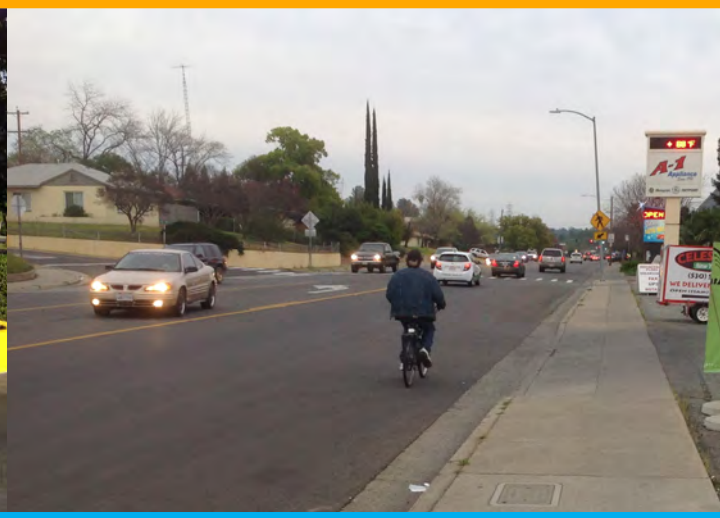
Butte County Association of Governments

SR 162 CORRIDOR PLAN

June, 2016



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1 INTRODUCTION

1.1 Purpose and Goals

The City of Oroville, through the Butte County Association of Governments (BCAG), has been awarded a Transportation Planning Grant to plan roadway infrastructure, active transportation infrastructure, and traffic operation improvements on SR 162 in the City of Oroville, CA. This study includes analysis of the SR 162 corridor from SR 70 to Foothill Boulevard. The goal of this study is to develop a corridor plan that will provide safer and more efficient long-term mobility for both motorized and active transportation travel.

SR 162 and other roadways in the City of Oroville currently experience high levels of congestion. The City of Oroville has adopted a General Plan that promotes infill development and smart growth principles, such as higher density and mixed-use development along SR 162. The City is working to reduce reliance on single passenger motor vehicles by creating an infrastructure that encourages compact development with high connectivity to bike routes, safe walking paths and public transportation facilities. These smart growth principles will be applied to develop alternatives that would not only improve vehicular flow, but also would encourage and improve non-motorized facilities and the use of public transit.

This study identifies recommendations for multi-modal transportation (multiple forms of transportation including walking, cycling, automobile, public transit, etc.) improvements on SR 162 between SR 70 and Foothill Boulevard with a focus on providing congestion relief, providing alternative travel options and creating a long-term infrastructure plan. The study provides a strategy for developing "Complete Streets" improvements that are coordinated with adjacent planned and existing land use. "Complete Streets" are streets which are designed and operated to enable safe access for all users, including pedestrians, cyclists, motorists, and transit riders of all ages and abilities. This study will identify deficiencies and potential solutions with respect to roadway capacity and safety issues, multi-modal travel options, access-management, projected land use, and future transportation needs and constraints.

Based on input received from the California Department of Transportation (Caltrans), BCAG, the City of Oroville, stakeholders, and the general public some of the primary priorities for the SR 162 corridor study are:

- Vehicular Capacity:
  - Improve traffic flow on SR 162
  - Evaluate Transportation Systems Management (TSM) and Intelligent Transportation Systems (ITS) alternatives along SR 162
  - Prioritize necessary capacity improvements in conjunction with alternative mode improvements
- Pedestrian/Bicycle Network & Transit
  - Provide better pedestrian and bike connectivity
  - Integrate multi-modal travel options emphasizing connectivity to public transit for bicyclists and pedestrians
  - Optimize and increase transit service capacity

- Safety:
  - Improve overall corridor safety for all modes of traffic
  - Address vehicle safety issues throughout the corridor by improving geometry and controls

1.2 Study Area

The study area consists of the 2.8-mile portion of SR 162 from SR 70 (west end) to Foothill Boulevard (east end). The corridor contains a grade-separated interchange with SR 70 at the west end. SR 162 is classified as a Principal Arterial by Caltrans. SR 162 is currently a five-lane roadway between SR 70 and Washington Avenue/Olive Highway with two travel lanes in each direction and a two-way left turn lane. SR 162 is a three-lane roadway between Washington Avenue/Oro Dam Boulevard and Lower Wyandotte Road, with one lane in each direction and a two-way left turn lane. Between Lower Wyandotte Road and Foothill Boulevard, SR 162 is a two-lane roadway with one lane in each direction.

SR 162 currently has no formal bicycle facilities but bicyclists do commonly travel along the striped shoulder or along the sidewalk where possible. The existing sidewalks along SR 162 vary in width from 4 feet to over 6 feet, however there are large stretches of the corridor which currently lack a sidewalk. The local Transit Center is located on Spencer Avenue just north of SR 162. All local transit routes and numerous regional transit routes connect to this main transit hub. There are four transit routes which operate along the corridor itself and a total of seven routes within the overall study area. These routes are operated by Butte Regional Transit.

Land uses in the study area surrounding SR 162 are predominantly residential with retail, commercial and office land uses on the corridor itself. The posted speed limits on SR 162 are 45 mph east of Lower Wyandotte Road and 35 mph throughout the rest of the corridor. The study limits and the project area are shown in **Figure 1-1** (next page).

Figure 1-1. Study Area

2 PUBLIC OUTREACH

A key part of any successful corridor study is the consistent interweaving of public involvement and stakeholder participation. The SR 162 Corridor Study project team sought to engage interested citizens and key stakeholders whenever possible, and to incorporate their feedback within the study products.

As part of the State Route 162 Corridor Plan process, the community was invited to provide input on challenges and opportunities for walking, bicycling, transit, and driving along the study corridor. Input was gathered at a number of events and meetings, including:

- Stakeholder Advisory Committee Meetings (June 24, 2015, October 13, 2015, April 6, 2016)
- Community Survey (online, May 4 to June 9, 2015)
- Project Website (www.go-oroville162.org)
- Feather Fiesta Days (May 9, 2015)
- Public Symposium (May 21, 2015)
- Stakeholder Interviews (June 3 and June 15, 2015)
- Public Meeting (May 9, 2016)

2.1 Community Input Summary

Overall Priorities

In all outreach events with opportunities to provide public feedback, Oroville community members consistently expressed a need to relieve traffic congestion, improve access for bicyclists and pedestrians, and revitalize the community through aesthetic enhancements and other improvements. Many residents, business owners, and other community members noted that the corridor currently does not present a positive first impression for visitors to the community, citing Montgomery Street as a positive example. Key challenges and opportunities expressed by the community for each transportation mode are outlined below.

Driving Challenges

Traffic congestion:

- Improve traffic flow and reduce congestion along the corridor
- Year-round: Olive Hwy., Oro Dam Blvd. to Lower Wyandotte Rd.
- Seasonal challenge: Summer additional traffic corridor-wide, and vehicles towing boats or trailers

Vehicle Speeds:

- Reduce vehicle speeds, corridor-wide

Mobility:

- Allow U-turns at some locations along the corridor - current prohibition at all signalized intersections requires motorists to make long detours
- Address difficulty in making unprotected left turns into and out of businesses. Key challenge areas include: south side of Olive Highway from Oro Dam Boulevard to Lower Wyandotte Road and on Oro Dam Boulevard from 5th Avenue to Lincoln Street

- Uncontrolled intersections with particular challenges at:
  - Spencer Avenue and Oro-Dam Boulevard
  - Currier's Square Shopping Center driveway and Oro-Dam Boulevard
  - Olive Highway at Executive Parkway: Pork chop island reportedly causes more traffic maneuvers because you can't make a left, so some drivers cut through the hospital parking lot
  - Reported that some community members use connected private parking lots to travel along the corridor rather than trying to make a left turn back onto SR 162
- Two way left turn lane - Not comfortable to use for left turns out of driveways

Key Intersection:

Oro-Dam Boulevard and Olive Highway:

- Many drivers are observed running the red light
- Free-flowing right turns onto south/eastbound Olive Highway mean there are few gaps in traffic
- Long delays at signal
- Drivers fail to yield to pedestrians in crosswalks

Additional challenges:

- Clarify lane markings on Olive Highway as it approaches Oro Dam Boulevard; road widens and it is unclear whether there are one or two north/westbound lanes
- Transit and emergency pre-emption
- Consolidate driveways
- Sight lines are obstructed in some places along the corridor
- Additional storage in turn pockets is needed
- Where double left-turn lanes exist, provide markings through the intersection at Oro-Dam Boulevard and Feather River Boulevard, and Oro-Dam Boulevard and Lincoln Street
- Consider implementing medians on Olive Highway from Oro Dam Boulevard to the hospital, and on Spencer Avenue adjacent to the transit center

Transit Challenges

Transit frequency:

- Increase frequency
- Expand weekend and evening services

Transit Center:

- Provide public restrooms at the transit center
- Restrooms at the transit center have been closed, creating challenges for transit riders and displacing transient populations that relied on these restroom facilities
- Lack of sufficient parking at transit center for park-and-ride users

Bicycling Challenges

Access to and along the corridor:

- Provide continuous bicycle facility on Oro Dam Boulevard from Hwy 70 to Olive Highway

- Provide continuous bicycle facility on Olive Hwy (Consider Class I Path)
- Provide biking opportunities from Foothill area
- Connect bicycle facilities to the trail west of Hwy 70
- Lack of bicycle facilities on approach streets
- Lack of comfortable crossing locations
- Traffic signals - Ensure bicycle detection at all signalized intersections

Education:

- Bicycle riding in the wrong (contra-flow) direction on SR162 is a safety concern due to lack of bicyclist education, driver awareness, and long block lengths between signals

Walking Challenges

Access to and along the corridor:

- Sidewalk gaps - Complete gaps in sidewalk on both sides of the street, provide separated sidewalks
- Lack of accommodation along the corridor for wheelchair users, or other pedestrians using mobility devices
- Lack of controlled crossings and/or marked crossings at convenient locations:
  - Provide additional crossing opportunities between 5th Avenue and Union Pacific Railroad, between Spencer Avenue and Myers Street, and on Olive Highway
  - Provide mid-block crosswalks with refuge areas
  - Consider Pedestrian Hybrid Beacons for midblock crossings

Additional challenges:

- Pedestrian visibility
  - Use high-visibility crosswalk markings
  - Provide additional lighting
- Pedestrian comfort and placemaking
  - Provide additional shade

Economic and Placemaking Challenges

- Corridor needs beautification
- Need for landscaping along the corridor
- Open space on south side of Oro Dam Boulevard near UPRR is an opportunity to create a community space: could be a rest area, small park, or landscaped drainage swale
- Large number of driveways creates challenges for all modes of transportation
- Need for education and encouragement targeted at school groups and disadvantaged communities
- General dislike of roundabouts
- Develop cohesive vision for growth on this corridor to support local businesses and strengthen image
- Need for storm water management; measures to prevent flooding in heavy rains

2.2 Stakeholder Advisory Committee

A Stakeholder Advisory Committee (SAC) was formed to provide input on concepts and recommendations throughout the planning process, and to review key project deliverables. Advisory committee members include representatives from the following stakeholder groups:

- Butte County Association of Governments
- Caltrans
- City of Oroville
- Lake Oroville Bicyclists Organization
- Oroville Chamber of Commerce
- Oroville Hospital
- Salvation Army
- Southside Oroville Community Center

SAC Identified Challenges

The Committee met on June 24, 2015 and identified the following corridor challenges:

1. Corridor needs beautification
2. Difficult left turns onto the corridor
   a. Two way left turn lane - Not comfortable to use
   b. People cut through parking lots rather than on street
   c. Uncontrolled intersections with particular challenges
      i. Spencer and Oro Dam
      ii. Currier's Square Shopping Center driveway and Oro Dam
3. Olive Hwy at Executive Parkway
   a. Pork chop causes more traffic because you can't make a left so they cut through hospital parking lot. Look at removing pork chop diverter
4. Oro Dam at Olive Hwy
   a. Signal - folks run; long signal that folks are tired of waiting at; dual left
5. Transit Center location
   a. No parking or not enough parking for park and ride, folks using retail parking lots
   b. Not signalized at Spencer - hard to get out, between two signalized intersections
6. Biking
   a. Bicyclists riding wrong direction creates a safety concern – combination of lack of education and long block lengths between signals
   b. Schools commute and school lunch traffic
   c. Plans for bike lanes along the corridor – goes up to Washington to trail
7. Walking
   a. Students walk from Lower Wyandotte to Taco Bell

Suggested Concept Ideas

The following list outlines the suggested corridor concepts identified by the SAC:

1. Separated sidewalks
2. Mid-block crosswalks with refuge areas
3. High visibility crosswalks
4. RRFB's: Any on state highways? On this corridor a Pedestrian Hybrid Beacon would be more appropriate

5. Provide biking opportunities from Foothill area?
6. U-turn opportunities
7. Olive Hwy: Can it be widened? Can we fit in more lanes?
8. Olive Hwy: Unbalanced lanes? 2 SB/EB and 1 WB/NB?
9. Could we do an easement for bike path? Or shared use facility?
10. Transit and emergency pre-emption
11. Consolidate driveways

October 13, 2015 SAC Meeting Overview

Comments and input from stakeholders and the public were developed into alternatives for each mode along the corridor. These alternatives included how to best handle current and future traffic volumes, concepts for designated bicycle facilities, pedestrian amenities, and bicycle intersection treatments. These alternatives were presented to the SAC on October 13, 2015. During this meeting members of the SAC provided guidance and input in regards to which alternatives were preferred. This input helped to shape the recommendations and preferred alternatives included in subsequent chapters.

April 6, 2016 SAC Meeting Overview

The preferred alternatives, cost estimates, and draft report was reviewed and discussed by the Stakeholder Advisory Committee. The committee agreed that the concepts and recommendations were consistent with their expectations and should be forwarded to the second Public Meeting for community consideration and input.

2.3 Community Survey

A community survey was developed to gather input on challenges and opportunities for walking, bicycling, transit, and driving in the study area. The survey was made available online and in hard copy to Oroville community members. The online survey was available from May 4, 2015 to June 9, 2015. Hard copies were distributed at the Feather Fiesta Days on May 9 and at the Public Symposium on May 21. A total of 80 responses to the survey were received. Summary data for each question is presented in the following pages.

Demographics

1. What age group are you in?

The largest age group represented was 45-54 years old, as shown in **Figure 2-1**.

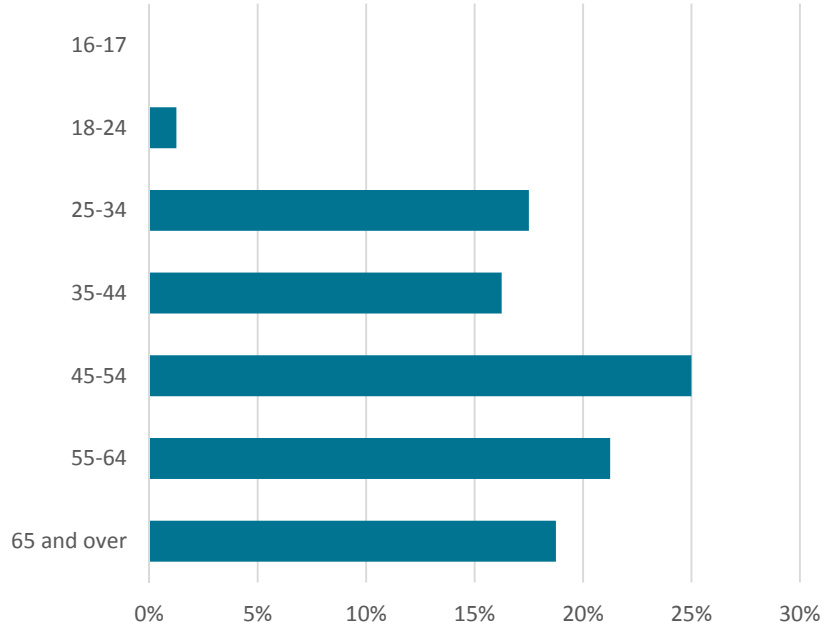


FIGURE 2-1. AGE OF RESPONDENTS

2. What is your gender?

More males responded to the survey than females, as shown in **Figure 2-2**, although the genders were fairly evenly represented.

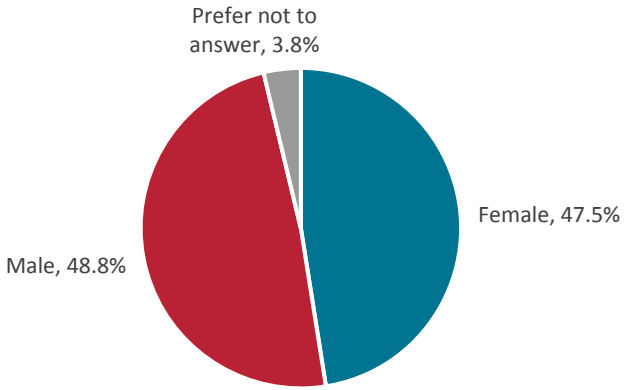


FIGURE 2-2. GENDER OF RESPONDENTS

3. Tell us about yourself

Nearly all respondents live and/or shop in Oroville, as shown in **Figure 2-3**, while fewer respondents indicated that they work in the city.

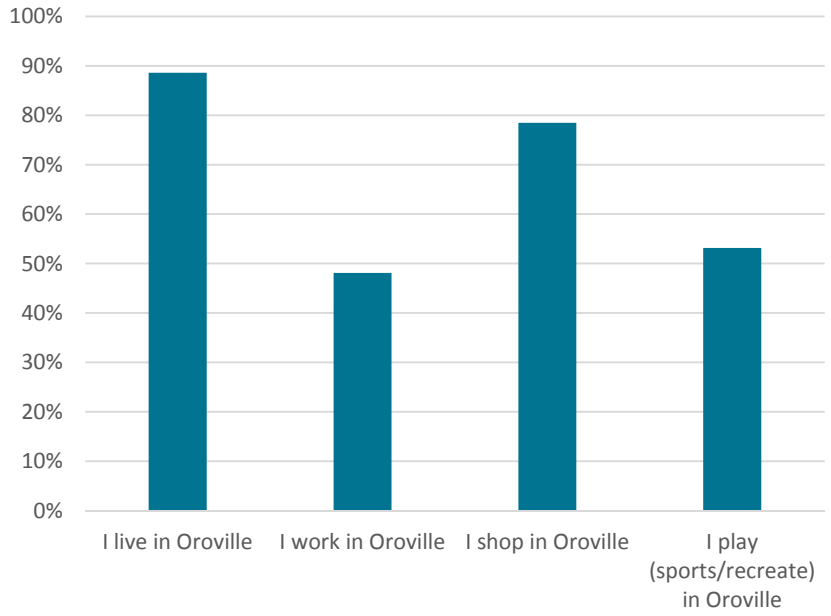


FIGURE 2-3. RESPONDENTS RELATIONSHIP TO OROVILLE

Priorities

1. Considering the overall corridor, what are your highest priorities for improvements?

The majority of respondents prioritize reduction in traffic backups as an outcome to this process, as shown in **Figure 2-4**.

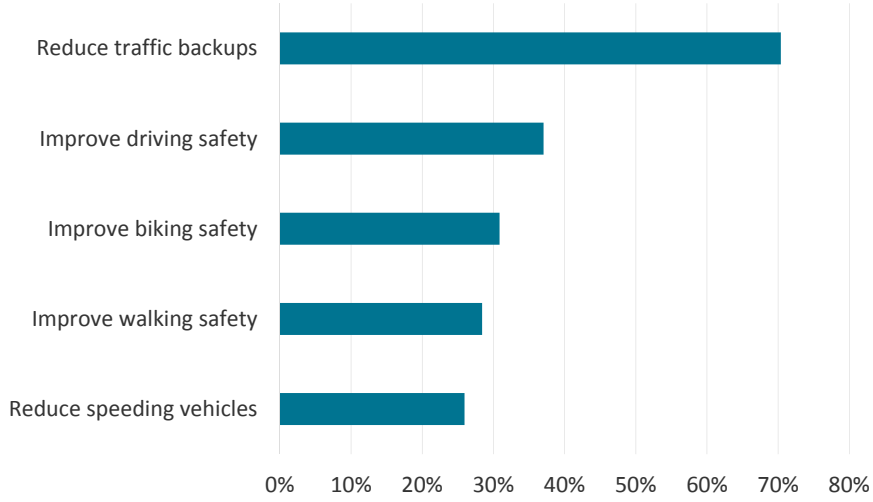


FIGURE 2-4. IMPROVEMENT PRIORITIES

Walking

1. Please tell us about your walking experience on SR 162.

Personal safety from cars and walking convenience were the two statements more respondents disagreed with, as shown in **Figure 2-5**.

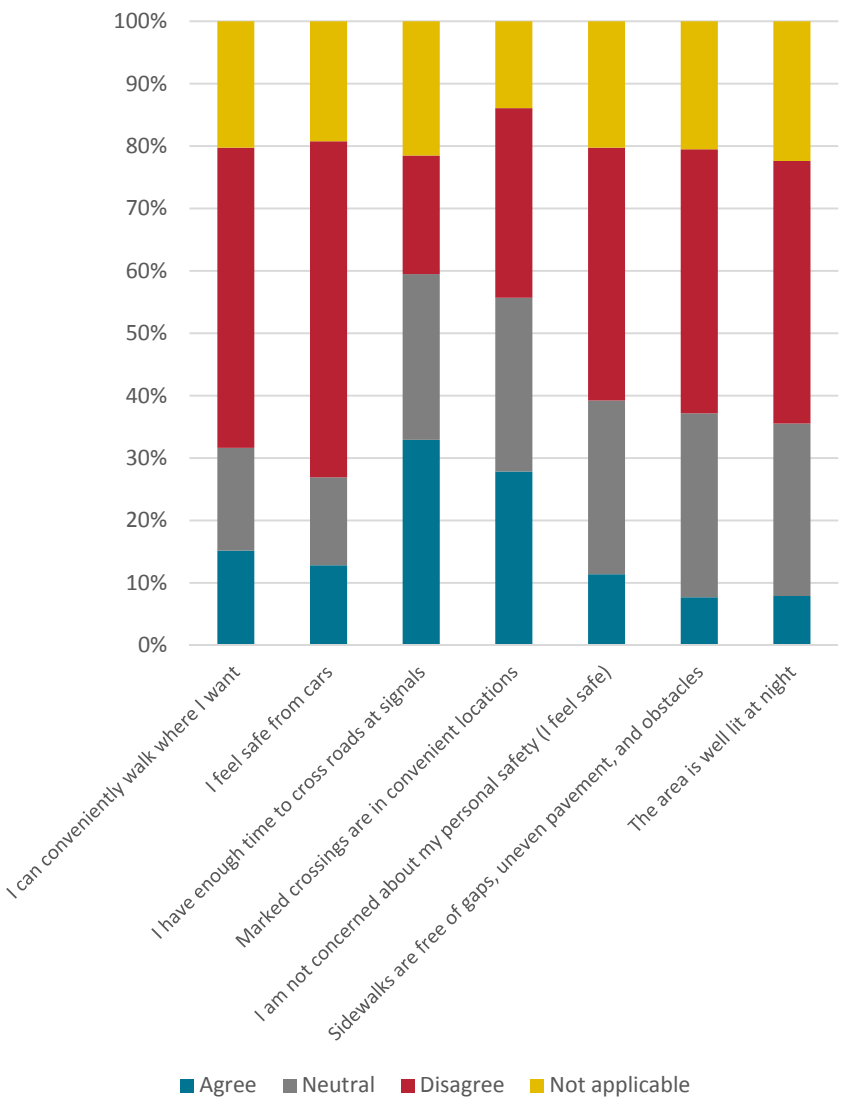


FIGURE 2-5. WALKING EXPERIENCE

2. What prevents you from walking in the study area more often?

Respondents reported that destinations are often too far to walk in their given amount of time, although lack of sidewalks and concerns about safety were other major responses, as shown in **Figure 2-6**.

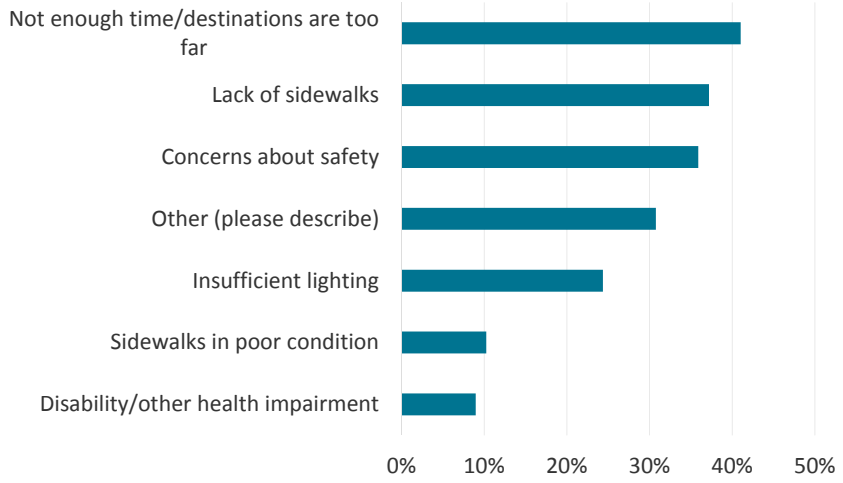


FIGURE 2-6. FACTORS THAT DISCOURAGE WALKING

Additional factors written in by respondents who selected "other" included:

- Crime
- Lack of shade trees
- Crosswalks needed in several locations
- I drive to my destinations
- Not a pleasant place to walk, as opposed to downtown Oroville
- Vehicle speeds

Bicycling

1. Please tell us about your bicycling experience on SR 162

Personal safety concerns and concerns about safety related to drivers were the two statements most respondents disagreed with, as shown in **Figure 2-7**.

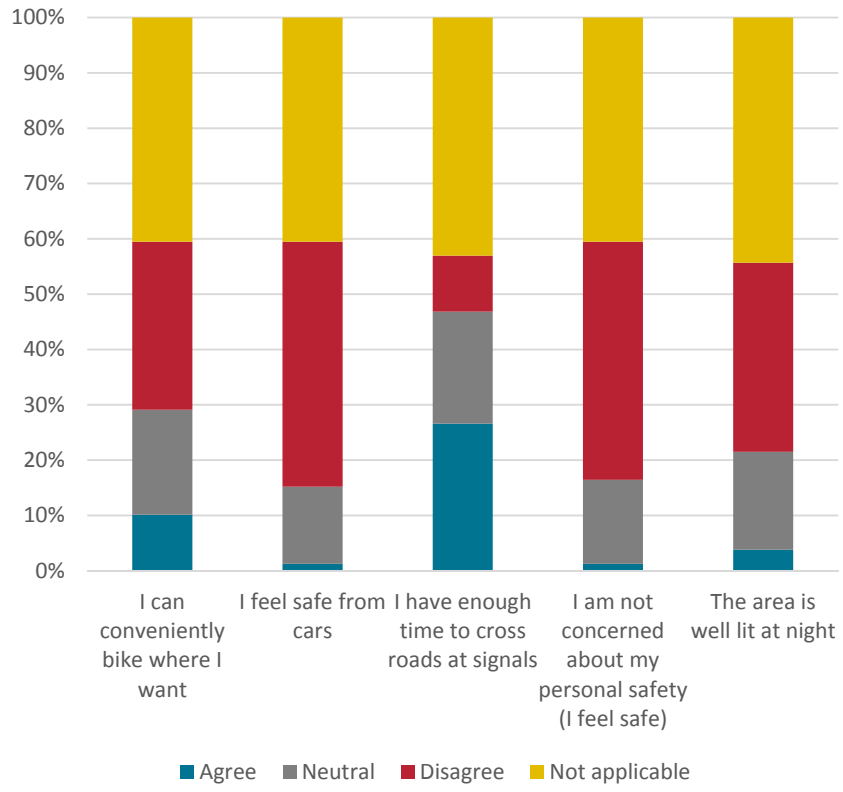


FIGURE 2-7. BICYCLING EXPERIENCES

2. What prevents you from bicycling in the study area more often?

Lack of bicycle facilities and safety concerns were the most stated responses, as shown in **Figure 2-8**.

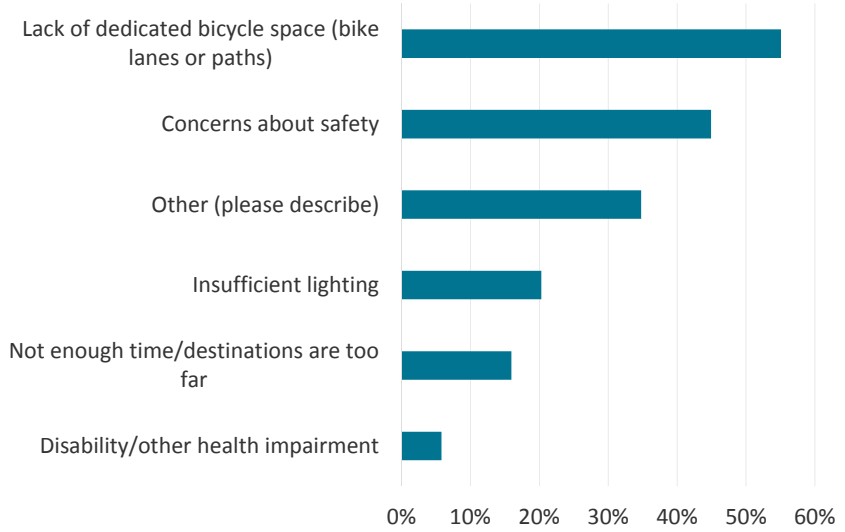


FIGURE 2-8. FACTORS THAT DISCOURAGE BICYCLING

Additional factors written in by respondents who selected "other" included:

- No bicycle
- Too many work related items to transport (computer, clients, etc.)
- It's not an attractive place to bike; no trees, no shade
- Too hilly in areas
- I drive

Transit

1. Please tell us about your transit experience at stops on SR 162

Comfort level and adequate bicycle parking at transit stops were the two statements most respondents disagreed with, as shown in **Figure 2-9**.

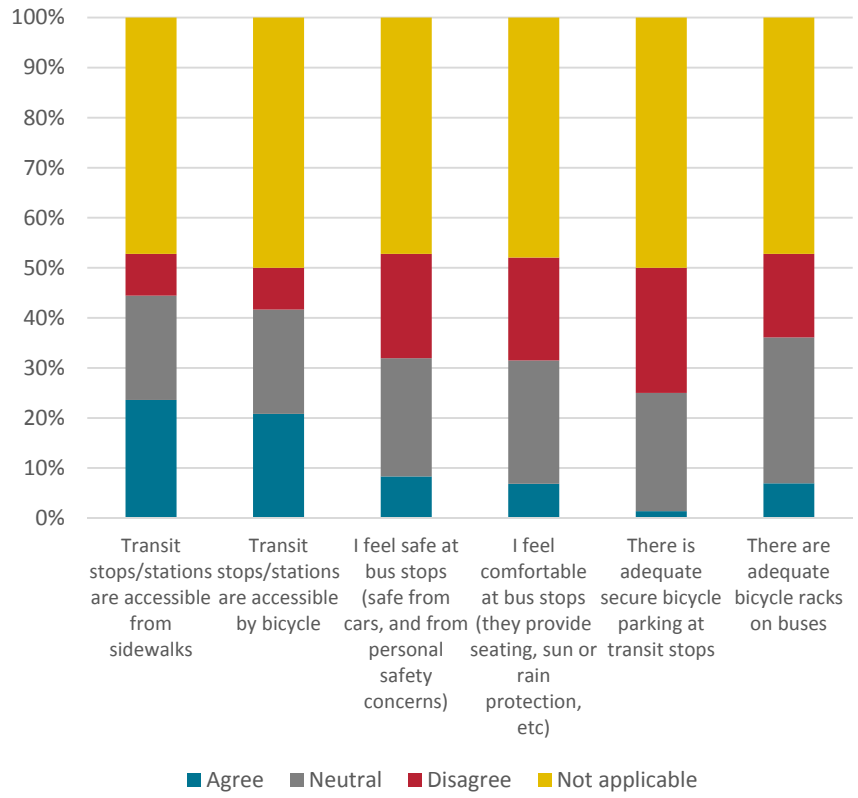


FIGURE 2-9. TRANSIT EXPERIENCES

2. What prevents you from using transit in the study area more often?

"Transit routes do not meet my needs" was the most common factor that discourages respondents from using transit, as shown in **Figure 2-10**.

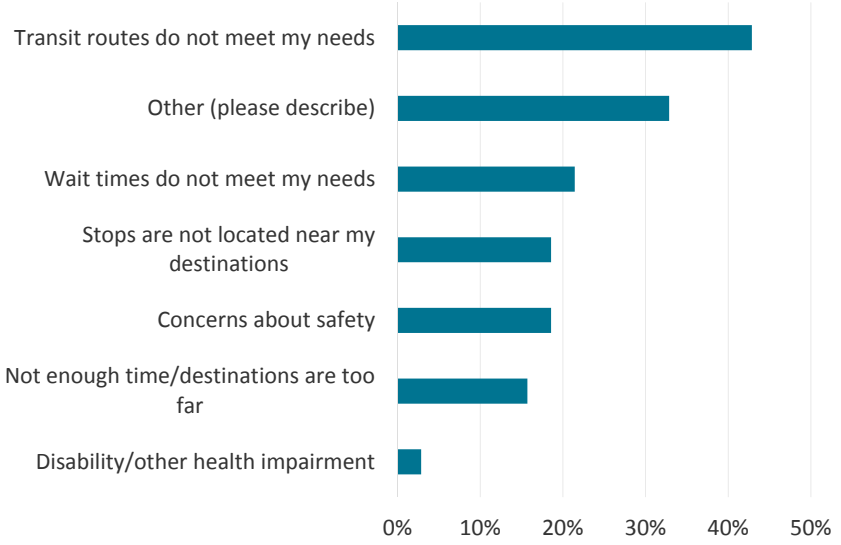


FIGURE 2-10. FACTORS THAT DISCOURAGE TRANSIT USAGE

Additional factors written in by respondents who selected "other" included:

- I use my own vehicle
- I live too far from town
- No bathrooms

Additional Comments

Respondents were provided an opportunity at the end of the survey to include any other comments or concerns related to walking, bicycling, and transit access in Oroville. General themes expressed in these comments included:

- Traffic backups on Olive Highway, especially in front of Oroville Hospital
- Traffic backups at intersection of Oro Dam Boulevard and Olive Highway
- Pedestrians crossing midblock
- Lack of enforcement in area
- Lack of shade trees
- Lack of sidewalks
- Vehicle speeds are too high
- Signal timing/coordination is needed

2.4 Project Website

A project website was created in order to collect survey responses, additional public comments, and provide information about upcoming events and project updates. The web address for this site is **www.go-oroville162.org**. This website provided downloadable versions of project documents as they became available during the length of the project. The website provided a draft version of the corridor plan for public comment and a final draft of the corridor plan. The community survey was available through the project website from May 4th through June 9th. Additionally, a form on the website for public comment was available throughout the entire project (**Figure 2-11**).

