Construction Noise Technical Memorandum

To:	Chris Carroll, Associate Environmental Planner District 3 North Region Local Assistance California Department of Transportation
CC:	Tracy R. Bettencourt, Regulatory and Grants Manager City of Chico Public Works – Engineering
From:	Claire Bromund, Project Manager
Prepared By:	Jason Volk, Principal Consultant, Noise/Vibration and Data Analytics ICF
Date:	September 20, 2019
Subject:	**Construction Noise Analysis for the Esplanade Corridor Safety and Accessibility Improvement Project in the City of Chico, California** **Federal Project No. ATPCML-5037(037)**

Introduction

The purpose of this memorandum is to evaluate potential effects of construction noise related to construction and operation of the Esplanade Corridor Safety and Accessibility Project in the City of Chico, California.

Because federal funds are involved with this project, this memorandum has been prepared to comply with the requirements of Title 23, Part 772, of the Code of Federal Regulations (CFR), "Procedures for Abatement of Highway Traffic Noise," and the California Department of Transportation (Caltrans) noise analysis policy as described in Traffic Noise Analysis Protocol for New Highway Construction and Reconstruction, and Retrofit Barrier Projects (Protocol) (California Department of Transportation 2011). Specifically, 23 CFR 772 provides procedures for preparing operational and construction noise studies and evaluating noise abatement considered for federal and federal-aid highway projects. According to 23 CFR 772.3, all highway projects that are developed in conformance with this regulation are deemed to be in conformance with FHWA noise standards.

A Preliminary Environmental Study was approved for the project in June 2019. The project would add non-motorized features and intersection improvements along the Esplanade corridor and adjacent roadways. The project would be a Type III project as defined in 23 CFR 772. Type III projects do not require a noise analysis and are not subject to the specific construction noise requirements in 23 CFR 772; however, Caltrans typically requires an analysis of construction noise for this type of project.

This memorandum has been prepared to support the project's Categorical Exclusion under the National Environmental Policy Act (NEPA). The analysis in this memorandum demonstrates that construction of the project would not result in adverse noise effects.

Background

The Esplanade Corridor Safety and Accessibility Improvement Project (proposed project) includes various non-motorized "complete streets" improvements along the Esplanade corridor and on Oleander Avenue from 11th Avenue to Memorial Avenue in the Chico (see the project vicinity map and project aerial located at the end of this document).

The following types of improvements are included in the proposed project.

- Pedestrian improvements
- ADA improvements
- Bicycle facility improvements
- Junior High School Area traffic flow improvements
- General vehicle guidance improvements
- 11th Avenue connection improvements
- Landscaping and lighting improvements
- Cross section and intersection treatments

The proposed project is listed in the Butte County Council of Governments' (BCAG) 2016 Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS). Caltrans is the lead agency under NEPA. The City of Chico is the lead agency under the California Environmental Quality Act.

Purpose and Need

Purpose

The purpose of the project is to enhance mobility, connectivity, safety, and accessibility for roadway users of all ages and abilities, including automobiles, trucks, buses, and other large vehicles, bicyclists, and pedestrians, on the Esplanade from Memorial Way to 11th Avenue in Chico. The City's

primary goal is to incorporate "complete streets" features and provide safer connectivity for all users between the downtown and destinations along the corridor.

Need

The project is needed due to multi-modal operational deficiencies and lack of sufficient facilities for pedestrian and bicycle travel modes on the Esplanade, and the parallel roadway, Oleander Avenue. Currently, no facilities, signage, or pavement markings are provided for bicycle riders on the complex Esplanade boulevard or frontage roads. Car/bicycle collision rates are extremely high. Pedestrians have no pedestrian signal crossings indicators, compounded by a signal system which does not provide the minimum crossing time needed. Curb ramps are installed at marked crosswalk locations with sidewalks, but the ramp designs do not meet current Americans with Disabilities Act (ADA) design requirements. There are substantial gaps in the sidewalk on the east side frontage road of the Esplanade between 8th and 11th Avenues, and in various locations on Oleander Avenue, as well as East 10th Avenue.

Project Location

The proposed project is located along an approximate 1.25-mile segment of the Esplanade within the City of Chico between Memorial Way and East 11th Avenue, along Oleander Avenue between Memorial Way and East 10th Avenue, along East 10th Avenue between Esplanade and Oleander Avenue, and along Memorial Way between Esplanade and approximately 0.06 miles (335 feet) east of the Memorial Way and Oleander Avenue intersection. The project is in the "Chico, CA" USGS Quadrangle, Sections 22 and 27, of Township 22 North, Range 1 East. See the figures at the end of this document.

Project Description—Build Alternative

The City of Chico proposes to create a separated and paved Class I multi-use bicycle/pedestrian path along the Esplanade, connecting downtown; California State University, Chico; Chico Junior and Senior High Schools; a regional hospital; and neighborhoods adjacent to the existing Airport Class I multi-use path at 11th Avenue. The parallel street to the east of the Esplanade, Oleander Avenue, would also receive signage, sidewalk, signal, and stop control improvements between 10th Avenue and Memorial Way. A roundabout would be installed at the intersection of Oleander Avenue and Memorial Way adjacent to Chico Junior High School. Two traffic signals are proposed to be installed at the intersections of Oleander Avenue/1St Avenue and West Sacramento Avenue/Esplanade.

Existing traffic signals would be outfitted with pedestrian signal crossing equipment (now absent), updated detection equipment, an associated traffic signal timing plan to accommodate the added pedestrian phases, and pedestrian refuge islands where applicable. Appropriate ADA ramps and sidewalks would be added.

The proposed non-motorized "complete streets" improvements along the Esplanade corridor and on Oleander Avenue are listed in more detail in the sections below and are shown on the project footprint map at the end of this document.

Pedestrian Improvements

- Install new pedestrian countdown crossing signal heads and pedestrian push button activation at all existing traffic signals on the Esplanade with sufficient crossing timing that meets Federal guidelines.
- Add vehicle detection as necessary replacing timed signalization with an on-demand detection system.
- Provide adequate pedestrian crossing refuge islands at unsignalized intersections on the Esplanade.
- Consistently mark pedestrian crosswalks at all crossing locations.
- Prepare enhanced signal timing plan to respond to vehicles, bikes and pedestrian needs.
- Maintain signal progression on the Esplanade during off-peak hours

ADA Improvements

- Improve connection to the 11th Avenue Airport Class I multi-use path with adequate walkway and ramps, on the southwest, southeast and northeast corner of the intersection.
- Install ADA accessible curb ramps at all crosswalk locations.
- Install missing sidewalks at identified gap closure locations (see project footprint map)

Bicycle Facility Improvements

- Install paved Class I multi-use bicycle/pedestrian path on old rail right-of-way (east side) with appropriate safety crossing measures.
- Discourage wrong-way riders on the west side frontage road by adding a shared space pavement design to slow vehicle and bicycle traffic through conflict zones.
- Add marked bicycle route on Oleander Avenue which favors minimal stopping except at 1st Avenue and 5th Avenue.
- Install traffic signals at West Sacramento Avenue/Esplanade and Oleander Avenue/1st Avenue with bike crossing emphasis.

Junior High School Area Improvements

- Change intersection design at Memorial Way/Oleander Avenue (near Chico Junior High School) to a single-lane roundabout.

General Vehicle Guidance Improvements

- Provide clear and consistent pavement markings at frontage road intersection areas.
- Create the shared space area at crossings of the east-west streets and frontage roads.
- Install traffic signal indications guiding cross traffic to stop "outside" of the frontage road where appropriate.

11th Avenue Connection Improvements

- Enhance connections between the 11th Avenue and the Airport Class I Multi-use path.

Other Amenities

- Install pedestrian-scale lighting in the form of full cutoff, energy-efficient LED fixtures restricted to illuminate pathways in order to minimize light "spill over" to adjacent properties.
- Install replacement landscaping within the project footprint.

