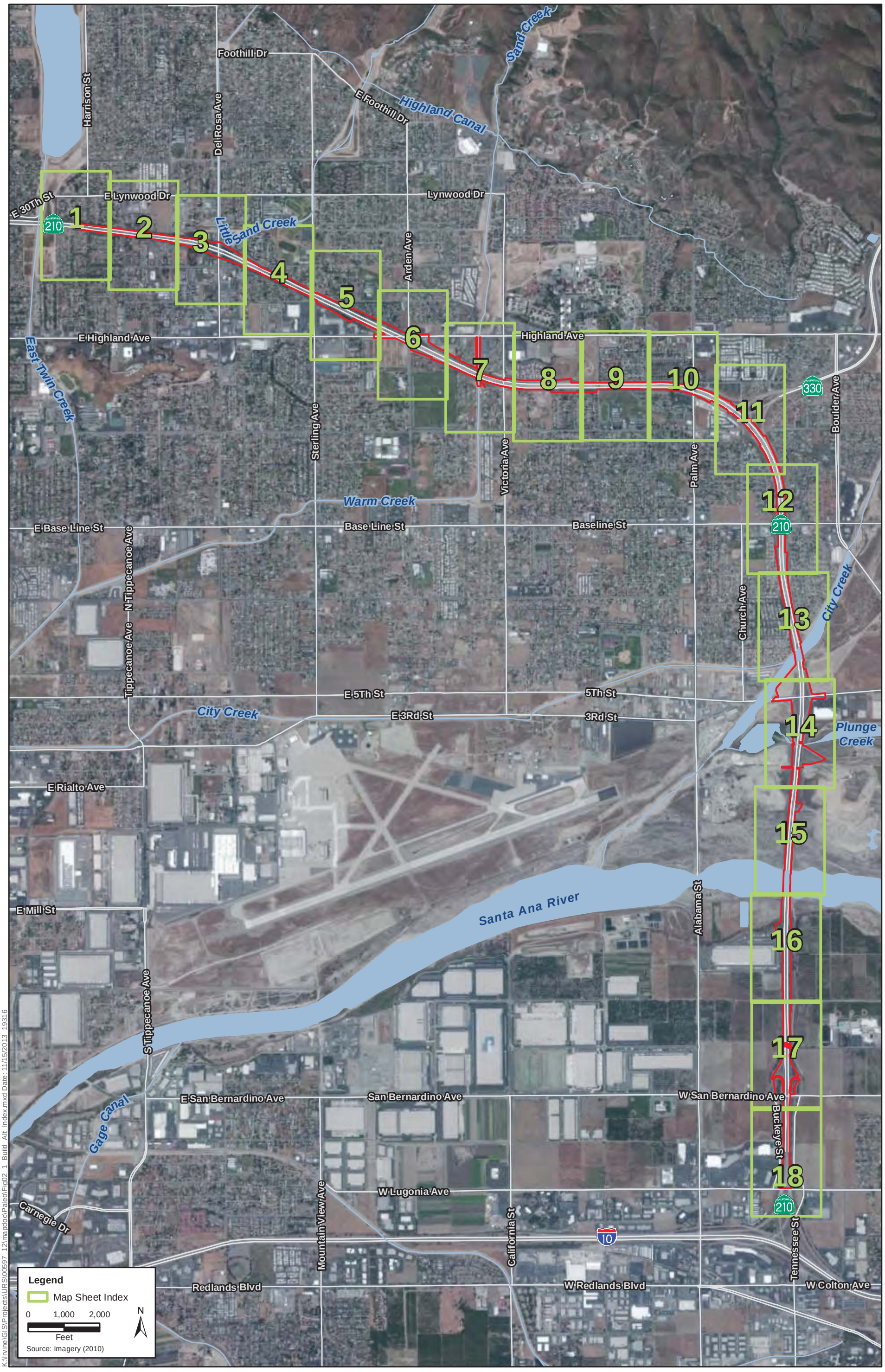

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Figure 1-3
Build Alternative - Index Map
State Route 210 Mixed Flow Lane Addition from Highland Avenue to San Bernardino Avenue

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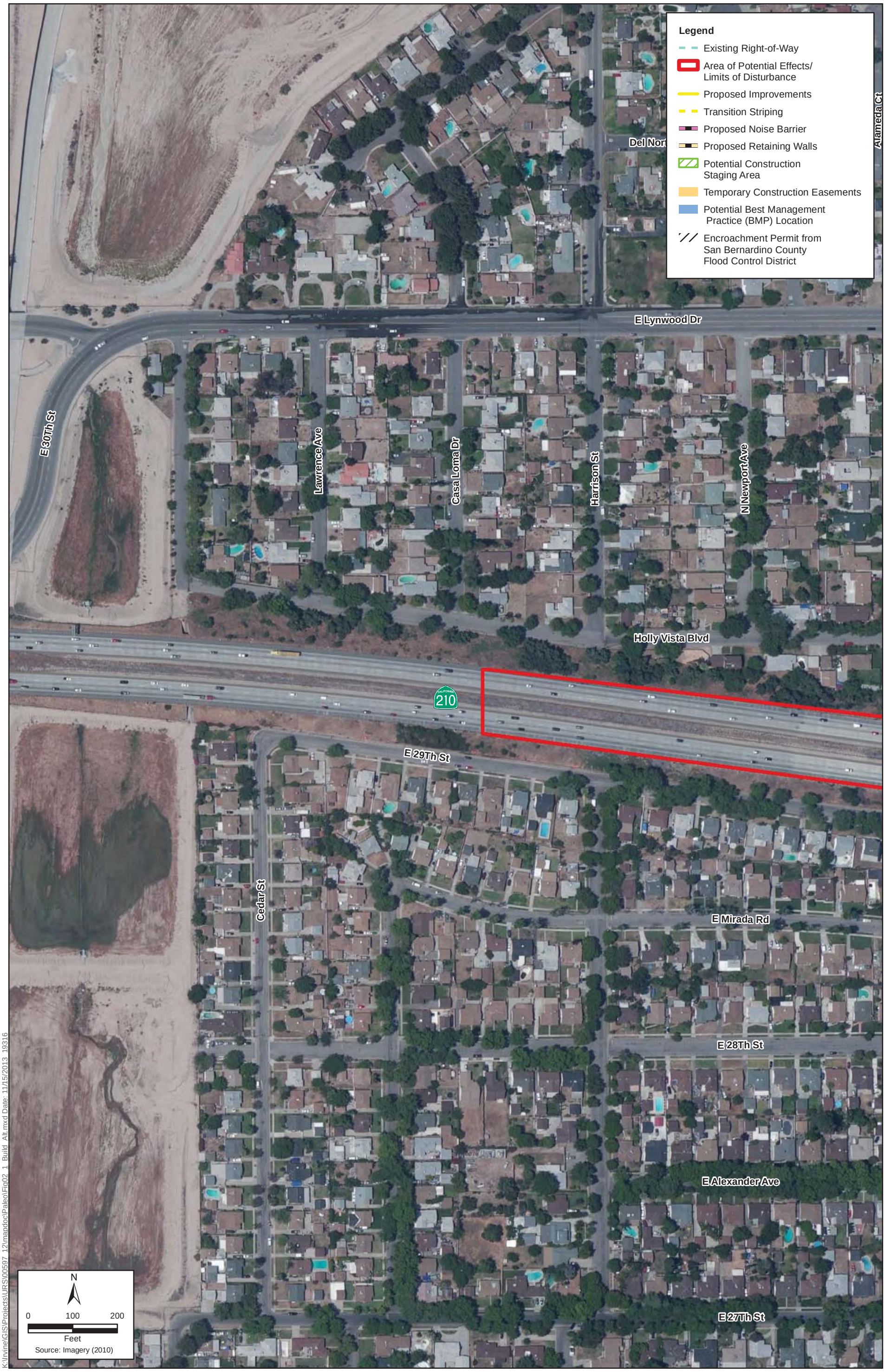

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Figure 1-3
Build Alternative - Sheet 1
State Route 210 Mixed Flow Lane Addition from Highland Avenue to San Bernardino Avenue

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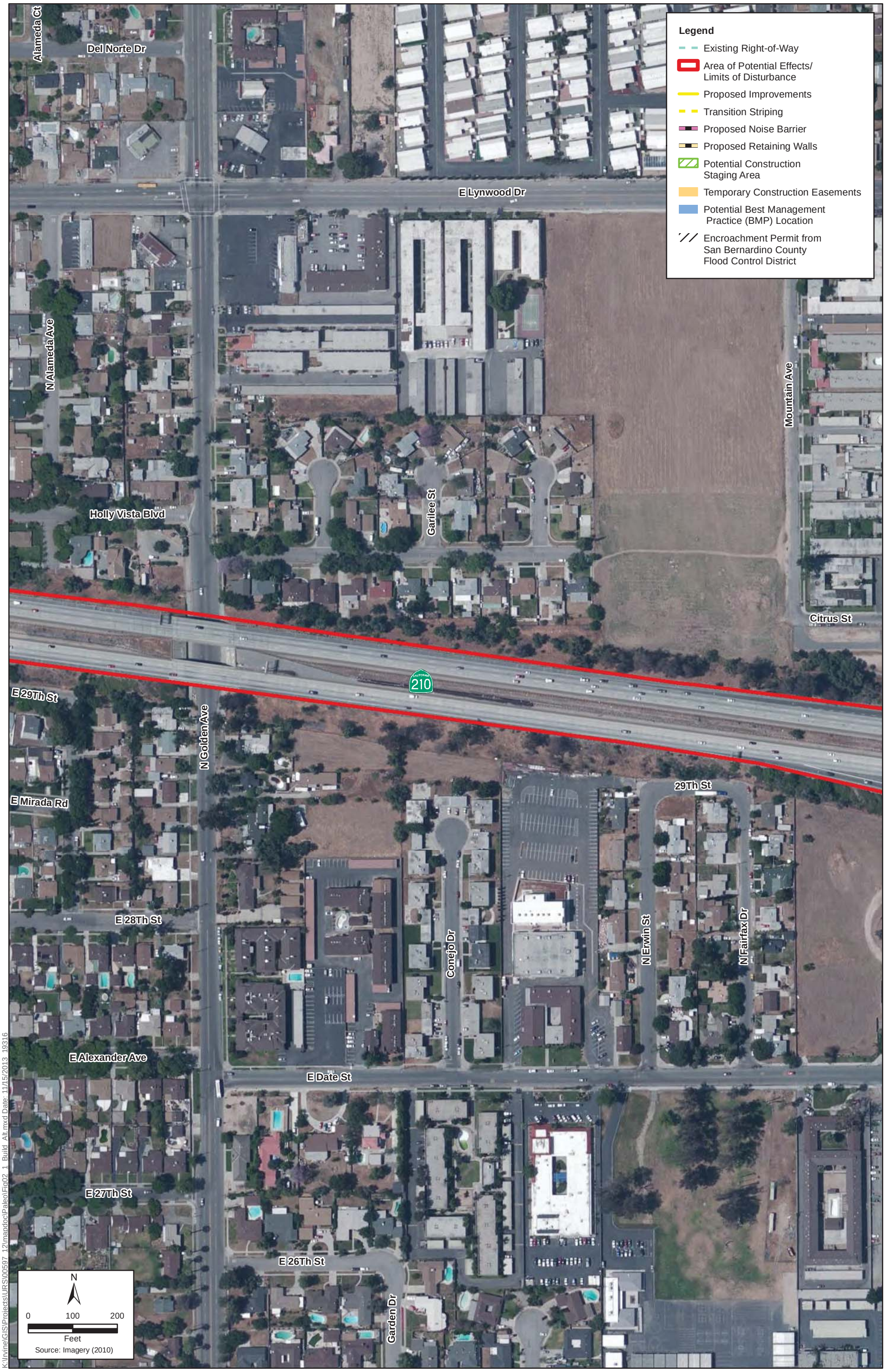