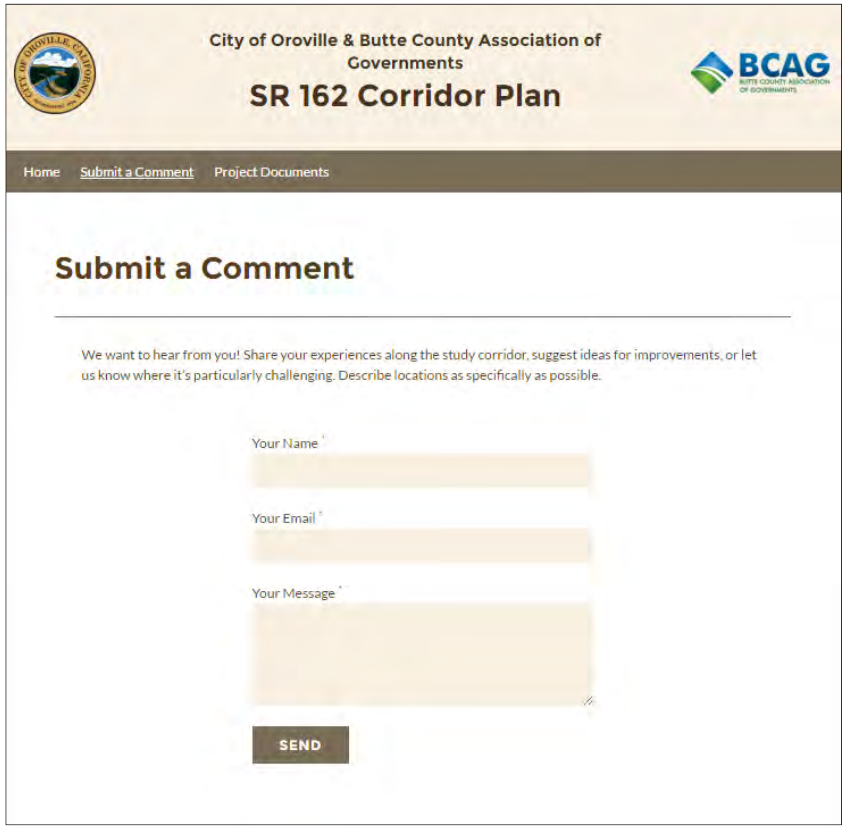


FIGURE 2-11. PUBLIC COMMENT FORM AVAILABLE ON PROJECT WEBSITE

2.5 Feather Fiesta Days

To gather input from community members who may not participate in a traditional planning process, project team members set up a booth at the Feather Fiesta Days on May 9, 2015. Festival visitors were invited to ask questions about the project, mark challenges or opportunities on a large map of the study area, and fill out paper copies of the community survey. Flyers advertising the Public Symposium were also distributed. Key themes among challenges noted by Festival attendees included:

- Vehicle congestion
- Difficulty making left turns
- Lack of frequent transit service on evenings and weekends
- Lack of complete sidewalks
- Lack of dedicated bicycle facilities

Specific challenges and opportunities identified include:

- Congestion along SR 162 leads some community members to seek alternate routes, including Montgomery Street and Mitchell Avenue
- Significant congestion at Oro Dam Boulevard and Olive Highway intersection, including many drivers running red lights and failing to yield to pedestrians
- Left turns out of businesses on the south side of Olive Highway are challenging
- Planned businesses, including Panda Express, Starbucks, and Walmart SuperCenter, may generate additional congestion
- Trees along the corridor create sight line issues in some places
- Lack of bicycle facilities along the corridor
- Lack of consistent sidewalks along the corridor
- Lack of access to the trail west of Highway 70
- Consider installing an additional signal between 5th Avenue and the Union Pacific Railroad, to manage traffic and create an opportunity for bicyclists and pedestrians to cross
- Distracted drivers
- Need for additional vehicle storage in turn pockets
- Need for intersection lane markings where double-left-turn lanes are present, particularly at Oro Dam Boulevard and Feather River Boulevard, and at Oro Dam Boulevard and Lincoln Street
- Buses are convenient during weekday regular service hours, but can create challenges when buses are late
- Need for more frequent transit service, especially on weekends

FIGURE 2-12. PROJECT BOOTH AT FEATHER FIESTA DAYS FESTIVAL

2.6 Public Symposium

A public symposium was held at the Centennial Cultural Center in Oroville on May 21, 2015. Symposium participants were presented with an overview of the planning process, and then invited to view maps showing existing walking, bicycling, transit, and driving facilities and provide comments or suggestions for improving the study corridor.

Fifteen community members attended the symposium. Their comments and concerns related to walking, bicycling, transit, and driving are summarized below.

Walking

- Lack of accommodation along the corridor for wheelchair users, or other pedestrians using mobility devices
- Lack of controlled crossings and/or marked crossings at convenient locations
- Need for complete sidewalks along both sides of the corridor
- Lack of designated crossing between Spencer Avenue and Myers Street, where pedestrians currently cross
- Lack of crossing opportunities on Olive Highway

FIGURE 2-13. PROJECT STAFF WORKING WITH MEMBERS OF THE PUBLIC DURING THE PUBLIC SYMPOSIUM

Bicycling

- Need for bike lanes along Oro Dam Boulevard
- Lack of bicycle accommodations crossing on and off ramps for Highway 70
- Lack of bicycle facilities on approach streets
- Lack of visibility of bicyclists on Olive Highway
- Need for bicycle detection at signalized intersections

Transit

Restrooms at the transit center have been closed, creating challenges for transit riders and displacing transient populations that relied on these restroom facilities.

Driving

- Congestion was expressed as a concern almost universally by symposium attendees
- Seasonal traffic creates additional challenges in summer, when many vehicles are towing boats or trailers
- Need for better signal timing and/or coordination
- Center turn lane is not used effectively by drivers
- Consider implementing medians on Olive Highway from Oro Dam Boulevard to the hospital, and on Spencer Avenue adjacent to the transit center

FIGURE 2-14. PROJECT STAFF WORKING WITH RESIDENTS DURING THE PUBLIC SYMPOSIUM

General Comments

- Need for landscaping and other beautification along the corridor
- Need for improved street lighting at both pedestrian and vehicle scales
- Large number of driveways creates challenges for all modes of transportation
- Need for education and encouragement targeted at school groups and disadvantaged communities
- General aversion to roundabouts

2.7 Stakeholder Interviews

Stakeholder interviews were conducted with key groups and individuals in the Oroville community to gain a deeper understanding of specific challenges and opportunities along the State Route 162 corridor in the study area. Stakeholders interviewed include representatives from the Chamber of Commerce, the Downtown Business Association, Gold Country Casino & Hotel, Oroville Hospital, and the Oroville Southside Community Center.

In-person interviews were conducted on June 3, 2015, with the Chamber of Commerce, the Downtown Business Association, and Gold Country Casino & Hotel. Telephone interviews with Oroville Hospital were conducted on June 15, 2015. The feedback received in these interviews is summarized below.

Chamber of Commerce

Representatives from the Chamber of Commerce stated two primary concerns with the SR 162 study corridor: the difficulty of navigating left turns along the corridor, and the unappealing aesthetic.

Congestion and multiple lanes of traffic were cited as factors that make it difficult to turn left onto SR 162 from the parking lots serving the many businesses along the corridor. Representatives indicated multiple routes and maneuvers they use to compensate for the lack of left-turn opportunities, including driving through connected parking lots, making multiple right turns to reach a destination, and using private parking lots to turn around because U-turns are prohibited at all intersections along the corridor.

Because Oro Dam Boulevard is one of the main exits off SR 70 to enter Oroville, the Chamber of Commerce representatives also expressed concern that the corridor does not present a positive image or reflect the aesthetics of the greater Oroville community. They described the current environment as hard, ugly, and unpleasant. Montgomery Street was identified as a corridor the representatives felt offered an appealing entrance to the community.

Other concerns noted in the interview included drivers frequently running the red light at the intersection of Oro Dam Boulevard and Olive Highway, and a lack of vision or cohesive planning effort for the rapid growth that has occurred along SR 162.

Downtown Business Association

The main concerns expressed by representatives from the Downtown Business Association were the incomplete sidewalks on the study corridor, and the lack of storm water collection and management.

Along the north side of Oro Dam Boulevard and Olive Highway, representatives said, a few business owners have installed sidewalks, but there are still large gaps. Much of the south side of the corridor has no sidewalks at all, and pedestrians are often seen walking along the shoulder of the roadway. They also noted few opportunities for pedestrians to cross the corridor, leading to many observations of pedestrians crossing at unmarked, uncontrolled locations.

A lack of storm water management was also brought up during the interview as a major concern for business owners. Representatives cited a recent rainstorm that led to water several inches deep flooding multiple shops along the SR 162 corridor and flowing across the roadway. Storm drains and sidewalks or catchment swales were both suggested as possible solutions to reduce the risk of future flooding.

Interviewees also indicated an open space on the south side of the corridor, west of the Union Pacific Railroad line, which represents an opportunity to create a community space. Suggestions included a rest area, a small park, or a landscaped drainage swale to retain flood water.

Suggestions to relieve congestion along the corridor included widening Olive Highway from two lanes to four, and considering coordinating signals along the corridor. Interviewees also suggested creating additional pedestrian crossing opportunities, and potentially reducing the speed limit.

Gold Country Casino & Hotel

Interviewees representing the Gold Country Casino & Hotel noted congestion along the SR 162 study corridor as a major concern, particularly during the summer recreation season when many residents and visitors towing boats or trailers are headed to Lake Oroville. One location noted to be particularly challenging is the westbound lane on Olive Highway approaching Oro Dam Boulevard. Representatives said they often see drivers confused as the road widens and the westbound lane is wide enough for two vehicles to pass, but marked as a single lane. It was suggested that restriping this section of the corridor to better structure the available space may minimize confusion.

They also suggested identifying alternative routes, such as Montgomery Street or Ophir Road, and providing additional wayfinding information to direct motorists to these routes and reduce the volume of traffic on SR 162.

Beautification of the corridor was also noted as a concern, as SR 162 is a main entrance to Oroville.

Oroville Hospital

Key challenges noted by representatives from Oroville Hospital include difficulty making left turns onto Olive Highway, and future impacts of hospital campus expansion.

Interviewees said the near-constant stream of vehicles turning right onto Olive Highway from Oro Dam Boulevard makes it challenging to make a left turn out of the hospital campus. Right turns are allowed on a red phase at that signal, which means there are few gaps in the flow of traffic. The two traffic signals near the hospital campus help alleviate this concern.

The hospital, which interviewees reported is growing by eight to twelve percent each year, currently occupies a large campus on the north side of Olive Highway near Medical Center Drive. The hospital has been acquiring additional properties adjacent to the existing campus, and plans to eventually expand to cover much of the area between Olive

Highway, Medical Center Drive, Gilmore Lane, and Oro Dam Boulevard. This expansion will likely generate additional traffic, potentially exacerbating existing congestion. Despite this, interviewees said they understand the importance of traffic in supporting the businesses along SR 162 and do not believe diverting traffic away from the corridor is the best solution.

Additional observations made by interviewees include:

- Sidewalks are complete from the hospital to Oro Dam Boulevard, but gaps exist between the hospital and Foothill Boulevard
- Many bicyclists and motorized wheelchair users have been observed on the corridor
- Transit Center creates some challenges for local business owners by attracting transient populations; businesses located near transit center are not complementary uses

2.8 Public Meeting

A public workshop was held Monday, May 9, 2016 at the Centennial Cultural Center in Oroville. Seventeen people attended and reviewed the interim and preferred improvement concepts presented by the project team, and shared their feedback.

Comments included:

- Love the idea of bike lanes – improving sidewalks will allow room for bicycles! The concept is very bicycle friendly.
- Need for a two-stage turn box on 162 turning left on Feather River Boulevard
- When developing the ultimate planting plan for landscape improvements, please give consideration to maintaining existing sight lines to existing outdoor advertising signs
- Pole at Starbucks is in a bad location
- Take improvements to Kelly Ridge Road
- Make the corridor a gateway off 70, not a truck stop

The draft corridor plan was available for public review on the project website (www.go-oroville162.org) in advance of the public workshop.

Comments submitted by community members through the project website included:

- Improvements in traffic flow at peak times and during business hours need to been improved, dramatically. The accident rate is extremely high and warrants improvements to safety. I believe the time has come for roundabouts at all intersections within the study area! Some thought about alternate routes, such as Oak Avenue improvements from Quincy Road direct to Oro-Dam Boulevard by way of a straight through new road and filling in the deep ditch will provide considerable work time traffic commuters a quick way to upper Feather River Bridge.
- Please widen Olive Highway to four lanes all the way to Gold Country Casino, don't stop at Foothill Boulevard!
- Consider a beltway route for the Oroville Area
- Fay Way seems to be getting really short shrift; in fact, it is scarcely mentioned except to point out that we shall be losing our bus stop and the current crosswalk over Olive Highway. In our cars, if there are eventually two lanes to cross, how on earth shall we ever enter our own street (if we enter from the

Oro Dam end of Olive Highway)? As it is, our wait time is sometimes over a minute. Due to the huge number of curb cuts in Olive Highway, there is a "river of cars" coming at us more often than not. In the current configuration, even when people coming towards town stop to let us make our turn, someone often moves over into the far right (which isn't a real lane) and zooms past – we have to be on our toes to avoid a collision. Synchronizing the signals won't help this altogether, due to the many, many curb cuts along Olive Highway on the south side of the roadway, and the frequent egress of cars exiting these and headed towards Oro Dam Boulevard. If I could "reverse engineer" this mess, I would have never allowed all those curb cuts on Olive!

3 Existing Conditions (Vehicular Traffic)

3.1 Existing Functional Classification

Roadway functional classification is the foundation for planning roadway improvements and setting appropriate standards (e.g., right-of-way requirements, roadway width, design speed, etc.,) that apply to each roadway facility. A brief description of the major roadways within the study area is provided below. These descriptions are for the portions of the roadways within the study area only.

- SR 162 – SR 162 is a major thoroughfare in the City of Oroville running in the east-west direction. As the highway enters Oroville, it crosses under SR 70. From SR 70 to Olive Highway, the roadway is known as Oro Dam Boulevard. SR 162 then follows Olive Highway and ends at Foreman Creek Road along the eastern edge of the Lake Oroville National Recreation Area. SR 162 between SR 70 and Olive Highway is also called as Oro Dam Boulevard and is classified as a 4-lane Major Arterial according to the City of Oroville 2030 General Plan.
- SR 70 – SR 70 within the study area is classified as a 4-lane Freeway. It forms a grade separated interchange with SR 162 at the west end of the study area.
- Feather River Boulevard – This is classified as a 2-lane Collector according to the City of Oroville 2030 General Plan. This is a north-south two lane roadway that runs parallel to SR 70. The posted speed limit is 35 mph.
- 5th Avenue – 5th Avenue is a two-lane roadway that is classified as a 2-lane Collector. The posted speed limit is 35 mph.
- Veatch Street – This is a two-lane roadway with the posted speed limit of 35 mph.
- Lincoln Street – This is classified as a 4-lane Major Arterial according to the City of Oroville 2030 General Plan. The posted speed limit is 30 mph. It is also a designated truck route.
- Myers Street – This is classified as a 2-lane Collector according to the City of Oroville 2030 General Plan. The posted speed limit is 35 mph.
- Spencer Avenue – This is classified as a 2-lane Collector according to the City of Oroville 2030 General Plan. The posted speed limit is 35 mph. Although it is classified as a Major Collector, the SR 162/Spencer Avenue intersection is un-signalized with STOP control on the Spencer Avenue approaches.
- Washington Avenue – This roadway intersects SR 162 at the location where SR 162 turns southeast onto Olive Highway. This is classified as a 2-lane Minor Arterial. The posted speed limit is 25 mph.
- Olive Highway – This roadway also intersects SR 162 at the location where SR 162 turns southeast onto Olive Highway. This is classified as a 2-lane Minor Arterial. The posted speed limit is 40 mph.
- Lower Wyandotte Road – This roadway is classified as a 2-lane Minor Arterial. The posted speed limit is 35 mph.
- Foothill Boulevard – Foothill Boulevard north of Olive Highway is classified as a 2-lane Collector and as a 2-lane Minor Arterial to south of Olive Highway. The posted speed limit is 40 mph.

3.2 Existing Cross-Sections

The existing roadway sections shown below were created using Caltrans Right of Way maps and GIS database assessor map parcel lines which are provided in **Appendix A**.

Oro-Dam Boulevard

Oro-Dam Boulevard has two typical cross-sections which are separated by the Union Pacific Railroad undercrossing bridge. The two typical cross-sections vary in their actual Right of Way and footprint throughout each segment but are generally characterized by the illustrations shown in **Figures 3-1** and **3-2**.

Right of Way: Varies 80' to 100'

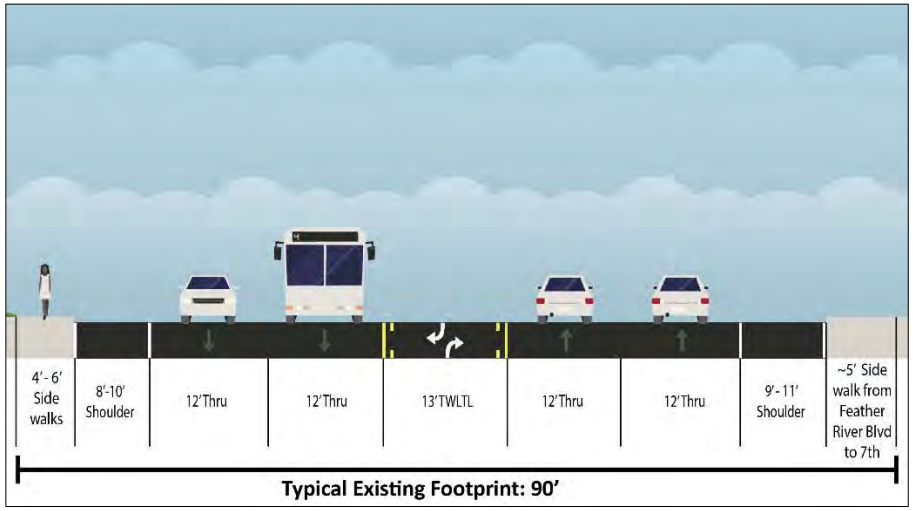


FIGURE 3-1. EXISTING ORO-DAM BOULEVARD CROSS-SECTION

(FEATHER RIVER BLVD TO RAILROAD UNDERCROSSING)

Right of Way: Varies 78' to 94'

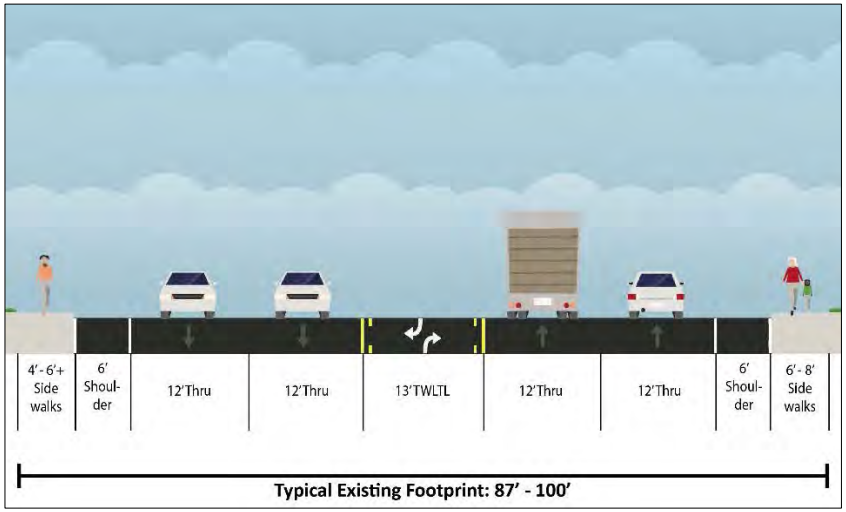


FIGURE 3-2. EXISTING ORO-DAM BOULEVARD CROSS-SECTION

(RAILROAD UNDERCROSSING TO OLIVE HIGHWAY)

Olive Highway

Olive Highway has two distinct cross-sections which are shown below. These cross-sections are located on either side of the Lower Wyandotte/Olive Highway intersection. **Figure 3-3** is the typical cross-section between Oro-Dam and Lower Wyandotte. **Figure 3-4** is the typical cross-section between Lower Wyandotte and Foothill Blvd.

Right of Way: 80'

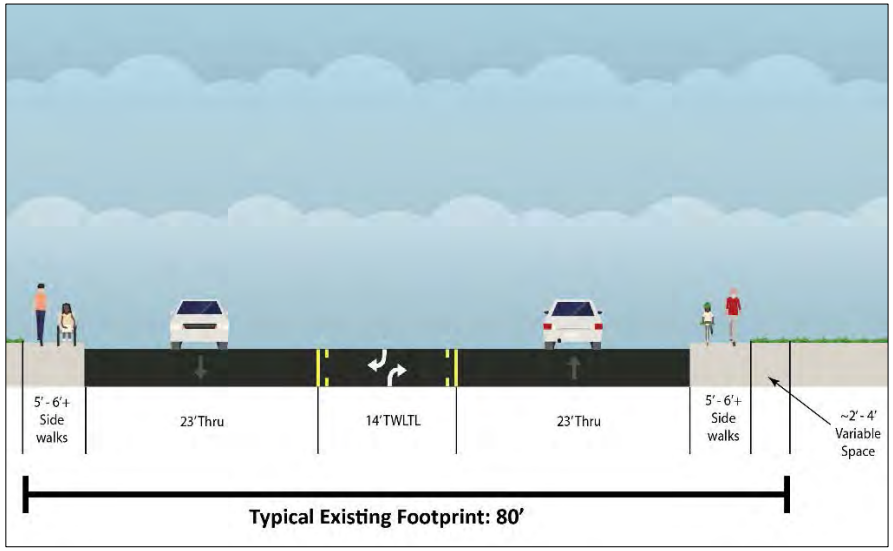


FIGURE 3-3. EXISTING OLIVE HIGHWAY CROSS-SECTION

(ORO-DAM BOULEVARD TO LOWER WYANDOTTE ROAD)

Right of Way: 80'

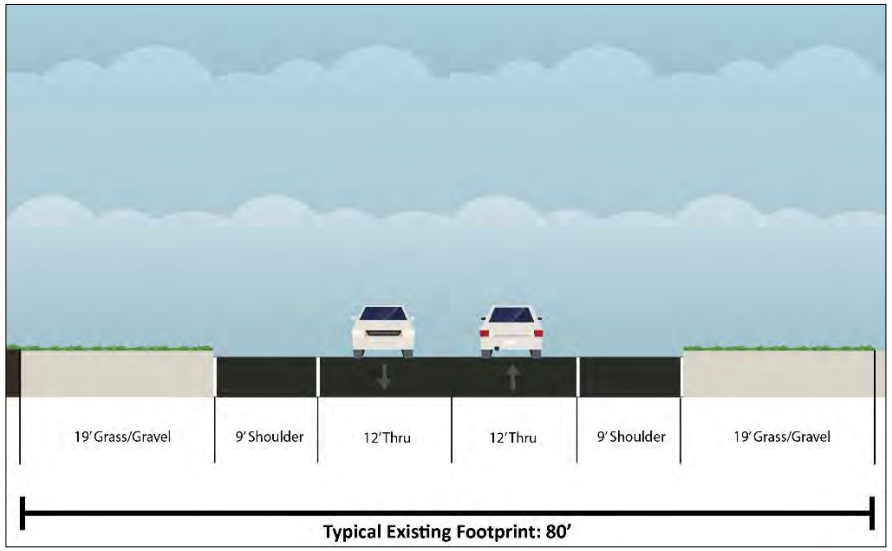


FIGURE 3-4. EXISTING OLIVE HIGHWAY CROSS-SECTION

(LOWER WYANDOTTE ROAD TO FOOTHILL BOULEVARD)

3.3 Existing Traffic Operations

Existing Traffic Volumes

Existing daily traffic volume data for the SR 162 corridor was obtained from the Caltrans 2013 Traffic Census and 24-hour vehicle counts performed by Traffic Works. The source data was primarily from the Caltrans Traffic Census. 24-hour hose counts were collected to reconfirm the Caltrans data and to identify the peak hour with the heaviest traffic volumes. The hose counts were conducted on SR 162 between Veatch Street and Lincoln Street and showed that the traffic volumes are highest between 3:15 PM and 4:15 PM. Hence 3:15 PM to 4:15 PM was established as the peak hour for traffic analysis. The mid-afternoon peak hour traffic volumes were found to be considerably higher than both traditional AM (7 AM to 9 AM) and PM (4 PM to 6 PM) peak hours. Even the directional volume for both eastbound and westbound directions was found to be the highest between 3:15 PM and 4:15 PM compared to traditional AM and PM peak hours. Turning movement volumes at all the study intersections were collected on a typical mid-week day by conducting new video counts. The existing daily volumes, peak hour traffic volumes and existing lane configurations are shown in **Figure 3-5** and **Figure 3-6**.

Level of Service Methodology

Signalized and Un-signalized Intersections

Level of Service (LOS) is an estimate of the quality and performance of the transportation system operations. The industry standard for evaluating traffic conditions is based on the methodology outlined in the Highway Capacity Manual 2010 (HCM 2010). Using this methodology, traffic conditions are assessed with respect to the average intersection delay (seconds/vehicle). The letter "A" is used to describe the least amount of congestion and best operations, and the letter "F" indicates the highest amount of congestion and worst operations. The HCM LOS criteria for signalized and un-signalized intersections are shown in **Table 3-1**.

Table 3-1. LOS Criteria for Signalized and Un-signalized Intersections

LOS Rating	Brief Description	Average Delay for Signalized Intersections (seconds/vehicle)	Average Delay for TWSC Intersections (seconds/vehicle)
A	Free flow conditions.	0-10	0-10
B	Stable conditions with some affect from other vehicles.	>10-20	>10-15
C	Stable conditions with significant affect from other vehicles.	>20-35	>15-25
D	High density traffic conditions still with stable flow.	>35-55	>25-35
E	At or near capacity flows.	>55-80	>35-50
F	Over capacity conditions.	> 80	> 50

Source: HCM 2010; TWSC: two-way stop control; LOS ratings for TWSC and three-legged stop-control intersections are based on the worst movement average delay; LOS is not defined for the overall intersection

Roadway Segments

The criteria for evaluating roadway LOS is outlined in the City of Oroville's *2012 TCIP & Traffic Impact Fee Program* and *Oroville Sustainability Updates Draft Supplemental EIR*. Peak hour roadway LOS is determined based on volume/capacity (v/c) ratios. For these calculations roadway capacity is determined by facility type, as shown in **Table 3-2**, and roadway volume based on peak hour segment volume.

Roadway LOS was determined by comparing the peak hour bi-directional roadway volumes to the standards shown in **Table 3-2**.

Table 3-2. LOS Criteria for Roadway Segments

Facility Type	Peak Hour LOS Capacity Threshold				
	A	B	C	D	E
Minor 2-lane Hwy	90	200	680	1,410	≤1,740
Major 2-lane Hwy/Exp	120	290	790	1,600	≤2,050
4-lane, Multi-lane Hwy/Exp	1,070	1,760	2,530	3,280	≤3,650
6-lane Expressway	1,610	2,640	3,800	4,920	≤5,480
2-lane Minor Arterial	--	--	650	1,180	≤1,250
2-lane Major Arterial	--	--	970	1,760	≤1,870
4-lane Major Arterial, Undivided	--	--	1,750	2,740	≤2,890
4-lane Major Arterial, Divided	--	--	1,920	3,540	≤3,740
6-lane Arterial, Divided	--	--	2,710	5,320	≤5,600
3-lane Arterial, One-way Rd	--	--	310	2,060	≤2,170
2-lane Freeway	1,110	2,010	2,880	3,570	≤4,010
2-lane Freeway + Aux Lane	1,410	2,550	3,640	4,490	≤5,035
3-lane Freeway	1,700	3,080	4,400	5,410	≤6,060
3-lane Freeway + Aux Lane	2,010	3,640	5,180	6,350	≤7,100
4-lane Freeway	2,320	4,200	5,950	7,280	≤8,140
6-lane Freeway	3,330	6,030	8,640	10,710	≤12,030
Minor 2-lane Collector	--	--	370	790	≤1,020
Major 2-lane Collector	--	--	550	1,180	≤1,520

* Source 2012 Transportation Capital Improvement Program (TCIP) and Impact Fee Update Program, City of Oroville.

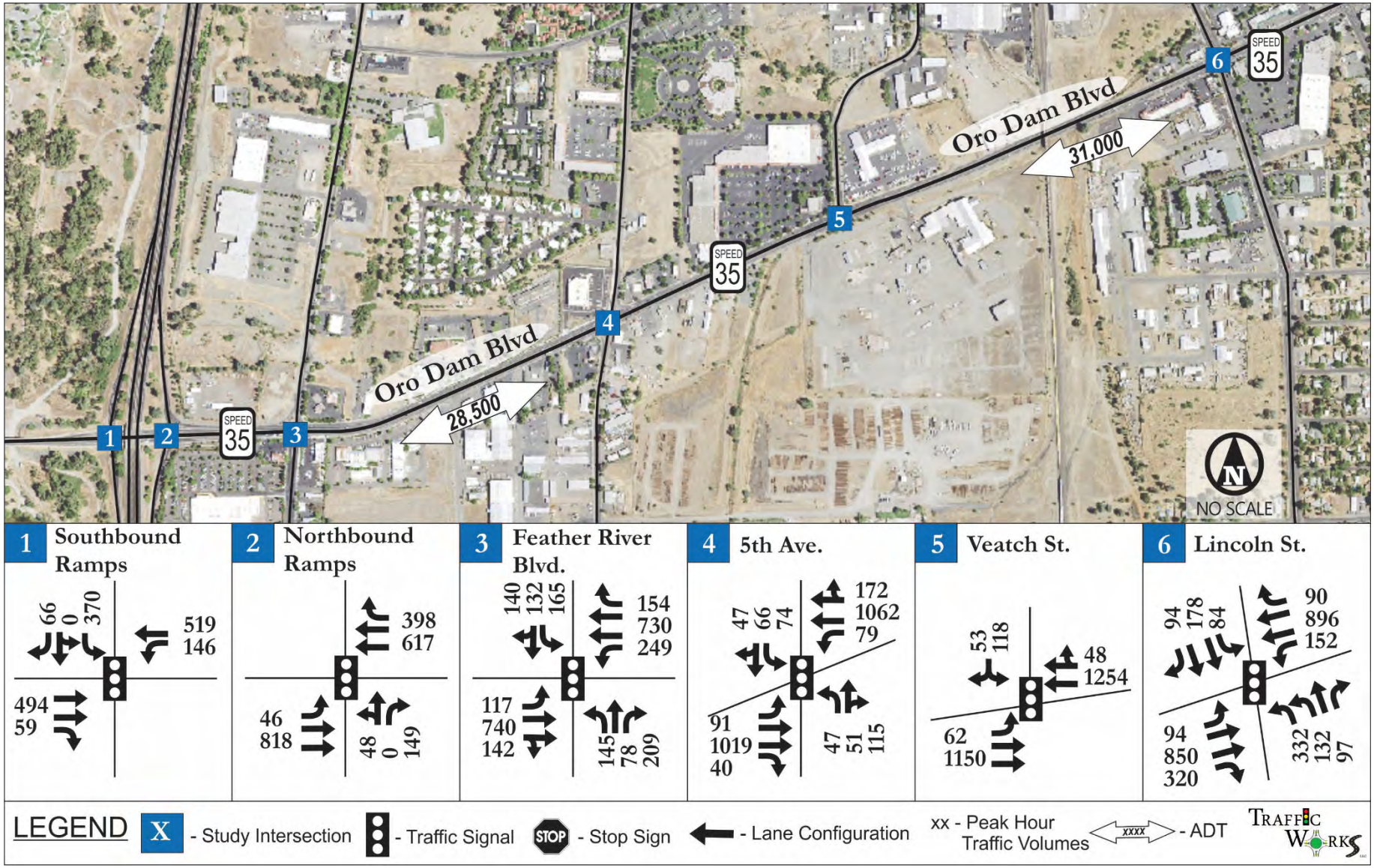


FIGURE 3-5. EXISTING PEAK HOUR TURNING MOVEMENT COUNTS (PANEL 1)

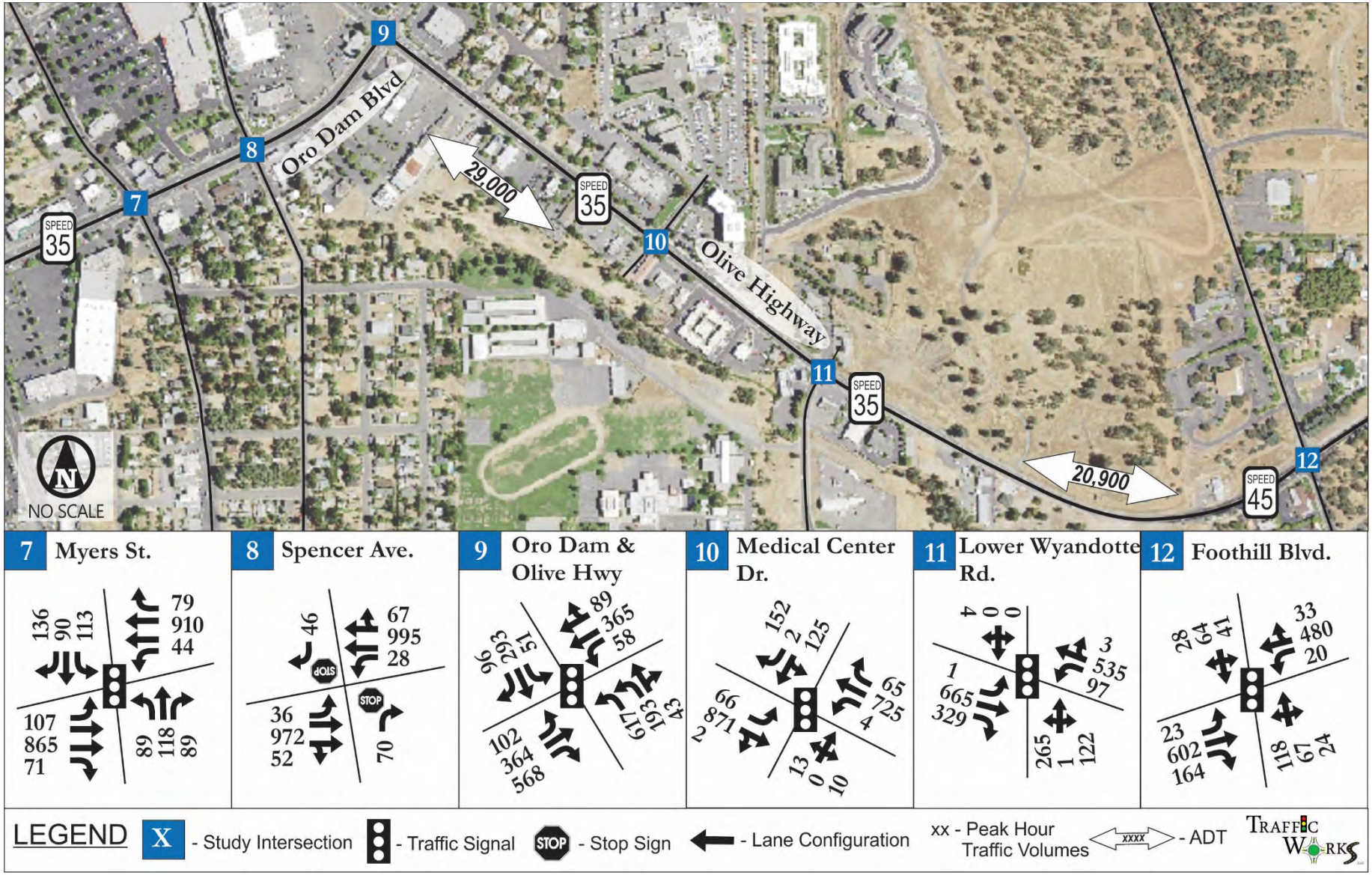


FIGURE 3-6. EXISTING PEAK HOUR TURNING MOVEMENT COUNTS (PANEL 2)

Level of Service Policy

Caltrans, Butte County, and the City of Oroville have all established level of service criteria standards and thresholds for the study area.