Typical Signalized Intersection

- Provide a Class I multi-use path in the eastern median.
- Provide textured "mixing zone" at the intersection of southbound frontage and east-west cross streets.
- Eliminate northbound right-turn pocket, where applicable.
- Provide pedestrian refuge islands on medians.
- Update signal timing with adequate crossing time in the east-west directions.
- Refresh striping and add crosswalks, where applicable.

Typical Unsignalized Intersection

- Provide a Class I multi-use path in the eastern median.
- Provide textured "mixing zone" at the intersection of southbound frontage and east-west cross streets.
- Provide pedestrian refuge islands on medians.
- Refresh striping and add crosswalks, where applicable.

ROW Acquisition and Temporary Construction Easements

To construct the roundabout at the intersection of Memorial Way and Oleander Avenue, both temporary (1,200 square feet) and permanent (1,400 square feet) acquisition is needed from undeveloped land on a parcel containing several Butte County department offices (APN 003-180-022). Temporary and permanent acquisitions would be from a small portion of undeveloped land at the northwest corner of the intersection, away from structures, trees, and other parcel features.

Construction and Schedule

The project would be constructed in one phase. It is currently anticipated that the proposed improvements would be constructed over an approximate 9-month period starting in early Spring of 2022.

Typical construction equipment would include pneumatic jack hammers, excavators, grading equipment, paving equipment, concrete equipment, striping equipment, generators, or other similar devices. The maximum grading and excavation depth needed for most of the project is approximately 3 inches. However, for the roundabout excavation depths of 3 to 4 feet may be necessary. All construction noise would be temporary and subject to the noise limits in the Chico Municipal Code, Chapter 9.38 Noise Ordinance, which regulates noise generation within the City of Chico. Construction activity noise is typically restricted to the hours of 7:00 a.m. to 9:00 p.m. on weekdays (10:00 a.m. to 6:00 p.m. on weekends and holidays), unless otherwise approved by the City Engineer. No night or weekend work is anticipated for the proposed project.

Traffic Management

A traffic management plan would be developed and implemented during construction in accordance with Caltrans' 2018 Standard Specifications and in compliance with the California Manual on Uniform Traffic Control Devices, Part 6, "Temporary Traffic Control." The Esplanade and Oleander Avenue would remain open during construction; however, the project would temporarily impact traffic patterns with on-site traffic controls (e.g., flagging, pilot car) and episodic, temporary single-lane traffic closures. The proposed project would not permanently close roadways or block access to private or commercial properties.

No-Build Alternative

Under the No-Build Alternative, bicycle lanes, pedestrian improvements, ADA improvements, and non-motorized improvements in the Esplanade project area would not be built, and there would be no improvements to intersections along the Esplanade and Oleander Avenue. There would be no temporary noise from construction under the No-Build Alternative.

Fundamental Noise Concepts

The following is a brief discussion of fundamental noise concepts. For a detailed discussion, please refer to the *Technical Noise Supplement* (Caltrans 2013), which is available on the Caltrans website: http://www.dot.ca.gov/hq/env/noise/pub/TeNS_Sept_2013B.pdf.

Sound Pressure Levels and Decibels

The amplitude of a sound determines its loudness. Loudness of sound increases and decreases with increasing and decreasing amplitude. Sound-pressure amplitude is measured in units of micro-Newtons per square meter ($\mu N/m^2$), also called micro-pascals (µPa). One µPa is approximately one-hundred billionth (0.00000000001) of normal atmospheric pressure. The pressure of a very loud sound may be 200 million µPa, or 10 million times the pressure of the weakest audible sound (20 µPa). Because expressing sound levels in terms of µPa would be cumbersome, sound pressure level (SPL) is used to describe in logarithmic units the ratio of actual sound pressures to a reference pressure squared. These units are called *bels*, named after Alexander Graham Bell. To provide finer resolution, a bel is divided into 10 decibels (dB).

Addition of Decibels

Because decibels are logarithmic units, SPL cannot be added or subtracted by ordinary arithmetic means. For example, if one automobile produces an SPL of 70 dB when it passes an observer, two cars passing simultaneously would not produce 140 dB; rather, they would combine to produce 73 dB. When two sounds of equal SPL are combined, they produce a combined SPL 3 dB greater than the original individual SPL. In other words, sound energy must be doubled to produce a 3-dB increase. If two sound levels differ by 10 dB or more, the combined SPL is equal to the higher SPL; the lower sound level would not increase the higher sound level.

A-Weighted Decibels

The A-scale weighting network approximates the frequency response of the average young ear when listening to most ordinary sounds. When people make judgments of the relative loudness or annoyance of a sound, their judgments correlate well with the A-scale sound levels of those sounds. Noise levels for traffic noise reports are typically reported in terms of A-weighted decibels (dBA). In environmental noise studies, A-weighted SPLs are commonly referred to as noise levels. Typical A-weighted noise levels from common activities are shown in Table 1.

Table 1. Typical Noise Levels

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
	— 110 —	Rock band concert
Jet fly-over at 300 meters (1000 feet)		
	— 100 —	
Gas lawn mower at 1 meter (3 feet)		
	— 90 —	
Diesel truck at 15 meters (50 feet) at 80 kph (50 mph)		Food blender at 1 meter (3 feet)
	— 80 —	Garbage disposal at 1 meter (3 feet)
Noisy urban area, daytime		
Gas lawn mower, 30 meters (100 feet)	— 70 —	Vacuum cleaner at 3 meters (10 feet)
Commercial area		Normal speech at 1 meter (3 feet)
Heavy traffic at 90 meters (300 feet)	— 60 —	
		Large business office
Quiet urban daytime	— 50 —	Dishwasher next room
Quiet urban nighttime	— 40 —	Theater, large conference room (background)
Quiet suburban nighttime		
	— 30 —	Library
Quiet rural nighttime		Bedroom at night
	— 20 —	
		Broadcast/recording studio
	— 10 —	
Lowest threshold of human hearing	— 0 —	Lowest threshold of human hearing

Source: Caltrans 2013.

Noise Descriptors

Noise in our daily environment fluctuates over time. Various noise descriptors have been developed to describe time-varying noise levels. The following noise descriptor is the most commonly used for construction noise analysis.

- **Equivalent Sound Level (L_{eq}):** L_{eq} represents an average of the sound energy occurring over a specified period. In effect, L_{eq} is the steady-state sound level that in a stated period would contain the same acoustical energy as the time-varying sound that actually occurs during the same period. The 1-hour A-weighted equivalent sound level (L_{eq}[h]), is the energy average of the A-weighted sound levels occurring during a 1-hour period.

Sound Propagation

When sound propagates over a distance, it changes in level and frequency content. The manner in which noise reduces with distance depends on the following factors.

- **Geometric Spreading:** Sound from a small, localized source (i.e., a point source) radiates uniformly outward as it travels away from the source in a spherical pattern, resulting in an attenuation (dropping off) rate of 6 dBA for each doubling of distance. For highways, where the movement of the vehicles on a roadway makes the source of the sound appear to emanate from a line (i.e., a line source) rather than a point, noise attenuates at a rate of 3 dBA per doubling of distance. This is because a line source results in cylindrical spreading rather than the spherical spreading that results from a point source.
- **Ground Absorption:** The noise path between the highway and the observer is usually very close to the ground. Noise attenuation from ground absorption and reflective-wave canceling adds to the attenuation associated with geometric spreading. No excess ground attenuation is assumed for acoustically hard sites (i.e., those sites with a reflective surface), while acoustically absorptive or soft sites (i.e., those sites with an absorptive ground surface) are assumed to result in an attenuation rate of about 1.5 dBA per doubling of distance. When added to the geometric spreading, the excess ground attenuation results in an overall drop-off rate of about 4.5 dBA per doubling of distance for a line source and about 7.5 dBA per doubling of distance for a point source.
- **Shielding by Natural or Human-Made Features:** A large object or barrier (i.e., hills, dense woods, buildings, and walls) in the path between a noise source and a receiver can substantially attenuate noise levels at the receiver, depending on the size of the object and the frequency content of the noise source. A barrier that breaks the line of sight between a source and a receiver will typically result in at least 5 dB of noise reduction, while a taller barrier may provide as much as 20 dB of noise reduction.