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Figure 1-3
Build Alternative - Sheet 2
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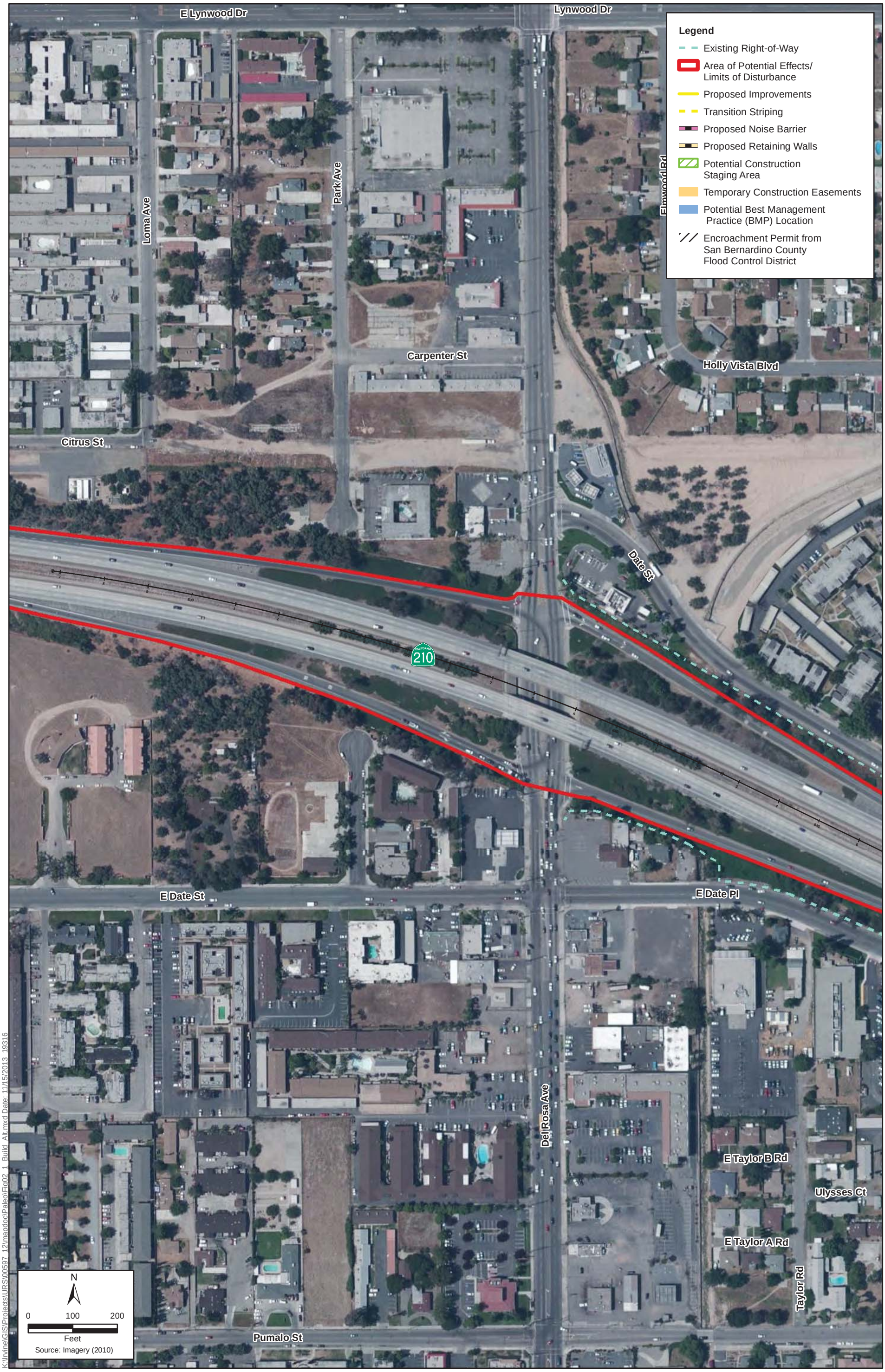

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Figure 1-3
Build Alternative - Sheet 3
State Route 210 Mixed Flow Lane Addition from Highland Avenue to San Bernardino Avenue

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Figure 1-3
Build Alternative - Sheet 4
State Route 210 Mixed Flow Lane Addition from Highland Avenue to San Bernardino Avenue

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Figure 1-3
Build Alternative - Sheet 5
State Route 210 Mixed Flow Lane Addition from Highland Avenue to San Bernardino Avenue

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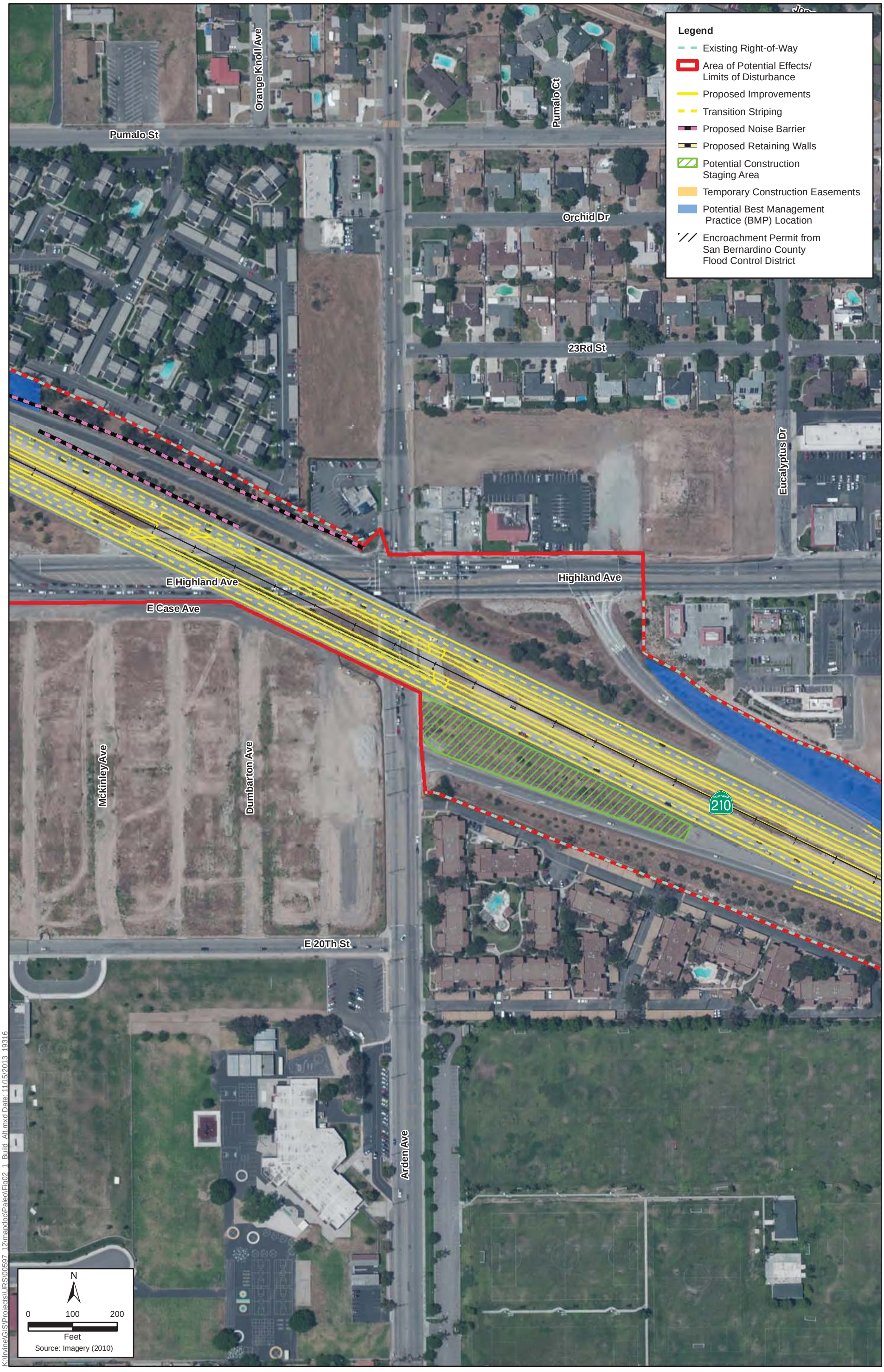

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Build Alternative - Sheet 6
State Route 210 Mixed Flow Lane Addition from Highland Avenue to San Bernardino Avenue

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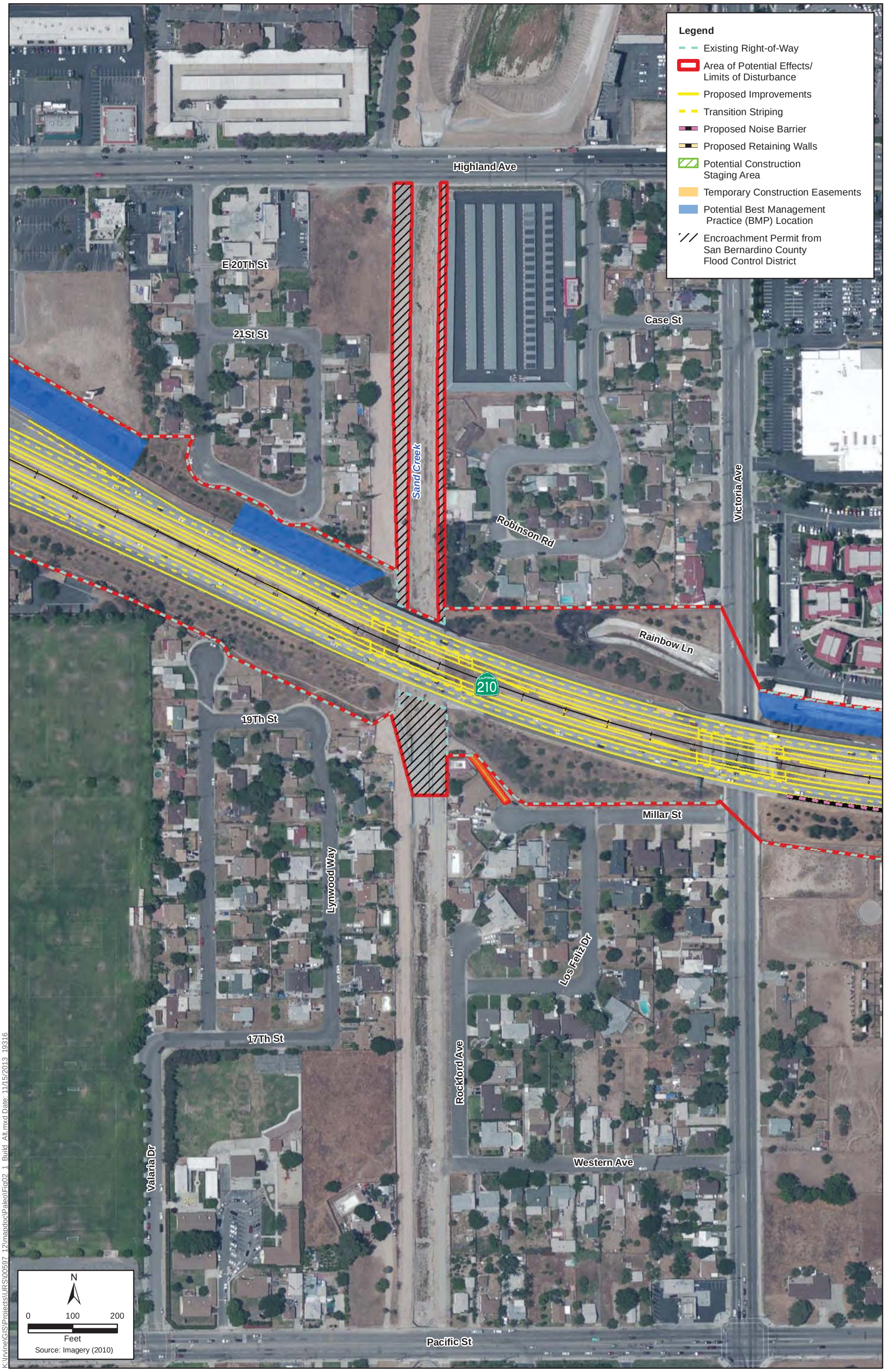