The Caltrans prepared *State Route 162 Transportation Corridor Concept Report (2011)* established concept LOS "E" for the segment between Highway 70 and Foothill Boulevard by stating "District 3 has established minimum Concept LOS standards for the 20-year planning horizon at LOS D for rural segments and LOS E for urban segments." Correspondence with Caltrans District 3 during the *Oroville Sustainability Updates* process in 2015, reaffirmed that Caltrans endeavors to maintain LOS "E" on SR162 in the project area.

The Butte County 2030 General Plan identifies Level of Service policy for facilities within Butte County. *Policy CIR-P6.2* states that the level of service on State Highways should at least match the concept level of service for the facility, as defined by Caltrans.

Since the study area falls within Oroville's City Limits, LOS policies consistent with the City of Oroville were also considered. The City of Oroville's LOS standards have been recently modified through the *Oroville Sustainability Updates* and corresponding *Final Supplemental EIR* (adopted in March 2015). The City's LOS policy applicable to the study segments is:

Policy P2.1: Maintain a Level of Service (LOS) D or better as defined in the most current edition of the Highway Capacity Manual or subsequent revisions for roadways and intersections, except as specified below:

State Facilities:

Oroville Dam Blvd – Feather River Boulevard to Olive Highway (LOS F)

Olive Highway – Oroville Dam Boulevard to Lower Wyandotte Road (LOS F)

Olive Highway – Lower Wyandotte Road to Foothill Boulevard (LOS F)

City of Oroville staff have explained that the City-wide overall LOS goal is indeed "D" but that severe fiscal constraints combined with the high traffic volumes on Oro Dam Boulevard and Olive Highway have left few, if any, options other than accepting poor level of service (F) on SR 162 through the busy commercial area. The City is hopeful that at least LOS "E" can be maintained through the study area but it does not currently have the necessary funding to ensure that. For this reason, LOS "F" was accepted for the purposes of the *Oroville Sustainability Updates Final Supplemental EIR*.

Since both Caltrans District 3 and the City of Oroville endeavor to provide at least LOS "E" on the corridor, and since this service level is also consistent with the *Butte County 2030 General Plan* and the prior *City of Oroville General Plan*, there is clear consensus that LOS "E" is the appropriate planning target for this study corridor. Therefore, the Level of Service criteria for this corridor study shall be: LOS "E" on SR 162 from Highway 70 to Foothill Boulevard.

Roadway Level of Service Analysis

Roadway Level of Service was calculated by comparing peak hour segment volumes to the thresholds shown in **Table 3-2**. The roadway Level of Service along various segments of SR 162 is shown in **Table 3-3** and **Figure 3-7**. All roadway segments on SR 162 between SR 70 and Washington Avenue operate at LOS D. The Olive Highway roadway segment currently operates at LOS F.

Table 3-3. Existing Roadway LOS Summary

Segment	Peak Hour	#Lanes	LOS
Oro Dam Blvd west of SR 70	1,138	2	D
Oro Dam Blvd - SR 70 to Feather River	2,014	4	D
Oro Dam Blvd - Feather River to Lincoln St	2,306	4	D
Oro Dam Blvd - Lincoln St to Olive Hwy	2,178	4	D
Olive Hwy	1,829	2	F

Intersection Level of Service Analysis

Level of service calculations were performed using the existing intersection configurations and traffic volumes collected. The intersection Level of Service and delay results are presented in **Table 3-4**.

Table 3-4. Existing Peak Hour LOS Summary

Intersection w/ SR162	Intersection Control	Coordinated/ Free	LOS	Delay (sec/veh)
SB Ramps	Signal	Free	B	16.7
NB Ramps	Signal	Free	B	10.9
Feather River Blvd	Signal	Free	C	34.5
5th Ave	Signal	Free	B	15.4
Veatch St	Signal	Free	B	10.0
Lincoln St	Signal	Coordinated	C	27.7
Myers St	Signal	Coordinated	C	26.9
Spencer Ave	TWSC	NA	B	14.3
Oro Dam Blvd/Olive Hwy	Signal	Coordinated	D	41.4
Medical Center Dr	Signal	Coordinated	B	17.8
Lower Wyandotte Rd	Signal	Coordinated	C	28.8
Foothill Blvd	Signal	Coordinated	C	23.1

The study intersections on SR 162 were analyzed using the HCM modules for signalized and two-way STOP controlled intersections in Trafficware's software program, Synchro 8.0 (Build 806.77).

As shown in **Table 3-4**, according to the HCM procedures, all the study intersections currently operate at acceptable level of service conditions during the peak hour.

Although the intersection Level of Service analysis shows that the intersections on Olive Highway operate at acceptable LOS standards, the roadway analysis that was performed based on total peak hour bi-directional volume shows that the Olive Highway segment operates at LOS "F", as shown in **Table 3-3**.

Synchro software, being a static model, analyzes the operations only at the intersections and does not take into consideration the impacts caused due to other dynamic roadway factors such as longer gaps between vehicles, delays caused due to vehicles turning into and out of driveways, spillback from downstream intersection(s), etc.

Queuing & Micro-Simulation

In addition to the LOS analysis, a micro-simulation analysis was also performed using SimTraffic to evaluate queue lengths along Olive Highway. Multiple simulations were averaged to get a representation of a typical peak hour. **Table 3-5** shows the 95th percentile queue lengths on Olive Highway at the study intersections. The 95th percentile queue is the theoretical maximum back of queue with 95th percentile traffic volumes.

As shown in **Table 3-5**, during the peak hour, the majority of queuing occurs on the eastbound approaches to intersections along Olive Highway. This is consistent with the field observations. The simulation shows the eastbound queues on Olive Highway spilling back into upstream intersections, which is also consistent with the field observations.

The eastbound 95th percentile queue length at the SR 162/Lower Wyandotte Road intersection is reported to be 1,059 feet which is more than the storage space available between Medical Center Drive and Lower Wyandotte Road. The eastbound queue from Lower Wyandotte Road spills back into the Medical Center Drive intersection. Similarly, the 95th percentile eastbound queue on Medical Center Drive is approximately 250 feet more than the distance between Oro-Dam Boulevard and Medical Center Drive, causing the queue to spill back into the Oro-Dam Boulevard/Olive Highway intersection. The 95th percentile eastbound queue at the Medical Center Drive is 1,804 feet.

During the peak hour, a constant eastbound queue exists from Lower Wyandotte Road to Oro-Dam Boulevard impacting the eastbound right-turn movement at the Oro-Dam Boulevard/Olive Highway intersection.

Table 3-5. Queue Length Summary

Intersection w/ SR162	Approach	95th %tile Queue (ft)
Oro Dam Blvd/Olive Hwy	Northbound	512
	Eastbound	531
Medical Center Dr	Eastbound	1,804
	Westbound	324
Lower Wyandotte Rd	Eastbound	1,059
	Westbound	307
Foothill Blvd	Eastbound	370
	Westbound	302

Although the existing intersection level of service appears to be acceptable, there are long queues that spill back to adjacent signals, and there is a high degree of congestion on Olive Highway during peak hours. As indicated by the road segment LOS analysis, Olive Highway is effectively functioning at LOS "F".

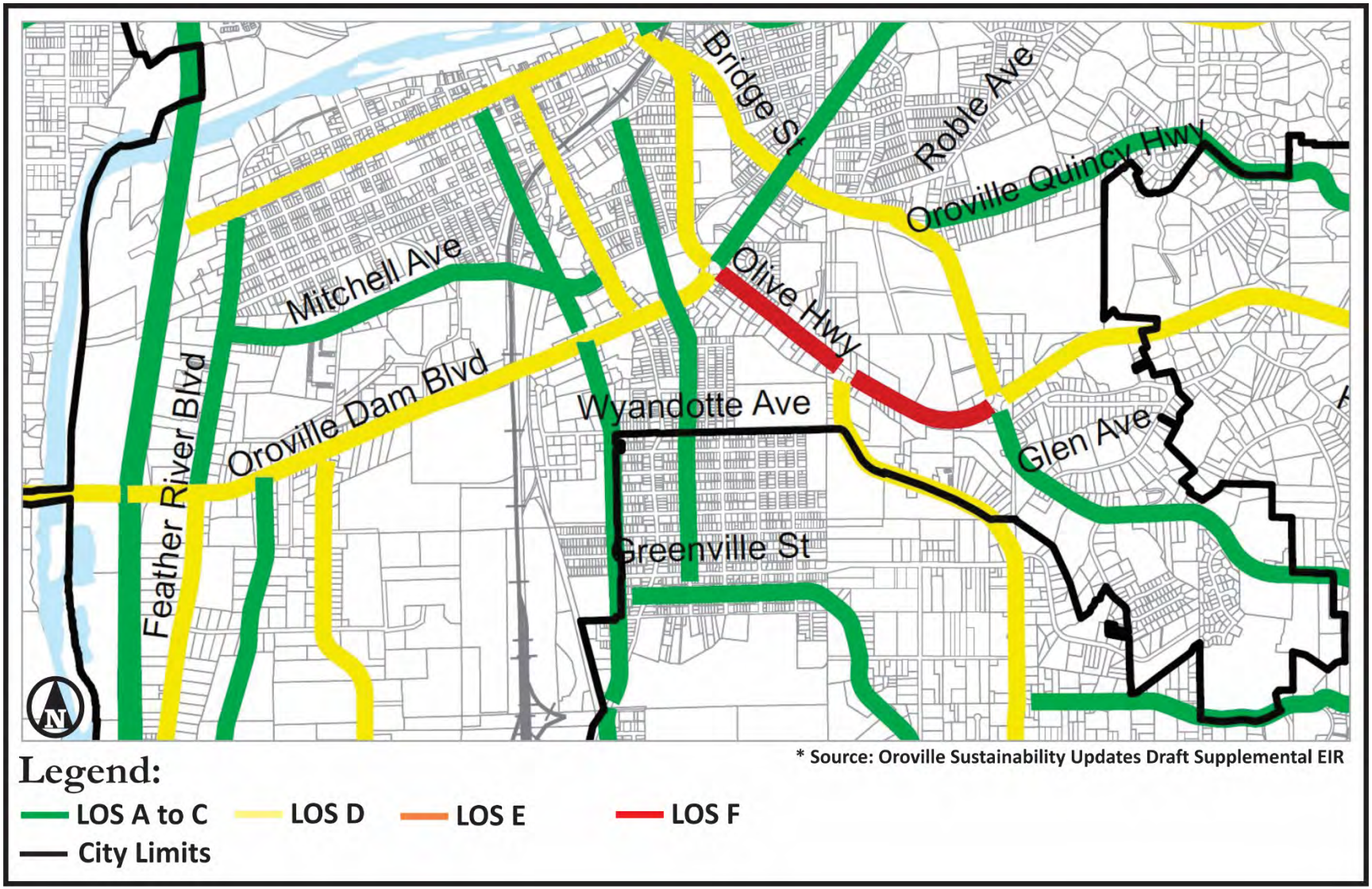


FIGURE 3-7. EXISTING ROADWAY PEAK HOUR LEVEL OF SERVICE

3.4 Collision History

Crash data for the previous three consecutive years (January 2011 to December 2013) was obtained from the Transportation Injury Mapping System (TIMS) and Statewide Integrated Traffic Records System (SWITRS) databases for the study corridor. Identifying crash types can inform the choice of safety countermeasures and aid in evaluations of countermeasure effectiveness. Crash summaries were prepared from the data obtained. **Table 3-6** shows the summary of crashes at each intersection and on SR 162 road segments between January 2011 and December 2013.

Based on the data obtained, a total of 107 crashes were reported between January 2011 and December 2013. The majority of crashes were Property Damage Only (PDO) incidents, accounting for 83% of the total crashes. 15% of the collisions resulted in injuries and 2% resulted in a fatality. Approximately 4% of the crashes (4 out of 102) involved bikes or pedestrians. **Figure 3-8** shows the distribution of crashes at the study intersections. The reported crashes were found to be fairly evenly distributed through the study area with no one single location accounting for more than 12% of all crashes.

The SR 162/Lincoln Street intersection has highest number of accidents compared to all other intersections, accounting for approximately 12% of the crashes. Both the SR 162/Veatch Street and SR 162/Medical Center Drive intersections account for approximately 10% of crashes, each. Based on the data obtained, of the 107 total crashes, 34 were reported in 2011, 44 were reported in 2012, and 29 were reported in 2013.

Table 3-6. Crash Summary for January 2011 to December 2013

Location	# Collisions	Fatal	Injury	PDO	# Bike / Pedestrian
SR 70 Ramps	8	0	3	5	0
Feather River Blvd	9	0	4	5	0
5th Ave	7	0	2	5	1
Veatch St	10	0	2	8	0
Lincoln St	12	1	1	10	1
Myers St	6	0	1	5	1
Spencer Avenue	7	0	0	7	0
Oro Dam Blvd	5	0	0	5	0
Medical Center Dr	10	0	1	9	0
Lower Wyandotte Rd	4	0	0	4	0
Foothill Blvd	5	1	0	4	1
Non-Intersection/ Roadway	24	0	2	22	0
TOTAL	107	2	16	89	4

The majority of the crashes were rear-end collisions accounting for 58% of all the crashes, followed by broadside crashes (14%), sideswipe crashes (9%), head-on crashes (4%), hit object crashes (3%), and vehicle-pedestrian crashes (2%). 10% of the crashes reported were categorized as “other” or were not-stated. **Figure 3-9** shows the percentage of crashes by type of accident.

The crash rate (expressed in number of accidents/million vehicle miles) is commonly used to describe relative safety of a particular roadway/highway compared to other similar roadways/highways. The benefit of using the crash rate is that it provides a simple comparison to statewide averages. According to the data received from Caltrans, the statewide average crash rate for similar statewide highways is 1.86 accidents per million vehicle miles travelled. The crash rate for the SR 162 study corridor is 1.23 accidents per million vehicle miles travelled. This roadway appears to be generally safer than other highways of similar type and no unusual efforts to improve safety are needed based on the current data.

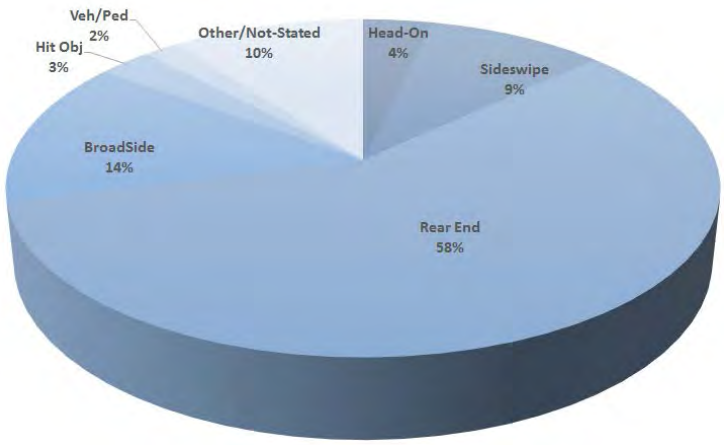


FIGURE 3-9. CRASHES BY TYPE

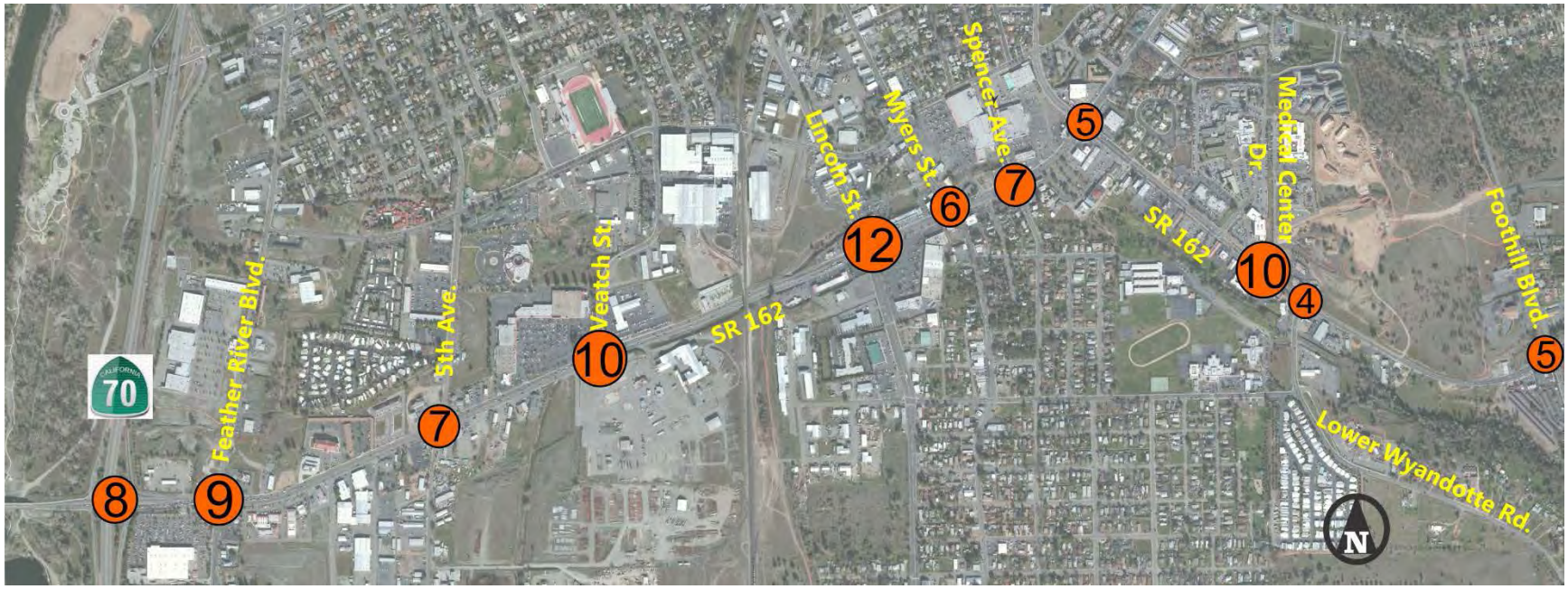


FIGURE 3-8. DISTRIBUTION OF CRASHES

4 Existing Conditions (Alternative Modes)

4.1 Self-Propelled Travel Modes

In order to maintain and enhance non-motorized travel, it is important to document existing conditions and identify deficiencies and opportunities for each mode. This section first describes the data collection effort on current pedestrian and bicycle volumes as well as the associated infrastructure, and identifies existing deficiencies and potential for enhancements.

A walking audit revealed that the pedestrian infrastructure on the corridor is generally good, but some basic improvements are still necessary. Connectivity is hindered by long gaps in sidewalks. And pedestrian mobility is somewhat impaired by objects in sidewalks restricting clear width. Newly-developed lots are providing sidewalks six (6) feet in width, and establishing overall pedestrian connections to commercial property.

There are currently no designated bike lanes in the corridor. Along most of its length, there are wide paved shoulders that support bicycle travel.

Data Collection

Pedestrian and bicycle turn movement data was collected at all of the signalized study intersections throughout the corridor, and at Spencer Avenue. Data was collected for each movement at the intersection, in 15-minute periods, during a mid-week day for the vehicular traffic peak hour. Pedestrian, bicycle, and wheelchair volumes, by movement, at each study intersection are shown in **Figures 4-1** through **4-12**.

Findings

Overall Movements

Based on the collected volumes at the study intersections, and observations made in the field, pedestrian volumes are significantly higher than bicycle volumes. Walking on average outnumbers cycling 7:1 throughout the corridor. The mode split amongst self-propelled modes is 87 percent pedestrian, 12 percent bicycles, and 1 percent wheelchair users.

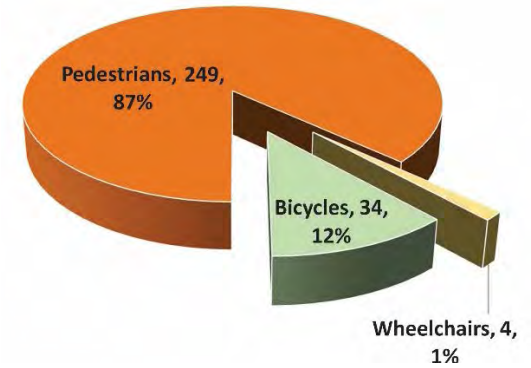


Figure 4-1. Mode Split for Self-Propelled Modes

The SR 162 / Myers Street intersection was found to have the highest self-propelled volumes with 63 total movements during the peak hour.

FIGURE 4-2. VOLUMES BY MOVEMENT AT SR 162 / SB RAMPS

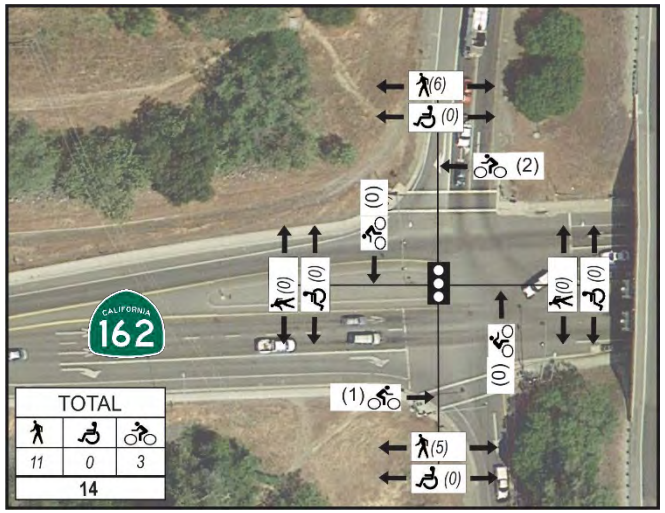


FIGURE 4-3. VOLUMES BY MOVEMENT AT SR 162 / NB RAMPS

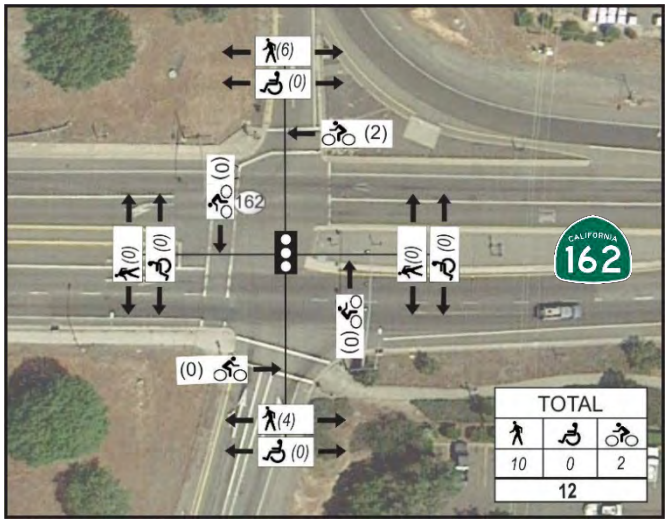


FIGURE 4-4. VOLUMES BY MOVEMENT AT SR 162 / FEATHER RIVER BLVD.

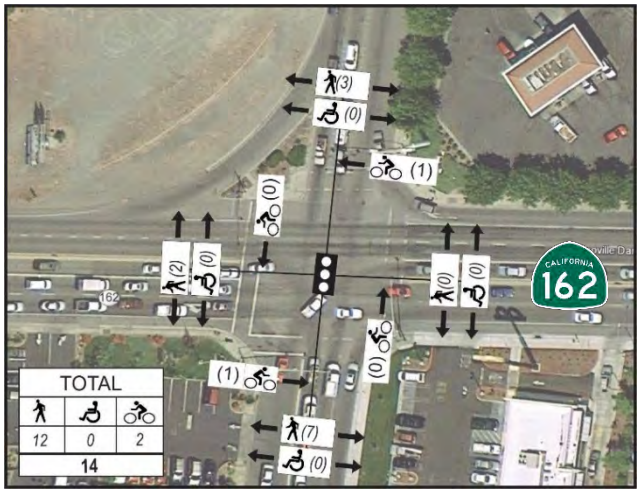
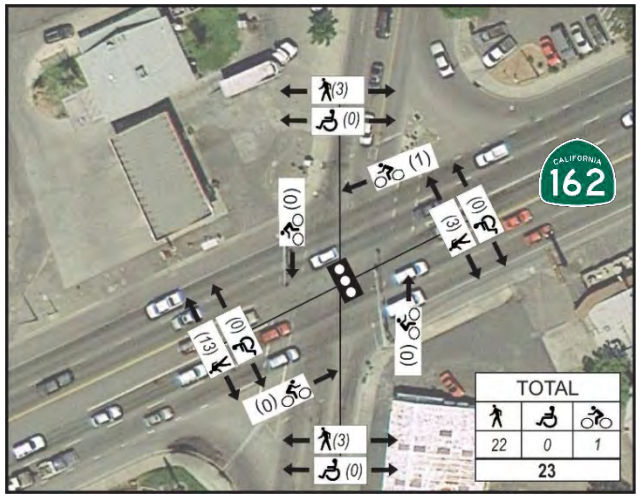


FIGURE 4-5. VOLUMES BY MOVEMENT AT SR 162 / 5TH AVE.



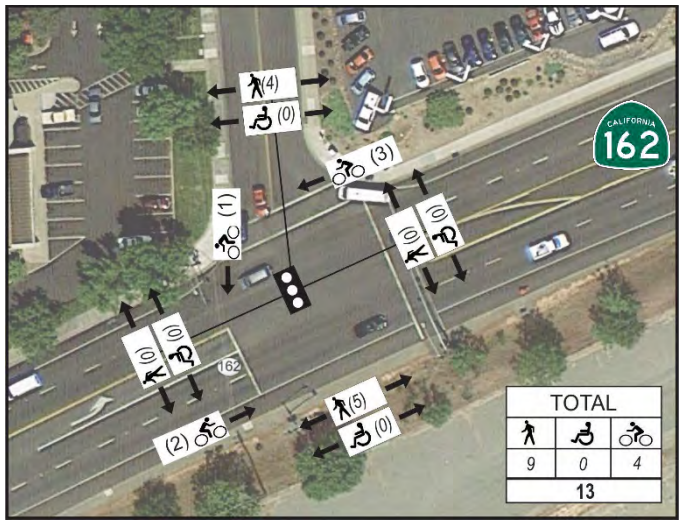


FIGURE 4-6. VOLUMES BY MOVEMENT AT SR 162 / VEATCH ST.

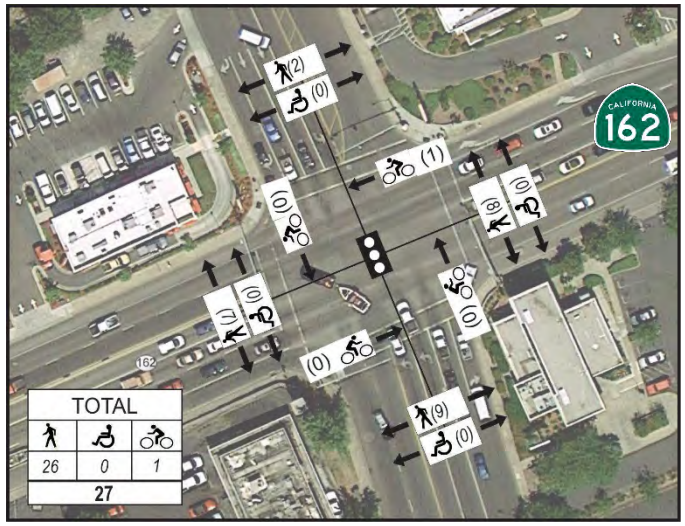


FIGURE 4-7. VOLUMES BY MOVEMENT AT SR 162 / LINCOLN ST.

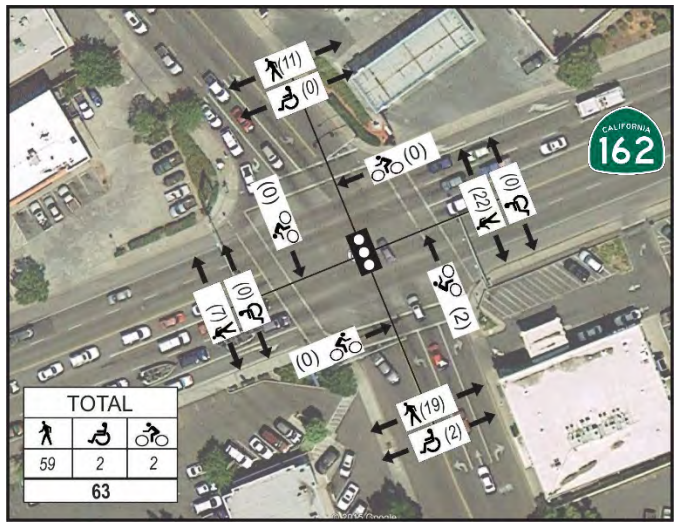


FIGURE 4-8. VOLUMES BY MOVEMENT AT SR 162 / MYERS ST.

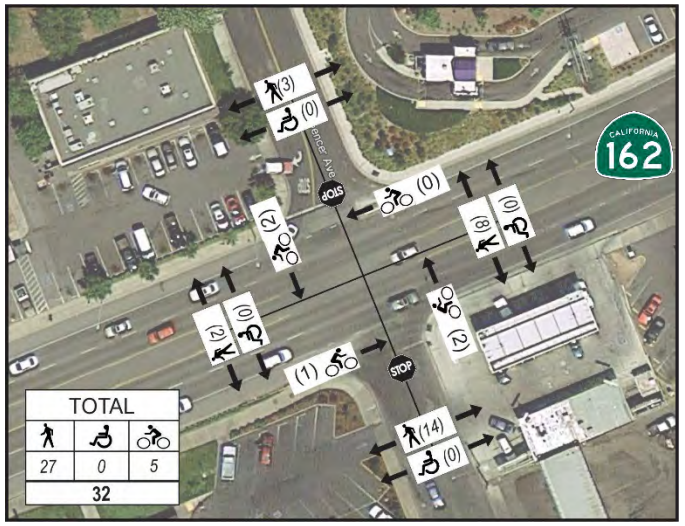


FIGURE 4-9. VOLUMES BY MOVEMENT AT SR 162 / SPENCER AVE.