Surrounding Land Use

The proposed project is located in an urban setting within the City of Chico. The Esplanade corridor contains a mix of residences, lodging facilities, medical facilities, places of worship, and commercial uses. Chico High School is also located along this section of the Esplanade. Land use along Oleander Avenue consists mostly of single-family residences. Chico Junior High School is located at the intersection of Oleander Avenue and Memorial Way. Many of these locations, especially residences, schools, and lodging facilities include outdoor use areas.

Regulations

Federal regulation 23 CFR 772 provides procedures for conducting noise studies for federal-aid highway projects and implementing noise abatement measures to help protect the public health and welfare. In addition to establishing noise abatement criteria, the regulation requires information to be given to local officials for use in planning and designing highways. The regulation categorizes highway projects as Type I, Type II, or Type III.

FHWA defines a Type I project as a proposed federal or federal-aid highway project that involves the construction of a highway on a new location, the physical alteration of an existing highway where there is either a substantial horizontal or substantial vertical alteration, or the addition of through-traffic lanes. Under 23 CFR 772, noise abatement must be considered for a Type I project if it is predicted to result in a traffic noise impact. A Type II project involves construction of noise abatement on an existing highway with no changes to highway capacity or alignment. A Type III project is a project that does not meet the classifications of a Type I or Type II project. Type III projects do not require a noise analysis.

As discussed in the *Introduction* section, the project is considered to be a Type III project, and evaluation of traffic noise impacts is not required under 23 CFR 772. The regulation states that for all Type I and II projects, a highway agency must identify land uses or activities that may be affected by noise from construction of the project and determine the measures that are needed in the plans and specifications to minimize or eliminate adverse construction noise impacts on the community. While the proposed project is a Type III project and not subject to the specific construction noise requirements in 23 CFR 772, Caltrans typically requires an analysis of construction noise for this type of project.

The Protocol specifies the policies, procedures, and practices to be used by agencies that sponsor new construction or reconstruction of federal or federal-aid highway projects. During construction of the project, noise from construction activities may intermittently dominate the noise environment in the immediate area of construction. Construction noise is regulated by Caltrans Standard Specifications Section 14-8.02, *Noise Control*, which states:

- Do not exceed 86 dBA at 50 feet from the job site activities from 9:00 p.m. to 6:00 a.m.
- Equip an internal combustion engine with the manufacturer-recommended muffler. Do not operate an internal combustion engine on the job site without the appropriate muffler.

Construction Noise Analysis

The assessment of potential construction noise levels was based on the general assessment methodology developed by FTA (Federal Transit Administration 2018). Table 2 summarizes typical noise levels produced by heavy equipment that would be used during construction. Individual types of construction equipment are expected to generate maximum noise levels ranging from 80 to 89 dBA at a distance of 50 feet.

Table 2. Typical Construction Equipment Noise Emission Levels

Equipment Type	Typical Equipment Noise Level at a Distance of 50 Feet from the Source, dBA
Truck	88
Loader	80
Crawler crane	80
Roller	80
Excavator	85
Paver	89
Air compressor	81
Grader	89
Jack hammer	88
Generator	82

dBA = A-weighted decibel.

Construction of the project is expected to take approximately 9 months to complete and would be done during weekday hours between 7:00 a.m. and 9:00 p.m. when noise from construction equipment is not regulated by the City. Construction during nighttime hours or weekends is not proposed. Construction of the project would not require use of heavy impact equipment such as pile drivers. However, vibratory equipment such as jackhammers may be used during demolition work.

To characterize a worst-case noise condition for construction, noise levels of the two loudest pieces of equipment were combined to calculate an overall noise level value from simultaneously operating equipment. The worst-case noise condition is expected to occur during paving of the project, where a paver and a grader may be used simultaneously. Estimated noise levels from the project construction site as a function of distance are shown in Table 3. Noise levels were calculated based on point-source attenuation over hard acoustically reflective ground. Construction noise levels typically attenuate at a rate of about 6 dB per doubling of distance.

Table 3. Predicted Worst-Case Noise Levels from Project Construction

Distance between Source and Receiver (feet)	Combined Noise Levels during Use of Heavy Construction Equipment,[a] Calculated dBA L_{eq} (1-hour)
50	92
100	86
200	79
400	73
500	72
750	68
1,000	66
1,500	62
2,000	59

[a] Calculations are based on FTA methodology (Federal Transit Administration 2018). Calculations do not include the effects, if any, of local shielding from walls, topography, or other barriers that may reduce sound levels further.
L_{eq} (1-hour) = hourly-equivalent sound level over 1 hour; dBA = A-weighted decibel.

The nearest noise sensitive locations are residences, lodging facilities, schools and places of worship located in the vicinity of areas where improvements would be built. The receivers that could potentially experience the highest levels are adjacent to the Esplanade, with outdoor areas as near as 50 feet away from project construction areas. The worst-case analysis indicates that noise levels from construction may be up to 92 dBA L_{eq} at a distance of 50 feet. However, given that construction would take place over a period of 9 months for the entire project and the building of improvements would progress over time along the 1.25-mile length of the project corridor, predicted noise levels would be at their highest only for a short period of time at a given location.

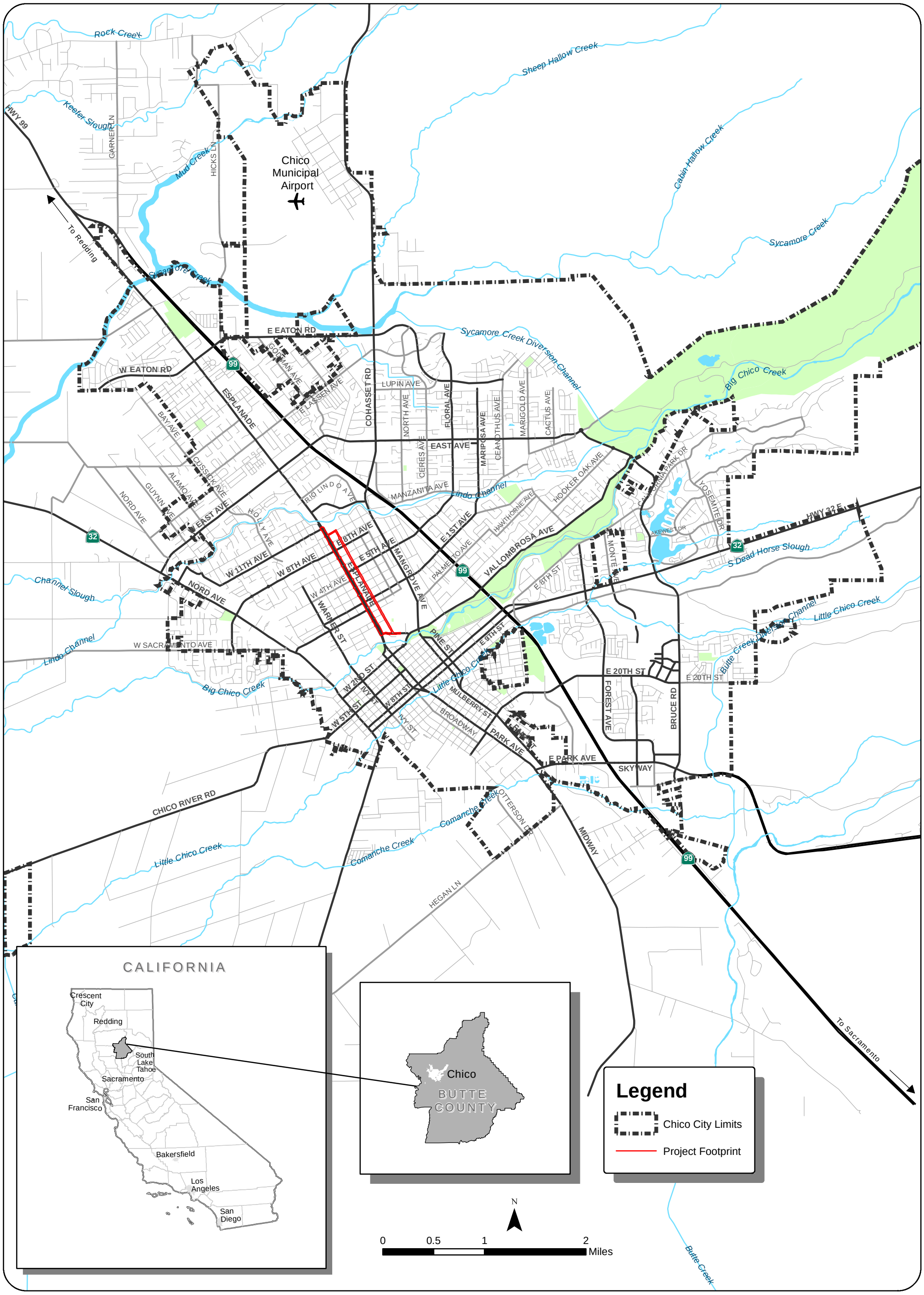
Construction noise associated with the project would be temporary and intermittent and would cease once construction is complete. As described earlier, no project construction work is expected during nighttime hours or weekends. Since construction activity would be done between the hours of 7:00 a.m. and 9:00 p.m. on weekdays, construction is anticipated to be in compliance with Caltrans Standard Specifications Section 14-8.02. Therefore, the project is not expected to result in an adverse effect due to temporary construction noise. No mitigation is required.