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Figure 1-3
Build Alternative - Sheet 7
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Figure 1-3
Build Alternative - Sheet 8
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Build Alternative - Sheet 9
State Route 210 Mixed Flow Lane Addition from Highland Avenue to San Bernardino Avenue

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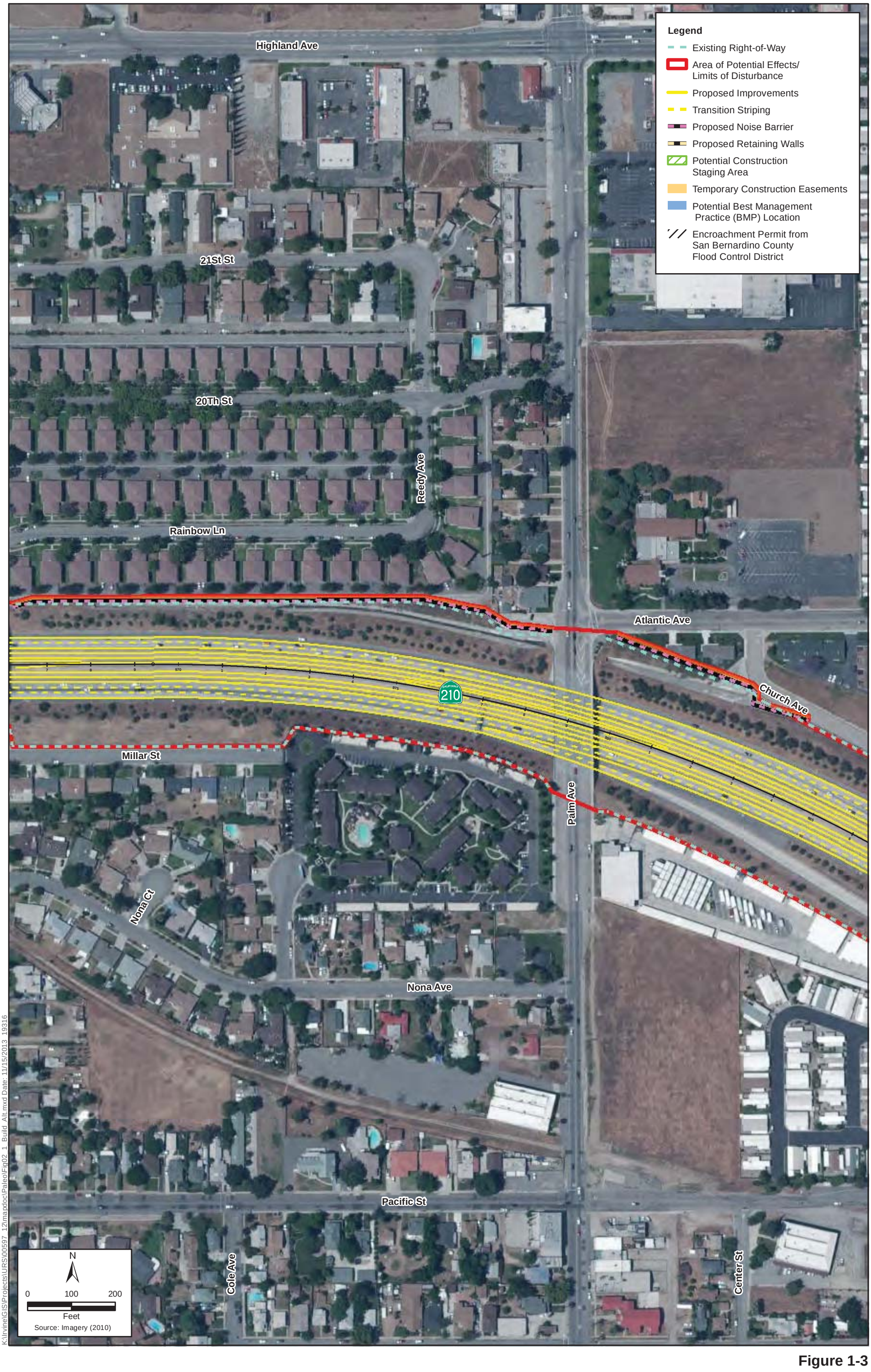

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Build Alternative - Sheet 10
State Route 210 Mixed Flow Lane Addition from Highland Avenue to San Bernardino Avenue

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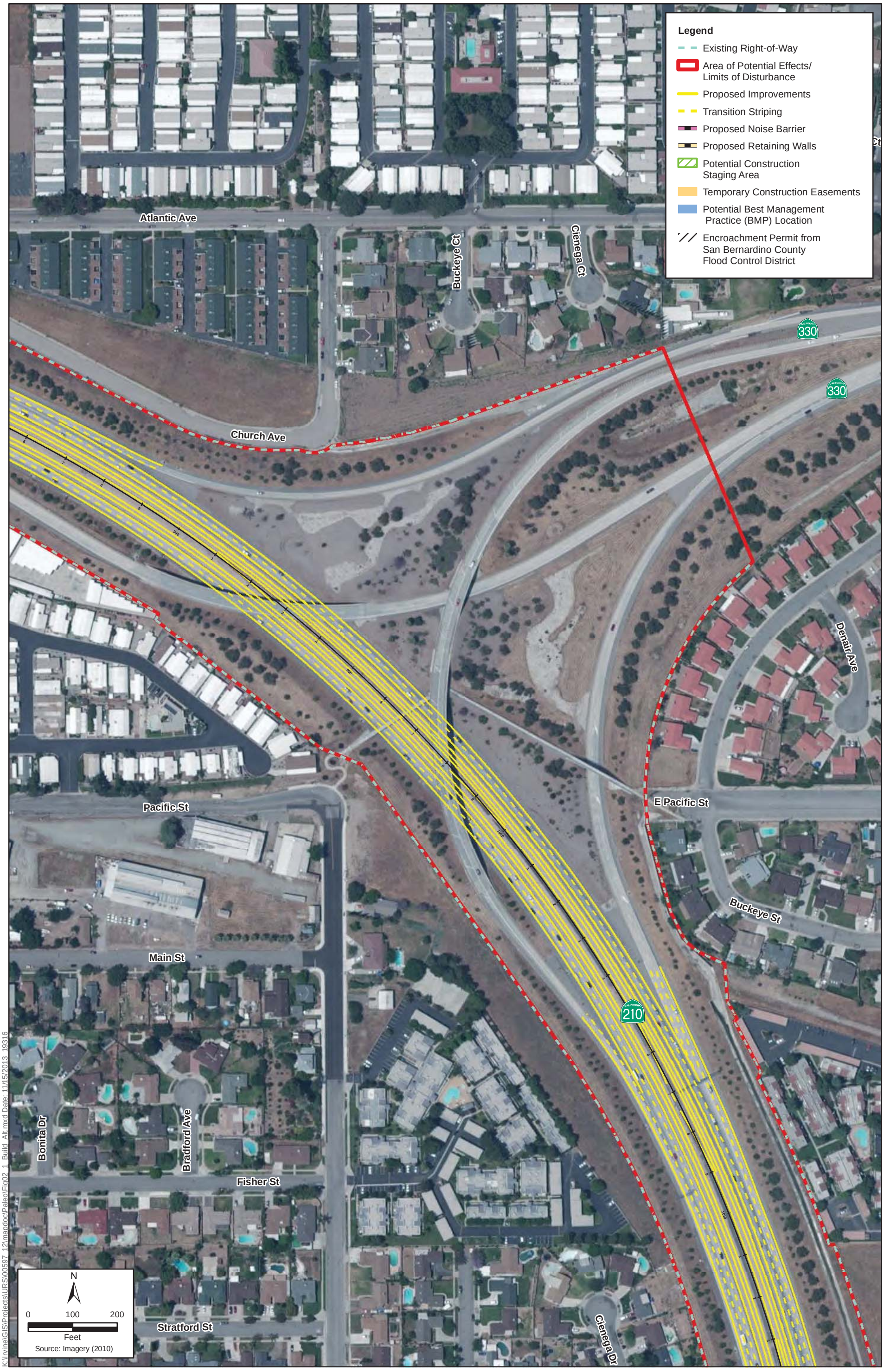

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Build Alternative - Sheet 11
State Route 210 Mixed Flow Lane Addition from Highland Avenue to San Bernardino Avenue

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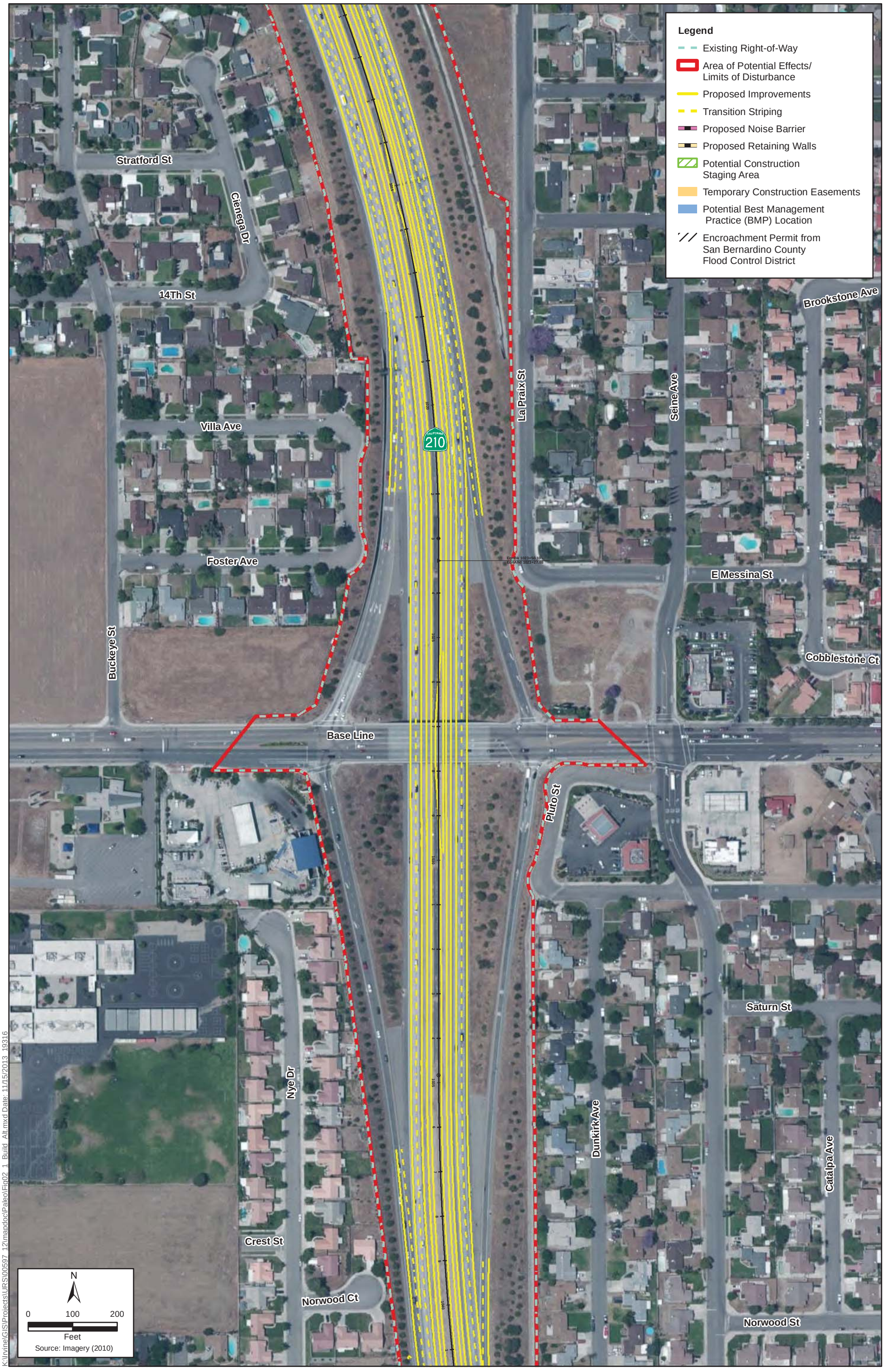