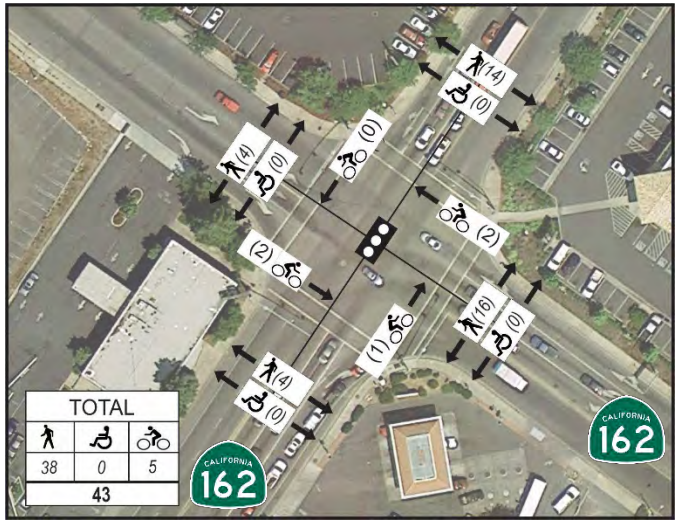


FIGURE 4-10. VOLUMES BY MOVEMENT AT SR 162 / ORO-DAM BLVD.

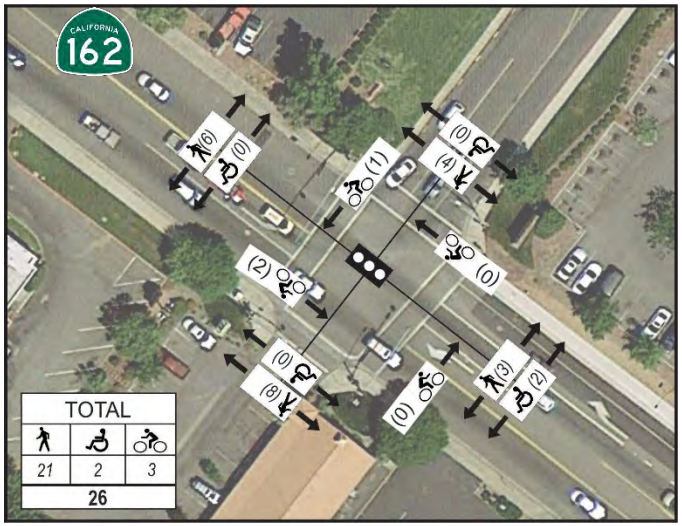


FIGURE 4-11. VOLUMES BY MOVEMENT AT SR 162 / MEDICAL CENTER DR.

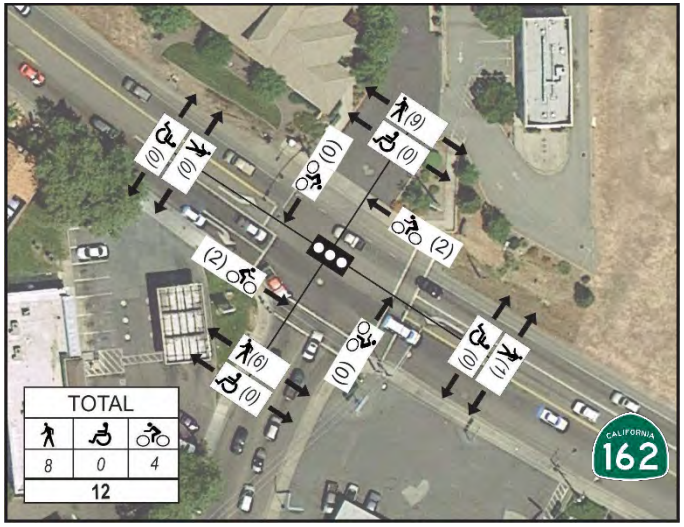


FIGURE 4-12. VOLUMES BY MOVEMENT AT SR 162 / LOWER WYANDOTTE RD.

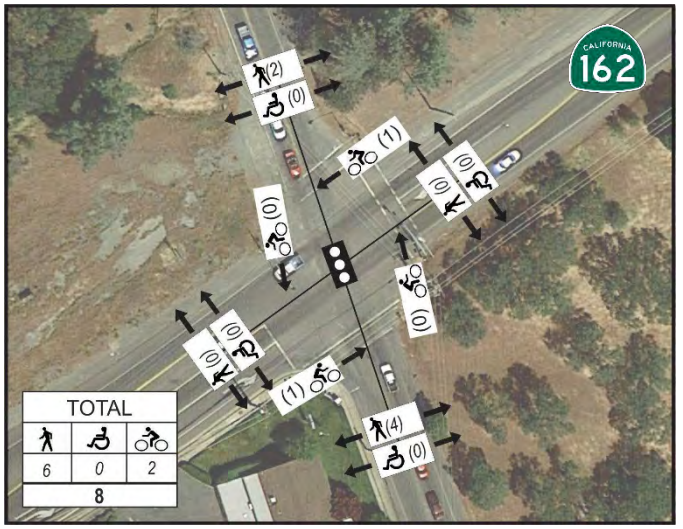


FIGURE 4-13. VOLUMES BY MOVEMENT AT SR 162 / FOOTHILL BLVD.

Pedestrians

The counts indicate higher pedestrian volumes along SR 162 between Lincoln Street and Oro Dam Boulevard/Olive Highway. Consistent with the overall trend, the SR 162/Myers Street intersection had the highest recorded pedestrian volume (see **Figure 4-8**). This intersection is near the Transit Center on Spencer Avenue. 22 of 59 total pedestrian movements during the peak hour were observed crossing SR 162 on the east leg. This crossing is the closest marked and signal controlled crossing to the Transit Center.

The second highest pedestrian volume location was found to be the Oro Dam Boulevard/Olive Highway intersection, with 38 total pedestrian movements. The highest frequency movement was crossing the intersection's south leg, between the Arco gas station and Walgreens (see **Figure 4-10**). *Note: This crossing conflicts with the eastbound right turn and northbound left turn, the highest vehicle movements.

A significant amount of pedestrian crossing activity was noted at Spencer Avenue (see **Figure 4-9**). The pedestrian crossing volume can be attributed to people walking to and from the Transit Center. There were ten pedestrians observed crossing SR 162 at this location. A total of 27 pedestrians were recorded at the intersection during the peak hour. This is a fairly significant number of crossings in the one hour for a location that does not currently have any crossing treatments. Pedestrians were observed having difficulty crossing SR 162 as gaps in traffic were not readily available to them.

There were 4 wheelchair users observed during the peak hour at all study intersections. The SR 162 / Myers Street and SR 162 / Medical Center Drive intersections were observed to have 2 wheelchair crossings each (see **Figure 4-11**).

Bicycles

The bicycle counts indicate fairly consistent usage throughout the corridor with no segment of SR 162 having significantly higher bicycle volumes. Of the counted cyclists, nearly 74 percent of them were observed traveling along SR 162. A substantial portion of the cyclists were observed riding on the sidewalks and against traffic, which is common on roadways without designated bicycle facilities. The riding of bicycles on sidewalks within the City of Oroville is unlawful according to the City of Oroville Municipal Code (Code 1954 § 5.9). These realities imply a need and demand for designated bike facilities on Oro-Dam Boulevard and Olive Highway.

Of the study intersections, both Oro Dam Boulevard/Olive Highway and SR 162/Spencer Avenue had the highest bicycle volumes with 5 total bicycle movements per intersection during the peak hour (see **Figure 4-8** and **Figure 4-9**.

Infrastructure Walking Audit Observations

The project team conducted a walking audit of the SR 162 corridor from the SR 70 interchange to the Foothill Boulevard intersection, focusing on the existing pedestrian and bicycle facilities. The corridor has a mix of sidewalk widths, ranging from 3 feet to greater than 6 feet. The audit concentrated on the characteristics of the existing facilities and the overall connectivity of the pedestrian and bicycle network throughout the corridor. Existing facilities and connectivity deficiencies are shown in **Figures 4-16** through **4-24.** Following are key findings:

- New development and redevelopment codes are doing a good job providing wide sidewalks along the frontage, as well as pedestrian access to the buildings.

FIGURE 4-14. EXAMPLE OF GOOD PEDESTRIAN FACILITIES

- Sidewalks are provided on one side or the other along most of the corridor. However, there are a few gaps in connectivity. The section of SR 162 west of Lincoln and east of Veatch, near the rail crossing, does not provide any pedestrian facilities on either side of the roadway. There is a very visible foot trail worn in by pedestrians walking along the side of the road through this section. The other section of SR 162 (Olive Highway) that does not have sidewalks on either side of the roadway is from east of Lower Wyandotte Road to west of Foothill Boulevard. This section feels somewhat rural in nature, however, a pedestrian connection should be provided to the commercial properties near Foothill Blvd where sidewalk exists. The section of SR 162 from 7th Avenue to Lincoln Street, for the most part, does not have sidewalk along the south side of the roadway. This limits pedestrian access and does not clearly define vehicular access points.
- Currently there is no crosswalk striping provided at minor side streets connecting to SR 162. Standard crosswalks are provided at most signalized intersections.
- There are currently no mid-block crosswalks in the study corridor. Intersections are spaced frequently enough to provide crossing locations for the majority of pedestrians desiring to cross SR 162.
- A considerable number of pedestrians were observed crossing SR 162 at the Spencer Avenue intersection. On multiple occasions, pedestrians were observed to be unable to cross at this location and continued to walk further down towards the

Myers intersection. Due to the crest vertical curve on SR 162 through this section, sight distance is limited and it may be difficult to see pedestrians trying to cross SR 162 on the east leg of the intersection.

FIGURE 4-15. PEDESTRIANS CROSSING EAST LEG AT SPENCER AVE.

- The majority of the signalized intersections do not meet the latest ADA accessible guidelines for pedestrian ramps and/or pedestrian push button type and/or location. While the majority of existing sidewalks provide more than 4 feet of clearance, there are several obstructions that reduce the clearance distance. These obstructions are illustrated in the following figures. The majority of obstructions are existing fire hydrants located in the sidewalk and signal equipment located on the corners of intersections.
- There are currently no bicycle facilities along the corridor. However, bicyclists were observed to ride in the striped shoulder of the roadway and along the sidewalk.

Pedestrian and Bicycle Collision History

Collision data obtained from the Transportation Injury Mapping System (TIMS) for the available previous three years (January 2011 to December 2013) was used to help identify any high crash locations and assist in determining if any trends are occurring.

Based on the data obtained, there were a total of four pedestrian and bicycle related crashes. One pedestrian injury crash occurred on eastbound SR 162, east of the 5th Avenue intersection, see **Figure 4-18**. Another pedestrian injury crash occurred on westbound Olive Highway, east of the Foothill Boulevard intersection, see **Figure 4-24**. The other two recorded collisions were bicycle related, one being an injury collision and the other being a fatality, see **Figures 4-20** and **4-21**. The fatal bicycle crash occurred at the intersection of SR 162 / Lincoln Street.

There were very few pedestrian and/or bicycle related collisions recorded during this time period and there are no apparent collision trends.

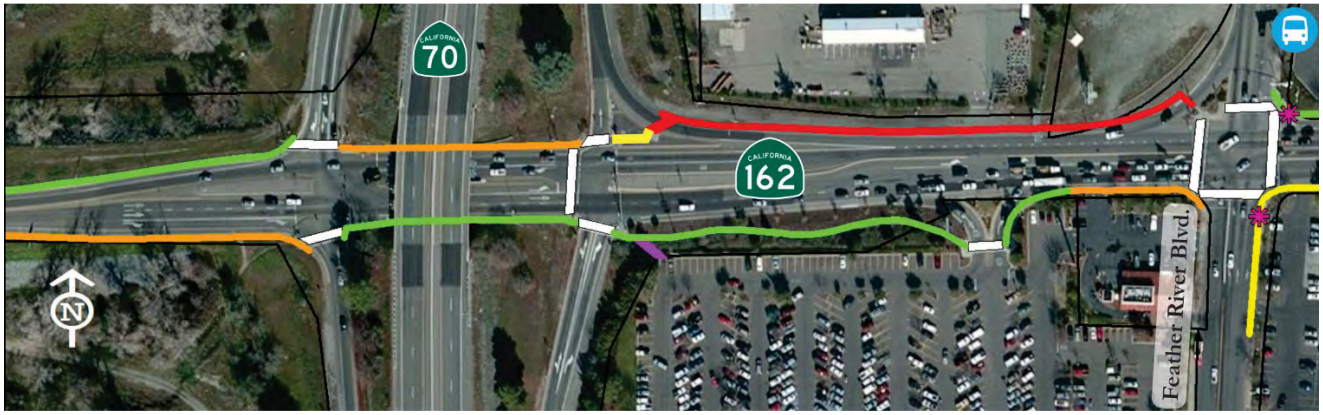


FIGURE 4-16. EXISTING BIKE/PED FEATURES SB RAMPS AT FEATHER RIVER BLVD.

FIGURE 4-17. EXISTING BIKE/PED FEATURES FEATHER RIVER BLVD. TO 7TH AVE.

FIGURE 4-18. EXISTING BIKE/PED FEATURES 5TH AVE. TO VEATCH ST.

LEGEND

- No Sidewalk
- 4' Sidewalk
- 5' Sidewalk
- 6' Sidewalk
- >6' Sidewalk
- Pinch point <4' Clearance
- No Crosswalk
- Existing Crosswalk
- Pedestrian Connection
- TC - Transit Center
- Bus Stop
- -Bicycle Injury Crash
- Bicycle Fatality Crash
- Pedestrian Injury Crash
- Right-of-Way (Parcel Lines)

FIGURE 4-19. EXISTING BIKE/PED FEATURES VEATCH ST. TO RAILROAD CROSSING

FIGURE 4-20. EXISTING BIKE/PED FEATURES RAILROAD CROSSING TO LINCOLN ST.

FIGURE 4-21. EXISTING BIKE/PED FEATURES MYERS ST. TO SPENCER AVE.

Figure 4-21. Existing Bike/Ped Features Myers St. to Spencer Ave.

LEGEND

- No Sidewalk
- 4' Sidewalk
- 5' Sidewalk
- 6' Sidewalk
- >6' Sidewalk
- Pinch point <4' Clearance
- No Crosswalk
- Existing Crosswalk
- Pedestrian Connection
- Transit Center
- Bus Stop
- -Bicycle Injury Crash
- Bicycle Fatality Crash
- Pedestrian Injury Crash
- Right-of-Way (Parcel Lines)

FIGURE 4-22. EXISTING BIKE/PED FEATURES ORO-DAM BLVD. TO MEDICAL CENTER DR.

FIGURE 4-23. EXISTING BIKE/PED FEATURES MEDICAL CENTER DR. TO LOWER WYANDOTTE RD.

FIGURE 4-24. EXISTING BIKE/PED FEATURES LOWER WYANDOTTE RD. TO FOOTHILL BLVD.

4.2 Transit

Butte Regional Transit (B-Line) operates seven routes within the study area. Four of these travel along SR 162 and have stops at some point along the corridor. All routes stop at the Oroville Transit Center located on Spencer Avenue. The four main routes serving the corridor are Routes 20, 25, 26, and 30. **Table 1**, describes these routes.

Figures 4-26 through **4-29**, show the four individual route maps including boarding and alighting data by transit stop.

Route 20, providing service between Chico and Oroville, has the highest ridership by far with 660 total recorded boardings during the surveyed day.

The three other routes have relatively low ridership with 59 to 77 daily boardings recorded.

Table 4-1. B-Line Transit Routes Operating on the Corridor

Route Name	Major Stops/Timepoints	Service Span (Rounded)	Headway (Frequency)
20 Chico - Oroville	Chico Transit Center, Fir Street Park and Ride, Forest Avenue Transfer (WalMart & Bank), Butte County Administration and Oroville Transit Center (Mitchell & Spencer).	Mon-Fri 5:50am - 8pm Sat-Sun 7:50am - 6pm	Peak 60 min Mid-day 120 min Weekend 120 min
25 Oro Dam	Oroville Transit Center (Mitchell & Spencer) and Feather River Cinemas. Through-routed with Route 26.	Mon-Fri 6:10am - 6:50pm	60 min
26 Olive Hwy/Kelly Ridge	Oroville Transit Center (Mitchell & Spencer), D Street & Meyers, Gold Country Casino, Kelly Ridge & Royal Oaks, Oroville Hospital and Orange & Acacia. Through-routed with Route 25.	Mon-Fri 6:30am - 6:20pm	60 min
30 Oroville - Biggs	Oroville Transit Center (Mitchell & Spencer), Lincoln & Palermo (Palermo), Heritage Oaks Mall (Gridley) and 6th and B Streets in Biggs.	Mon-Fri 7:45am - 5pm Sat 8:45am - 5pm	Weekday 240 min Saturday 120 min

Source: Butte County Transit & Non-Motorized Plan

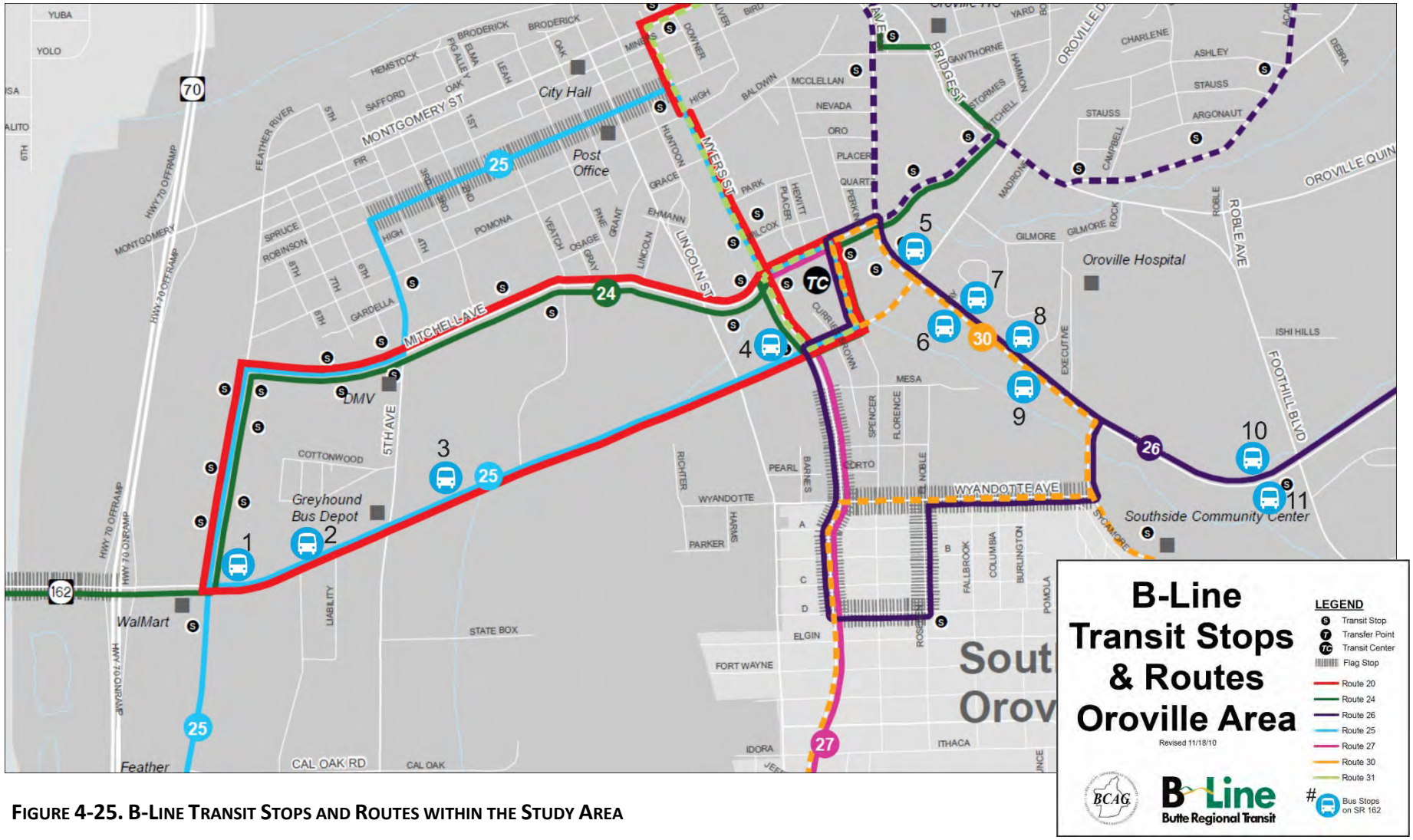


FIGURE 4-25. B-LINE TRANSIT STOPS AND ROUTES WITHIN THE STUDY AREA

Route 20

Route 20 provides intercity service between Chico and Oroville. Major stops and timepoints include Chico Transit Center, Fir Street Park-and-Ride, Forest Avenue Transfer, the Butte County Administration Complex, and Oroville Transit Center. Other destinations served include WalMart and the Butte College Chico campus, as well as the Community Employment Center in Oroville. Route 20 completes one round trip in approximately one hour and 50 minutes (110 minutes), with a layover at the Oroville Transit Center. Additionally, on weekdays, the first two runs and the last two runs of Route 20 serve the Oroville Park-and-Ride at 3rd & Grand.

On weekends, Route 20 covers a larger area in Oroville, looping clockwise on Oro Dam Boulevard, Feather River Boulevard, and Mitchell Avenue to serve WalMart and other destinations.

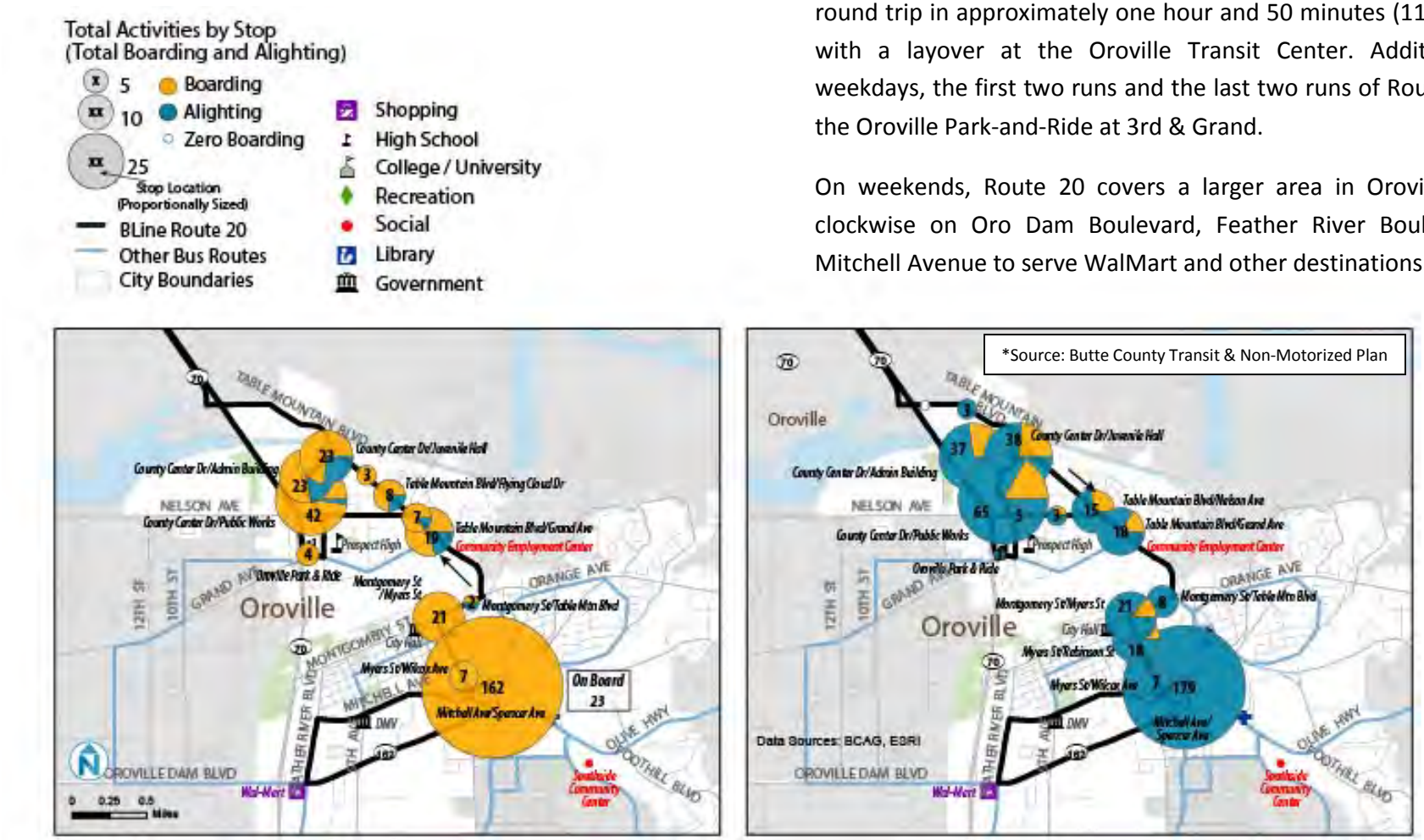


FIGURE 4-26. ROUTE 20

Route 25

Route 25 provides local service within Oroville, operating in a clockwise loop between the Oroville Transit Center, Feather River Cinemas, and downtown Oroville. Other destinations served by Route 25 include the Oroville DMV, Challenge Charter High School, and the Oroville Library.

The time to complete one loop is approximately 18 minutes. Like other Oroville routes, Route 25 includes a few sections of flag-stop operation, notably in downtown Oroville along Robinson Street. Route 25 is through-routed with Route 26.

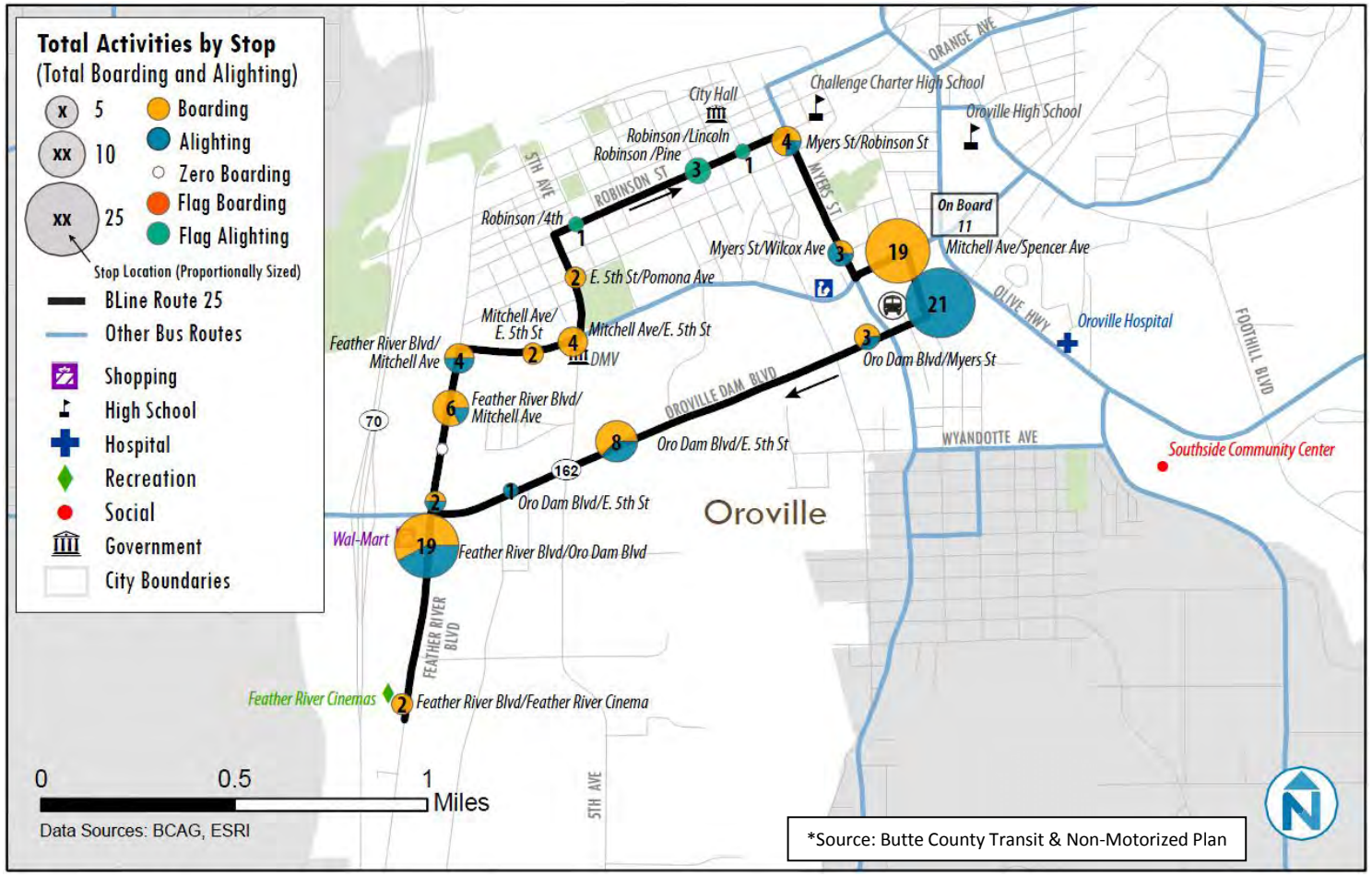


FIGURE 4-27. ROUTE 25

Route 26

Route 26 provides additional local service within Oroville and to neighborhoods and destinations to the northeast and east of the City. The route operates between the Oroville Transit Center and South Oroville to the Gold Country Casino on 60 minute headways, and serves on alternating 120 minute headways to Kelly Ridge (5 trips per day) and Orange & Acacia areas (6 trips per day).

These two sub-routes are designated Routes 26a and 26b. Major stops and timepoints on Route 26 are the Oroville Transit Center, D Street & Meyers, Gold County Casino, Kelly Ridge & Royal Oaks, Oroville Hospital, and Orange & Acacia. Other destinations adjacent to Route 26 include the Southside Community Center and Oroville Hospital. Total running time for Route 26 is between 28 and 34 minutes, depending on which alternate loop it is running. Route 26 is through-routed with Route 25.

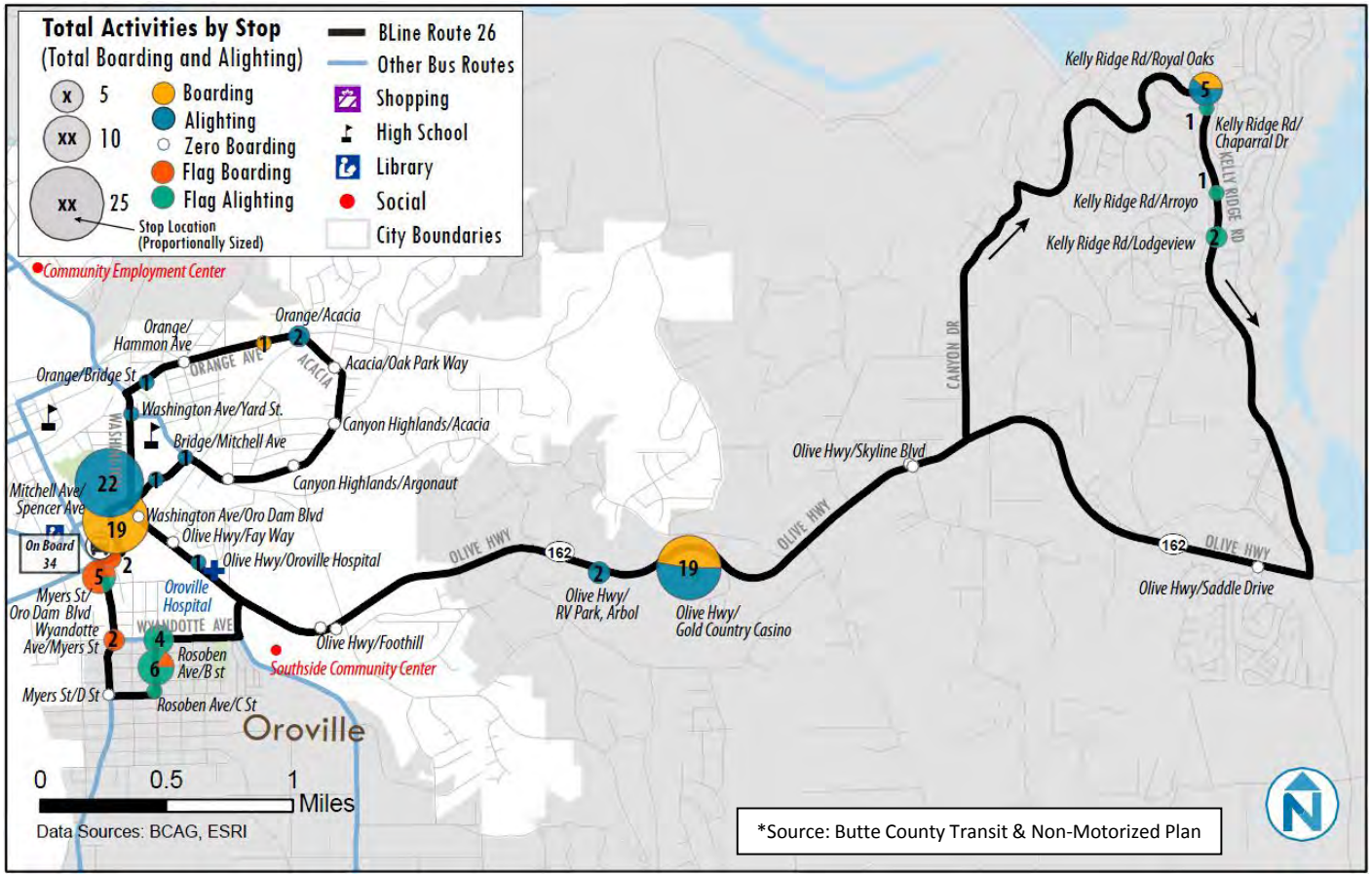


FIGURE 4-28. ROUTE 26

Route 30

Route 30 links Oroville and Biggs with intermediate stops in Palermo and Gridley. Major stops and timepoints include the Oroville Transit Center, Lincoln & Palermo in Palermo, Heritage Oaks Mall in Gridley, and 6th & B Streets in Biggs.