References

California Department of Transportation (Caltrans). 2011. *Traffic Noise Analysis Protocol for New Highway Construction, Reconstruction, and Retrofit Barrier Projects.* May. Sacramento, CA.

———. 2013. *Technical Noise Supplement to the Traffic Noise Analysis Protocol*. September. Available: http://www.dot.ca.gov/hq/env/noise/pub/TeNS_Sept_2013A.pdf. Accessed: February 15, 2016.

Federal Transit Administration (FTA). 2018. *Transit Noise and Vibration Impact Assessment.* FTA Report No. 0123. Available: https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/research-innovation/118131/transit-noise-and-vibration-impact-assessment-manual-fta-report-no-0123_0.pdf. Accessed: October 31, 2018.



CITY OF CHICO

PUBLIC WORKS DEPARTMENT
ENGINEERING DIVISION

411 Main Street
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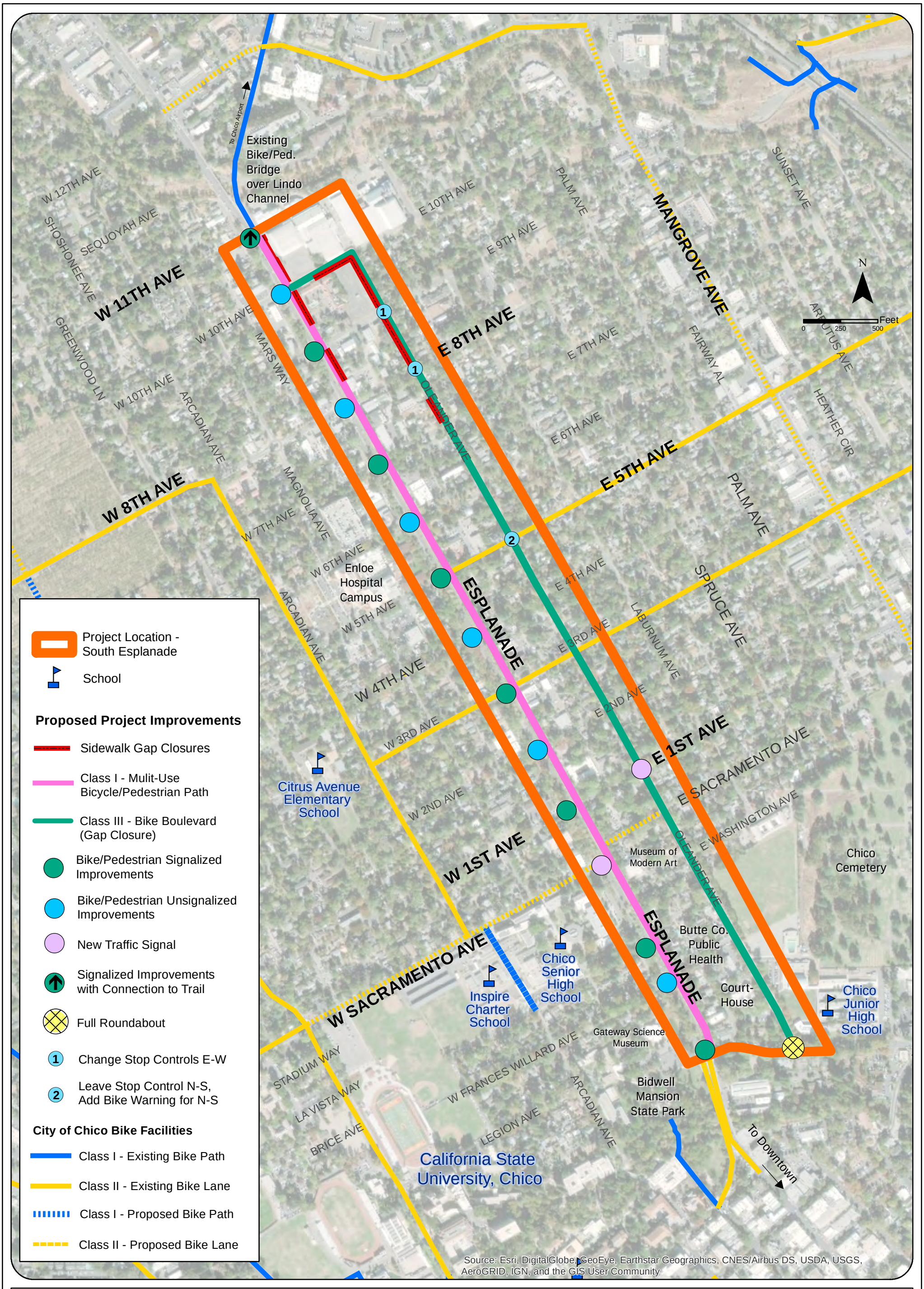
ESPLANADE CORRIDOR SAFETY AND ACCESSIBILITY IMPROVEMENT PROJECT