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Build Alternative - Sheet 12
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Figure 1-3
Build Alternative - Sheet 13
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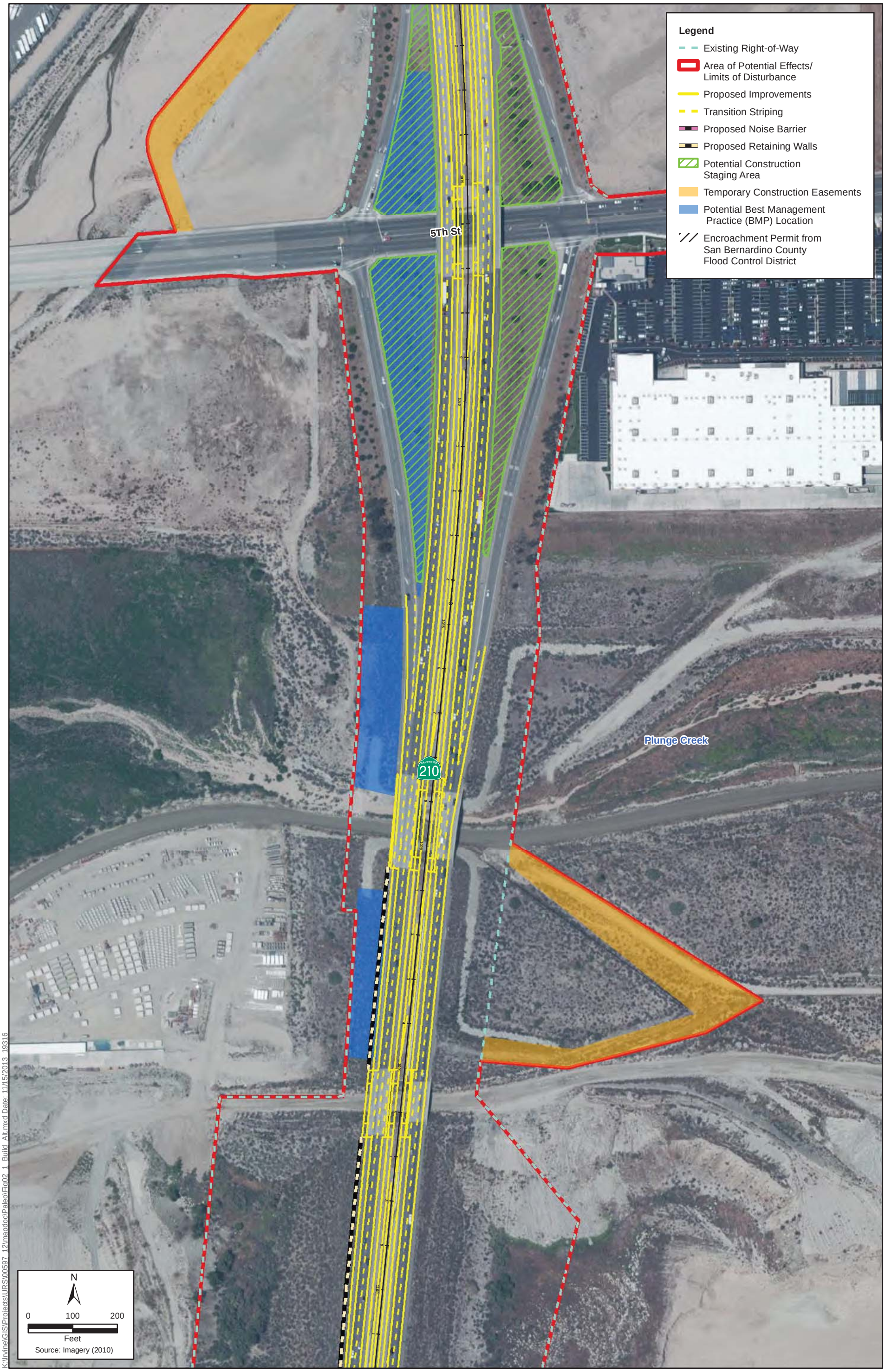

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Figure 1-3
Build Alternative - Sheet 14
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Figure 1-3
Build Alternative - Sheet 15
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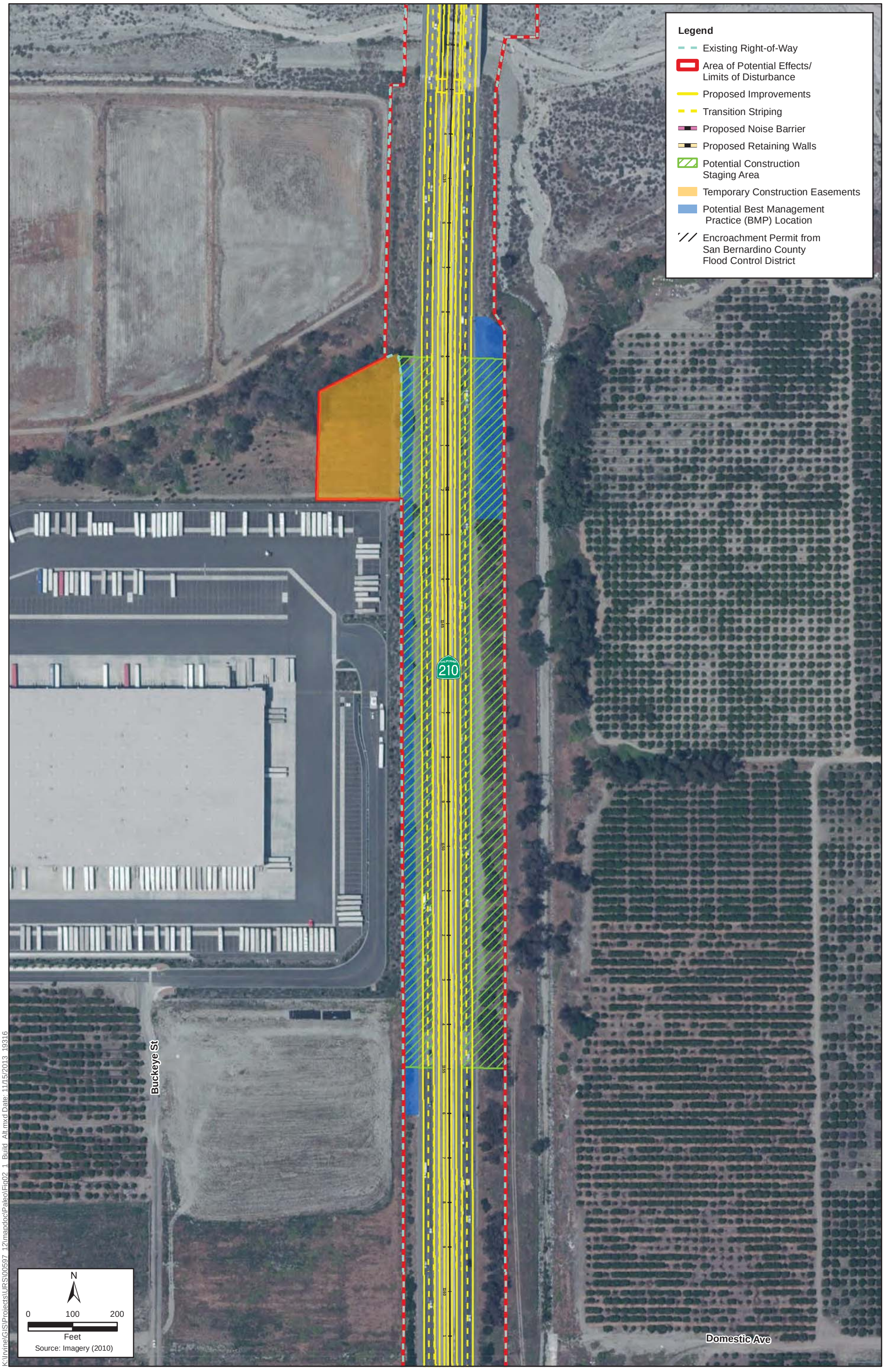

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State Route 210 Mixed Flow Lane Addition from Highland Avenue to San Bernardino Avenue

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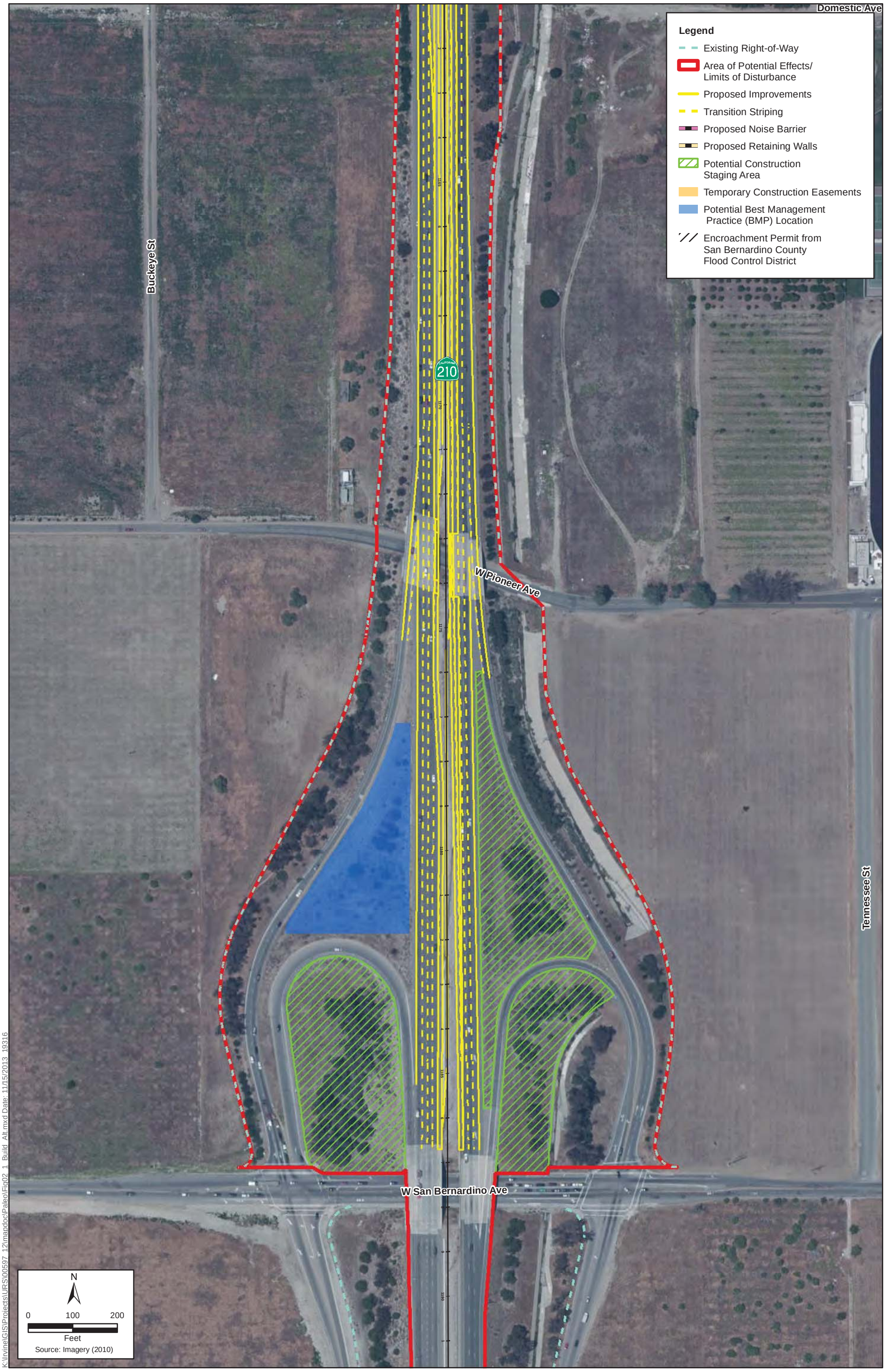