On weekdays, headways are approximately four hours, but on Saturdays buses operate on two-hour headways. Total round-trip travel time on Route 30 is approximately one hour and 40 minutes (100 minutes). The segment of the route on Lincoln Street between Ophir and Palermo Roads is designated for flag stops.

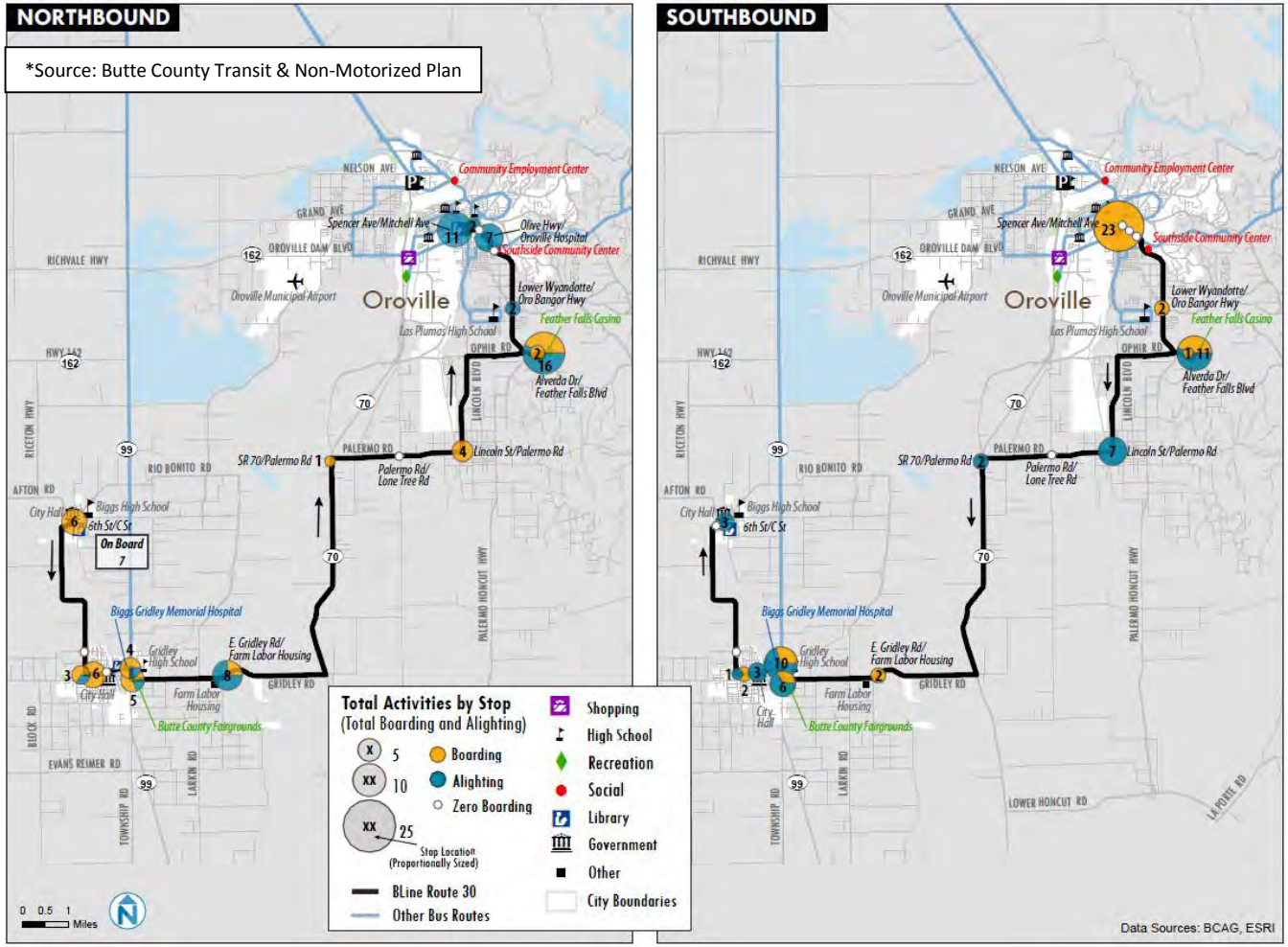


FIGURE 4-29. ROUTE 30

Transit Stops on the Corridor

Ten transit stops were verified in the field during the walking audit. The majority of the stops provide only a sign marking the stop location. **Figure 4-30** shows a typical transit stop along the corridor. All transit stops are located on sidewalks, however, none of the transit stops along the corridor provide a concrete pad meeting the minimum 5 feet by 8 feet landing suggested in the ADA guidelines. Stops 3 and 8, numbered in **Figure 4-25**, are the only two locations that provide a shelter and bench at the transit stop. Stop number 3 is the only location that provides a trash receptacle.

FIGURE 4-30. TYPICAL TRANSIT STOP ALONG THE CORRIDOR

FIGURE 4-31. TRANSIT SHELTER AT THE MEDICAL CENTER TRANSIT STOP

The Olive Highway section of SR 162 has wide paved shoulders, especially westbound, that allow buses to pull out of the travel lane when stopping at the transit stops. Buses stopping at transit stops along the Oro Dam Blvd section of SR 162 stop in the lane while passengers board and depart.

5 2035 CONDITIONS

This section of the report describes the future horizon year (2035) roadway network, projected traffic volumes, and anticipated traffic operations if no improvements were made. A 20-year horizon was chosen for future conditions analysis as this is the furthest horizon scenario in the BCAG travel demand model and projecting realistic turn movements at intersections would be difficult beyond this time frame.

5.1 Roadway Characteristics

Overall, SR 162 is anticipated to serve the same function in the roadway network (State Highway through the Oroville commercial core) and accommodate similar travel patterns as exist today through the 20-year horizon and beyond. As such, it is unlikely that the roadway's functional classification or applicable design criteria would change all that much.

Similarly, land use in the study area is expected to remain generally consistent with current land uses. Intensification and continued infill are anticipated, and desired by the City, particularly on and near the former Las Plumas Lumber site which has recently undergone environmental remediation through Federal grant programs.

It is the goal of this study to accommodate future traffic volumes associated with redevelopment and infill in the corridor, add multi-modal facility improvements that encourage walking and cycling, and create transit facilities that support well balanced new development projects.

5.2 2035 Traffic Volumes

With continued development and land use intensification, traffic volumes on SR 162 are anticipated to increase in the future. The current BCAG travel demand model, developed for the 2012 Regional Transportation Plan, was used to estimate future traffic volumes for the 2035 horizon year. The travel demand model is the only source for travel forecasts that can accurately predict significant shifts in traffic flow. Traffic Works staff worked interactively with BCAG and City of Oroville staff while developing the methodology of estimating 2035 volumes and obtained their approval on both the methodology and resulting traffic volumes. Year 2035 daily traffic volumes were developed using the following approach:

Step 1: Determine the existing (2013) average daily traffic volumes (ADT) from the Caltrans traffic count data base.

Step 2: Obtain BCAG travel demand model ADT outputs for the 2010 base year and future year (2035) scenarios.

Step 3: Using the BCAG travel demand model outputs, calculate the difference between the 2010 and 2035 daily traffic volumes.

Step 4: Determine the percent change, and percent per year change, over the 25-year model range, by roadway segment.

Step 5: Review the growth trends and make adjustments for general consistency throughout the corridor. It was assumed that declines in traffic volume are not appropriate for this planning effort, therefore any negative values were increased to a 0.0% per year growth rate.

Similarly, extraordinarily high growth rates on individual road segments were reduced to be consistent with adjacent road segments. The adjusted annual growth rates are shown on the "adjusted %/year" line of **Table 5-1**.

Step 6: Multiply the adjusted growth rate times 22 years to obtain the 22-year growth multiplier (2013 to 2035).

Step 7: Apply the 22-year multiplier to the existing (2013) daily traffic volumes to calculate the "2035 Design Volumes" shown in **Table 5-1**.

The traffic volumes along SR 162 are expected to increase by approximately 1.0 to 2.5 percent annually between 2010 and 2035. The growth rate is anticipated to be highest near SR 70 with a growth rate of 2.5 percent annually. The growth rate gradually decreases to 1.5 percent per year near Lincoln Street and to 1.0 percent per year on Olive Highway at the east end of the project.

2035 peak hour turning movement volumes were estimated by applying the 22-year growth factor, shown in **Table 5-1**, to existing turning movement counts (shown in **Figure 3-1** and **Figure 3-2**). The 2035 PM peak hour turning movement volumes are shown in **Figure 5-1** and **Figure 5-2**.

Location -->	W/O Ramps	E/O Ramps	E/O Feather River	W/O 5th	E/O 5th	W/O Lincoln	E/O Lincoln	E/O Myers	W/O Washington	E/O Washington	N/O Oro Dam	S/O Oro Dam	N/O Wyandotte	S/O Wyandotte	E/O Foothill
CALTRANS 2013 AADT	**13,200**	**30,000**	**28,500**			**28,500**	**30,500**	**31,000**				**29,000**		**20,900**	**12,400**
2010 (Demand Model)															
EB/SB	5297	9,797	8,751	8,777	10,281	10,970	9,644	9,423	9,699	3,729	3,344	10,686	10,089	9,699	9,840
WB/NB	5849	12,319	10,109	10,273	11,401	11,975	9,963	9,511	9,809	3,632	3,141	10,697	9,997	9,714	10,525
2010 BCAG Model Volumes	**11146**	**22,116**	**18,860**	**19,050**	**21,682**	**22,945**	**19,607**	**18,934**	**19,508**	**7,361**	**6,485**	**21,383**	**20,086**	**19,413**	**20,365**
2035 (Demand model)															
EB/SB	9345	16,866	13,362	13,860	15,299	15,640	12,796	12,870	13,110	5,502	3,921	13,368	12,661	12,055	12,478
WB/NB	9557	19,714	15,382	15,974	17,233	17,447	13,494	13,382	13,660	5,225	3,077	13,350	12,567	12,009	13,055
2035 BCAG Model Volumes	**18,902**	**36,580**	**28,744**	**29,834**	**32,532**	**33,087**	**26,290**	**26,252**	**26,770**	**10,727**	**6,998**	**26,718**	**25,228**	**24,064**	**25,533**
Growth Rates															
Model Difference 2010-2035	7,756	14,464	9,884	10,784	10,850	10,142	6,683	7,318	7,262	3,366	513	5,335	5,142	4,651	5,168
25 Years % Change	70%	65%	52%	57%	50%	44%	34%	39%	37%	46%	8%	25%	26%	24%	25%
% per year	2.8%	2.6%	2.1%	2.3%	2.0%	1.8%	1.4%	1.5%	1.5%	1.8%	0.3%	1.0%	1.0%	1.0%	1.0%
Adjusted %/year	**2.5%**	**2.5%**	**2.5%**	**2.5%**	**2.0%**	**2.0%**	**1.5%**	**1.5%**	**1.5%**	**1.5%**	**1.0%**	**1.0%**	**1.0%**	**1.0%**	**1.0%**
22 years growth factor	**1.55**	**1.55**	**1.55**	**1.55**	**1.44**	**1.44**	**1.33**	**1.33**	**1.33**	**1.33**	**1.22**	**1.22**	**1.22**	**1.22**	**1.22**
2035 Design Volumes	**20,500**	**46,500**	**44,200**			**41,100**	**40,600**	**41,300**				**35,400**		**25,500**	**15,200**

TABLE 5-1. ESTIMATION OF 2035 DAILY TRAFFIC VOLUMES

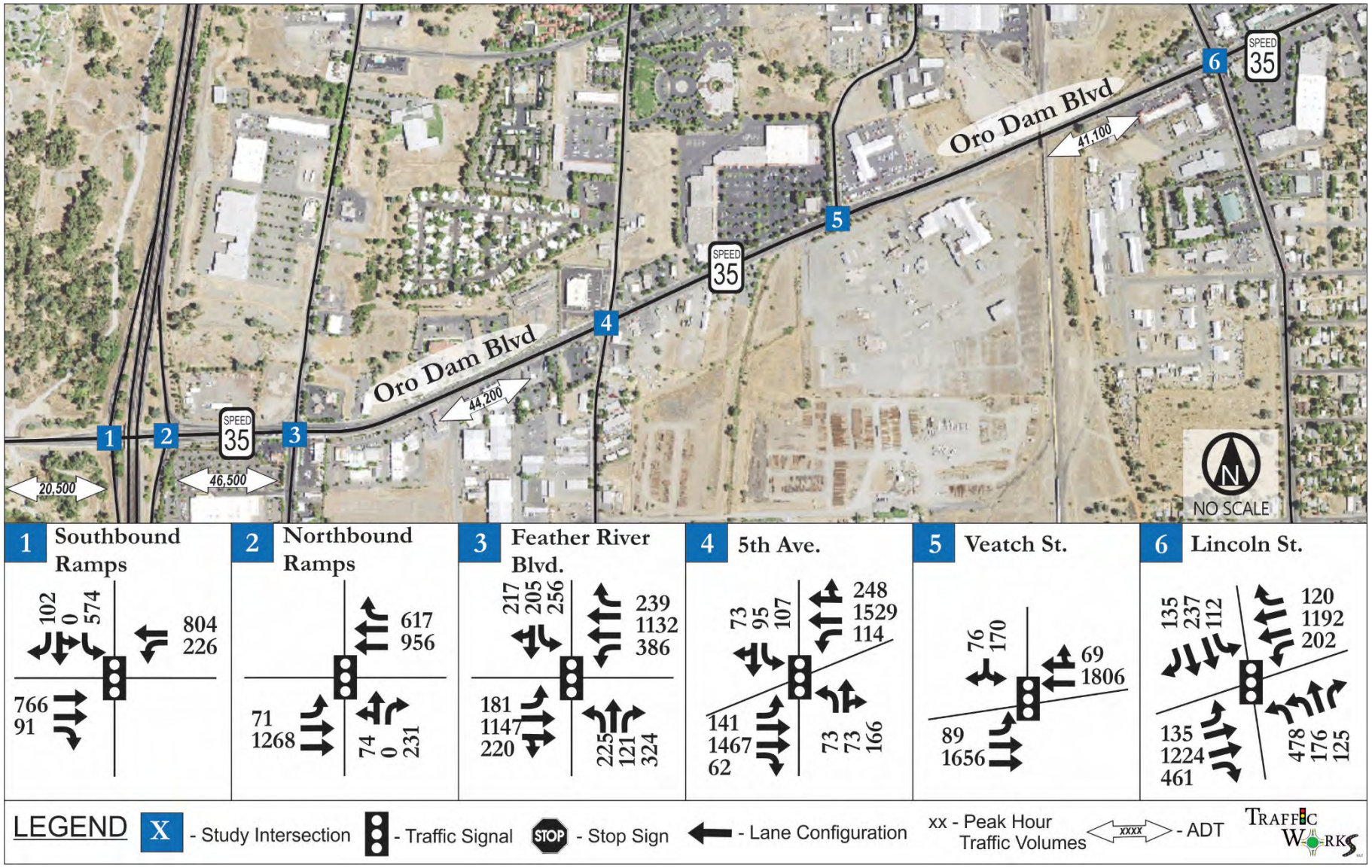


Figure 5-1. 2035 Peak Hour Turning Movements (Panel 1)

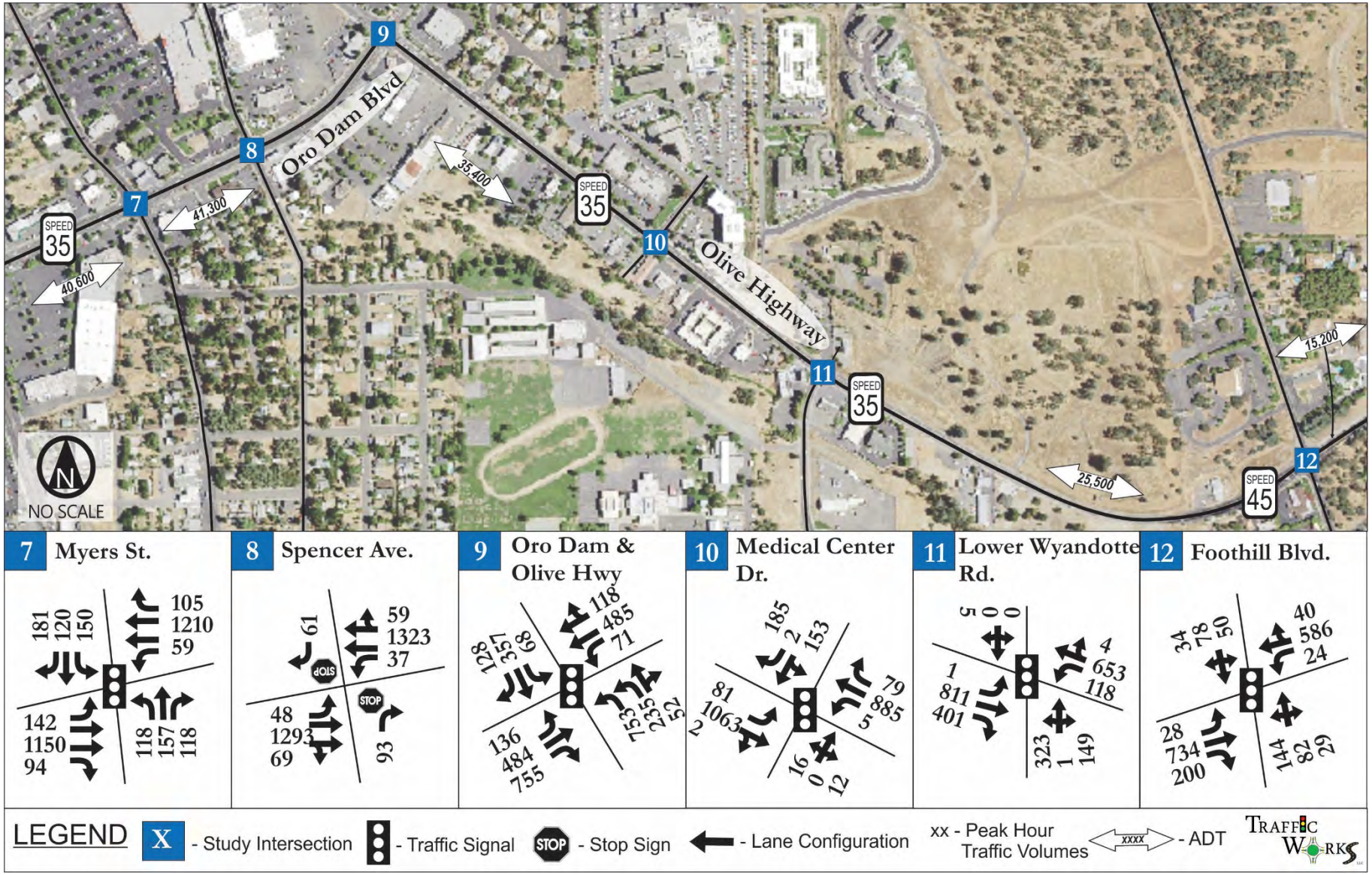


Figure 5-2. 2035 Peak Hour Turning Movements (Panel 2)

5.3 Year 2035 Traffic Operations

Roadway Level of Service

Roadway Level of Service was calculated by comparing the projected 2035 peak hour segment volumes to the thresholds shown in **Table 3-2**. The roadway LOS along various segments of SR 162 is shown in **Table 5-2**, assuming existing lane configurations.

Table 5-2. 2035 Roadway Segment Level of Service Summary

Segment	# Lanes	Existing Peak Hour	Existing LOS	2035 Peak Hour	2035 Baseline LOS
Oro Dam Blvd west of SR 70	2	1,138	D	1,763	E
Oro Dam Blvd b/w SR 70 and Feather River	4	2,014	D	3,121	D
Oro Dam Blvd b/w Feather River and Lincoln St	4	2,306	D	3,625	F
Oro Dam Blvd b/w Lincoln St and Olive Hwy	4	2,178	D	2,895	E
Olive Hwy	2	1,829	F	2,232	F

As shown in **Table 5-2**, by the year 2035, SR 162 between Feather River Boulevard and Lincoln Street is anticipated to degrade to LOS "F". Olive Highway is also anticipated to operate at LOS "F".

Intersection Level of Service

Accounting for land use development assumptions and traffic volume forecasts, the year 2035 peak hour traffic operations were analyzed in detail. The clearance intervals (Yellow and All Red) at signals were updated to meet the required outlined in NCHRP Report 731, *"Guidelines for Timing Yellow and All-Red Intervals at Signalized Intersections"*. Additionally, as a result of traffic volume growth, existing peak hour factors (PHF) below 0.92 were adjusted up to 0.92, or assumed to remain the same if currently above 0.92. The 2035 intersection Level of Service and delay results, with existing lane configurations, are presented in **Table 5-3**.

Table 5-3. 2035 Intersection Level of Service Summary

Intersection w/ SR162	Intersection Control	Existing		2035 Baseline	
		LOS	Delay (sec/veh)	LOS	Delay (sec/veh)
SB Ramps	Signal	B	16.7	D	43.9
NB Ramps	Signal	B	10.9	D	45.4
Feather River Blvd	Signal	C	34.5	F	>100
5th Ave	Signal	B	13.5	C	31.6
Veatch St	Signal	B	10.0	B	19.5
Lincoln St	Signal	C	27.7	D	51.6
Myers St	Signal	C	26.9	D	41.8
Spencer Ave	TWSC	B	14.3	C	19.2
Oro Dam Blvd/ Olive Hwy	Signal	D	41.4	E	67.2
Medical Center Dr	Signal	B	17.8	C	23.2
Lower Wyandotte Rd	Signal	C	28.8	D	44.3
Foothill Blvd	Signal	C	23.1	C	27.9

The 2035 peak hour LOS and delay at all the study intersections deteriorate compared to existing conditions. The only intersection that is shown to operate at unacceptable levels is the Oro-Dam Boulevard/Feather River Boulevard intersection which will operate at LOS "F" during 2035 peak hour.

Although most of the intersections are shown to operate at acceptable LOS standards, it should be noted that the side streets at most of the intersections along SR 162 will experience excessive delays and

queuing as the signal timings favor the through movements. It should also be noted that the queue lengths at most of the intersections exceed the existing storage space, especially for left-turn movements, resulting in the queues blocking other movements at the intersection.

Micro-Simulation

Although the intersections on Olive Highway would theoretically operate at acceptable LOS standards, the roadway segment analysis shows that Olive Highway will operate at deep LOS "F" conditions. Because of this discrepancy between the analysis methods, multi-run simulation analysis was also performed to evaluate delays and queue lengths on Olive Highway. The simulation analysis showed that the queue lengths at intersections on Olive Highway exceed the storage space and spill back into upstream intersections in both the eastbound and westbound directions. In addition, the side streets (Medical Center Drive, Lower Wyandotte Road, and Washington Avenue) also experience excessive delays and queuing. **Figure 5-3** show screenshots of the simulation illustrating excessive queuing on Olive Highway. **Table 5-4** provides delays based on the SimTraffic simulations and compares the 2035 and existing 95th percentile queue lengths on Olive Highway. The queue lengths on Olive Highway are anticipated to be significantly higher in the year 2035 compared to existing conditions. It should be noted that there would be significant queuing on the side street approaches. ***The conclusion is that the roadway segments and intersections on Olive Highway will function at unacceptable levels of delay and congestion unless improvements are made.***

Table 5-4. Delay & Queue Length Summary

Intersection w/ SR162	2035 Delay per Vehicle (sec)	Approach	Existing 95% Queue (ft)	2035 95% Queue (ft)
Oro Dam Blvd/Olive Hwy	74.1	Northbound	512	1,721
		Eastbound	531	829
Medical Center Dr	90.2	Eastbound	1,804	2,008
		Westbound	324	927
Lower Wyandotte Rd	71.2	Eastbound	1,059	1,076
		Westbound	307	825
Foothill Blvd	24.9	Eastbound	370	448
		Westbound	302	392

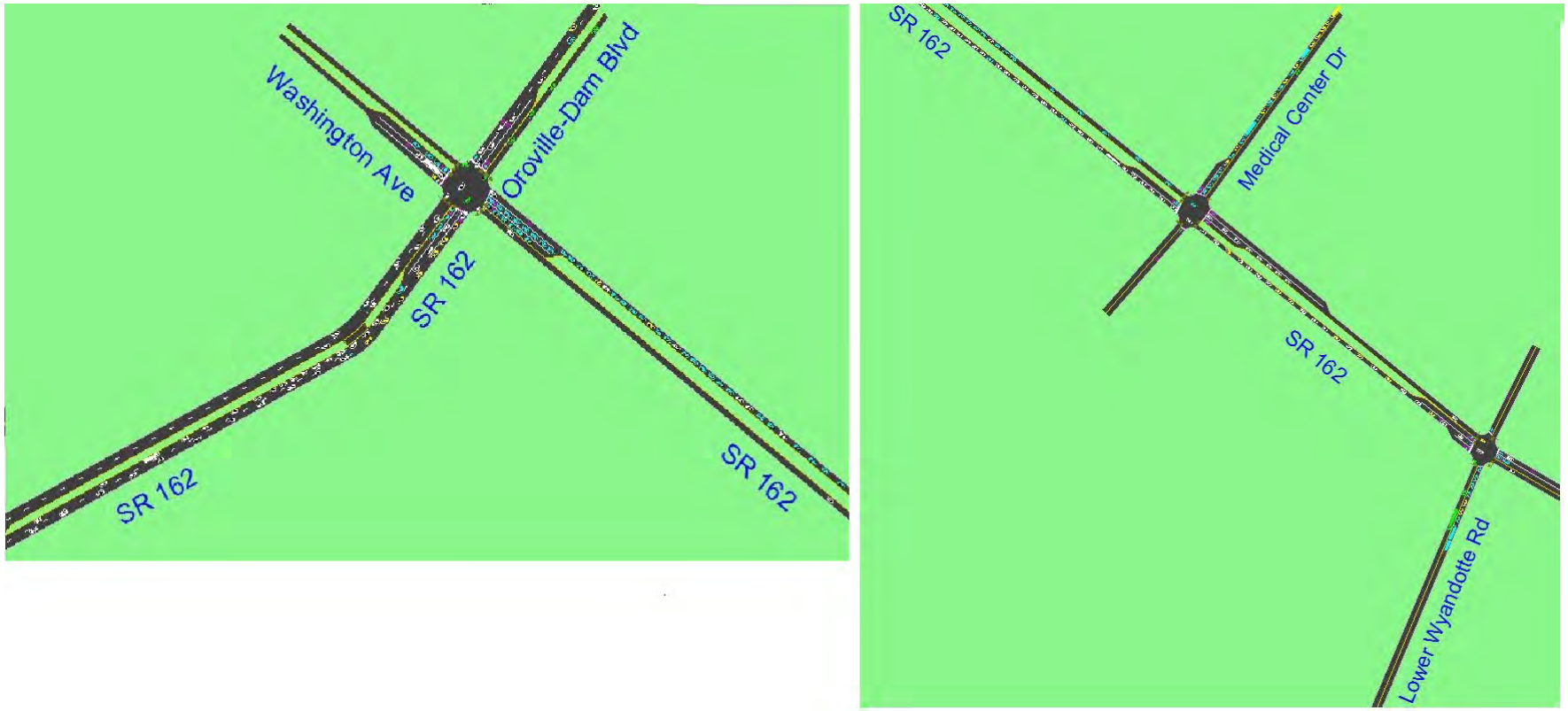


Figure 5-3. 2035 Peak Hour Simulation Screenshot

6 Alternatives Development (Traffic)

As discussed in Chapter 5, several roadway segments and intersections (primarily those on Olive Highway) will experience unacceptable Level of Service conditions coupled with excessive delays and queue lengths, both along SR 162 and on the side-street approaches. The 2035 traffic operations analysis clearly demonstrates a need for improvements on SR 162 in order to maintain policy LOS "E".

Through the public outreach activities and input received, it is evident that the community is significantly interested in managing traffic congestion. Seventy (70) percent of the survey respondents indicated a desire to "reduce traffic backups". Other comment themes included:

- Traffic backups on Olive Highway, especially in front of Oroville Hospital
- Traffic backups at intersection of Oro Dam Boulevard and Olive Highway
- Lack of enforcement in the area
- Vehicle speeds are too high / reduce speeding
- Improve driving safety, and
- Improve signal timing & coordination

The project team developed and evaluated multiple alternatives to manage traffic volume increases through 2035. Two distinct varieties of improvements were applied throughout the corridor to manage traffic growth and improve traffic flows and safety:

- **Operational Improvements**: Improvements such as signal timing optimization, signal coordination, access management, turn restrictions, etc., can be used to improve traffic flows first without the construction of additional travel lanes. These improvements could be immediately impactful corridor-wide, and are discussed in Chapter 9.

- **Capacity Addition**: Additional capacity could be created by constructing more through travel lanes and by adding and lengthening turn pockets at intersections. Capacity adding alternatives for the study corridor are divided into two segments based on location:
  - The "Oro-Dam Boulevard Segment" of SR 162, from SR 70 to Olive Highway
  - The "Olive Highway Segment" of SR 162, from Oro-Dam Boulevard to Foothill Boulevard

The goal is to use operational improvements to the extent possible and *then add capacity only where necessary* due to the high associated costs of roadway widening. Providing additional capacity in this manner would further improve upon any operational improvements only where peak-hour traffic flow and safety is still insufficient for current and future demand.

It should be noted that within the City of Oroville, roadway segment LOS is not calculated based on Average Daily Volumes (ADT). The roadway LOS thresholds are rather based on the peak hour segment volume. Hence, road segments slightly over capacity during the peak hour(s) would in many cases operate at acceptable LOS standards during non-peak hours. With this in mind, it is important to consider

both road segment LOS and intersection LOS when determining the most appropriate improvements. If intersections (which typically govern overall traffic operations) can be proven to function within acceptable levels, an adjacent theoretical segment failure may not be deemed a significant issue (segment widening may not be needed).

6.1 Capacity Improvements on Oro-Dam Boulevard

As discussed in Section 5.3, the 2035 road segment LOS analysis indicates that SR 162 between Feather River Boulevard and Lincoln Street is anticipated to operate at LOS "F". In addition, the Oro-Dam Boulevard/Feather River Boulevard intersection is also anticipated to operate at LOS "F" during the 2035 peak hour. Isolated capacity issues are anticipated at several of the other study intersections.

Two (2) capacity alternatives were developed to improve traffic operations throughout the Oro-Dam Boulevard Segment.

Alternative 1 – Intersection Improvements

The goal of this alternative is achieving LOS "E" or better operations, and managing vehicle queuing, without wholesale widening along the length of Oro-Dam Boulevard. This alternative consists of specific turn lane improvements at the intersections on Oro-Dam Boulevard that would fall below policy LOS or have major queuing issues. This alternative includes:

- Oro-Dam Boulevard/Feather River Boulevard (**Figure 6-1**)
  - Add a second westbound left-turn pocket
  - Add an eastbound right-turn pocket
  - Increase turn pocket lengths on the north and south approaches
- Oro-Dam Boulevard/5th Avenue
  - Increase the left-turn pocket lengths on the eastbound, westbound, and southbound legs
- Oro-Dam Boulevard/Lincoln Street
  - Increase the right-turn and left-turn pocket lengths on the westbound approach
  - Increase the left turn pocket lengths on the eastbound and northbound approaches
- Oro-Dam Boulevard/Myers Street
  - Increase the left-turn pocket lengths on northbound and southbound approaches

FIGURE 6-1. INTERSECTION IMPROVEMENTS AT FEATHER RIVER BLVD

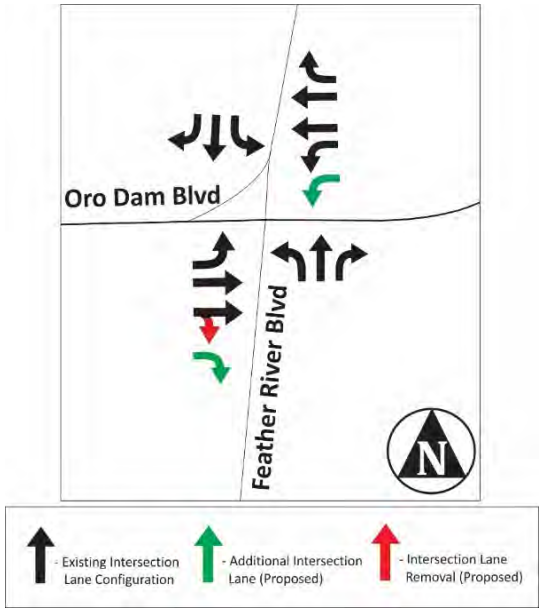


Figure 6-2 illustrates the needed Oro-Dam lane configurations.