CIP NO. 50355

PROJECT VICINITY MAP

J ERDAHL
AUGUST 2019



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ESPLANADE CORRIDOR SAFETY AND ACCESSIBILITY IMPROVEMENT PROJECT

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PROJECT AERIAL

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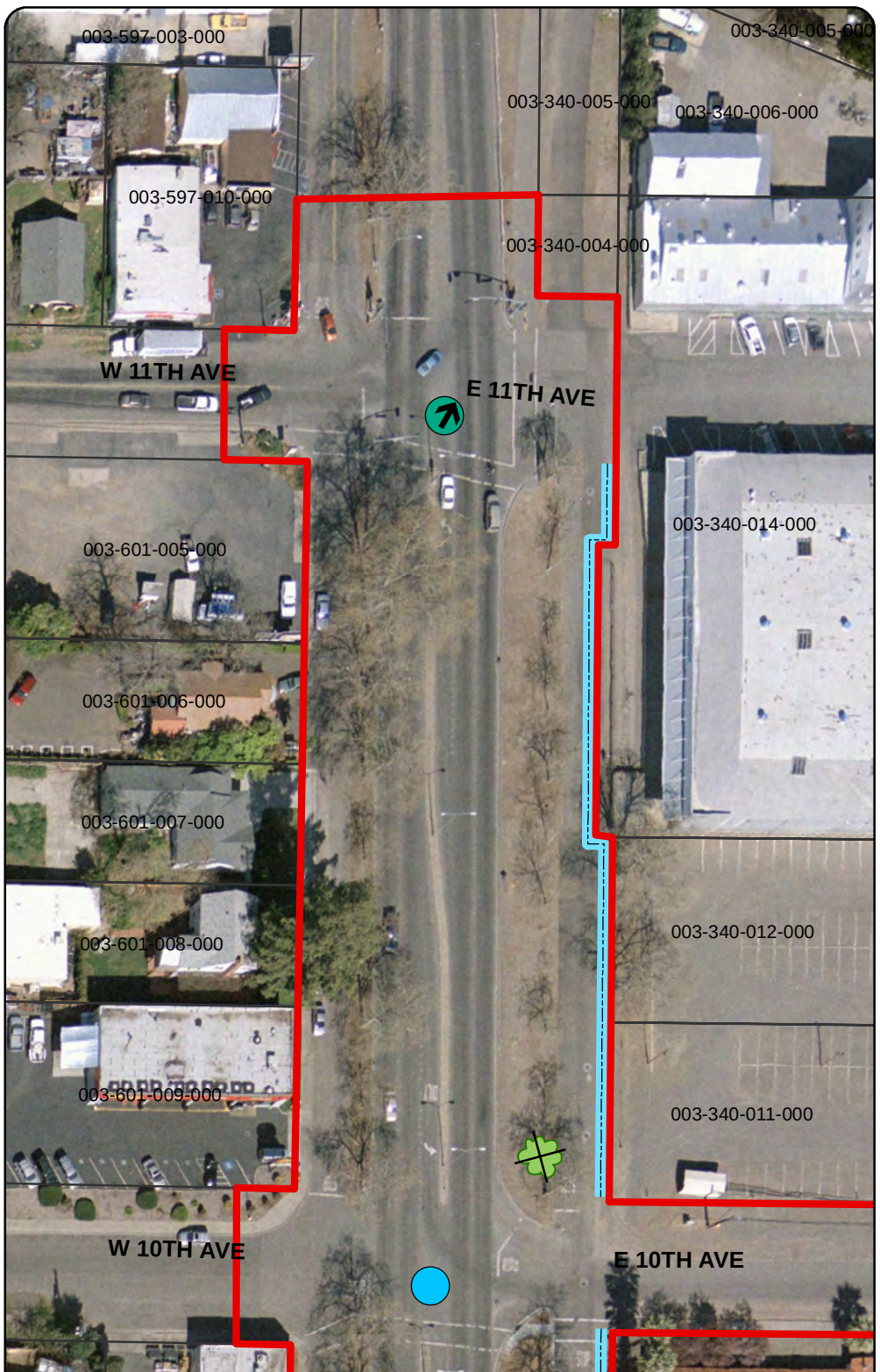