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Figure 1-3
Build Alternative - Sheet 17
State Route 210 Mixed Flow Lane Addition from Highland Avenue to San Bernardino Avenue

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Figure 1-3
Build Alternative - Sheet 18
State Route 210 Mixed Flow Lane Addition from Highland Avenue to San Bernardino Avenue

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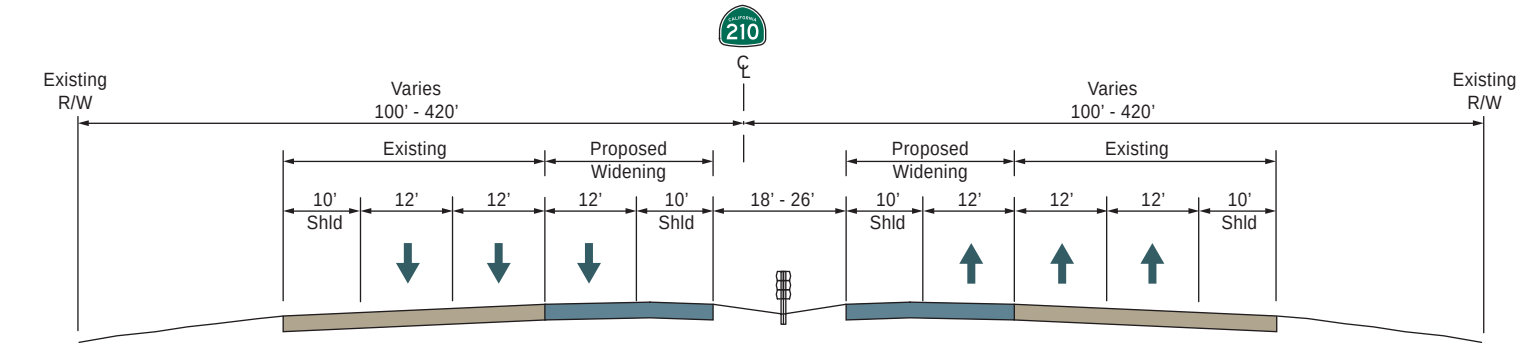
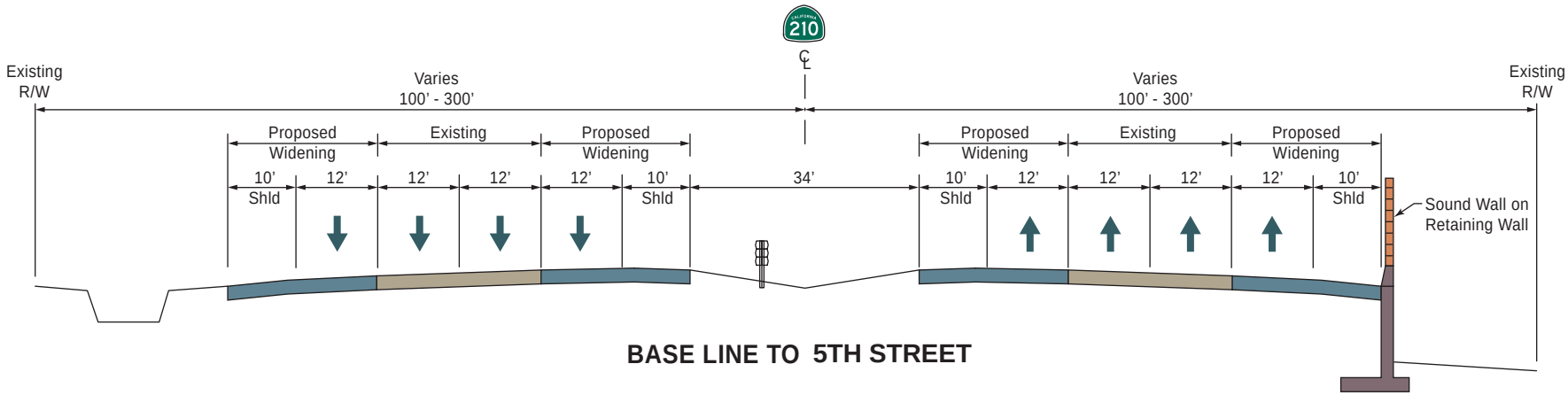
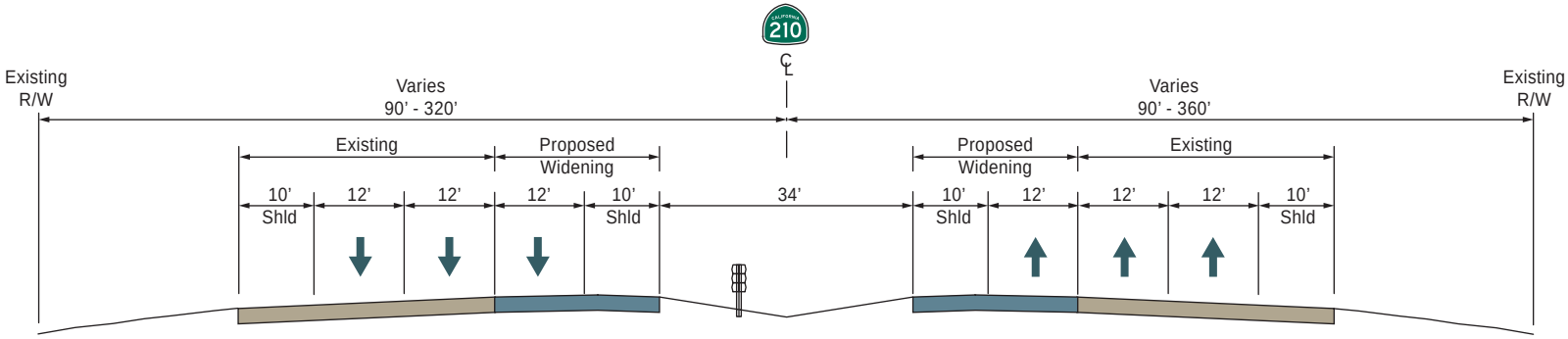


5TH STREET TO SAN BERNARDINO AVENUE



BASE LINE TO 5TH STREET



HIGHLAND AVENUE TO BASE LINE

Figure 1-4, Typical Cross Sections State Route 210 Mixed Flow Lane Addition from Highland Avenue to San Bernardino Avenue

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1.1.2 No-Build Alternative

Under the No-Build Alternative, no additional lanes would be constructed along SR-210 between Sterling Avenue and San Bernardino Avenue. This alternative, however, does not preclude the construction of future improvements.

The No-Build Alternative provides a baseline for comparing impacts with the Build Alternative. It is used to compare the relative impacts and benefits of the proposed project improvements, but it does not meet the identified purpose and need.

1.1.3 Project Footprint and Excavation Parameters

In this report, the terms *area of potential effect, project footprint,* and *limits of disturbance* represent the area proposed for direct impact, including both permanent and temporary effects. The proposed disturbance area extends northwest and south of the physical highway improvements to account for the placement of signage during construction (see Figure 1-3)

In general, the horizontal extent of ground-disturbing activities (e.g., digging, grading, drilling) would be limited to the current Caltrans right-of-way and temporary construction easements. The vertical extent of excavation is expected to reach a maximum depth of two feet, with the majority of earthwork impacting existing artificial fill. Piles would be installed at structures and/or bridges to a depth of 30 to 80 feet.

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Chapter 2 Regulatory Environment

2.1 Regulatory Setting

This section summarizes federal and state laws and regulations related to paleontological resources. Various federal, state, and local requirements are integrated with the development of construction projects, and each is outlined below.

2.1.1 Federal Requirements

Federal-Aid Highway Act of 1935 (20 USC 78)

The Federal Highway Act of 1935 (20 United State Code [USC] 78) addresses issues related to paleontological resources. Section 305 of the act (20 USC 78, 78a) gives authority to use federal funds to salvage archaeological and paleontological sites that are affected by highway projects. The Federal-Aid Highway Act of 1935 would only be applicable in the event of a fossil discovery during project construction.

Antiquities Act of 1906 (16 United States Code [USC] 431-433)

The Antiquities Act of 1906 states, in part "That any person who shall appropriate, excavate, injure or destroy any historic or prehistoric ruin or monument, or any object of antiquity, situated on lands owned or controlled by the Government of the United States, without the permission of the Secretary of the Department of the Government having jurisdiction over the lands on which said antiquities are situated, shall upon conviction, be fined in a sum of not more than five hundred dollars or be imprisoned for a period of not more than ninety days, or shall suffer both fine and imprisonment, in the discretion of the court." Although there is no specific mention of natural or paleontological resources in the Act itself, or in the Act's uniform rules and regulations (Title 43 Part 3, Code of Federal Regulations [43 CFR 3]), "objects of antiquity" has been interpreted to include fossils by the National Park Service (NPS), the Bureau of Land Management (BLM), the Forest Service (FS), and other federal agencies. Permits to collect fossils on lands administered by federal agencies are authorized under this Act (see "Permit Requirements section, below). This law does not apply to the proposed project because the project does not involve or affect federal lands.

Archaeological and Paleontological Salvage (23 USC 305)

Statute 23 USC 305 amends the Antiquities Act of 1906. Specifically, it states: "Funds authorized to be appropriated to carry out this title to the extent approved as necessary, by the highway department of any State, may be used for archaeological and paleontological salvage in that state in compliance with the Act entitled "An Act for the preservation of American Antiquities," approved June 8, 1906 (PL 59-209; 16 USC 431-433), and State laws where applicable." This statute allows funding for mitigation of paleontological resources recovered pursuant to federal aid highway projects, provided that "excavated objects and information are to be used for public purposes without private gain to any individual or organization." Because the proposed project has not received federal funding, this regulation does not apply.

National Environmental Policy Act of 1969 (42 USC 4321)

The National Environmental Policy Act (NEPA) directs federal agencies to use all practicable means to "Preserve important historic, cultural, and natural aspects of our national heritage…" (Section 101(b) (4)). Regulations for implementing the procedural provisions of NEPA are found in 40 CFR 1500 1508. If the presence of a significant environmental resource is identified during the scoping process, federal agencies and their agents must take the resource into consideration when evaluating project effects. Consideration of paleontological resources may be required under NEPA when a project is proposed for development on federal land, or land under federal jurisdiction. The level of consideration depends upon the federal agency involved. Because the proposed project does not impact federally owned or controlled land, this regulation does not apply.

2.1.2 State Requirements

California state laws and regulations under CEQA and Public Resources Code Section 5097.5 apply to paleontological resources and the proposed project.

California Environmental Quality Act

Under CEQA, state and public agencies are required to investigate mitigation measures to reduce significant environmental effects of proposed projects. If paleontological resources are identified during an environmental assessment of a project, then the sponsoring agency (in this case, Caltrans) must take the resources into consideration when evaluating project effects.

Public Resources Code Section 5097.5

Section 5097.5 of the California Public Resources Code protects historic or prehistoric ruins, burial grounds, archaeological or vertebrate paleontological sites, and any other archaeological, paleontological, or historical feature that is situated on land owned by, or in the jurisdiction of, the state of California or any city, county, district, authority, public corporation, or agency thereof.

2.1.3 Local and Regional Requirements

City of Highland General Plan

The City of Highland General Plan does not contain any policies that address issues related to paleontological resources directly.

City of San Bernardino General Plan

The City of San Bernardino General Plan does not contain any policies that address issues related to paleontological resources directly.

City of Redlands General Plan

The following policies within the City of Redlands General Plan are applicable to the proposed project in regards to paleontological resources:

- **Policy 7.30a.** Protect archaeological and paleontologic resources for their aesthetic, scientific, educational, and cultural values.
- **Policy 7.30f.** Work with the San Bernardino County Museum to identify and protect Redlands' significant nonrenewable paleontological resources.

County of San Bernardino General Plan

The County of San Bernardino General Plan Conservation Element identifies the following goal, which is applicable to the proposed project:

- **GOAL M/CO 4.** Protect cultural and paleontological resources within the Mountain Region.