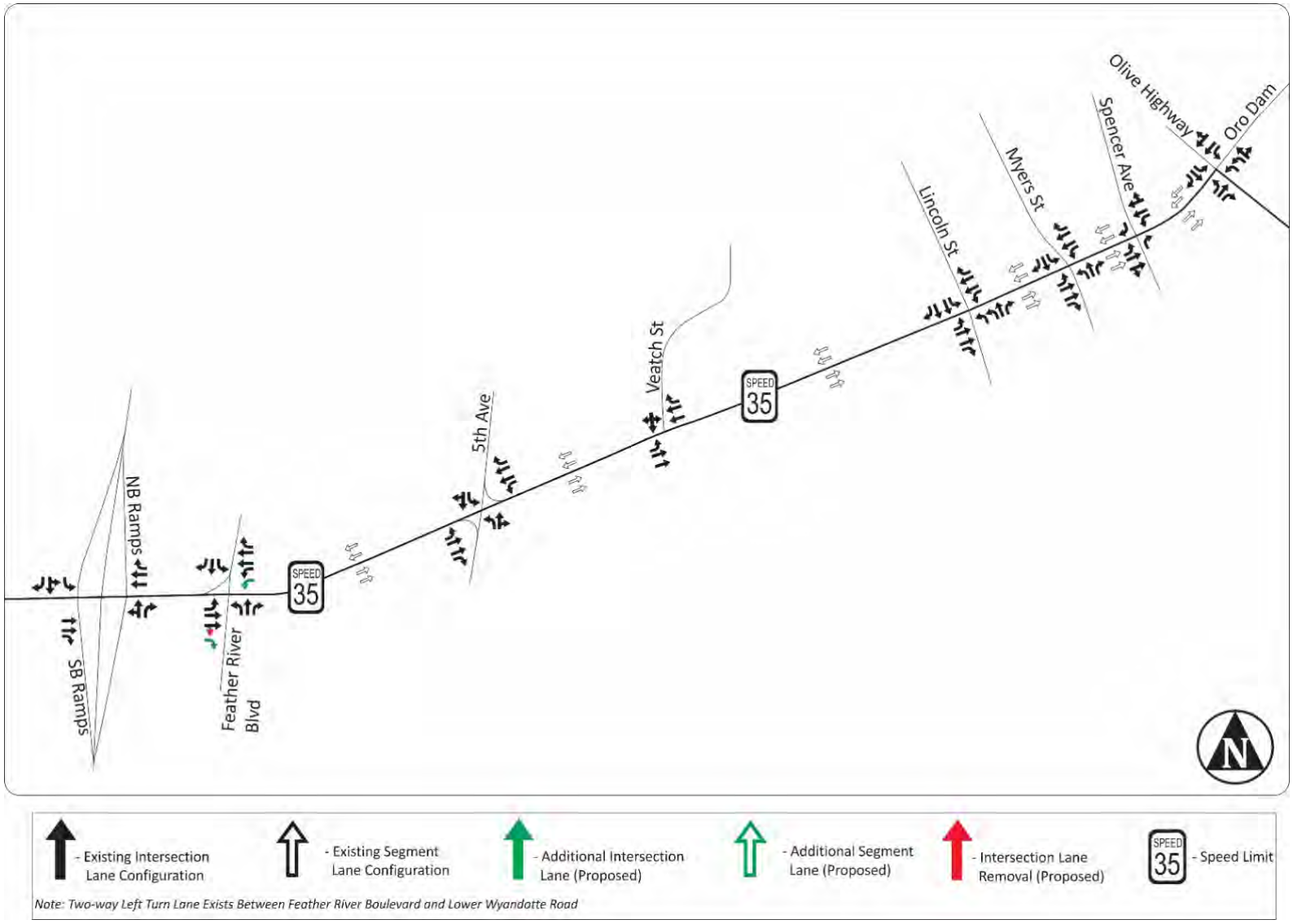


FIGURE 6-2. ORO DAM LANE CONFIGURATIONS (ALTERNATE 1)

With these improvements in place, all intersections would operate at acceptable levels of service as shown in **Table 6-1**.

Table 6-1. Oro-Dam Boulevard Alternative 1 Level of Service Summary

Intersection w/ SR162	Intersection Control	2035 Coordinated Signals	
		LOS	Delay (sec/veh)
SB Ramps	Signal	C	29.7
NB Ramps	Signal	B	16.5
Feather River Blvd	Signal	E	69.9
5th Ave	Signal	C	22.7
Veatch St	Signal	B	15.0
Lincoln St	Signal	E	57.1
Myers St	Signal	C	34.3
Spencer Ave	TWSC	C	19.2
Oro Dam Blvd/ Olive Hwy	Signal	E	59.8

It is important to note that, while the roadway segment between Feather River Boulevard and Lincoln Street would theoretically operate at LOS "F" based on peak-hour segment analysis, the intersections within that segment are shown to operate at LOS "E" or better. As intersection operations typically dictate overall conditions, a slight exceedance of the segment volume threshold is not considered a failure in meeting the policy level of service in this case.

Alternative 2 – Six Lanes (Feather River to Lincoln)

This alternative consists of mainline widening of Oro-Dam Boulevard to provide additional capacity and meet policy LOS on all roadway segments and at the intersections. This alternative consists of:

- Provide three (3) through lanes in each direction between Feather River Boulevard and Lincoln Street
- The third eastbound through lane would become a right-turn drop lane to Lincoln Street
- The third westbound through lane can be converted into a right-turn drop lane to Feather River Boulevard or it could be carried past the Feather River Boulevard intersection up to the SR 70 northbound on-ramp
- All the intersection specific improvements specified in Alternative 1 above are also included in this alternative.

With these improvements in place, all intersections would operate at acceptable levels of service as shown in **Table 5-2**. Additionally, the Feather River Boulevard to Lincoln Street segment would operate at better levels of service with six lanes instead of four. With the existing four through lanes in this segment, the roadway would be at or near capacity in 2035.

However, widening to provide six through travel lanes has some significant consequences when considering walking, cycling, and the resulting street environment, not to mention the tremendous construction costs and right-of-way needs.

Table 6-2. Oro-Dam Boulevard Alternative 2 Level of Service Summary

Intersection w/ SR162	Intersection Control	2035 6-Lanes	
		LOS	Delay (sec/veh)
SB Ramps	Signal	C	29.7
NB Ramps	Signal	B	16.5
Feather River Blvd	Signal	E	64.6
5th Ave	Signal	C	20.3
Veatch St	Signal	B	12.2
Lincoln St	Signal	E	57.1
Myers St	Signal	D	35.4
Spencer Ave	TWSC	C	19.2
Oro Dam Blvd/ Olive Hwy	Signal	E	60.0

Widening to six lanes does pose a significant risk of performing in such a way that is contrary to the goal of creating a more walkable, bicyclist-friendly, and transit-friendly corridor that reduces emphasis on automobile travel. Specifically, wider roadways have longer and more exposed crosswalks, often have higher resulting travel speeds, and de-emphasize pedestrian scale development. *Because of these counterproductive effects, as well as the lack of interest in acquiring significant amounts of adjacent property and relatively high costs for construction, this alternative was dismissed by the Stakeholder Advisory Committee.* Spot improvements at specific locations, as listed in Alternative 1, are shown to provide acceptable overall operations in the corridor and were deemed the more appropriate solution.

6.2 Capacity Improvements on Olive Highway

As discussed in Chapter 5, the entire Olive Highway segment is anticipated to operate at LOS "F" in the year 2035. In addition, the SimTraffic simulation showed excessive queuing on Olive Highway and the approaching side streets, resulting in queues spilling back into upstream intersections in both directions. Three (3) capacity-adding alternatives were developed and tested to improve traffic operations within the Olive Highway segment.

Alternative 1 – Four-Lanes with Roundabouts

This alternative includes increasing the number of through lanes on Olive Highway and changing the intersection control to roundabouts at Medical Center Drive and Lower Wyandotte Road as shown in **Figure 6-3**.

FIGURE 6-3. FOUR LANES WITH ROUNDABOUTS CONCEPT

The following roadway capacity improvements are proposed:

- Four Lanes (two travel lanes in each direction) on Olive Highway between Oro-Dam Boulevard and Foothill Boulevard

In addition to the road widening, certain intersection specific improvements would be needed, including:

- Olive Highway/Medical Center Drive - Change the intersection control to a roundabout. A two-lane roundabout would be needed to serve the travel demand and meet LOS standards. The roundabout would have two entry and two exit lanes on Olive Highway, and one entry and exit lane on the Medical Center Drive and the other minor leg. A preliminary configuration for the roundabout is shown in **Figure 6-4**.
- Olive Highway/Lower Wyandotte Road - Change the intersection control to a roundabout. A two-lane roundabout would be needed to meet the LOS standards. The second eastbound through lane on Olive Highway would become an eastbound right-turn drop lane at this location. A preliminary layout of the roundabout is shown in **Figure 6-5**. The roundabout would have:
  - Two entry lanes but one exit lane on the Olive Highway east leg
  - One entry lane, one right-turn drop lane, and two exit lanes in the Olive Highway west leg
  - One lane entry, one right-turn slip lane and one exit lane on south leg of Lower Wyandotte Road
  - One lane entry and one lane exit on the north leg

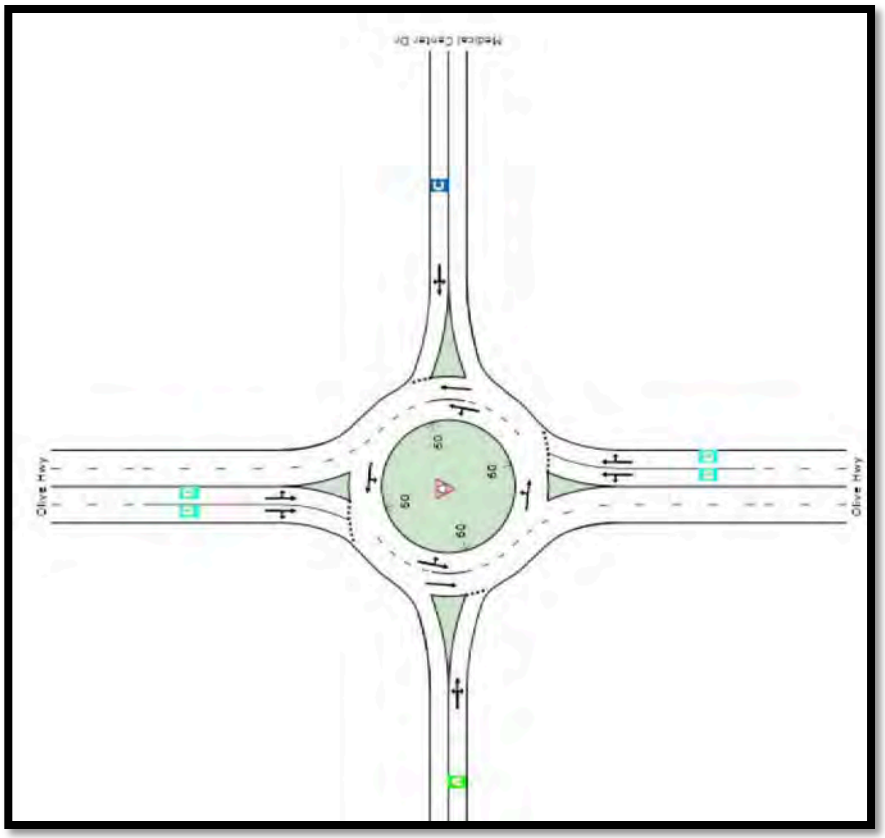


FIGURE 6-4. OLIVE HIGHWAY/MEDICAL CENTER DRIVE ROUNDABOUT

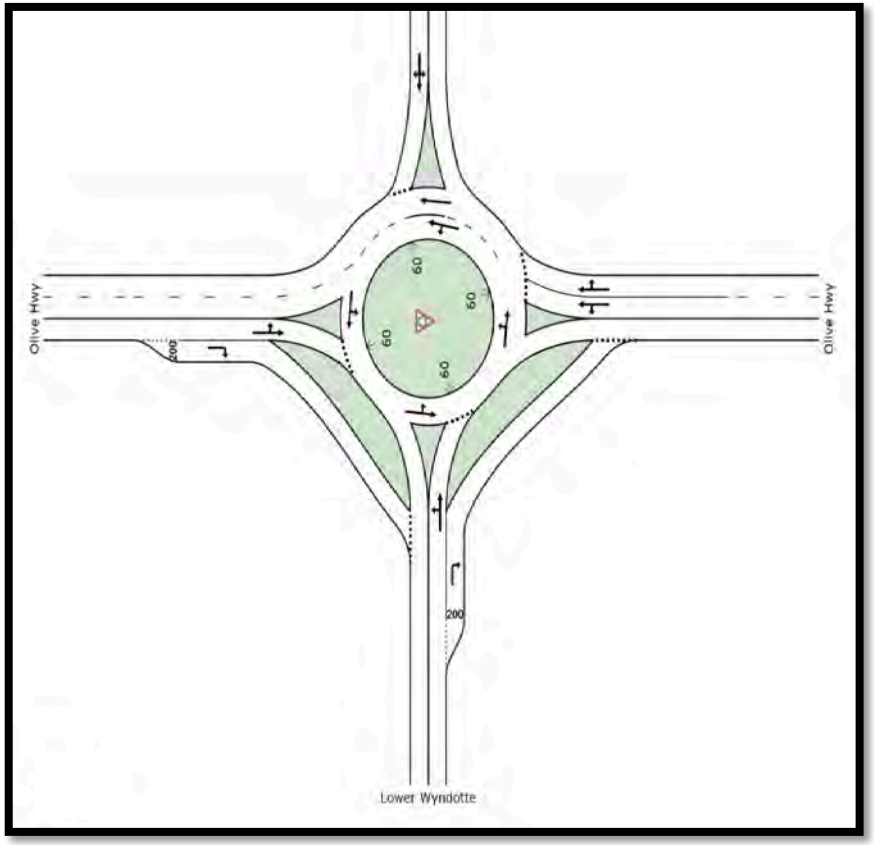


FIGURE 6-5. OLIVE HIGHWAY/LOWER WYANDOTTE ROAD ROUNDABOUT LAYOUT

With these improvements in place, the intersections and road segments on Olive Highway would operate at acceptable level of service conditions, as shown in **Table 6-3**.

Table 6-3. Olive Highway Alternative 1 Level of Service Summary

Intersection w/ SR162	2035	
	LOS	Delay (sec/veh)
Medical Center Drive	B	13.4
Lower Wyandotte Road	C	17.8
Foothill Boulevard	C	27.9

Implementing roundabouts would provide many advantages including increased safety, U-turn ability without additional delay, smooth traffic flow, relatively uninterrupted traffic flow for through vehicles, ability to enforce strict access management techniques, etc. However, *constructing multi-lane roundabouts would require considerable right-of-way acquisition surrounding the intersections. The amount of new right-of-way that would be needed is significant enough the alternative was dismissed by the stakeholder advisory committee.*

Alternative 2 – Four-Lanes with Signals

This alternative includes increasing the number of through lanes on Olive Highway (from two to four, plus a center turn lane) and improving the existing signal controls. Added width would be provided to accommodate U-turns at the signalized intersections on Olive Highway in response to the numerous comments about difficulty accessing businesses throughout the corridor.

Similar to Alternative 1, the roadway capacity improvements are:

- Widen to four Lanes (two travel lanes in each direction, plus a center turn lane) on Olive Highway between Oro-Dam Boulevard and Foothill Boulevard
- Eastbound outside lane would become a right-turn drop lane at Foothill Boulevard

In addition to the road widening, the following intersection improvements are proposed:

- Provide adequate widths for U-Turn movements at both the Medical Center Drive and Lower Wyandotte Road intersections
- Increase the SR 162 eastbound and westbound left-turn pocket lengths at Medical Center Drive and Lower Wyandotte Road
- Increase the left-turn pocket length for the northbound left-turn movement (SR 162 westbound) at the Oro-Dam Boulevard/Olive Highway intersection
- Extend/construct a raised median on Olive Highway between Oro-Dam Boulevard and Fay Way

While the U-turn movements are important for easier and safer access, it should be noted that allowing U-turns will slow the left-turn movement, slightly increasing delay and requiring longer turn-pocket lengths.

Figure 6-6 illustrates the Olive Highway lane configurations. With these improvements in place, the Olive Highway signals and segments would operate at acceptable levels of service and with reasonable queue lengths, as shown in **Table 6-4**, through the year 2035.

Table 6-4. Olive Highway Alternative 2 Level of Service Summary

Intersection w/ SR162	2035	
	LOS	Delay (sec/veh)
Medical Center Drive	B	14.2
Lower Wyandotte Road	C	24.4
Foothill Boulevard	C	27.9

Alternative 2 offers the advantages of needing significantly less right-of-way at the intersections and the ability of phasing the improvements over time. The recommended widening could be completed by segment if needed (potentially delaying the Lower Wyandotte to Foothill segment) and interim measures as described in Alternative 3 could be utilized as opposed to the roundabout alternative which requires significant changes all at once.

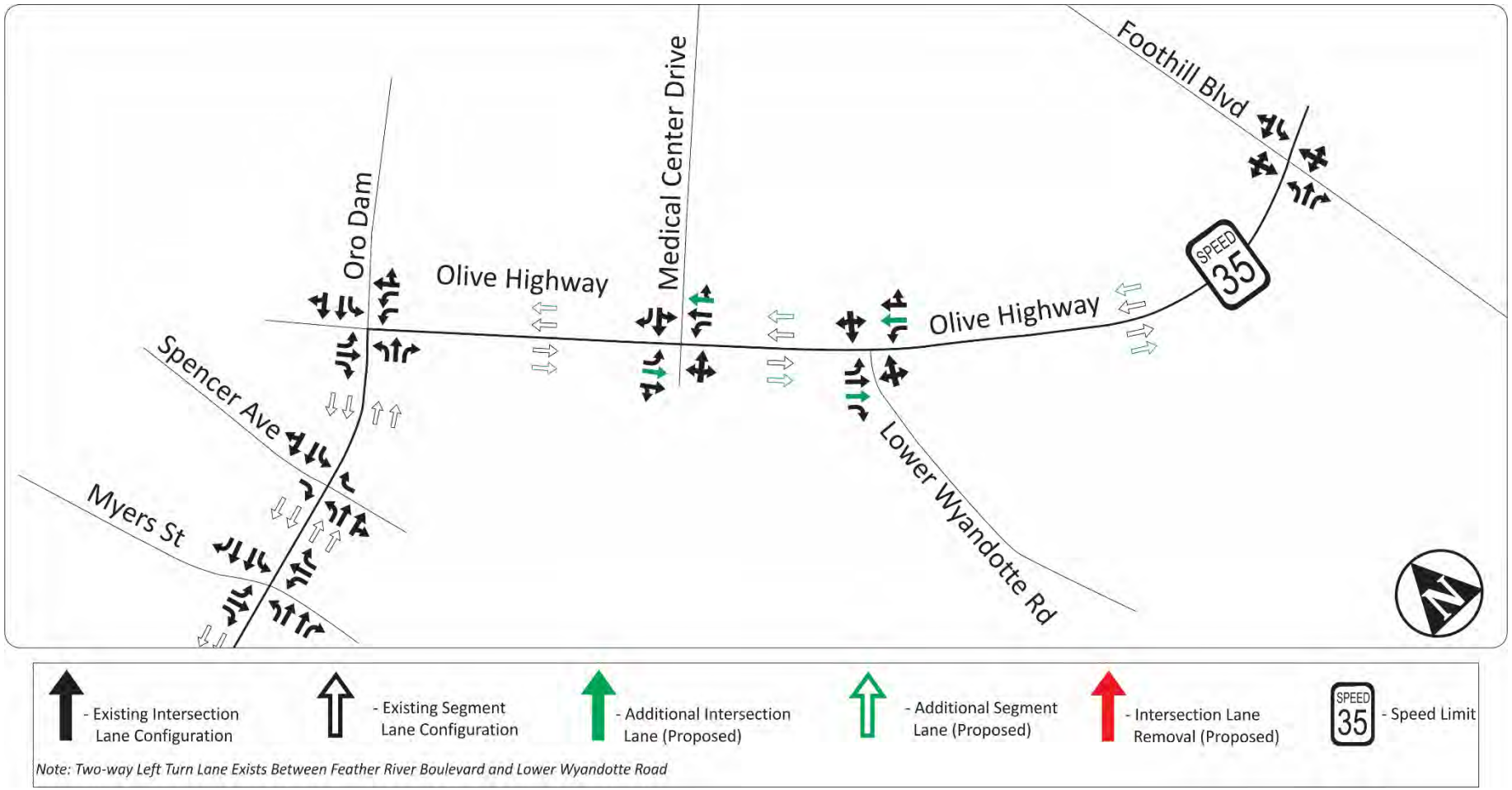


FIGURE 6-6. OLIVE HIGHWAY LANE CONFIGURATIONS (FOUR LANES WITH SIGNALS ALTERNATIVE)

Alternative 3 – Unbalanced Lanes with Signals

As an interim improvement alternative, the Olive Highway segment between Oro-Dam Blvd and Lower Wyandotte Road could be re-striped to have two eastbound lanes and one westbound lane. As the majority of the congestion, delay and queue spill back currently occurs in the eastbound direction, this interim measure could improve traffic operations on Olive Highway without the need to acquire any new right-of-way. There is sufficient width available between the existing curbs on Olive Highway to accommodate two eastbound through lanes, one westbound through lane, a center turn lane, and bicycle lanes as shown in **Figure 6-7**.

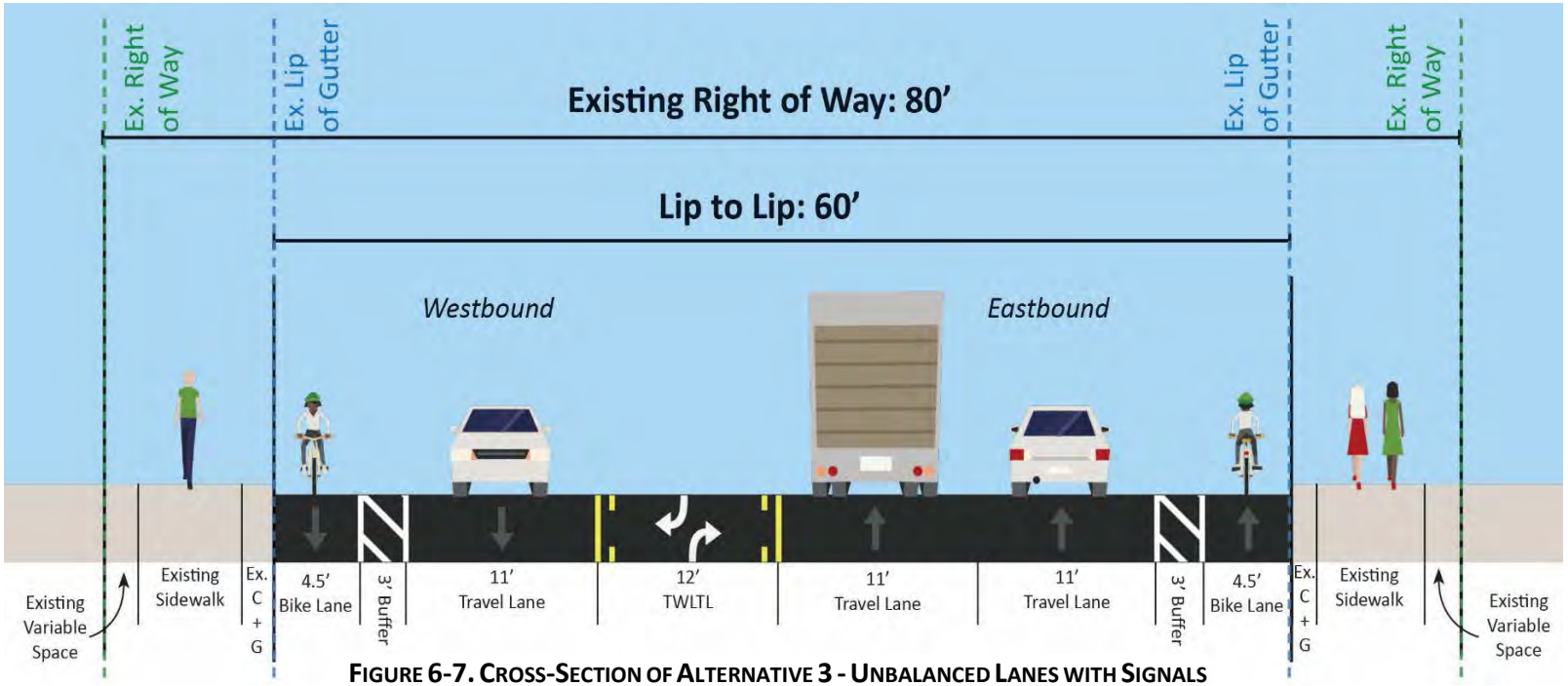


FIGURE 6-7. CROSS-SECTION OF ALTERNATIVE 3 - UNBALANCED LANES WITH SIGNALS

6.3 U-Turns at Signalized Intersections

Currently, U-turns are prohibited at all signalized intersections, which requires motorists to make long detours and additional turning movements. Numerous comments were received during the public engagement process regarding the difficulty of navigating the corridor due to the U-turn prohibitions. Providing U-turn opportunities would enable better circulation and the implementation of access management strategies such as installing raised medians and restricting turning movements from certain driveways.

We recommend allowing U-turns at signalized intersections which have lower left-turning volumes including, but not limited to, the following:

- Oro-Dam Boulevard/5th Street
- Oro-Dam Boulevard/Veatch Street
- Oro-Dam Boulevard/Myers Street
- Olive Highway/Medical Center Drive
- Olive Highway/Lower Wyandotte Road
- Olive Highway/ Foothill Boulevard

U-turns can be facilitated using any of the following three techniques:

- Left turning and U-turning vehicles share the same left-turn lane at the intersection.
- Left-turn lanes can be provided for U-turning vehicles in advance of signalized intersections. This avoids concentrating development-related turning traffic at the signal. Some alternate left-turn lane concepts are shown in **Figure 6-8**.
- Dual left-turn lanes can be provided at signalized intersections with the inner lane dedicated to U-turns. This alternative is less applicable to the subject corridor since U-turn volumes are expected to be low to moderate at most locations. It is recommended that dual left turn lanes are separated from thru travel lanes with striping, throughout the corridor. The separation has a significant crash reduction factor and will improve safety.

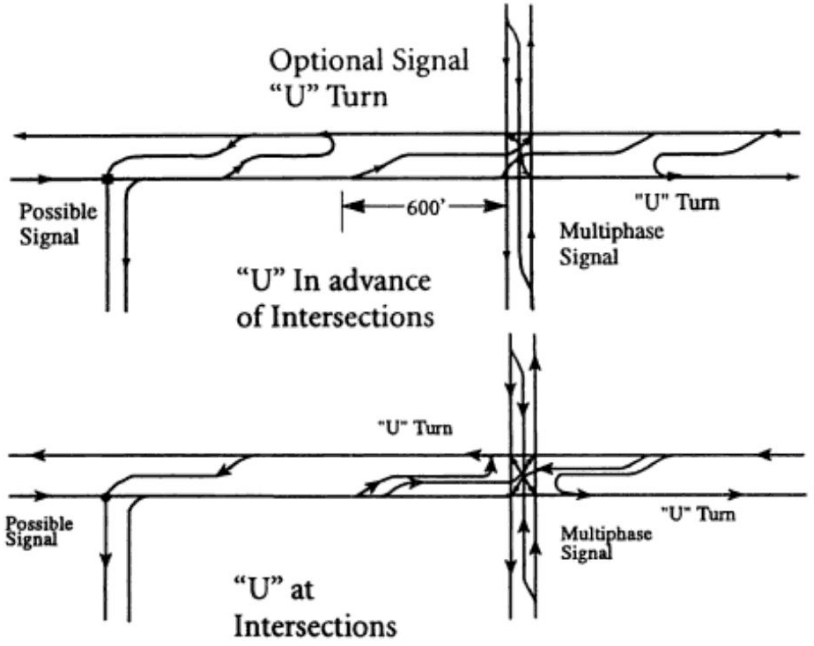


FIGURE 6-8. U-TURN CONCEPTS

In some cases, minor widening may be needed to provide adequate maneuvering space at the U-turn location. The geometry should be tested and confirmed or adjusted during future design phases.

7 Pedestrian & Bicycle Improvements

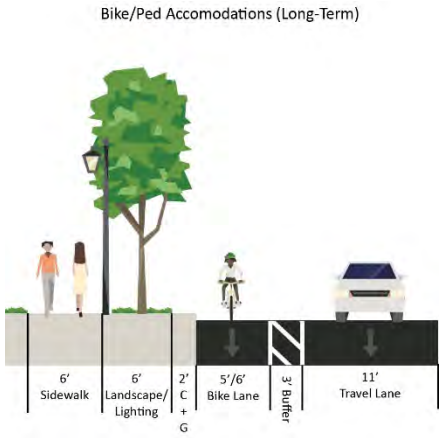
7.1 Improvement Goals

The primary improvement goals for bicycle and pedestrian accommodation in this SR 162 Corridor Plan include the following:

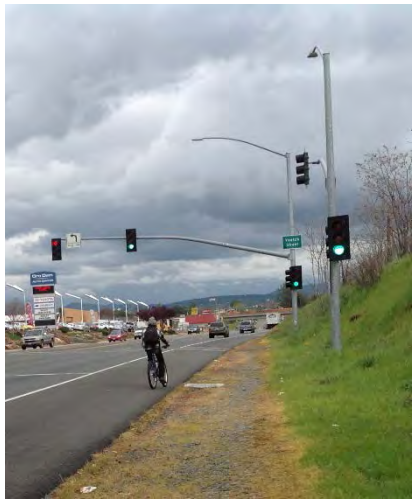
- Safety – Providing safe facilities for pedestrians and bicyclists along SR 162 is of the utmost importance. Input received so far highlights the need for a safer pedestrian and bicycling environment with the establishment of dedicated safe facilities for each mode along the entire length of the corridor, and by focusing on specific safety issues:
  - Adding crosswalks on side streets for pedestrian visibility
  - Adding intersection bike lane crossing treatments
  - Addressing midblock pedestrian crossings at Fay Way and Spencer Avenue
  - Addressing pedestrian crossings at the SR 162 / Spencer Avenue intersection

- Connectivity – gaps must be closed, including non-existent sidewalks. Improved connectivity also results from removing sidewalk obstructions and ensuring ADA compliance with barrier-free ramps, sidewalk angles, etc.

- Environment & Amenities – create a more welcoming pedestrian and bicycling environment through the addition of designated space and new facilities, as well as benches, shade trees, and pedestrian-scale lighting.



- Designated Bicycle Facilities – Providing designated bicycle facilities throughout the corridor was identified as a community need and has been a primary goal of this study. The addition of designated bicycle facilities will provide bicyclists a safe and comfortable space in which to travel.



7.2 Complete Street Principles

This plan incorporates the "Complete Streets" concept, which is that a street should be designed and operated to enable safe and comfortable access for all roadway users. In applying the principle to this study, *the overarching complete street recommendations are to install 6-foot-wide sidewalks and designate space in the right of way for bicycle facilities, for the length of the corridor*. These facilities are intended to be enhanced by various pedestrian and bicycle design alternatives, and recommendations are included in the following sections of this chapter.

7.3 Pedestrian & Bicycle Alternatives & Concepts

The public has expressed its desire to construct and improve pedestrian and bicycle facilities throughout the corridor. There are several options for providing high quality facilities. The following descriptions of potential solutions to present issues provide further detail these options.

Mid-Block Pedestrian Crossings

Marked crosswalks are not recommended on roadways of four lanes or more without additional treatments due to the number of lanes required for a pedestrian to cross and the increased potential for collisions; especially "double threat" collisions (**Figure 7-1**). The additional treatments that would be acceptable for pedestrian crossings on four lane roadways include traffic signals or pedestrian

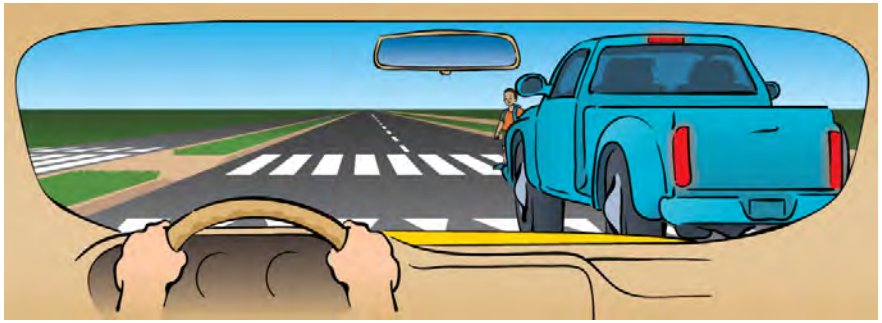


FIGURE 7-1. DOUBLE THREAT EXAMPLE

activated hybrid beacons. Both of these options were considered at two locations along the corridor. Incorporating pedestrian refuge islands with Pedestrian Activated Hybrid Beacons was also considered.

Pedestrian Activated Hybrid Beacons

Hybrid beacons are used to improve non-motorized crossings of major streets at either midblock or intersection locations. At locations where enhanced pedestrian crossing safety measures are warranted, pedestrian activated Hybrid Beacon systems are an option. **Figure 7-2** shows an illustration of a typical Pedestrian Hybrid Beacon.

A hybrid beacon consists of a signal head with two red lenses over a single yellow lens on the major street, and a pedestrian signal head and push button for the crosswalk. To promote consistency throughout the corridor all crosswalk warning systems should be pedestrian activated. This treatment is Caltrans Approved – 2014 CA MUTCD Chapter 4F. Pedestrian Hybrid Beacons.

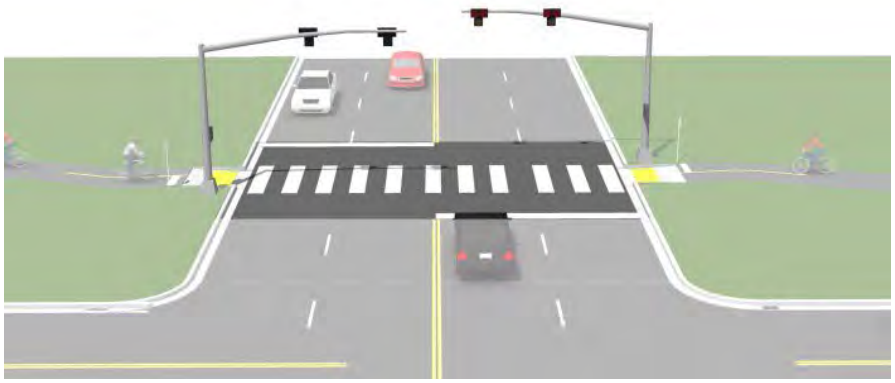


FIGURE 7-2. HYBRID BEACON SYSTEM

FIGURE 7-3. PEDESTRIAN REFUGE ISLAND

Pedestrian Refuge Islands

Pedestrian refuge islands provide a safe location for pedestrians to wait in the center of the roadway. This reduces the crossing distance, allows pedestrians to cross the roadway in two stages, and reduces the delay to vehicular traffic by dividing the pedestrian crossing times into two cycles.