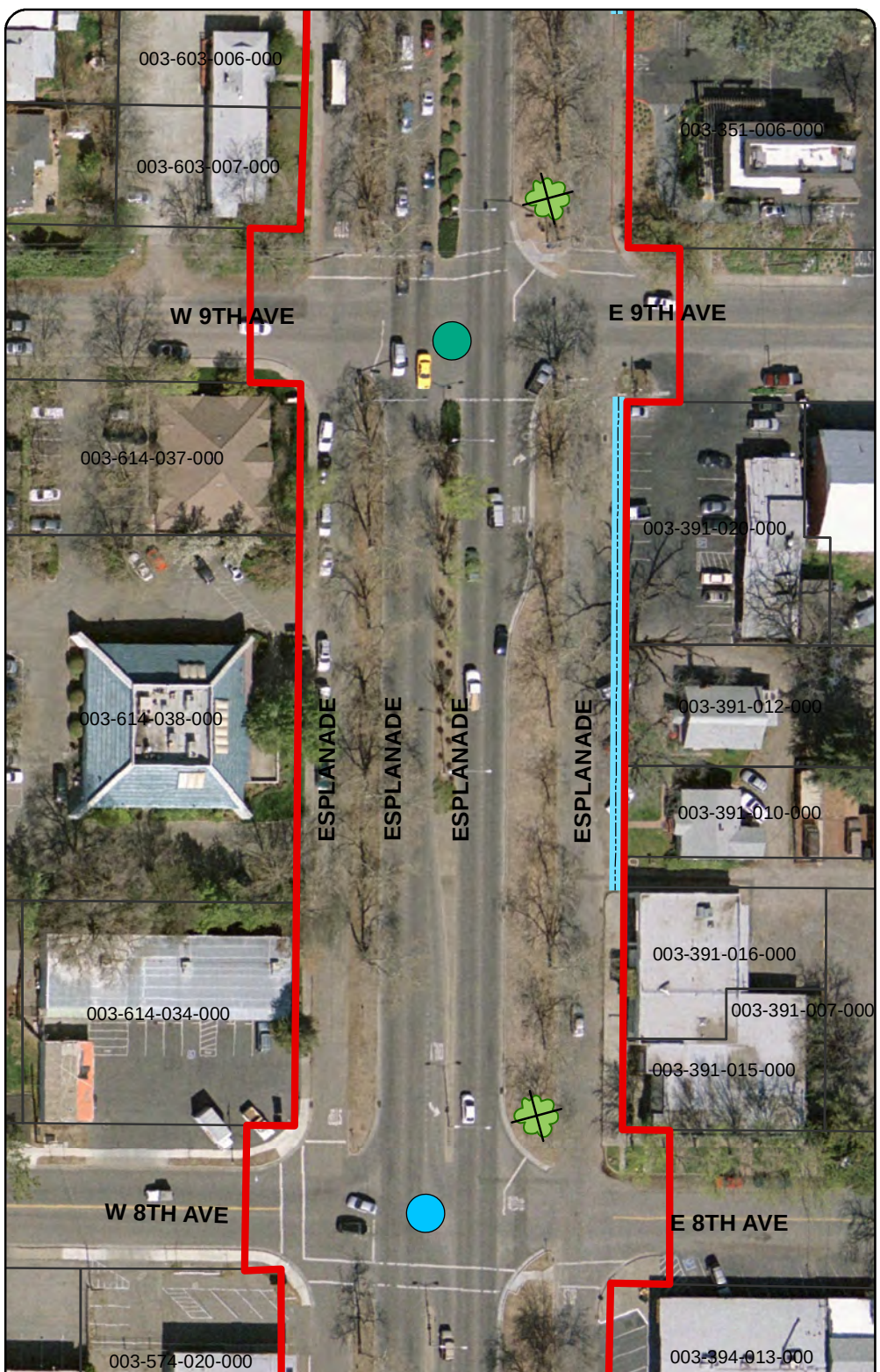

Feet
0 25 50 100

Project Footprint

Assessor Parcel

Signalized Improvements

Unsignalized Improvements

New Traffic Signal

Signalized Improvements with Connection to Trail

Full Roundabout

Tree Removal

1 Change Stop Controls E-W

2 Leave Stop Control N-S, Add Bike Warning for N-S

Sidewalk Gap Closures

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ESPLANADE CORRIDOR SAFETY AND ACCESSIBILITY IMPROVEMENT PROJECT

CIP No. 50355

PROJECT FOOTPRINT MAP 1

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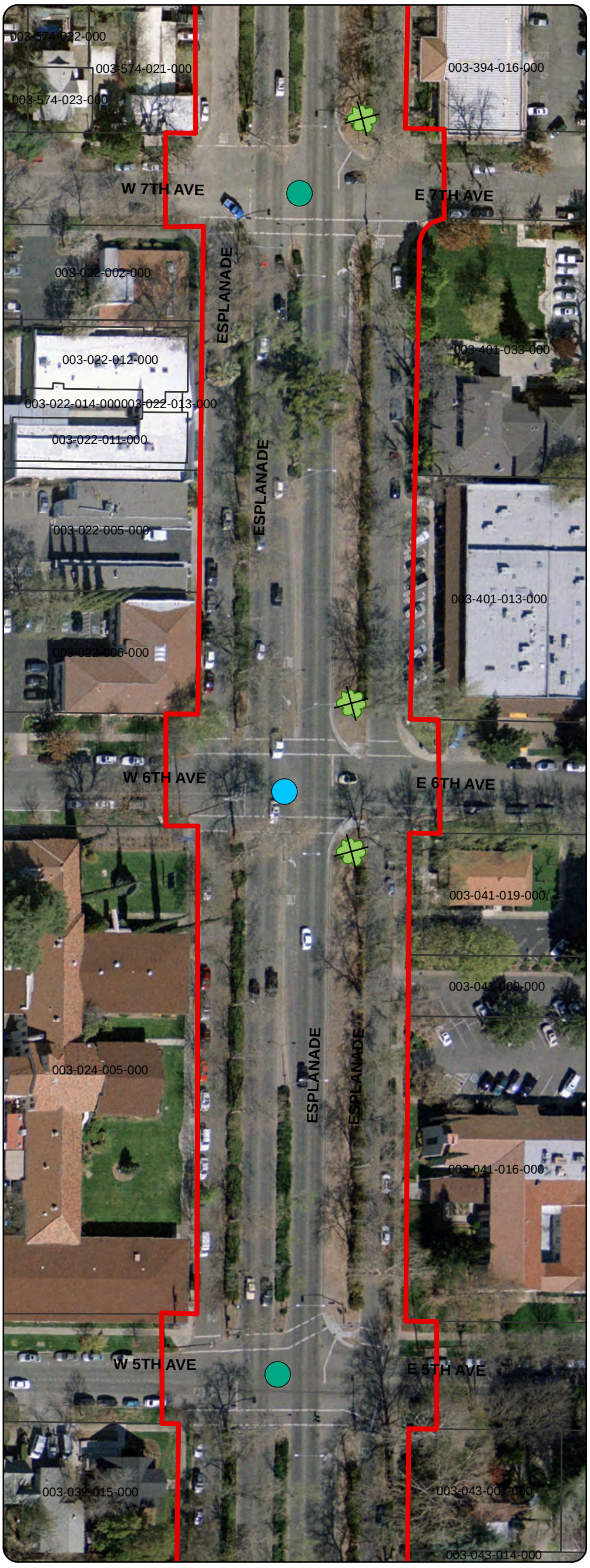

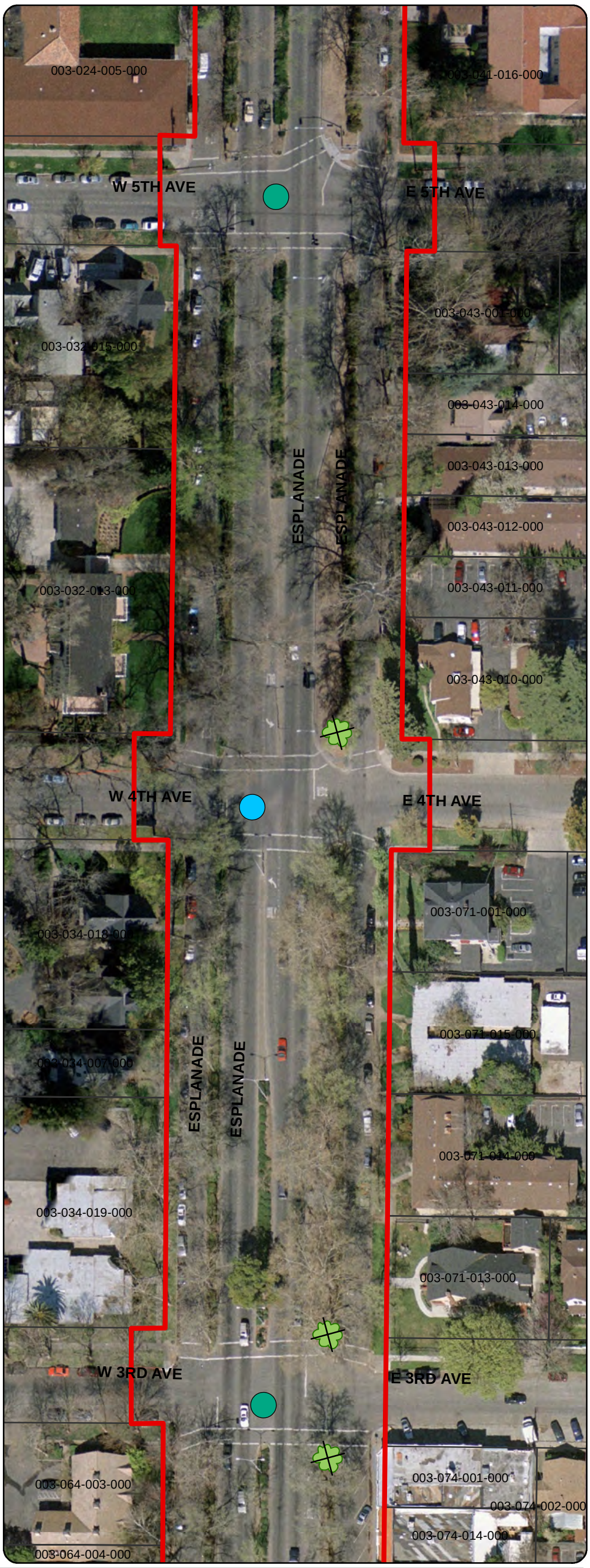

Project Footprint

Assessor Parcel

Feet
0 25 50 100

Signalized Improvements

Unsignalized Improvements

New Traffic Signal

Signalized Improvements with Connection to Trail

Full Roundabout

Tree Removal

1 Change Stop Controls E-W

2 Leave Stop Control N-S, Add Bike Warning for N-S

Sidewalk Gap Closures

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PROJECT FOOTPRINT MAP 2

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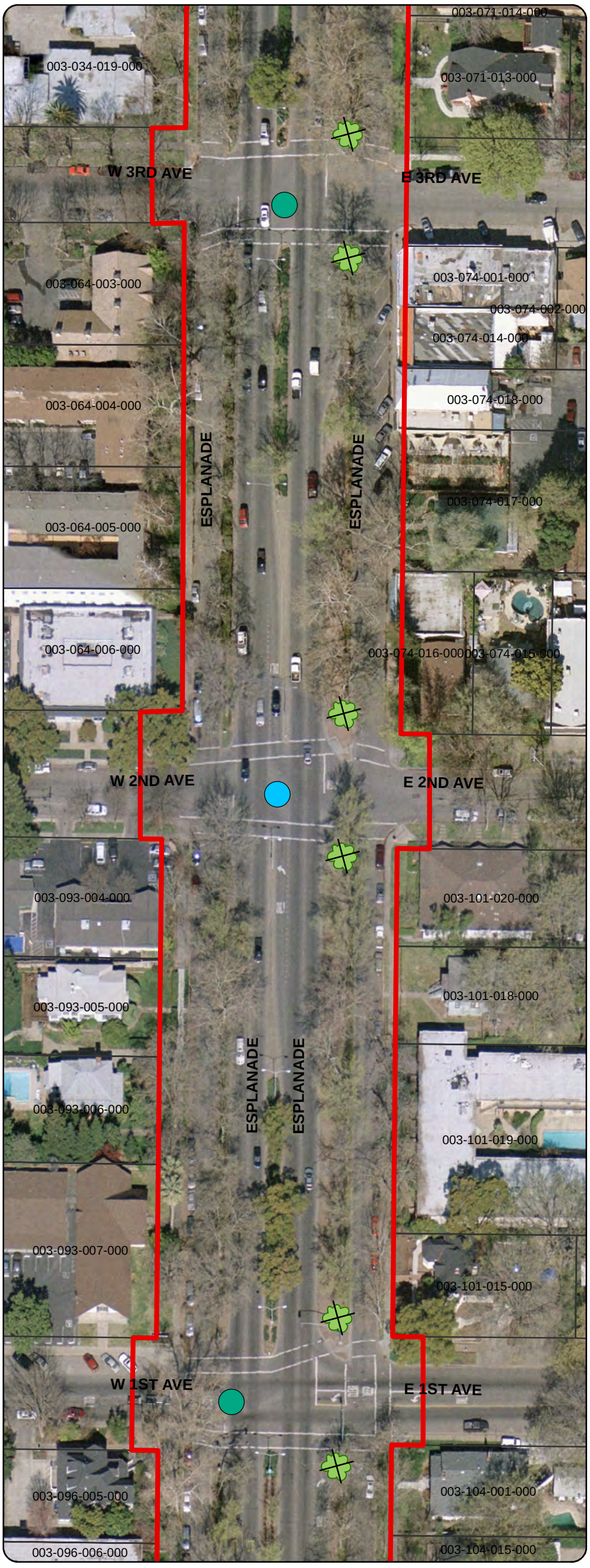