2.2 Geologic Setting

The proposed project lies within the broad Santa Ana River Valley, southwest of the San Bernardino Mountains. Basement rocks in this area consist primarily of igneous and metamorphic rocks of Cretaceous age and older (i.e., more than 65 million years old). These basement rocks are overlain by a thick accumulation of younger sedimentary deposits of Cenozoic age (approximately 45 million to 11,000 years old). Artificial fill overlies native deposits within the current Caltrans right-of-way, where previous construction along the SR-210 disturbed surface sediments. Artificial fill was also imported to aid in construction of aboveground portions of the highway.

The proposed project area is bounded to the north by the San Andreas Fault Zone (Dibblee and Minch 2004; Morton and Miller 2003; Matti et al. 2003). Sedimentary rock units mapped along the proposed project alignment include, from youngest to oldest (see Figure 2-1), very young alluvial wash deposits (late Holocene; < 5,000 years old [Qw and Qw_1]), young alluvial fan deposits (middle to late Holocene; < 11,000 years old [$Qyf_{1–4}$]), young alluvial valley deposits (middle to late Holocene; approximately < 11,000 years old [Qya_3 and Qya_4, respectively]), and old alluvial fan deposits (late to middle Pleistocene; approximately 500,000 to 11,000 years old [Qof_3]). Nearby bedrock units include conglomerate, sandstone, and arkose (Miocene; approximately 23 to five million years old [Tsg]) and gneissic granitoid rocks (age unknown [gg]). These latter two rock units, however, do not crop out in the vicinity of the proposed project alignment but instead are confined to areas to the north, immediately adjacent to the San Andreas Fault Zone (see Figure 2-1).

2.2.1 Stratigraphy

The following section provides a brief description of the Quaternary sedimentary rock units that occur in areas within the proposed project right-of-way where the grading of sedimentary rock units may occur.

Artificial fill

Description

Artificial fill materials consist of disturbed sediments that presumably were derived from earlier construction activities. Typically, fill materials are placed in such a way as to provide topographically high areas and/or flat surfaces for current and future development.

Paleontology

No fossils of paleontological interest are located in artificial fill materials. Any contained paleontological resources have lost their original stratigraphic/geologic context due to the disturbed nature of the artificial fill materials, and thus are assigned a zero paleontological sensitivity.

Distribution

Artificial fill materials overlie the majority of the proposed project right-of-way, wherever previous construction along SR-210 has disturbed surficial sedimentary deposits.

Unnamed Young Alluvial Deposits (Holocene [Qw, Qf, Qyf, and Qya])

Description

Sedimentary rocks, which are generally mapped as Holocene (11,000 years ago to present) alluvial deposits, underlie the majority of the proposed project right-of-way (see Figure 2-1). For the most part, these deposits consist of poorly consolidated silts, sands, and gravels and are recognized primarily according to their geologic origin (Morton and Miller 2003). The youngest deposits are wash deposits (Qw) and alluvial fan deposits (Qyf). The former are associated with active stream channels, such as the modern Santa Ana River and City Creek (see Figure 2-2), while the latter are associated with active alluvial fans, such as those forming today along the base of the San Bernardino Mountains. Also in this category are young alluvial valley deposits (Qya). These are sediments that are accumulating today in the modern floodplain of the Santa Ana River (see Figure 2-1 [Qw is shown in pale gray, Qya in yellow, and Qyf in dark gray]).

Paleontology

The late Holocene age of these deposits (as indicated by their lack of pedogenic soils and obvious compaction) suggests that they are too young to contain true fossil remains or traces; therefore, these deposits have low paleontological sensitivity.

Distribution

Unnamed young alluvial deposits are mapped throughout the proposed project right-of-way. As shown in Figure 2-1, Quaternary unnamed alluvial deposits include very young wash deposits (Qw; late Holocene), alluvial fan deposits (Qf; late Holocene) young alluvial-fan deposits (Qyf; middle to late Holocene), young axial channel deposits (Qya; middle to late Holocene).

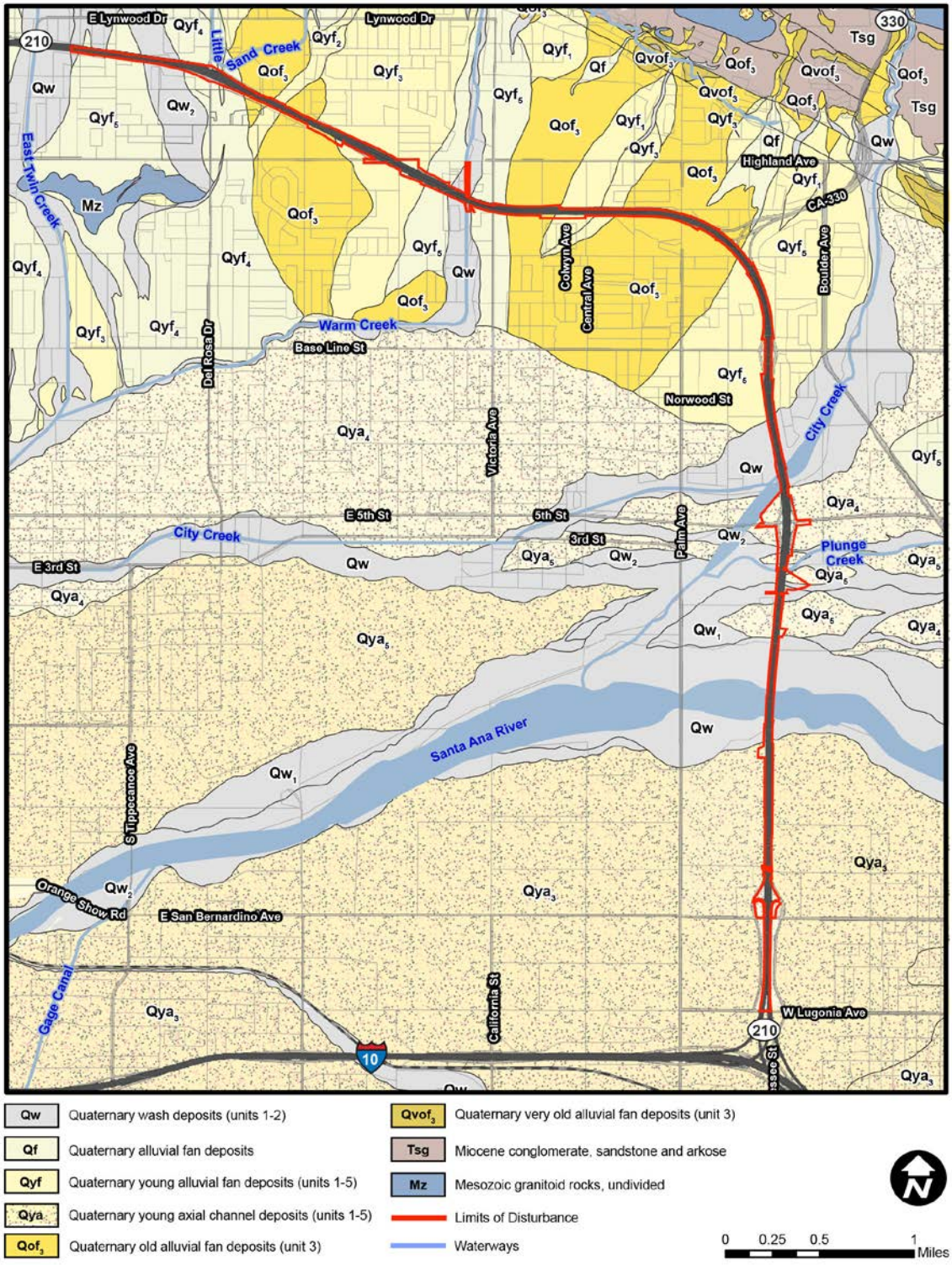

Figure 2-1. Geologic Units. Proposed project alignment map shown on the geology of the SR-210 corridor. Geology based on mapping by Morton and Miller (2003). Quaternary – age, unnamed alluvial deposits include: very young wash deposits (Qw; late Holocene), alluvial fan deposits (Qf; late Holocene) young alluvial-fan deposits (Qyf; middle to late Holocene), young axial channel deposits (Qya; middle to late Holocene), old alluvial fan deposits (Qof_3; middle to late Pleistocene), and very old alluvial fan deposits ($Qvof_3$; early to middle Pleistocene). Nearby bedrock geological rock units include: conglomerate, sandstone, and arkose (Tsg; Miocene) and undivided granitoid (Mz; Mesozoic).

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Figure 2-2. Holocene age coarse-grained sedimentary deposits observed in City Creek, south of the intersection of Powell Drive and Church Avenue. View east toward the SR-210 freeway.

Unnamed Old Alluvial Deposits (Pleistocene [Qof_3])

Description

These old alluvial fan deposits are thought to be late to middle Pleistocene in age (younger than approximately 500,000 years old) and, presumably, derived from ancient streams that drained from the ancestral San Bernardino Mountains to the northeast (see Figure 2-1; shown in tan [Qof_3]). In composition, these deposits consist of moderately consolidated to well-consolidated silt, sand, and gravel, with reddish-brown, coarse-grained strata found closer to the source area in the San Bernardino Mountains (Morton and Miller, 2003). These Pleistocene alluvial deposits are locally capped by younger Holocene alluvium and artificial fill and, at depth, are underlain by Cretaceous and older igneous and metamorphic rocks (Dibblee and Minch 2004; Morton and Miller 2003).

Paleontology

Scientifically significant paleontological resources have been recovered from correlative Pleistocene old alluvial deposits elsewhere in San Bernardino County. These include several recorded fossil collecting localities. In general, these localities have yielded fossils of terrestrial plants, freshwater and terrestrial invertebrates (clams and snails), and terrestrial mammals (mammoths, mastodons, ground sloths, dire wolves, short-faced bears, sabre-toothed cats, large and small horses, large and small camels, and bison) (Jefferson 1991; Reynolds and Reynolds 1991; Springer et al. 2009, 2010; Scott 2010, 2013). Fossil localities recorded at the Natural

History Museum of Los Angeles County (LACM) from older Quaternary deposits include a specimen of horse (*Equus* sp.) from the San Jacinto Valley, located south-southeast of the proposed project site, and a specimen of coachwhip snake (*Masticophis flagellum*), which was found near Mira Loma (McLeod 2013). Because vertebrate fossils have been recovered from Pleistocene old alluvial deposits exposed elsewhere in San Bernardino County, similar fossils may also be preserved in the exposed old alluvial deposits along the proposed project right-of-way. These deposits would have high paleontological sensitivity.

Distribution

Pleistocene old alluvial deposits are mapped (Morton and Miller 2003) along several portions of the proposed project right-of-way, and are anticipated to be found underlying adjacent young alluvial fan deposits, including from a point approximately 300 feet east of Victoria Ave to approximately 0.25 mile south of Base Line (at approximately Norwood Street) (refer to Figures 2-1 and 2-3).

Figure 2-3. Pleistocene old alluvial deposits underlie the portion of the proposed project right-of-way surrounding the Orange Street overcrossing (pictured in background) of SR-210. Landscaping, residential housing, and roadways in the area effectively cover these deposits. Photo taken facing east, from the Central Avenue overcrossing.

2.2.2 Records Search Results

To assess the impact of the proposed project on nonrenewable paleontological resources, a review was conducted of relevant published and unpublished geologic reports (Dibblee and Minch 2004; Morton and Miller 2003) dealing with the proposed project area and vicinity. Reviews of paleontological site records housed at the Department of Paleontology at San Diego Natural History Museum (SDNHM), the Vertebrate Paleontology Section at Los Angeles County

Museum (LACM), and the Division of Geological Sciences at San Bernardino County Museum (SBCM) were also conducted. According to paleontological site records housed at LACM, the SDNHM, and the SBCM, no previously recorded fossil collecting localities occur within a one-mile radius of the proposed project right-of-way (McLeod 2013; Scott 2013). Although SBCM does have a recorded fossil collecting locality approximately one mile northeast of the proposed project right-of-way (SBCM 1.101.8), this locality occurs in a geologic rock unit (Miocene Potato Sandstone) that does not crop out within the proposed project right-of-way (Scott 2013). Previously recorded LACM and SBCM fossil collecting localities have deposits similar to those mapped within the proposed project right-of-way (McLeod 2013; Scott 2013). As mentioned earlier, fossils collected from these Pleistocene localities consist of significant remains of terrestrial mammals, including mammoths, mastodons, ground sloths, dire wolves, short-faced bears, saber-toothed cats, large and small horses, large and small camels, and bison. The discovery and recovery of fossils from old alluvial deposits west of the proposed project site and elsewhere within San Bernardino County indicates a high potential for fossil occurrences in Pleistocene old alluvial deposits within the proposed project right-of-way.