Islands must meet accessibility guidelines, preferably by providing an at-grade passage through the island rather than ramps. This passage may be angled to position pedestrians so they face slightly towards oncoming traffic as they pass through the refuge. This treatment is Caltrans Approved – 2015 CA HDM 405.4 Traffic Islands. **Figure 7-3** shows an illustration of a typical Pedestrian Refuge Island (it is important to note that the Rectangular Rapid Flashing Beacon shown is not approved by Caltrans at this time).

Fay Way Alternatives

With the widening of Olive Highway from two lanes to four lanes the existing marked crosswalk at Fay Way will need to be modified to continue to allow safe crossing for pedestrians. In considering the most feasible way to accomplish this, three improvement alternatives were assessed.

Alternative 1 – Traffic Signal

A traffic signal at the Fay Way intersection would provide pedestrians with protected phases at which to cross Olive Highway safely. However, *installing a signal at Fay Way would create unacceptable traffic operations issues, including spill back into the Oro-Dam/Olive Highway intersection. It's also highly unlikely that this location would meet signal warrants with current or 2035 traffic volumes. This alternative was therefore dismissed.*

Alternative 2 – Pedestrian Activated Hybrid Beacon

The installation of a pedestrian activated hybrid beacon was considered but also dismissed due to the traffic operational issues it would cause at the Oro-Dam/Olive Highway intersection. These issues are similar to those that would be caused by a traffic signal. Additionally, a pedestrian refuge island cannot fit on either side of the intersection due to a high concentration of driveways on this portion of the roadway. Additionally, the crossing volumes are not expected to reach levels that warrant a pedestrian-activated hybrid beacon.

Alternative 3 – Removal of Fay Way Crosswalk

Providing an un-signalized crosswalk across four lanes of traffic increases the chances for pedestrian-involved vehicle collisions. Crosswalks across four lanes can result in an increase in "double threat" collisions which are caused when a vehicle in one lane blocks the pedestrian from the field of view of a driver in the other lane (**Figure 7-1**). The close proximity of the protected pedestrian crossing at the Olive Highway/Oro-Dam intersection provides a safer alternative for pedestrians to cross this portion of Olive Highway. It is recommended that *the crosswalk at Fay Way should be removed upon the addition of a fourth travel lane on Olive Highway.* The existing transit stop located near this crosswalk is addressed in Chapter 8.

Spencer Avenue Alternatives

During the public outreach meetings, multiple comments were concerning the safety and convenience of crossing Oro-Dam Boulevard at Spencer Avenue. There are no marked crossings at this location. Count data shows approximately 10 pedestrians crossing Oro-Dam Boulevard during the peak hour. Lack of a designated crossing, in combination with the limited sight distance for eastbound vehicles on Oro-Dam Boulevard, makes Spencer Avenue in its current condition an unsafe location for pedestrians to cross. Three improvement alternatives were considered at Spencer Avenue, as described below.

Alternative 1 – Traffic Signal

A traffic signal would provide protected pedestrian phases for controlled crossings at Spencer Avenue. However, it is highly unlikely that the traffic volumes at this location would meet signal warrants. The Spencer Avenue intersection does not meet the peak hour warrant even with 2035 traffic volumes. Spencer Avenue is less than 500 feet away from the Oro-Dam Boulevard/Myers Street intersection, and less than 700 feet away from Oro-Dam Boulevard/Olive Highway intersection. Introducing an interruption in traffic flow at such close distances, between two high-volume intersections, will create significant challenges to providing coordinated traffic operations and avoiding spill back into upstream intersections. *Considering that the existing and 2035 traffic volumes do not meet signal warrants, and the short distance between Spencer Avenue and two high-volume signalized intersections, this alternative was dismissed.*

Alternative 2 – Double Pedestrian Activated Hybrid Beacon & Z-Crosswalk

This alternative includes installing two pedestrian activated hybrid beacons at the Oro-Dam Boulevard/Spencer Avenue intersection, providing a pedestrian refuge island in the center of Oro-Dam Boulevard, and installing an angled crosswalk (Z-Crosswalk) from the north and south sides of Oro Dam to the pedestrian refuge island (**Figure 7-4**). Each hybrid beacon would affect only one direction of thru traffic on Oro Dam Boulevard, either eastbound or westbound, at

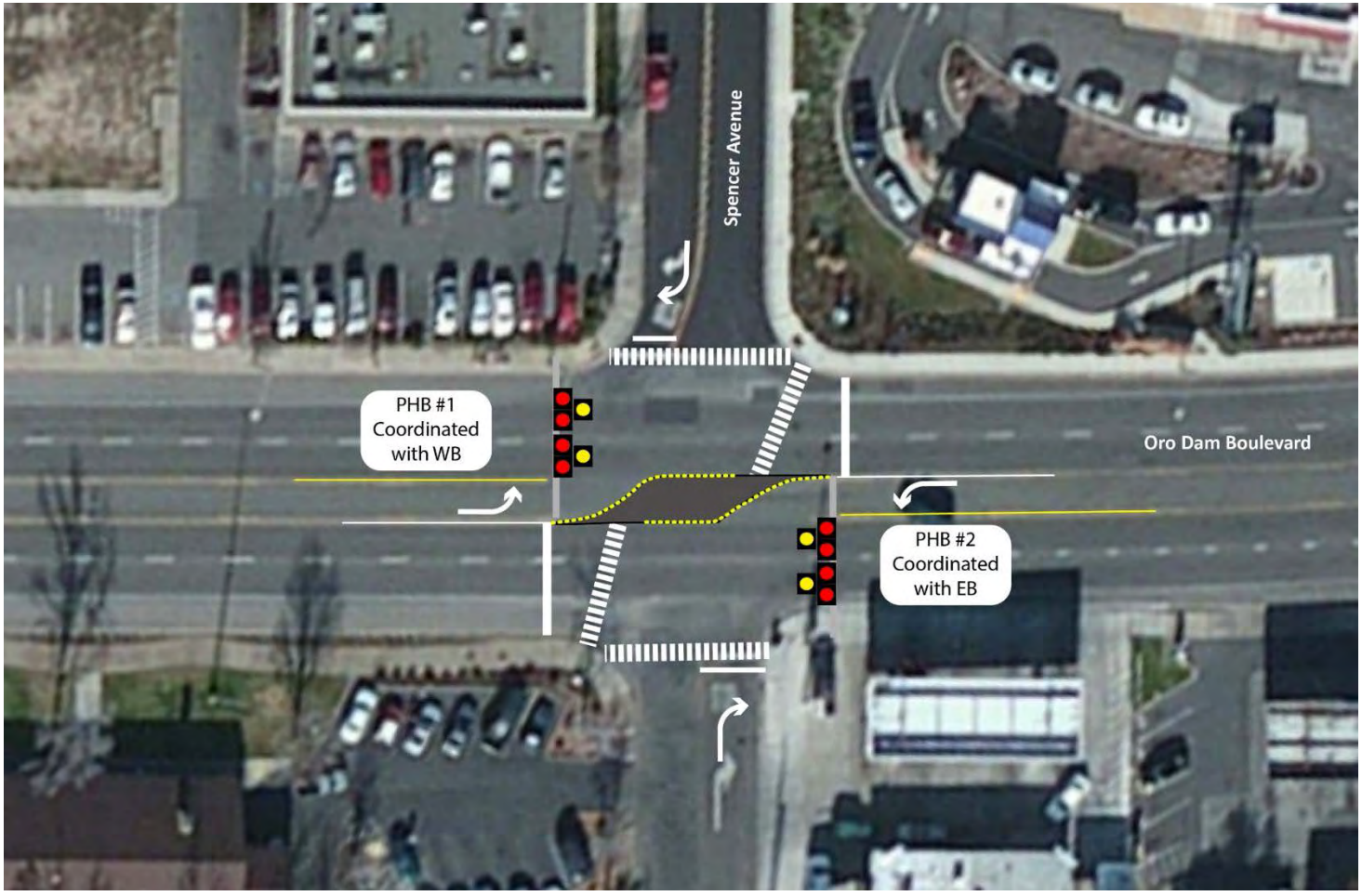


FIGURE 7-4. DOUBLE PEDESTRIAN HYBRID BEACON & Z-CROSSWALK INTERSECTION TREATMENT

a time. These hybrid beacons could be coordinated with upstream traffic signals in order to prevent excessive queuing in either direction. This treatment would also maintain space for left-turn movements onto Spencer Avenue from Oro Dam Boulevard; left-turns onto Oro Dam would continue to be prohibited. By placing the crosswalks on the near-side of the intersection, potential conflicts between pedestrians crossing Oro Dam and vehicles turning left onto Spencer Avenue or right out of Spencer Avenue are essentially eliminated.

Because this treatment would have a minimal effect on traffic operations, and provide pedestrians with a safer and easier way to cross Oro-Dam Boulevard, it is the preferred alternative.

Alternative 3 – Fencing for Pedestrian Safety

Spencer Avenue is closely spaced between Myers Street and Olive Highway, a fact which means any disruption to traffic flow causes queues to spill back into intersections. It should be noted that protected crossings are available at Myers Street and Olive Highway which are within 500 and 700 feet. A pedestrian fence in a raised median would deter pedestrians from crossing at the Spencer Avenue intersection and would instead encourage crossings at either of the two proximate signalized intersections. This option would not cause any interruption in traffic flow. However, a pedestrian fence at this location would need to extend from the Meyers intersection to the Oro-Dam/Olive Highway intersection. Installing a fence of this type would limit left-turns into and out of driveways along this stretch of road which could cause an impact to local businesses. Limiting left-turns in this way would force drivers to make a U-turn at the Oro-Dam/Olive Highway intersection. This addition of U-turns would hinder traffic operations at this high-volume intersection. *This alternative was dismissed due to its negative effects on traffic operations and business access.*

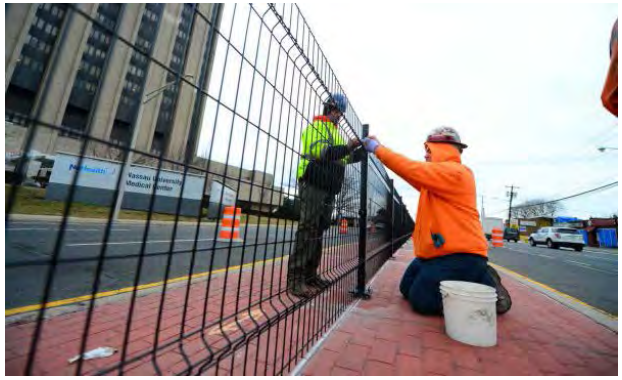


FIGURE 7-5. PEDESTRIAN FENCING EXAMPLE (NEW YORK)

Conclusion

It is recommended that the Double Pedestrian Activated Hybrid Beacon and Z-Crosswalk be installed at the Spencer Avenue intersection. This option would have minimal traffic impacts and would provide pedestrians with a safer and easier way to cross Oro Dam at this busy location. Future analysis of the crosswalk placement, Pedestrian Hybrid Beacon justification, and enhanced pedestrian treatment warrants should consider the latent or unserved pedestrian crossing demand and the significant current safety issues at this location. The current conditions are poor enough that pedestrians may wish to cross here but choose alternate routes or travel modes to avoid the situation. The actual demand is potentially greater than currently shown by the counted volumes.

Bicycle Alternatives

A variety of measures may be implemented to improve safety and comfort, and to reduce delay for bicyclists and autos at intersections.

Bicycle Signal Heads

A bicycle signal is a traffic control device that should be used in combination with an existing conventional traffic signal and are typically coordinated with corresponding thru phases. Bicycle signals are typically used to improve identified safety or operational problems involving bicycle facilities or to provide guidance for bicyclists at intersections where they may have different needs from other road users (e.g., bicycle only movements, leading bicycle intervals). Bicycle signal heads may be installed at signalized intersections to indicate bicycle signal phases and other bicycle-specific timing strategies. Bicycle signal heads are a potential enhancement to bicycle loop detection (required by California Vehicle Code Section 21450.5).

FIGURE 7-6. BICYCLE SIGNAL HEADS

Bicycle Intersection Crossing Treatments

Providing safe and comfortable ways for bicyclists to cross intersections is important to maintain an attractive and safe bicycling environment on the SR 162 corridor. Intersection crossing markings increase the visibility of bicyclists by indicating their intended path, and provide a clear boundary between that path for bicyclists and motor vehicles in the adjacent lane, as shown in **Figure 7-7**.

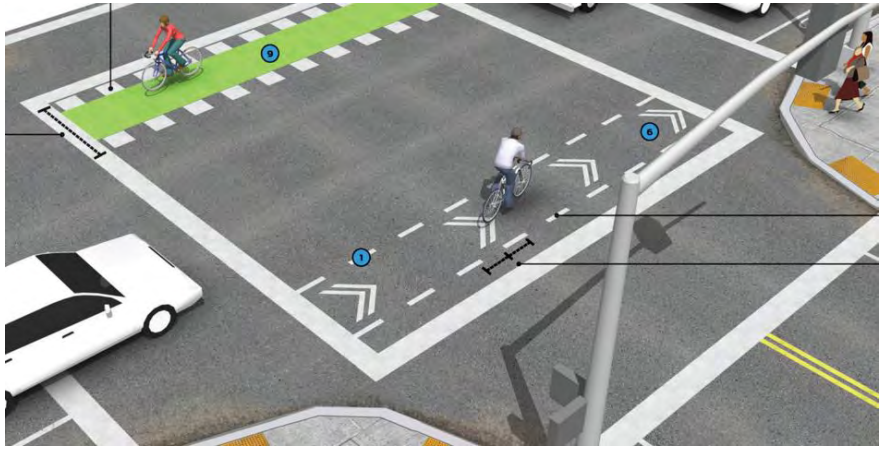


FIGURE 7-7. EXAMPLE OF BICYCLE INTERSECTION CROSSING TREATMENTS

Bicycle Turning Movements

Three alternatives have been identified to address bicycle turning movements at intersections, as well as bicycle conflicts with automobile turning movements at intersections. In evaluating these options, a preferred alternative (Two-Stage Turn Box) has been identified. The two additional alternatives are intended to represent an interim alternative and a long-term alternative to the Two-Stage Turn Box.

Two-Stage Turn Box

Two-Stage Turn Box treatment would be an ideal bike treatment at the Oro-Dam Boulevard/Olive Highway and Oro-Dam Boulevard/Feather River Boulevard intersections, which are multi-lane signalized intersections with heavy crossing vehicular traffic. This treatment is typically applied on multi-lane streets with high traffic speeds and/or volumes. Two-stage turn queue boxes offer bicyclists a safe way to make left turns at multi-lane signalized intersections from a right side cycle track or bike lane, or right turns from a left side cycle track or bike lane, by helping a bicyclist make an L-shaped turn by crossing one leg of the intersection at a time. Benefits of this treatment include:

- Improves bicyclist comfort
- Improves bicyclist ability to safely and comfortably make left turns
- Provides formal waiting area for bicyclists making left turns outside of the crosswalk
- Reduces turning conflicts between bicyclists and motor vehicles
- Separates turning bicyclists from through bicyclists

This treatment is not a Caltrans approved traffic control device, however the City of Oroville can apply to Caltrans for approval to experiment. Two-stage turn boxes are currently under experiment through the FHWA. An illustration is show in **Figure 7-8**. If Two-Stage Turn Boxes are not approved on this corridor, bike boxes or advance stop bars may be considered as alternatives.

FIGURE 7-8. TWO-STAGE TURN BOX

Bicycle Pockets

The bike lane approach to an intersection with right-turn lanes for automobiles can present a safety issue. Pavement markings and striping that warn roadway users of bicycle conflict points with automobile turning movements on intersection approaches help to avoid the most common incident of all, the "right hook". A bike lane between a thru lane and a dedicated right turn lane, called a "bike pocket," helps lead to more predictable bicyclist and motorist travel movements. An illustration of a bicycle pocket is shown in **Figure 7-9**. This treatment is Caltrans Approved – 2014 CA MUTCD Section 9.04.

FIGURE 7-9. BIKE POCKETS

Shared Bike Lane/Turn Lane

Most of the signalized intersections on Oro-Dam Boulevard have right turn lanes in both the eastbound and westbound directions. At these intersections, there is not enough space to maintain a standard width bike lane without widening the roadway. A shared or combined bike lane/turn lane can accommodate bicycles without widening the intersection, as shown in **Figure 7-10**. A shared bike lane/turn lane places a suggested bike lane within the inside portion of a dedicated right-turn lane. Shared lane markings or conventional bicycle stencils with a dashed line can delineate the space for bicyclists and motorists within the shared lane or indicate the intended path for through bicyclists. This treatment includes signage advising motorists and bicyclists of proper positioning within the lane.

FIGURE 7-10. SHARED BIKE LANE/TURN LANE

7.4 Pedestrian & Bicycle Recommendations

These recommendations for improving the pedestrian and bicycle mode apply to all alternatives, corridor-wide.

Sidewalk Gap Closure

Addressing pedestrian connectivity issues is a primary goal of the SR 162 Corridor Plan. In order to improve overall connectivity along the corridor it is vital to close existing gaps in the pedestrian network. This study recommends that 6-foot-wide sidewalks be constructed on both sides of the roadway along the entirety of the corridor, space permitting. The addition of 6-foot-wide sidewalks along the length of the corridor will close numerous existing sidewalk gaps and widen existing sidewalk from 4 feet to 6 feet, as shown in **Figure 7-11** (next page). Construction of new sidewalks is intended to be incorporated with new developments and future roadway projects as they occur along the SR 162 Corridor.

Network Connectivity

The connectivity of pedestrian and bicycle networks is a primary goal of this plan. By linking existing bicycle and pedestrian facilities together through the construction of new facilities, SR 162 will provide alternative mode connections between important activity centers and destinations within Oroville. This will provide better connectivity to key destinations like the Feather River (**Figure 7-11**) and will also create safer and more accommodating alternative mode connections along and across SR 162 for students attending Central Middle School and Wyandotte Elementary School.

Clear Travel Paths

Removing sidewalk obstructions along SR 162 is proposed in order to create better pedestrian connectivity and provide ADA compliance along the corridor. **Figure 7-11** shows the existing sidewalk obstructions that are recommended to be removed as part of the construction of new sidewalk and widening of existing sidewalks. In some cases, it may be more feasible to widen the sidewalk around an object than to remove the obstruction itself.

ADA Upgrades at Traffic Signals

It is recommended that all traffic signals along the corridor be upgraded to conform to current ADA requirements. A core principle of complete streets is ensuring that a street provides easy travel options for all roadway users. This is especially important for individuals with disabilities. Without sufficient upgrades to traffic signals and pedestrian facilities, travel along the SR 162 corridor will not be an option for many of these individuals.

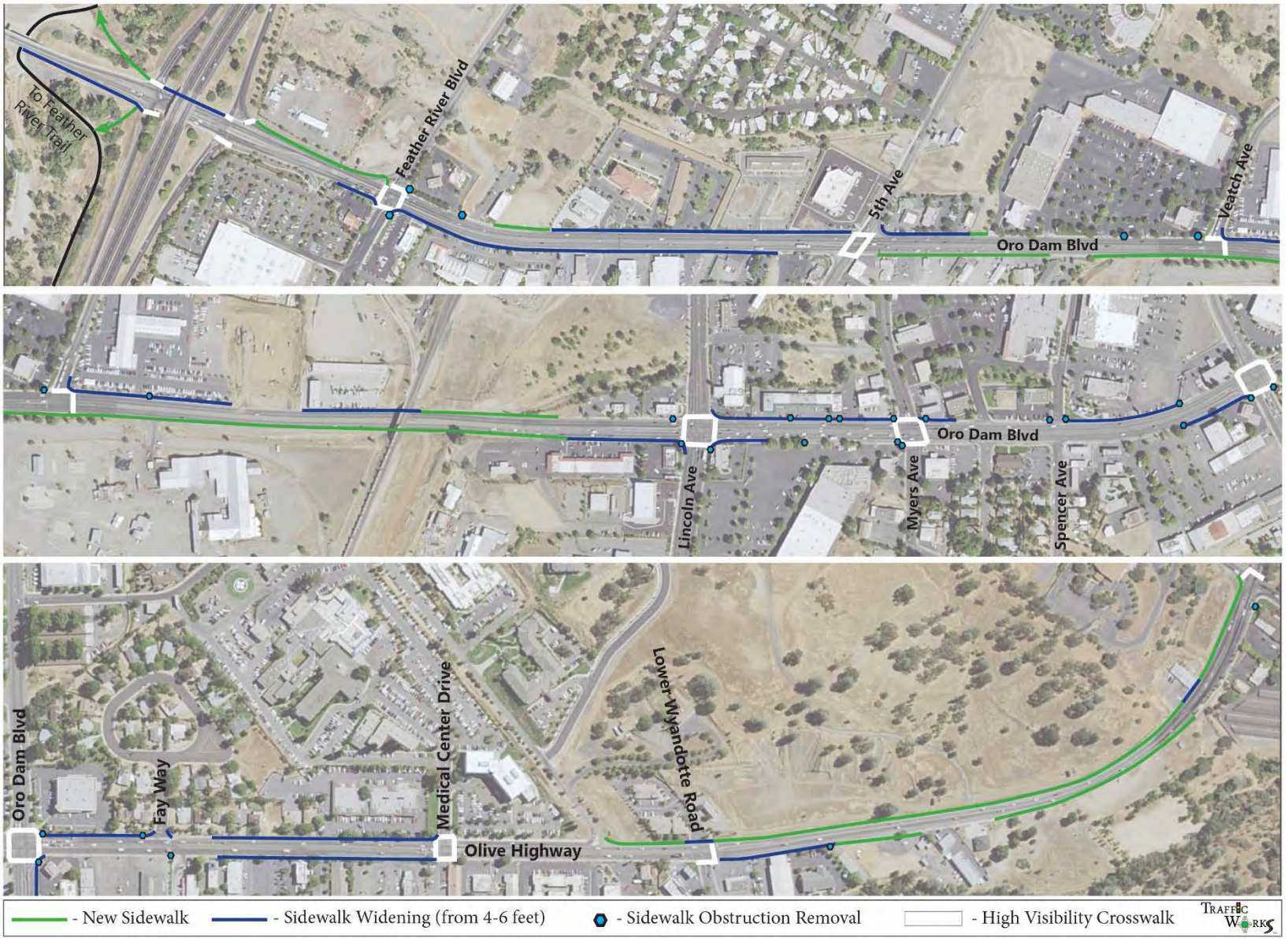


FIGURE 7-11. SIDEWALK GAP CLOSURES, SIDEWALK OBSTRUCTION REMOVALS & EXISTING CROSSWALKS

Crosswalks On Approaches

In order to improve pedestrian safety and address safety concerns from the public it is recommended that high visibility crosswalks be installed at all side street and signalized approaches along the corridor. Marked crosswalks guide pedestrians and alert drivers to a crossing location, so it is important that both drivers and pedestrians clearly see the crossings. There are a number of different marked crosswalk types, including the high visibility continental style as shown in **Figure 7-12**.

FIGURE 7-12. HIGH VISIBILITY CONTINENTAL STYLE CROSSWALK

These types of crosswalks are more visible to drivers and are generally recommended at locations with high pedestrian activity, where slower pedestrians are expected (such as near schools), and where high numbers of pedestrian related collisions have occurred. The minimum crosswalk width is six feet wide but should be wider at crossings with high numbers of pedestrians (10 foot widths are preferred). School-related crosswalks should be checked annually before the start of the school year. If necessary, fresh paint should be applied and other improvements made to keep the crosswalks in good condition. This treatment is Caltrans Approved – 2014 CA MUTCD Section 3B.18 Crosswalk Markings.

Safety Lighting at Marked Crosswalks

Safety lighting is recommended at all marked crosswalks in order to improve pedestrian safety through increased pedestrian visibility.

Pedestrian Scale Lighting

Providing pedestrian scale lighting will help make the corridor a more attractive place to walk at night and will improve the night-time safety perceptions of pedestrians as the entire sidewalk will be well lit. It is recommended that pedestrian scale lighting be installed along the full length of the corridor. An example is shown in **Figure 7-13.**

FIGURE 7-13. EXAMPLE OF PEDESTRIAN SCALE LIGHTING

Shade Trees

It is recommended that shade trees be installed along the length of the corridor where space permits. This feature will substantially improve the attractiveness of the pedestrian environment and will help to improve overall corridor aesthetics. Trees should be located so as not to block the visibility of advertising signs and store fronts. Shade trees and other landscaping options can be implemented using Xeriscaping techniques as shown in **Figures 7-14**.

FIGURE 7-14. EXAMPLES OF XERISCAPED LANDSCAPING

Transit Benches

In order to provide a more accommodating pedestrian and transit environment, it is recommended that benches and trash receptacles be provided at transit stops where space permits. The addition of benches will provide transit users and pedestrians in the corridor a place to wait for a bus or to just relax (**Figure 7-15**). The addition of trash receptacles will help to maintain a clean corridor.

FIGURE 7-15. EXAMPLE OF TRANSIT BENCHES

Bicycle Detection

It is recommended that bicycle detection be added to the existing traffic signals during ADA upgrades. This will make traffic signals more responsive to bicyclists needs and is required by California Vehicle Code Section 21450.5. Bicycle detection may be further enhanced with the installation of bicycle signal heads as described on page 7-6. The most appropriate bicycle detection technology will be identified during the design phase of the project.

Buffered Bike Lanes

Buffered bike lanes are recommended for the entire length of the corridor. The ideal layouts for these bike lanes are shown in **Figures 7-16** and **7-17**. These facilities will accomplish two primary project goals of improving bicycling safety and providing designated bicycle facilities. *Providing a 6-foot-wide bike lane with a 3-foot wide, striped buffer in each travel direction will create a safe and comfortable facility for bicyclists on Olive Highway. This configuration of bicycle lane and buffer is recommended as the best accommodation for bicyclists. However, a variation on this configuration may be necessary due to project constraints including funding and right-of-way acquisition*. Interim bicycle facility alternatives are elaborated on in **Figure 7-19**.

The current constraints along Oro-Dam Boulevard limit the amount of space available for bicyclists. *The recommended bicycle facility for Oro-Dam Boulevard is a 4.5-foot-wide bike lane accompanied by a 2-foot-wide striped buffer. The bicycle facility width is further widened, effectively, by the 2-foot-wide curb and gutter.*

The addition of the 2-foot-wide striped buffer will help create a safe and comfortable bicycle facility along Oro-Dam Boulevard. This can be implemented by restriping the roadway, and does not require additional right-of-way between intersections. This configuration fits the smallest portions of the existing roadway. The width of the bike lanes may be adjusted to fit larger portions of the existing roadway.

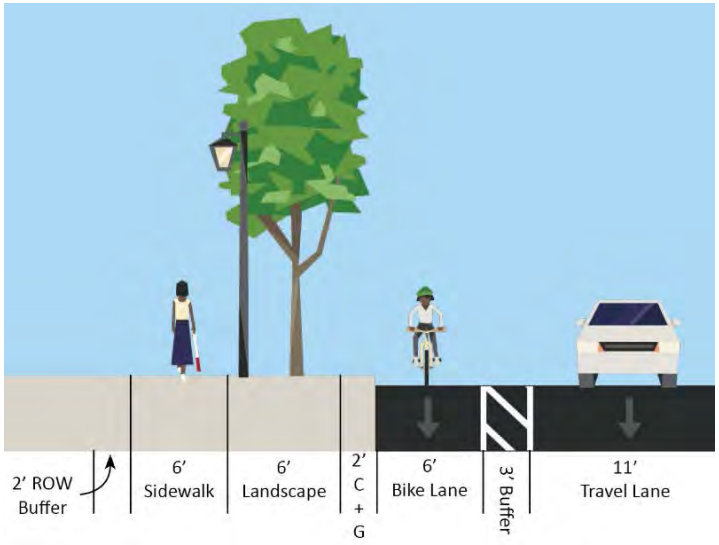


FIGURE 7-16. OLIVE HIGHWAY BIKE LANE RECOMMENDATION

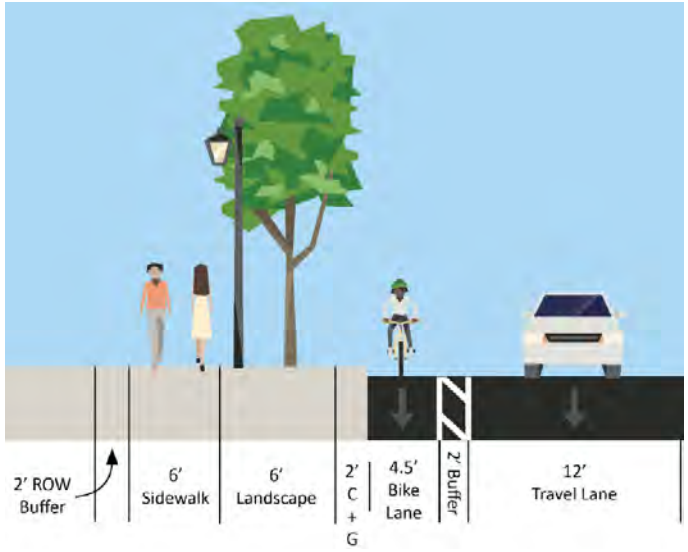


FIGURE 7-17. ORO DAM BOULEVARD BIKE LANE RECOMMENDATION

Buffered Bike Lane Treatments at Driveways

Buffered bike lanes must allow for driveway access and alert bicyclists and motorists of the location of driveways. This is accomplished by modifying the striping of the buffer, as shown in **Figure 7-18**.

FIGURE 7-18. BUFFERED BIKE LANE TREATMENTS AT DRIVEWAYS

Community Wayfinding

With the pedestrian and bicycle recommendations, a comprehensive walking and cycling wayfinding plan should be adopted that coordinates with the regional Transit & Non-Motorized Transportation Plan and City of Oroville standards. There are many options that effectively integrate bicycle and pedestrian wayfinding signage with the rest of the transportation infrastructure, while reducing sign clutter.

A wayfinding system consists of comprehensive signing to guide roadway users to their destinations along preferred routes. The system can be supplemented with pavement markings that primarily benefit bicyclists. There are three general types of wayfinding signs: confirmation signs, turn signs, and decision signs. Confirmation signs indicate to bicyclists they are on a designated route. Turn signs indicate where a route turns from one street onto another. Decision signs mark the junction of two or more routes, inform roadway users of key destinations, and indicate the destination, distance and direction. Examples are shown in **Figure 7-19**.

This treatment is Caltrans Approved – 2014 CA MUTCD Section 2D.50 Community Wayfinding and Section 9B.20 Bicycle Guide Signs.

FIGURE 7-19. EXAMPLES OF POTENTIAL WAYFINDING SIGNAGE

7.5 Short-Term & Long-Term Improvements

The phasing of the recommendations identified above generally fall into either Short-Term or Long-Term categories, based on constraints such as right-of-way acquisition and funding levels. Recommendations have been placed in two categories based on these factors (**Figure 7-20**). Short-Term recommendations are those which can be constructed or implemented within the existing ROW and may be accomplished through restriping of the roadway. Long-term recommendations require additional right-of-way, or they would be incorporated with a long-term roadway project such as roadway widening or traffic signal upgrades. Long-term recommendations may also be constructed, if applicable, as a condition of any new development on the corridor. The Buffered Bike Lane recommendation falls into both short-term and long-term categories, as the facilities on both Oro-Dam and Olive Highway may be constructed in the short-term and/or modified during the long-term.

Recommendation		Phasing	
		Short-Term	Long-Term
Pedestrian	Sidewalk Gap Closure	Sidewalk Construction/Expansion within ROW	Sidewalk Construction/Expansion requiring ROW
	Network Connectivity	X	X
	Clear Travel Paths	X	X
	ADA Upgrades at Traffic Signals		X
	Side Street Crosswalks	X	
	Fay Way Crosswalk	X	
	Shade Trees		X
	Spencer Avenue Crosswalk Treatment	X	
	Street Furniture		X
Bicycle	Buffered Bike Lanes	X	X
	Oro-Dam	4.5' Bike Lane & 2' Buffer	4.5' Bike Lane & 2' Buffer
	Olive Highway	4.5' Bike Lane & 3' Buffer	6' Bike Lane & 3' Buffer
	Bicycle Intersection Treatments	Mixed Bike Lane & Right Turn Lane	Two-Staged Turn Box or Bike Pocket
	Bicycle Loop Detection		X

FIGURE 7-20. PEDESTRIAN & BICYCLIST IMPROVEMENT RECOMMENDATION PHASING

8 Transit Improvements

The viability of transit on the SR 162 Corridor depends on the level of service offered in the corridor, as well as the nature of the corridor's built environment. The two dependencies are inter-related in that potential riders are attracted to higher levels of service and would need safe and welcoming access to bus stops. And relatedly, transit ridership is impacted by the density of residents, visitors, and employees on a corridor.

During outreach to agency stakeholders and the public for the Plan, participants expressed the desire for increased levels of service. Specifically, there should be an increase in bus frequency and weekend and evening bus services should be expanded. Other prevalent concerns included pedestrian safety, vehicle and station/stop comfort, and bicycle parking at bus stops, and the lack of parking at transit center for park-and-ride users. Despite this feedback, the BCAG Transit & Non-Motorized Plan does not recommend enhancements to transit service on the corridor, based on current ridership and low expectations for transit-oriented re-development.

8.1 Transit Enhancement Objectives

All of the public feedback on transit will be put to good use by our stakeholder agencies. This Corridor Plan will focus its recommendations on the SR 162 built environment as it relates to encouraging and accommodating greater use of transit. This chapter will therefore focus on the physical location of stops on the corridor, as they affect transit/traffic operations and service. Passenger access to bus stops, passenger safety, and passenger amenities are also identified and described. It should also be noted that many of this Plan's recommendations for the corridor's pedestrian environment will contribute to improved access to transit.