Project Footprint

Assessor Parcel

Feet
0 25 50 100

Signalized Improvements

Unsignalized Improvements

New Traffic Signal

Signalized Improvements with Connection to Trail

Full Roundabout

Tree Removal

1 Change Stop Controls E-W

2 Leave Stop Control N-S, Add Bike Warning for N-S

Sidewalk Gap Closures

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CIP No. 50355

PROJECT FOOTPRINT MAP 3

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Project Footprint

Assessor Parcel

Feet
0 25 50 100

Signalized Improvements

Unsignalized Improvements

New Traffic Signal

Signalized Improvements with Connection to Trail

Full Roundabout

Tree Removal

1 Change Stop Controls E-W

2 Leave Stop Control N-S, Add Bike Warning for N-S

Easement/ Right-of-Way Anticipated

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PROJECT FOOTPRINT MAP 4

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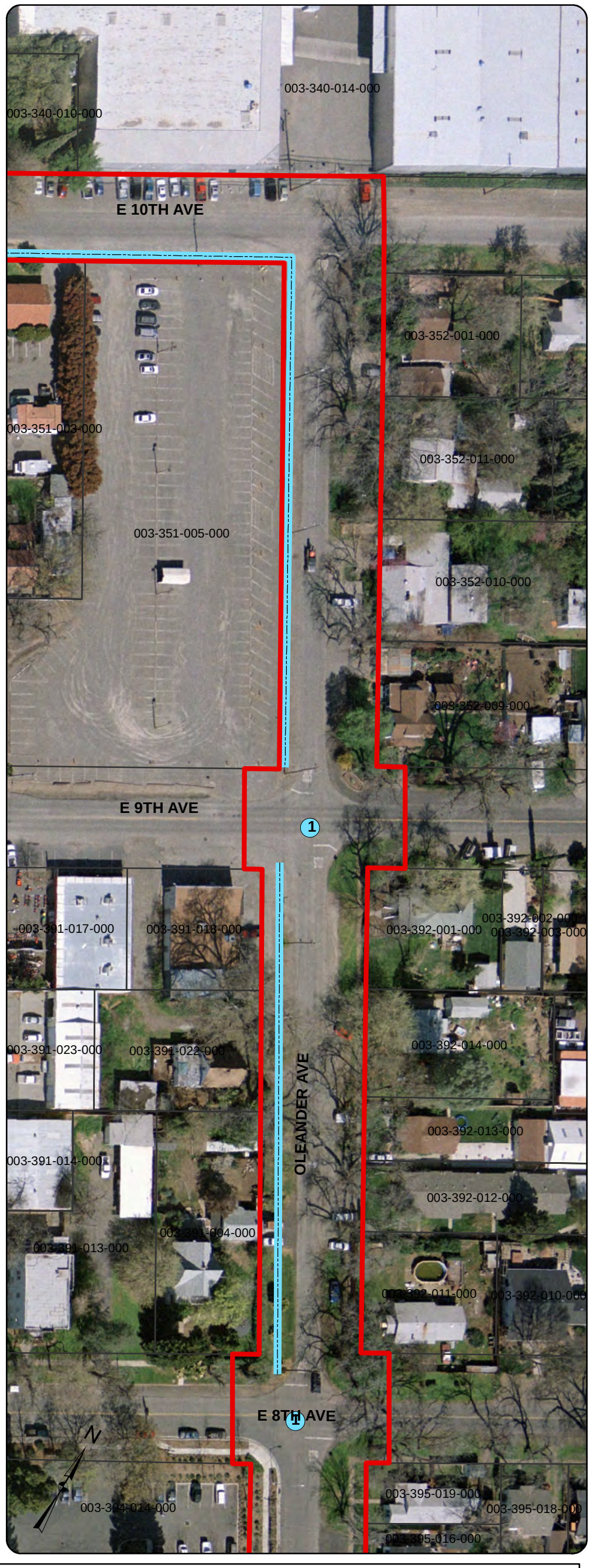

Project Footprint

Assessor Parcel

Feet
0 25 50 100

Signalized Improvements

Unsignalized Improvements

New Traffic Signal

Signalized Improvements with Connection to Trail

Full Roundabout

Easement/ Right-of-Way Anticipated

1 Change Stop Controls E-W

2 Leave Stop Control N-S, Add Bike Warning for N-S

Sidewalk Gap Closures

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ESPLANADE CORRIDOR SAFETY AND ACCESSIBILITY IMPROVEMENT PROJECT

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PROJECT FOOTPRINT MAP 5

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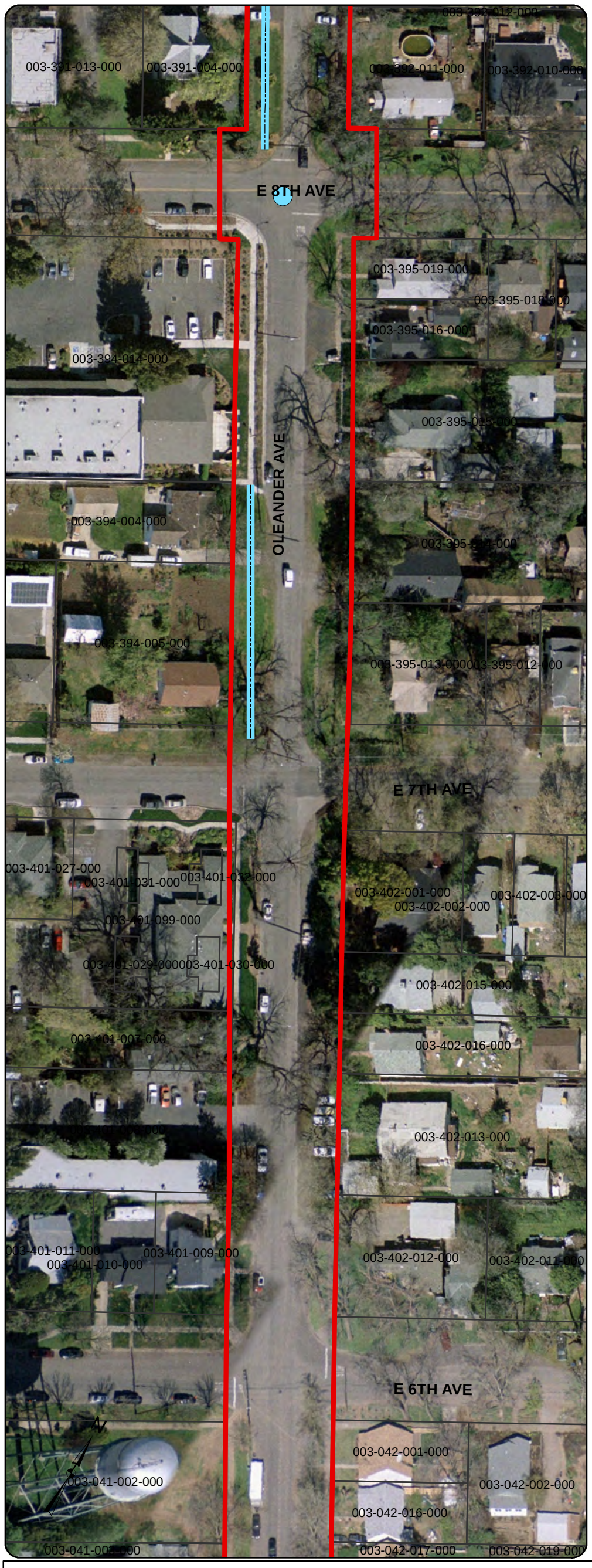