2.2.3 Paleontological Field Reconnaissance

A windshield survey of the proposed project alignment was carried out on April 18, 2013, to field check the results of the literature and records reviews. This approach was followed in recognition of the direct relationship between paleontological resources and the geologic deposits/formations within which they occur. By knowing the geology of a particular area and the past fossil productivity of the deposits/formations, it is possible to make reasonable predictions regarding where fossils will, or will not, be encountered.

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Chapter 3 Environmental Consequences

3.1 Paleontological Sensitivity and Significance

3.1.1 Definitions of Significance and Sensitivity

If a paleontological resource cannot be avoided, then it is necessary to determine its significance or scientific importance before any mitigation measures are proposed. This may be for a particular fossil species, fossil assemblage, or a rock unit as a whole.

There are two generally recognized types of paleontological significance (Caltrans 2012):

National: A National Natural Landmark–eligible paleontological resource in an area of national significance (as defined under 36 Code of Federal Regulations 62) that contains an outstanding example of fossil evidence of the development of life on Earth. This is the only codified definition of paleontological significance.

Scientific: Definitions of a scientifically significant paleontological resource can vary by jurisdictional agency and paleontological practitioner.

Generally, scientifically significant paleontological resources are identified sites or geologic deposits containing individual fossils or assemblages of fossils that are unique or unusual or diagnostically or stratigraphically important. Such resources add to the existing body of knowledge in specific areas—stratigraphically, taxonomically, or regionally (Reynolds et al. 1990:6). Particularly important are fossils found in situ (undisturbed) in primary context (e.g., fossils that have not been subjected to disturbance subsequent to their burial and fossilization). As such, they aid in stratigraphic correlation, particularly those offering data regarding tectonic events, geomorphological evolution, paleoclimatology, relationships between aquatic and terrestrial species, and evolution in general. In situ fossil-bearing deposits of many species, especially vertebrates, are rare discoveries. Terrestrial vertebrate fossils are often assigned greater significance than other fossils because they are rarer. This is primarily because the best conditions for fossil preservation include little or no disturbance after death and quick burial in oxygen-depleted, fine-grained sediments. Although these conditions often exist in marine settings, they are relatively rare in terrestrial settings (e.g., because of pyroclastic flows and flashflood events). This has ramifications regarding the amount of scientific study needed to characterize an individual species adequately and therefore affects how relative sensitivities are assigned to formations and rock units.

Impacts on paleontological resources are typically rated in terms of the significance or potential for a given rock unit to yield fossils. Following the paleontological sensitivity/potential classification system described in Caltrans' *Environmental Handbook*, Volume 1, Chapter 8, Paleontological Resources (Caltrans 2012), a given rock unit is classified as having high, low, or no paleontological resource potential. Note that significance may also be stated for a particular rock unit, predicated on the research potential of fossils suspected to occur in that unit. Such significance is often stated in terms of "sensitivity" or "potential." In most cases, decisions regarding how to manage paleontological resources must be based on this potential because the

actual situation cannot be known until excavation for the project is under way. The specific criteria applied to each potential fossil yield category, as described by Caltrans, are summarized below.

High Potential

These are 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 that are temporally or lithologically suitable for the preservation of fossils. These units may also include some volcanic and low-grade metamorphic rock units. Fossiliferous deposits with very limited geographic extent or an uncommon origin (e.g., tar pits and caves) are given special consideration and ranked as highly sensitive. High sensitivity includes the potential for containing 1) abundant vertebrate fossils; 2) a few significant fossils (large or small vertebrate, invertebrate, or plant fossils) that may provide new and significant taxonomic, phylogenetic, ecologic, and/or stratigraphic data; 3) areas that may contain datable organic remains older than Recent, including *Neotoma* (sp.) middens; or 4) areas that may contain unique new vertebrate deposits, traces, and/or trackways. 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 some 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 because vertebrates are generally rare and found in more localized stratum. Rock units designated as low potential generally do not require monitoring and mitigation. However, as excavation for construction gets under way, it is possible that new and unanticipated paleontological resources might be encountered. If this occurs, a Construction Change Order must be prepared to have a qualified principal paleontologist evaluate the resource. If the resource is determined to be significant, monitoring and mitigation will be required.

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.

3.1.2 Paleontological Resource Sensitivity Map

A Paleontological Resource Sensitivity Map (see Figure 3-1) was prepared for the proposed Build Alternative. The map provides a graphical summary of information obtained from the literature search, records search, and field survey conducted for the proposed project, and illustrates paleontological potential/sensitivity along the entire proposed project limits of disturbance. This mapping takes into account the presence of unmapped artificial fill, the

location of previous construction related excavation activities, the anticipated extent and depth of proposed construction related excavation activities, and the depth at which geologic formations with high paleontological resource sensitivity/potential may underlie units of low sensitivity (i.e., areas where excavations may extend deep enough to impact units of high resource sensitivity/potential buried beneath surficial units of low resource sensitivity/potential. Within the proposed project limits of disturbance, areas of low resource sensitivity/potential are mapped in green, and represent areas where construction is only anticipated to impact artificial fill and/or native formations of low paleontological resource potential/sensitivity. Areas of high resource sensitivity/potential are mapped in red, and represent areas where construction has the potential to impact native formations of high paleontological resource potential/sensitivity either at the surface or at depth. Specifically, the areas mapped as high potential occur where previous construction along the SR-210 corridor has graded into a hillslope. This previous work removed a significant volume of young alluvial deposits, and there is a potential that the underlying older alluvial deposits are now exposed either at the surface, or at a shallow depth. Because shallow construction related excavations may impact these older deposits, this entire segment of the alignment has been assigned high paleontological resource potential/sensitivity.

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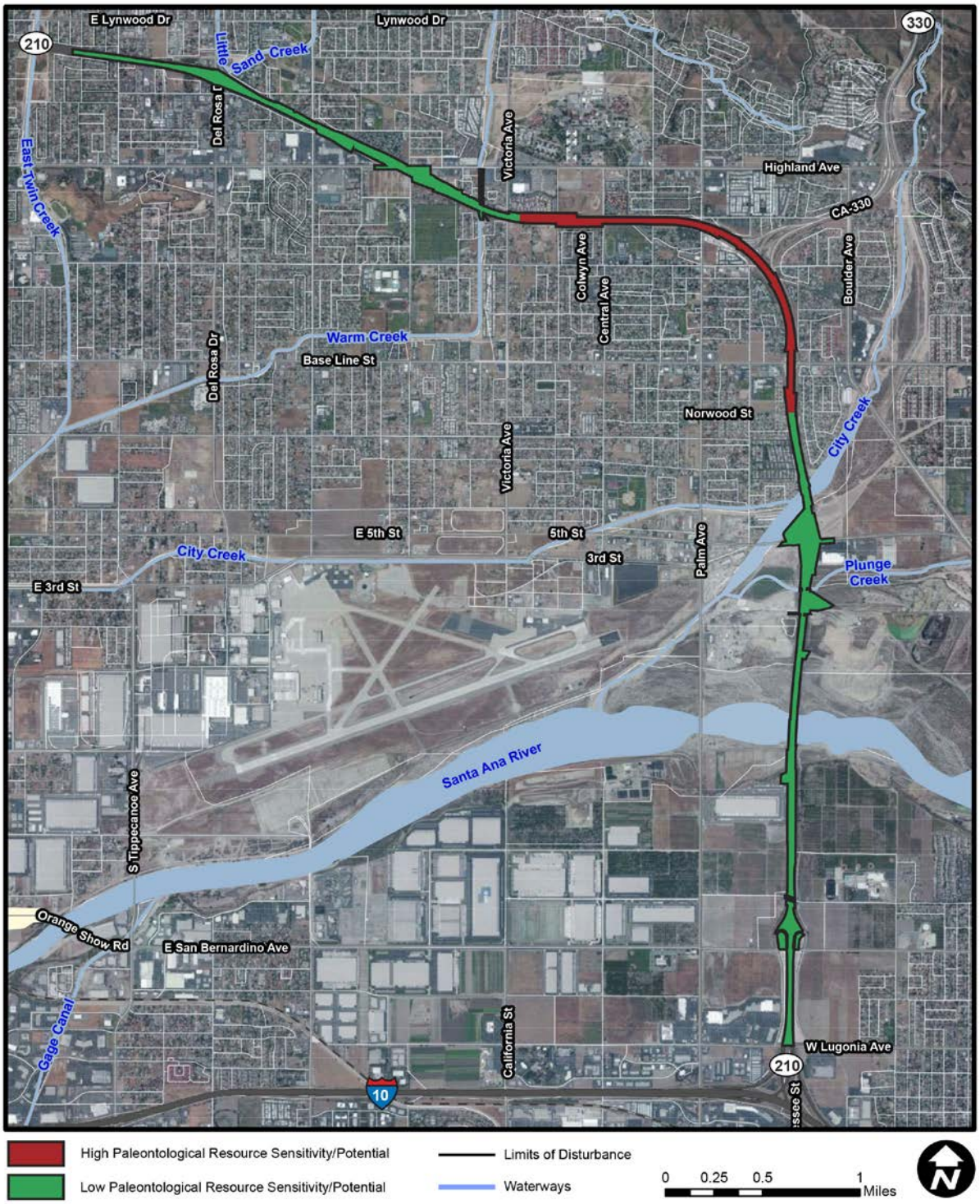

Figure 3-1. Paleontological Sensitivity Map. Areas of low resource sensitivity/potential (green) represent areas where construction is only anticipated to impact artificial fill and/or unnamed young alluvial deposits. Areas of high resource sensitivity/potential (red) represent areas where construction has the potential to impact old alluvial deposits either at the surface or at depth. Notably, significant excavations into the hillslope near the CA-330 interchange were made during previous construction along the SR-210 corridor, and removed a large volume of young alluvial deposits. The underlying older alluvial deposits have the potential to be exposed near the surface and thus may be impacted during construction.

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Chapter 4 Recommendations

4.1 Recommendations

As discussed in this report, the majority of the proposed improvements would occur within areas of existing fill or low sensitivity deposits (see areas shaded in green on Figure 3-1). However, some of the construction activities associated with the proposed highway improvements project (e.g., excavations for bridge extension, auxiliary lane additions, sound wall construction, and drainage improvements) between a point approximately 300 feet east of Victoria Street and a point approximately 0.25 mile south of Base Line (at approximately Norwood Street) have the potential to adversely affect deposits with a high paleontological resource sensitivity rating (i.e., Pleistocene alluvial deposits [Qof_3], see areas shaded in red on Figure 3-1). Under CEQA, negative impacts on paleontological resources require mitigation. As the lead agency, Caltrans is responsible for ensuring that mitigation is completed. To reduce impacts to a level below significance, it is recommended that a PMP be developed and implemented prior to commencement of project construction. The PMP will follow Caltrans and SVP guidelines and format requirements and would be prepared and submitted to Caltrans for review during the Plans, Specifications, and Estimate (PS&E) phase. It is recommended that the PMP be included in the final PS&E for the proposed project so that prospective bidders are aware of the paleontological resource mitigation requirements.

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Chapter 5 Preparers

Thomas A. Deméré
Director, PaleoServices
Education: Ph.D., Biology (University of California, Los Angeles); M.S., Geology (University of Southern California); B.S., Geology (San Diego State University)
Project Responsibilities: Project Management
Title: Director of PaleoServices; Curator, Department of Paleontology
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Email: tdemere@sdnhm.org

Dr. Deméré has worked as a professional paleontologist since 1974, first as a micropaleontologist in the petroleum industry and then as a paleontologist with the San Diego Natural History Museum where he was involved with collecting, curating, and interpreting fossils. Since 1994, Tom has served as Curator of Paleontology and Director of PaleoServices at the museum. Dr. Deméré is the author of numerous scientific and popular articles dealing with the paleontological history of Southern California and the evolutionary history of marine mammals. Since 1981, he has also worked as an environmental consultant to various planning firms, municipalities, and land development companies. In this last capacity, Dr. Deméré's work has ranged from initial resource assessments, through impact evaluation, to actual impact mitigation. Although the majority of this work has been for residential and commercial developments within San Diego County, it has also included a number of water, sewer, and natural gas pipeline and utility transmission line projects in Southern California.

Sarah A. Siren
Paleontological Field Manager, PaleoServices (No longer employed by SDNHM)
Education: M.S., Paleontology (South Dakota School of Mines and Technology); B.S., Geology (The George Washington University); B.A., French Language and Literature (The George Washington University)
Project Responsibilities: Recovery of Stratigraphic and Taphonomic Data, Collection of Geographic and Topographic Information, Final Report Preparation
Title: Paleontological Field Manager
Certification: Qualified Paleontologist, City of San Diego; Orange County Certified Paleontologist; Geologist-in-Training, California, No. 167; 40-hour HAZWOPER Training
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Ms. Siren received a bachelor of science degree in geology (1999) from The George Washington University and was awarded a master's degree in paleontology (2002) from the South Dakota School of Mines and Technology. She is an associate geology professor at Saddleback Community College in Mission Viejo, California, and a curatorial assistant with the Natural History Museum of Los Angeles County. Sarah has conducted studies at both the Smithsonian Institution and Badlands National Park and supervised, as lead research scientist, various field activities, curation projects, and laboratory preparations. Her diverse experience includes monitoring, identifying, mapping, and preparing fossils. She has served as project manager and paleontologist for numerous projects in Southern California involving multiple agencies, public- and private-sector clients, a variety of resources, and multidisciplinary staff supervision. Sarah is

a Geologist-in-Training (no. 167) with the State of California, an Orange County Certified Paleontologist, and a Qualified Paleontologist with the City of San Diego.

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Appendix A: Los Angeles County Museum and San Bernardino County Museum Record Searches

Natural History Museum
of Los Angeles County
900 Exposition Boulevard
Los Angeles, CA 90007

tel 213.763.DINO
www.nhm.org

NATURAL HISTORY MUSEUM
LOS ANGELES COUNTY

Vertebrate Paleontology Section
Telephone: (213) 763-3325
Fax: (213) 746-7431
e-mail: smcleod@nhm.org

28 February 2013

Department of PaleoServices
San Diego Natural History Museum
P.O. Box 121390
San Diego, CA 92112

Attn: Sarah A. Siren, M.S., Paleontological Field Manager

re: Paleontological resources for the proposed State Route 210 from Del Rosa Avenue to San Bernardino Avenue Project, San Bernardino County, project area

Dear Sarah:

I have conducted a thorough search of our paleontology collection records for the locality and specimen data for the proposed State Route 210 from Del Rosa Avenue to San Bernardino Avenue Project, San Bernardino County, project area as outlined on the portions of the San Bernardino North, Harrison Mountain and Redlands USGS topographic quadrangle maps that you sent to me via e-mail on 20 February 2013. We have no fossil vertebrate localities that lie directly within the proposed project boundaries, nor do we have any localities nearby that occur in the same or similar sedimentary deposits as occur in the proposed project area.

The entire proposed project area has surface deposits composed of soil and younger Quaternary Alluvium, derived primarily as alluvial fan deposits from the San Bernardino Mountains just to the north across the San Andreas rift zone, but also derived as fluvial deposits from the little Sand Creek and Sand Creek in the western portion of the proposed project area and especially from the confluence of City Creek and the Santa Ana River Wash in the southern portion of the proposed project area. Usually these types of deposits do not contain significant vertebrate fossils in the uppermost layers, especially in the coarser deposits both closer to the San Bernardino Mountains and in the active drainage channels, and we have no vertebrate fossil localities very nearby from these deposits. At varying depths, however, these deposits always have the potential to contain significant fossil vertebrate remains. Our closest vertebrate fossil

locality from somewhat similar deposits is LACM 4540, south-southeast of the proposed project area on the northeastern side of the San Jacinto Valley just west of Jack Rabbit, that produced a specimen of fossil horse, *Equus*. Our next closest fossil vertebrate locality from similar deposits is LACM 7811, southwest of the proposed project area near Mira Loma, that produced a fossil specimen of coachwhip, *Masticophis flagellum*.

Grading or shallow excavations in the younger Quaternary Alluvium in the proposed project area are unlikely to uncover significant fossil vertebrate remains. Deeper excavations that extend down into older Quaternary deposits, however, may well discover significant late Pleistocene vertebrate fossils similar to those found at the Rancho La Brea asphalt deposits in Los Angeles. Any substantial excavations in the proposed project area below the uppermost layers, therefore, should be monitored closely to quickly and professionally recover any fossil remains discovered while not impeding development. Any fossils recovered during mitigation should be deposited in an accredited and permanent scientific institution for the benefit of current and future generations.

This records search covers only the vertebrate paleontology records of the Natural History Museum of Los Angeles County. It is not intended to be a thorough paleontological survey of the proposed project area covering other institutional records, a literature survey, or any potential on-site survey.

Sincerely,

Samuel A. McLeod

Samuel A. McLeod, Ph.D.
Vertebrate Paleontology

enclosure: invoice

26 April 2013

San Diego Natural History Museum
Department of PaleoServices
attn: Sarah Siren, Paleontological Field Manager
1788 El Prado
San Diego, CA 92101

re: **PALEONTOLOGY LITERATURE AND RECORDS REVIEW, STATE ROUTE 210 FROM DEL ROSA TO SAN BERNARDINO, SAN BERNARDINO COUNTY, CALIFORNIA**

Dear Ms. Siren,

The Division of Geological Sciences of the San Bernardino County Museum (SBCM) has completed a literature review and records search for the above-referenced project in the northern Redlands and Highland areas of San Bernardino County, California. The study corridor traverses portions of sections 30, 31, 32, and 33, Township 1 North, Range 3 West, as well as sections 4, 9, 16, and 21, Township 1 South, Range 3 West, San Bernardino Base and Meridian, as seen on the Harrison Mountain, California and the Redlands, California 7.5' United States Geological Survey topographic quadrangle map (1967 editions; photorevised 1980 and 1987, respectively).

Previous geologic mapping of the study area (Bortugno and Spittler, 1986; Matti and others, 2003) indicates that the proposed project alignment traverses a number of geologic units of Pleistocene and Holocene age, including (from oldest to youngest): Pleistocene older fan deposits (= unit **Qof**), Holocene alluvium (= **Qyf**, **Qya**), and recent wash sediments of the Santa Ana river (= **Qvyw**). Of these, the Pleistocene sediments have high potential to contain significant nonrenewable paleontologic resources, depending upon their lithology and upon whether or not they have been previously disturbed. These deposits are therefore assigned high paleontologic sensitivity. Older Pleistocene alluvial sediments elsewhere throughout the Inland Empire have been reported to yield significant fossils of extinct animals from the Ice Ages (Jefferson, 1991; Reynolds and Reynolds, 1991; Anderson and others, 2002; Scott and Cox, 2008; Springer and others, 2009, 2010; Scott, 2010). Fossils recovered from these Pleistocene sediments represent extinct taxa including mammoths, mastodons, ground sloths, dire wolves, short-faced bears, sabre-toothed cats, large and small horses, large and small camels, and bison (Jefferson, 1991; Reynolds and Reynolds, 1991; Springer and others, 2009, 2010; Scott, 2010).

For this review, I conducted a search of the Regional Paleontologic Locality Inventory (RPLI) at the SBCM. The results of this review indicated that no paleontologic localities are recorded within the

boundaries of the study area. However, one locality, SBCM 1.101.8, is located approximately one mile northeast of the project alignment where it intersects Palm Avenue. Two additional localities SBCM 1.96.14 and SBCM 1.96.15 are located one half mile further east. These three localities yielded fossil leaf impressions from surface exposures mapped (Bortugno and Spittler, 1986) as the fossiliferous Potato Sandstone. This rock unit, which dates to the latter part of the Miocene Epoch (≥ 5 million years before present), has yielded fossil remains of plants, snails and vertebrates (Hillenbrand, 1990). This formation therefore has high potential throughout its extent to contain significant nonrenewable paleontologic resources. However, this formation is not expected to be encountered along the proposed project corridor.

Recommendations

The results of the literature review and the check of the RPLI at the SBCM demonstrate that excavation into previously-undisturbed Pleistocene alluvial fan deposits present along the proposed project alignment has high potential to adversely impact significant nonrenewable paleontologic resources. These sediments therefore have high paleontologic sensitivity. Excavation into undisturbed sediments of this alluvium will require a qualified vertebrate paleontologist to develop a program to mitigate impacts to significant nonrenewable paleontologic resources, including curation of recovered resources (Scott and others, 2004). Such a mitigation program must be consistent with the provisions of the California Environmental Quality Act (Scott and Springer, 2003), as well as with regulations currently implemented by the County of San Bernardino.

The County of San Bernardino (Development Code §82.20.040) defines a qualified vertebrate paleontologist as meeting the following criteria:

Education: An advanced degree (Masters or higher) in geology, paleontology, biology or related disciplines (exclusive of archaeology).

Professional experience: At least five years professional experience with paleontologic (not including cultural) resources, including the collection, identification and curation of the resources.

The County of San Bernardino (Development Code §82.20.030) requires that paleontologic mitigation programs include, but not be limited to:

(a) Field survey before grading. In areas of potential but unknown sensitivity, field surveys before grading shall be required to establish the need for paleontologic monitoring.

(b) Monitoring during grading. A project that requires grading plans and is located in an area of known fossil occurrence, or that has been demonstrated to have fossils present in a field survey, shall have all grading monitored by trained paleontologic crews working under the direction of a qualified professional, so that fossils exposed during grading can be recovered and preserved. Paleontologic monitors shall be equipped to salvage fossils as they are unearthed, to avoid construction delays, and to remove samples of sediments that are likely to contain the remains of small fossil invertebrates

and vertebrates. Monitors shall be empowered to temporarily halt or divert equipment to allow removal of abundant or large specimens. Monitoring is not necessary if the potentially-fossiliferous units described for the property in question are not present, or if present are determined upon exposure and examination by qualified paleontologic personnel to have low potential to contain fossil resources.

(c) Recovered specimens. Qualified paleontologic personnel shall prepare recovered specimens to a point of identification and permanent preservation, including washing of sediments to recover small invertebrates and vertebrates. Preparation and stabilization of all recovered fossils is essential in order to fully mitigate adverse impacts to the resources.

(d) Identification and curation of specimens. Qualified paleontologic personnel shall identify and curate specimens into the collections of the Division of Geological Sciences, San Bernardino County Museum, an established, accredited museum repository with permanent retrievable paleontologic storage. These procedures are also essential steps in effective paleontologic mitigation and CEQA compliance. The paleontologist must have a written repository agreement in hand prior to the initiation of mitigation activities. Mitigation of adverse impacts to significant paleontologic resources is not considered complete until curation into an established museum repository has been fully completed and documented.

(e) Report of findings. Qualified paleontologic personnel shall prepare a report of findings with an appended itemized of specimens. A preliminary report shall be submitted and approved before granting of building permits, and a final report shall be submitted and approved before granting of occupancy permits. The report and inventory, when submitted to the appropriate Lead Agency along with confirmation of the curation of recovered specimens into the collections of the San Bernardino County Museum, will signify completion of the program to mitigate impacts to paleontologic resources.

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Please do not hesitate to contact us with any further questions you may have.

Sincerely,

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