Project Footprint

Assessor Parcel

Feet
0 25 50 100

Signalized Improvements

Unsignalized Improvements

New Traffic Signal

Signalized Improvements with Connection to Trail

Full Roundabout

Easement/ Right-of-Way Anticipated

1 Change Stop Controls E-W

2 Leave Stop Control N-S, Add Bike Warning for N-S

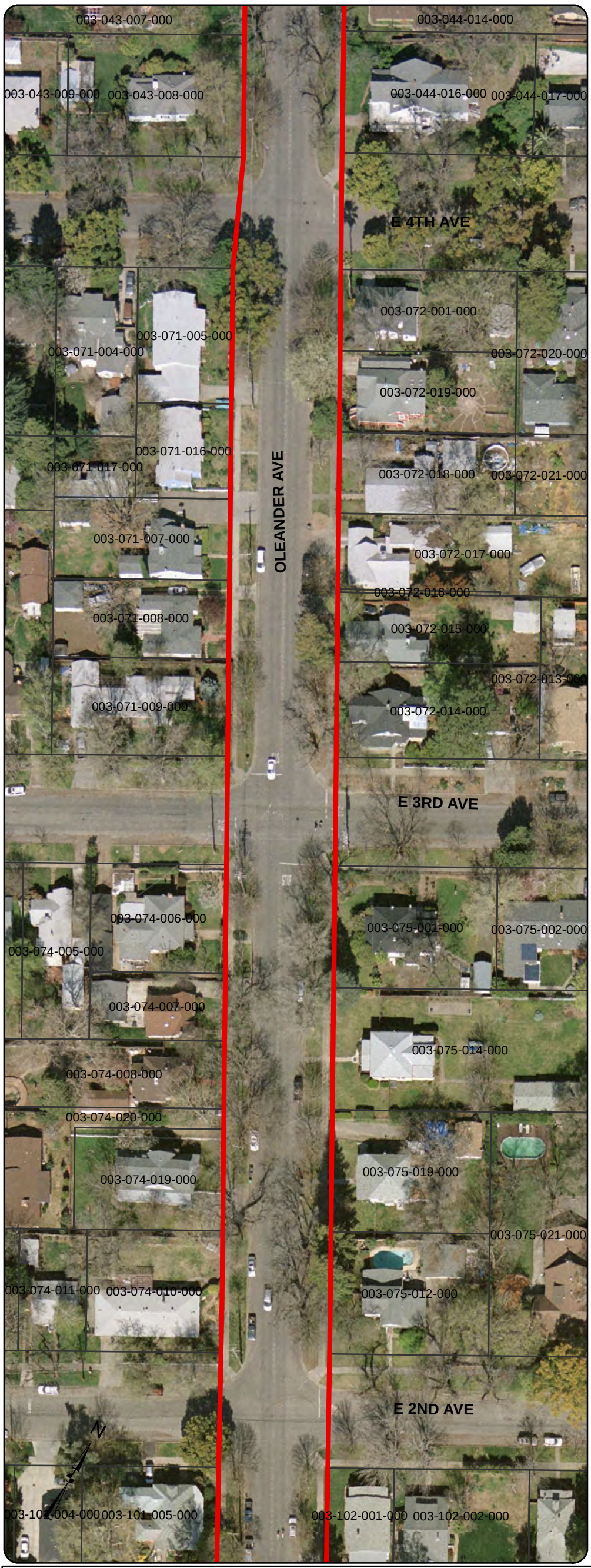
Sidewalk Gap Closures

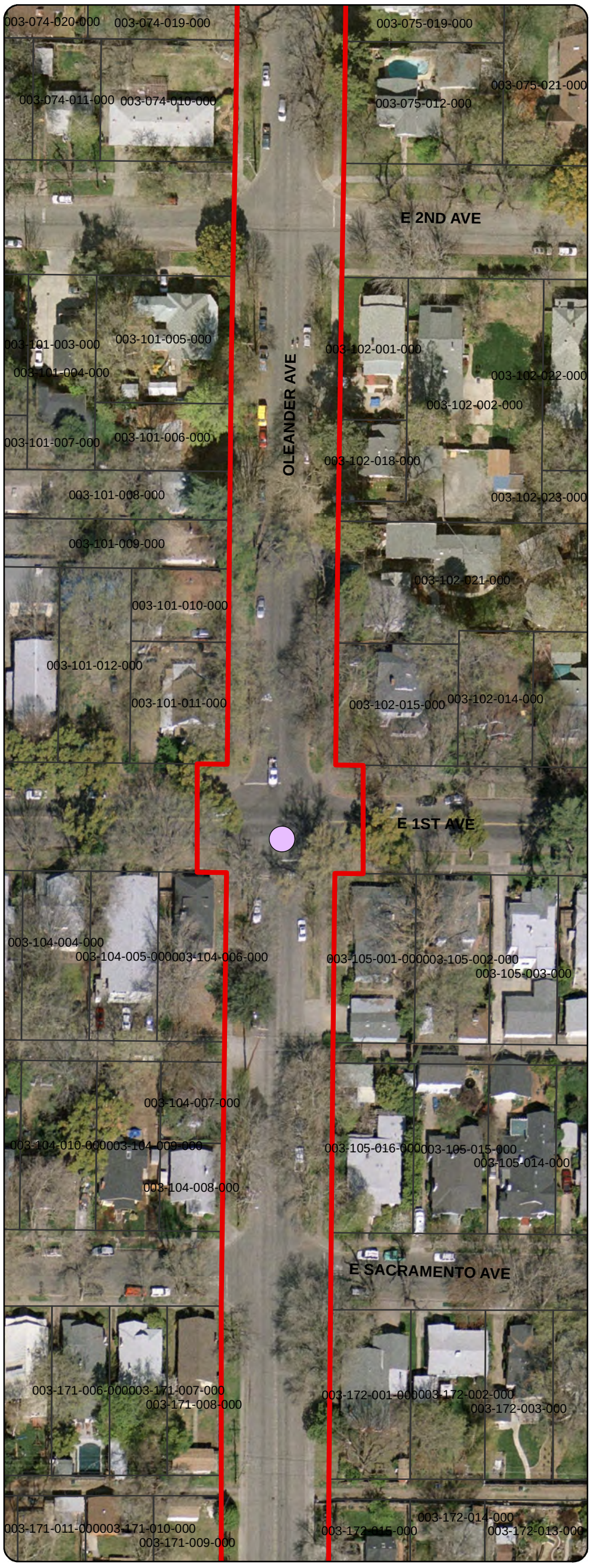
CITY OF CHICO
PUBLIC WORKS DEPARTMENT
ENGINEERING DIVISION
411 Main Street
Chico, California 95926

ESPLANADE CORRIDOR SAFETY AND ACCESSIBILITY IMPROVEMENT PROJECT
CIP No. 50355

PROJECT FOOTPRINT MAP 6

AUGUST 2019
J ERDAHL





N

Project Footprint

Assessor Parcel

Feet
0 25 50 100

Signalized Improvements

Unsignalized Improvements

New Traffic Signal

Signalized Improvements with Connection to Trail

Full Roundabout

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PROJECT FOOTPRINT MAP 7

AUGUST 2019
J ERDAHL

N

Project Footprint

Assessor Parcel

Feet

0 25 50 100

Signalized Improvements

Unsignalized Improvements

New Traffic Signal

Signalized Improvements with Connection to Trail

Full Roundabout

Easement/ Right-of-Way Anticipated

1 Change Stop Controls E-W

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Sidewalk Gap Closures

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ESPLANADE CORRIDOR SAFETY AND ACCESSIBILITY IMPROVEMENT PROJECT

CIP No. 50355

PROJECT FOOTPRINT MAP 8

AUGUST 2019
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