8.2 Bus Stop Improvements

Bus stops are key components of a transit system. In addition to being a rider's access point to the bus service, they accommodate a passenger's needs while waiting for a bus. They also provide a mechanism to promote transit service to the general public. Transit - dependent riders are more likely to tolerate bus stops with no protections from the elements or ones that are not easy to access. But for the B-Line to improve the ridership experience and attract more types of riders, but stops should be:

- located on a well-connected pedestrian network,
- connected by crosswalks and other pedestrian facilities to the opposite side of adjacent or nearby streets,
- be well-lit, and
- have benches and trash receptacles, and weather protection.

Bus Stop Locations

Transit agencies often follow a set of guidelines to ensure that stops are properly located and meet the needs of riders without negatively impacting transit operations. Key bus stop location attributes include spacing, and distance/position in relation to intersections.

Bus stops are located closer to signalized intersections and crosswalks, preferably, to improve passenger/rider safety and convenience. Mid-block stops encourage riders to illegally cross busy streets.

Stop spacing presents a tradeoff, where short spacing between stops increase the convenience of access. But short spacing can slow down bus travel times. *BCAG has an informal guideline of placing stops ¼ mile (1,320 feet) apart, wherever feasible*. A few of the stops exceed BCAG's stop spacing goal, but these are associated with the long stretches of the corridor without an intensity of land use and/or access to the corridor. The stops at Fay Way are close to other stops at Medical Center Drive and at Oro-Dam Boulevard. With the current ridership levels, this short spacing is not an issue in the short term.

When located at an intersection, stops can be placed before the cross street (near side) or after the intersection (far side). *BCAG's guidance calls for far side stops, where feasible.* Far side stops improve safety due to a stopped bus not blocking sight lines at the intersection. The far side location offers more area for the bus to maneuver as it approaches the stop. The bus can also use the intersection for the approach to the stop. And with Transit Signal Priority, the signal can permit buses to re-enter the travel lane on the far side, ahead of busy traffic.

When a stop is on the near side, cars attempt turns in front of the bus, and buses need to negotiate with other vehicles needing to make turns or wanting to make it through the traffic signal. All bus stops perform better and do not hinder traffic flow as much when the bus is out of the travel lane (i.e., in a pullout).

Table 8-1 in the following two pages summarizes the location attributes of bus stops on the SR 162 corridor. A number of stops are located before intersections and some are located a significant distance from the nearest cross street. Controlled intersections exist near all stop locations except at Oro-Dam Boulevard / Spencer Avenue (access to the Transit Center), and Oro- Dam Boulevard / 7th Street. *Bus stop locations can be revisited and analyzed for possible re-location, as part of future infrastructure projects on SR162.*

Bust Stop Amenities

BCAG does not have a formal policy on the installation of bus stop shelters, but the more highly used stops on the corridor do have them. Levels of passenger boarding are often used as criteria for bench and shelter placement at bus stops. *Shelters, benches, and trash receptacles at all bus stop locations should be considered as a general transit policy on SR 162. It is recommended that the implementation of such a policy be done in coordination with a review and plan for the possible addition and relocation of bus stops.*

Table 8-1. Bus Stop Attributes

Stop	Relationship to Intersection	Corridor Routes Served	Distance From Prior Stop (ft.)	Boardings & Alightings*	
Olive & Foothill (WB)	480 ft. past	26	Off Corridor	0	0
Olive & Foothill (EB)	290 ft. prior	26	2800	0	0
Olive & Medical Center (WB)	270 ft. past	26, 30	3170	0	9
Olive & Medical Center (EB)	150 ft. past	30	1040	0	0
Olive & Fay Way (WB)	50 ft. prior	26, 30	700	0	0
Olive & Fay Way (EB)	110 ft. past	30	930	0	0
Washington & Oro Dam (NB)	180 ft. past	26, 30	720	1	8
Washington & Oro Dam (SB)	330 ft. prior	30	Off Corridor	0	0

*boarding and alightings per average day

Table 8-2. (continued) Bus Stop Attributes

Stop	Relationship to Intersection	Corridor Routes Served	Distance From Prior Stop (ft.)	Boardings & Alightings*	
Transit Center		25,26,30	N/A	61	54
Oro Dam Blvd. & Myers (WB)	410 ft. past	25	1400	2	1
Oro Dam Blvd. & 5th (WB)	720 ft. prior	25	3630	5	3
Oro Dam Blvd. & 7th (WB)	150 ft. prior (7th)	25	1600	0	1
Feather River & Oro Dam (SB)	450 ft. past	25	1580	11	8
Feather River Cinema		25	2250	2	0
Feather River & Oro Dam (NB)	270 ft. past	25	2990	1	1

*boarding and alightings per average day

8.3 Short-Term Improvements

This Plan recommends that physical improvements for transit in the short term include improving or providing basic bus stop amenities (i.e., shelters, benches, and chairs), modifying at least one bus route, and increasing park-and-ride capacity wherever practical and feasible.

At the bus stops that are not expected to be relocated, it is recommended that bus shelters, benches, and trash receptacles be added wherever they currently do not exist. Bus shelters currently exist at:

- Olive & Medical Center (WB);
- Washington & Oro Dam (NB);
- Transit Center;
- Oro Dam & Myers St. (WB);
- Oro Dam & 5th St. (WB); and
- Feather River & Oro Dam (SB) – Walmart.

With the relocation of Walmart near the corridor, Route 25 will be realigned to service customers. Figure 8-1 shows the new alignment and bus stop location at a signalized intersection near the corner of the store's parking lot.

Figure 8-1. New Walmart Routing

Increased park-and-ride capacity on the SR 162 corridor has merit, but potential users are looking for easy access to routes serving Chico. The BCAG Transit & Non-Motorized Plan notes that the existing park-and-ride lot adjacent to Highway 70 at Grand Avenue has a total of 30 parking spaces. If demand for additional parking spaces exists, the plan suggests that BCAG could explore a shared parking agreement with Home Depot at Nelson Avenue/3rd Street. If this option were pursued, Route 20 would need to be slightly modified to serve this lot.

8.4 Long-Term Improvements

As mentioned in the beginning of this chapter, the viability of transit on the corridor will greatly depend on the degree of transformation of the built environment. Increased transit ridership and resulting community benefits are dependent on quality access to transit, a high level of transit service and, perhaps most importantly, a critical mass of transit-supportive land uses. Transit-supportive land uses are those associated with a mixture of land uses (residential, retail, commercial, etc.), a higher density of built floor area and human activity, pedestrian-oriented design, and close proximity to transit. It is difficult for transit improvements to lead and encourage this kind of development, but improved service and investments in transit infrastructure can be made in concert with, or in partnership with, redevelopment activity.

Figure 8-2. Transit-Land Use Interrelationship

The previous section noted some stops that may merit re-location to the far side of intersections, closer to signalized intersections, to improve passenger safety and traffic operations/safety. These desired relocation improvements should be addressed in conjunction with roadway and redevelopment projects on the corridor. The following bus stop location changes will provide safer and more efficient transit stops, by locating the stops near signalized crosswalks and providing far-side bus stops, as shown in **Figure 8-3**:

- Relocate the 7th Avenue stop further east to 5th Avenue, nearer the signalized intersection.
- Relocate the 5th Avenue stop further east to Veatch Avenue, nearer a signalized intersection.
- Relocate the Meyers Avenue stop closer to Meyers Avenue (further east, nearer a signalized intersection).
- Remove the Fay Way Eastbound and Westbound stops as these are very close to the Medical Center Drive stops. This is a poor crossing location for pedestrian safety and the stops have extremely low use.
- Relocate the Medical Center Drive Eastbound and Westbound stops closer to Medical Center Drive (nearer the signal).
- Relocate the westbound Foothill Boulevard stop closer to the Foothill Boulevard signal.

The installation of benches and shelters is recommended at all new or relocated stop locations. All existing and relocated transit stops should have adequate space for transit vehicles to stop.

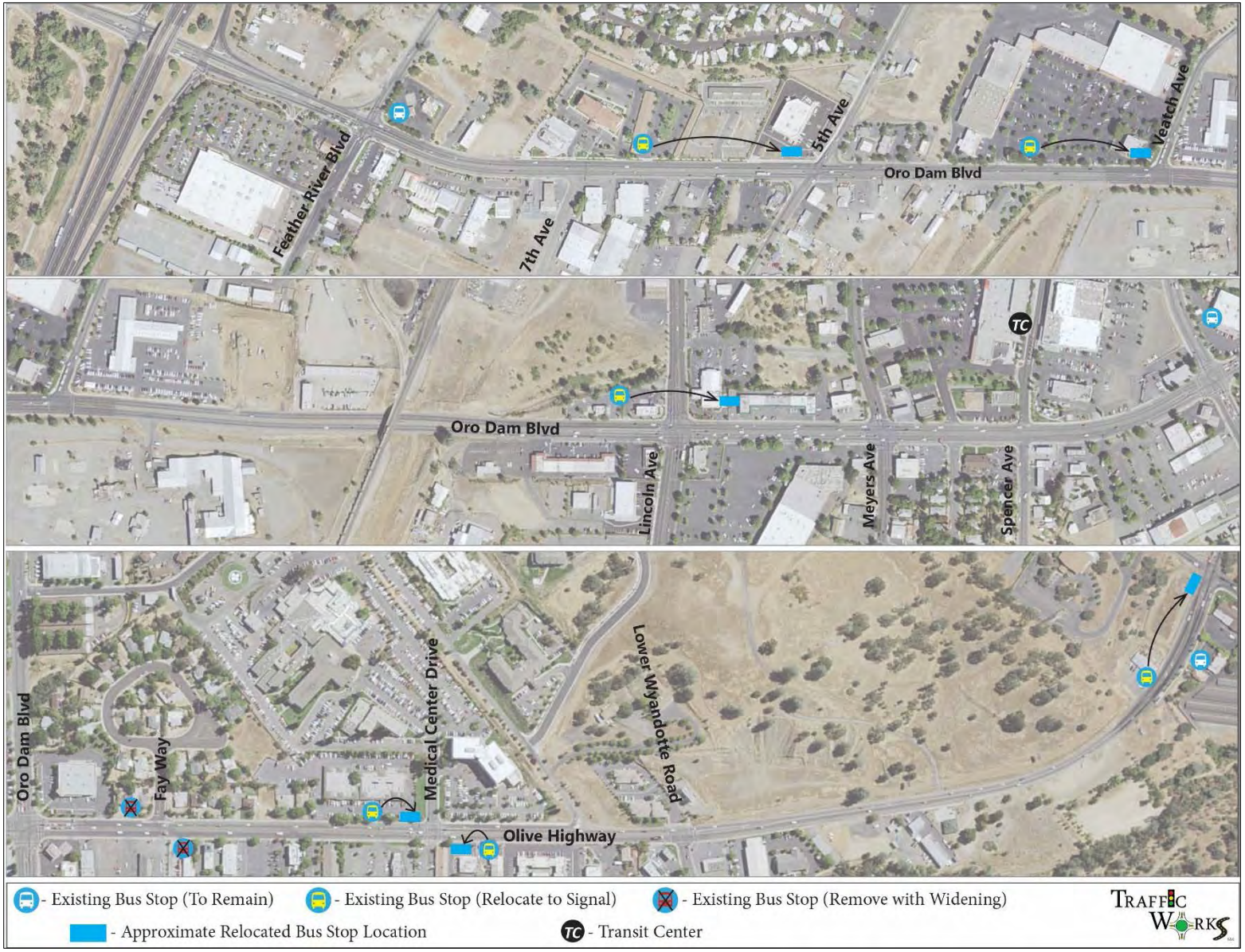


Figure 8-3. Transit Stop Recommendations

9 Management Techniques & Technologies

This chapter identifies, describes, and recommends the potential use of specific Transportation System Management (TSM) techniques and Intelligent Transportation System (ITS) technologies, as applicable to the SR162 corridor in order to improve mobility and reduce congestion, thereby lowering greenhouse gas (GHG) emissions.

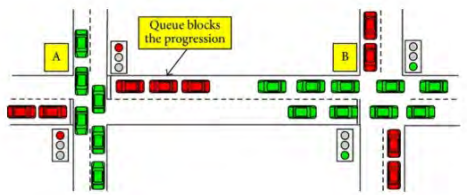
9.1 Transportation System Management Strategies

Transportation System Management (TSM) aims to reduce GHG emissions by improving transportation system capacity and efficiency. TSM strategies may also address pedestrian/driver safety, efficiency, congestion, travel time, and driver satisfaction. The U.S. Federal Highway Administration reviews the primary TSM GHG reduction strategies in its *Reference Sourcebook for Reducing Greenhouse Gas Emissions from Transportation Sources*. As this review notes, some TSM strategies are designed to improve system-wide efficiency, while other strategies target problematic areas to affect localized congestion, safety, efficiency, and GHG emissions.

Brief descriptions of the most applicable TSM strategies are provided as follows. These techniques can be employed independently or in combination with the Intelligent Transportation Systems (ITS) strategies and user services described in Section 9.2.

Traffic Signal Optimization / Coordination

Traffic signals can increase stop-and-go driving which reduces fuel efficiency and increases GHG emissions. Traffic signal optimization is the process of improving the operations, maintenance, timing, and location of traffic signals to reduce residual queuing, to promote smoother traffic flow and simultaneously reduce GHG emissions.



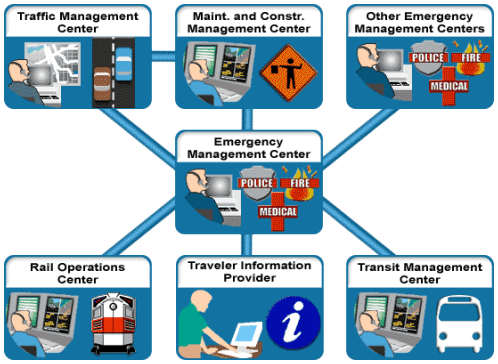
Adaptive Traffic Signals

Adaptive Traffic Signal Control is an emerging technology for improved signal timing optimization. This technology system responds more quickly and intelligently to fluctuations in traffic flows. Sensors capture actual traffic volumes in real time and the signal timings are automatically changed by the controller to serve the actual volumes rather than preset timing schemes.

Ramp Metering

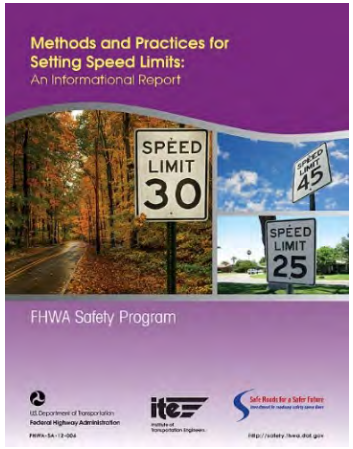
Ramp meters are traffic signals installed on freeway on-ramps to control the frequency at which vehicles enter the flow of traffic on the freeway. Ramp metering reduces overall freeway congestion by managing the rate of traffic entering a freeway, and also by preventing the bunching of vehicles or "platoons" that make it difficult to merge onto the freeway. These meters can reduce congestion on the freeway but increase idling on the ramp, both of which affect fuel consumption and GHG emissions.

Incident Management



Incident management programs use vehicular patrols and ITS technologies to quickly detect and clear traffic incidents, thereby reducing delays and congestion and, in turn, reducing fuel consumption and GHG emissions. Effective incident management also improves the safety of motorists, crash victims and emergency responders.

Speed Limit Reduction and Enforcement



A vehicle's speed affects its fuel consumption and its GHG emissions, with the optimal speed for most motor vehicles being 45-55 mph. TSM-related speed reduction and enforcement policy warranted by a traffic engineering study would seek to reduce vehicle speeds on highways and throughways in order to improve safety and reduce GHG emissions. Any alteration of a posted speed limit on an arterial or highway should be based on an engineering study that has been performed in accordance with California standard practices. The engineering study shall include an analysis of the current speed distribution of free-flowing vehicles, and determine the prevailing speed by averaging the 85th percentile speed, the upper limit of the most common range of 10 mph, and the average test run speed.

Traffic Signal Head Retroreflective Back Plates

Back plates are added to a traffic signal head to improve the visibility of the illuminated face of the signal by introducing a controlled-contrast background. The signal head is made even more conspicuous in daytime and nighttime conditions by framing the back plate with a retroreflective border. This installation can reduce unintentional red-light running and crashes.

Roundabouts

A modern roundabout is a circular intersection where drivers travel counterclockwise around a center island. There are no traffic signals or stop signs. Drivers yield at entry to traffic in the roundabout. Studies by the Federal Highway Administration have found that roundabouts can increase traffic capacity by 30 to 50 percent compared to traditional intersections.

Highway/Roadway Capacity Expansion

In the short to medium term, expanding roadway capacity on congested highways can reduce traffic delays and improve mobility, and lead to reduced fuel consumption and GHG emissions. Expansion may increase demand, however, which could ultimately offset initial congestion-relief benefits and lead to longer-term increases in fuel consumption and GHG emissions.

Resurfacing Roads

Resurfacing rough roads reduces friction, thereby improving fuel efficiency and reducing GHG emissions. Systematic and highly-refined life cycle asset management practices in roadway resurfacing programs reduce direct and indirect costs to the traveling public.

Alternative Construction Materials

The majority of GHG emissions in transportation facility construction comes from the production of cement and asphalt pavement materials. Using lower-energy alternatives decreases GHG emissions.

Enhanced Transit Stops

Bus shelters and benches at transit stop locations are desirable, especially where service headways are longer, because they increase safety and comfort of passengers. Resulting increased transit user comfort increases transit usage, and therefore reduces congestion. We recommend that bus shelters with benches (and if possible trash receptacles) be installed where bust stops are expected to not move, where we are recommending bus stop re-locations (see Chapter 8, Transit Improvements), and at all new bus stops on the corridor.

Information on the application of the Study Team's recommendations for the preceding TSM GHG reduction strategies can be found in **Table 9-1**, on the following two pages.

Table 9-1. Application of TSM Techniques for SR 162

TSM Technique	SR162 Opportunity	Operations Benefits	Emissions Benefits and Costs	Implementation Concerns
Traffic Signal Optimization / Coordination And Adaptive Signal Control	1) Efficiently manage traffic with closely spaced intersections. Allow adding new controls (e.g., at Spencer Avenue). 2) Signal coordination and ITS features that support recreational tourism. 3) Consider Adaptive Signal control	Signal optimization is often undertaken to improve traffic flow. Some studies have shown a 30 to 40 percent reduction in travel times.	Where Traffic signal optimization has been implemented and studied at signalized intersections, the literature shows 3-12% fuel savings and GHG emissions reduction, and that costs may range from $25 to $34 per metric ton of CO_2.	Requires ongoing maintenance and management. Costs can include hiring specialists to create/implement traffic optimization plans, and software/signalization technology upgrades.
Ramp Metering	Ramp meters on the NB, SB SR 70 on-ramps, Oro Dam Blvd. @ SR 70 (potentially)	Control the rate of vehicles entering the freeway to avoid collisions or disruptions to highway traffic flow.	The benefits and costs per unit to reduce GHG emissions are uncertain. Wide range of reported installation and O&M costs per ramp meter.	Ramp metering may be expensive, and the public may oppose it due to delays at the ramp and perceptions of inequity.
Incident Management	Implement Traffic Incident Management (TIM) operations, corridor-wide	Quickly detect and clear traffic incidents, thereby reducing delays and congestion.	Studies show varying impacts on GHG emissions. Costs are not well known and depend on the technology and approaches used.	Generally acceptable given the time and fuel saving benefits of TIM. Requires ongoing funding.
Speed Limit Reduction and Enforcement	The existing speed limit corridor-wide is 35 mph, which is appropriate. This TSM technique is therefore currently not as applicable to the corridor as others.	Reduces frequency and severity of accidents and collisions, thereby reducing delays.	Increase fuel efficiency and reduce emissions by 2-15%, depending on speed reductions. Costs are mainly enforcement-related, ($9-$12/ton of CO_2).	Motorists accustomed to speed limits and a margin for speeding. Official and public resistance undermines national speed limit compliance and enforcement.
Traffic Signal Head Retroreflective Back Plates	Systemically improve safety performance at signalized intersections.	Maintain and improve safety/ operations of intersections.	Adding to an existing signal head and/or back plate can be low-cost. Materials are a back plate and/or strips of retroreflective sheeting.	Can add to existing mast arm assemblies. Make as a standard treatment.

Table 9-1 (continued). Application of TSM Techniques for SR 162

TSM Technique	SR162 Opportunity	Operations Benefits	Emissions Benefits and Costs	Implementation Concerns
Roundabouts	Roundabouts were considered at: 1) Olive Hwy./Medical Center Dr. intersection 2) Olive Hwy./ Lower Wyandotte Rd. intersection *Note: Insufficient ROW at these two proposed roundabout locations (see Chapter 6: Alternatives Development)	Can reduce number and severity of accidents, vehicle idle times and improve traffic flow.	Estimated 16% to 30% reduced fuel consumption and emissions over intersections. Net GHG unknown; fuel-efficiency benefits reduced by emissions from construction.	Right of way land expense. Public may not wish to recognize benefits. Current driver behavior in the U.S. is tentative, which affects overall performance and reduces capacity.
Highway/Roadway Capacity Expansion	Capacity increases have been evaluated in detail. (Chapter 6: Alternative Development) Alternative 1: Intersection Improvements Alternative 3: Olive Hwy., Oro-Dam Blvd. to Foothill Blvd. 2 lanes to 4 Lanes (2 lanes each direction)	Can reduce traffic delays and improve mobility, but may also increase demand.	GHG reductions may be partly or totally offset by emissions from capacity-induced demand. Cost: approx. $4-$7 million/lane-mile. Cost/unit of reduction unknown.	While beneficial as a way to relieve congestion, it may not be effective in reducing GHG emissions, long-term. More expensive than other strategies.
Resurfacing Roads	Corridor-wide	Allows for greater avg. speed under/at posted speed limits.	May increase GHG emissions due to significant CO2 from manufacturing of pavement materials. Cost is approx. $200K/lane-mile.	May not be an effective GHG strategy given high costs and uncertain effects. Resurfacing for safety and mobility are otherwise well received.
Alternative Construction Materials	Corridor-wide	N/A	Emission reductions vary per material. Could be critical to Materials relatively lower cost.	Barriers are low given the cost effectiveness of most of these materials.
Enhanced Transit Stops	Corridor-wide (where shelters, benches, and trash receptacles do not currently exist)	User comfort and convenience adds to ridership, reduces congestion.	Shelters and benches can be provided separately or together, and vary widely in price depending on design and materials.	Needs to be coordinated with the review of bus stop locations/spacing, and with streets/works improvement projects.

9.2 Intelligent Transportation System Strategies

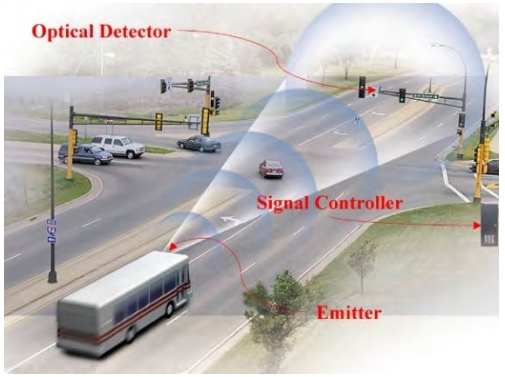
Intelligent Transportation Systems (ITS) include the integrated application of computer, electronics, and communications technologies and management strategies to provide traveler information that is intended to increase the safety and efficiency of the surface transportation system. ITS also provides useful, real-time information to system operators. The North Valley Regional ITS Architecture and relevant plans of Butte Regional Transit serve as a basis for the existing and anticipated use of ITS in the region. That being the case, specific ITS improvements for the SR 162 corridor have not been determined and there are no ITS deployments on the subject roadways. SR162 could serve as an ITS pilot corridor for the region. In addition to traffic signal coordination solutions for enhanced/improved transit operations, transit user-friendliness, and transit security likely represent the greatest ITS opportunities with respect to this corridor.

Public Transportation Management

The Public Transportation Management (PTM) user service seeks to apply transportation management and information technologies to public transit systems to increase their efficiency of operation and improve the safety of public transportation riders. Applications include real-time passenger information systems, automatic vehicle location and passenger counting systems, bus arrival notification systems, and systems providing priority of passage to buses at signalized intersections. The Study Team's recommendations, with associated implementation information for the following PTM/ITS applications are shown in **Table 9-2**, on page 9-9.

Transit Signal Priority

Transit Signal Priority (TSP) gives transit vehicles the preference of right of way at traffic signals to keep them on schedule. Unlike emergency vehicles that can preempt signal phases to guarantee travel though an intersection, transit vehicles rely on extended or shortened phases to prioritize their travel only when behind schedule. TSP requires transponders on buses and detectors at signals to communicate priority requests to the signal controllers.

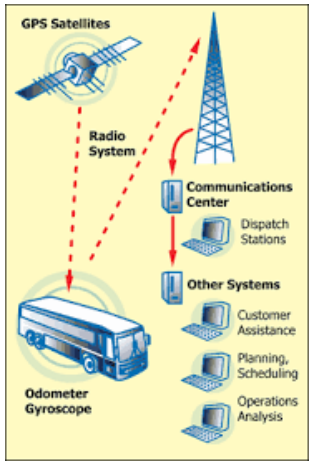


Emergency Vehicle Traffic Signal Preemption

Signal preemption systems use sensors to detect an approaching emergency vehicle and provide a green signal. The technology can be combined with TSP technology, and Emergency Vehicles can use transit only lanes.

Automated Vehicle Location (AVL)

AVL systems give a dispatch center the capability to monitor the location of all transit vehicles continuously, in real time. AVL uses global positioning systems (GPS), and is usually integrated with digital communications and mapping systems to streamline instructions from the dispatcher who is able to view vehicle itineraries and locations graphically. This technology is currently utilized by Butte Regional Transit (B-Line) on transit routes. Each driver has a Mobile Data Terminal (MDT) in the vehicle that allows extensive planning information to be collected at a lower cost than by manual methods (i.e. schedule adherence, location-based passenger counts, and location-based fare collection information). Some Transit Signal Priority (TSP) systems allow drivers to initiate a priority request, while others rely on AVL and communications with the operations center to manage priority requests.



Automated Passenger Counting

Automated Passenger Counting (APC) uses an electronic device installed on transit vehicles that accurately records passenger boarding and alighting. This technology can improve the accuracy and reliability of tracking transit ridership over manual counting by drivers or estimation through random surveying. APC devices are becoming more common among transit operators seeking to improve the accuracy of reporting patronage and analyze transit use patterns by linking boarding and alighting data with stop or station location.

En-route Transit Information

The En-Route Transit Information user service provides real-time status information to travelers using public transportation after their trips have started. Real-time arrival systems use AVL technology to track vehicle locations. This information is available on-board transit vehicles, at transit stations and stops, as well as on the internet to assist travelers in making informed decisions about route choices and modes.

Smartphone / Mobile Device Transit Apps

Information that is made available via web portals can be "pulled" by users who are already en-route, with their tablets and smart phones.

Dynamic Message Signs

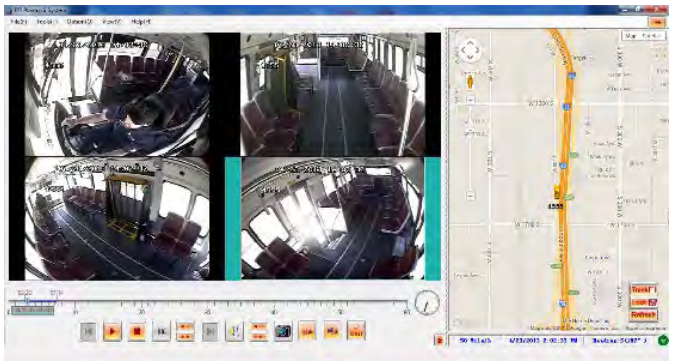
Arrival and other status information can also be displayed on dynamic messaging signs at transit centers, and "pushed" to riders at individual transit stops. BCAG currently allows users to "pull" bus arrival information via text messaging. The B-Line Tracker allows users to text a known Bus Stop ID, and in return receive a text showing pending bus arrival times. BCAG is in the process of developing a smart phone application. Such transit "apps" provide enhanced interfaces that allow users to save favorite stops, see upcoming arrivals over longer periods, find bus stops, etc. These apps also provide trip planning resources showing routes and schedules, along with interfaces to Google Transit-based trip planners.

Pre-trip Travel Information

The Pre-Trip Travel Information (PTTI) ITS user service allows travelers to access a range of real-time, multi-modal transportation information before trips originate. Information on transit schedules and services, road network conditions, incidents, weather, etc. are conveyed over PTTI systems. With such pre-trip information travelers can select the best departure times, routes and modes of travel, or decide not to make a trip. The Google Transit tool allows providers to show routes and schedules via Google Maps on internet-connected devices resulting in effective promotion of transit to new riders. Google Transit is built around the General Transit Feed Specification (GTFS), now a common format for shared public transportation data. The B-Line Trip Planner, powered by GTFS and Google Maps, is on the BCAG website.

Public Travel Security

The Public Travel Security user service provides technology and systems that monitor transit facilities, transit stations, bus stops, parking lots, key infrastructure, and inside transit vehicles. These systems usually include video and audio capture technologies and can generate alarms, alerts, and notification. Public Travel Security technologies help to improve transit user safety and increases the perceived level of safety for most passengers. B-Line and the Oroville Transit Center are currently equipped with cameras.



Recommendations and associated implementation information for these enhancement options can be found in **Table 9-3** and **Table 9-4**, on page 9-10.

Table 9-2. ITS Public Transportation Management User Service Recommendations

ITS/PTM User Service	SR162 Opportunity (Priority / Timeframe)	Benefits	Costs	Implementation Concerns
Transit Signal Priority (TSP)	Future traffic signal upgrade projects include TSP for improved B-Line transit system performance, and incorporate current signal/traffic control technologies, as appropriate. (Medium/Ongoing)	Reduced transit travel times, improve schedule adherence, improve transit efficiency. Important for bus rapid transit system success. Travel time savings, increased overall travel speeds for buses.	System maintenance can be part of regular maintenance to save cost. Minimal costs to roadway users (signal adjustments in seconds, timing re-adjusts quickly.	Proper use requires monitoring at TMC or automated priority system capabilities. Implementation includes the costs required to analyze system needs.
Emergency Vehicle Traffic Signal Preemption	Better time/traffic management of incidents, response to emergencies and special events.	A radio-based or GPS-based system reduces average response times. Most communities rate benefits as "moderate" to "very high" (2010).	Can be combined with existing or planned TSP technology.	Best implemented with other traffic signal modifications for cost efficiency.
Automated Vehicle Location (AVL)	Track B-Line transit vehicle locations to manage schedule adherence, integrate with automated passenger counting, and monitor need for TSP override, etc. (High/Short-Term)	Better estimate transit arrival times. Improve safety and security. Improve customer perception of transit. Staff time is reduced to monitor schedule adherence. Improve entire system by supporting automated TSP.	Costs vary widely by size of the agency, system type, and amenities. Technology for new mobile applications update cost. Training and maintenance cost.	Avoid expense and risk of building a proprietary system - use standards. IT infrastructure exists. Ongoing need for updating tech and apps.
Automated Passenger Counting (APC)	Monitor B-Line passenger boarding and alighting and adjust service accordingly. Integrate with AVL to collect location-based data. (Medium/Medium-Term)	Improve accuracy of reporting riders and analyze transit use patterns by linking boarding and alighting data with stop/station location. Can be crucial in allowing all-door boarding on buses for gathering accurate passenger data and comparing that data to fare revenues.	Initial cost of installing infrared lights and sensing devices above doorways. Higher cost may be integration with AVL/GPS.	Installation of CCTV cameras for manual counts to verify accuracy of APC may also serve transit security purpose.

Table 9-3. ITS En-Route Transit Information Delivery Methods

En-Route Transit Information Delivery Method	SR162 Opportunity (Priority / Timeframe)	Benefits	Costs	Implementation Concerns
Smartphone / Mobile Device Transit Apps	Develop B-Line SmartPhone app in combination with AVL. (High/Ongoing-Short-term)	Useful for disseminating real-time transit information, including trip updates, service alerts, and vehicle positions. Reduce private vehicle trip demand by promoting ease of use of transit services.	As technology is constantly changing, it is difficult to create mobile applications that will work for all versions of the wide variety of platforms available for mobile devices.	Requires good public promotion and awareness to be successful. Use General Transit Feed Specification - Real Time Format (GTFS-RT)
Dynamic Messaging Signs	Real-time bus arrival displays at major station/stop locations. Initial deployments at or near high-volume stops where riders have option to wait indoors. Transit Center (Medium/Mid-term), Walmart (Medium/Mid-term), Medical Center (Medium/Long-term) are key locations.	Access to real-time information reduces passenger anxiety during wait time. If bus is delayed passenger can make informed decision about alternatives. AVL systems combined with real-time information for customers can result in steep declines in customer complaints.	Implementation can be expensive due to costs of installation, maintenance, and electricity for operation. Installation approx. $5,000 per display. Some installations may require cellular data, adding to ongoing costs.	Ability to use real-time data using established standards, and translating it for dynamic messaging.

Table 9-4. Other ITS Travel User Services

ITS Travel User Service	SR162 Opportunity (Priority / Timeframe)	Benefits	Costs	Implementation Concerns
Pre-Trip Travel Information	Enhance existing internet and mobile device trip planning and transit status information.	Users having more knowledge of transit status, potential routes, and trip times can increase transit mode share.	Cost of internet technology and apps/GUIs small compared to investment in real-time data collection technologies.	Costs of maintaining and upgrading website / mobile pre-trip data and applications.
Public Travel Security	Improve safety for B-Line users by being able to deter crime and respond more rapidly to emergency/criminal situations. Enhancing existing CCTV equipment on buses and at Oroville Transit Center.	User comfort in regards to safety and security can maintain and increase ridership. Can help to improve incident response.	Large long-term cost of monitoring CCTV/security systems. Higher installation cost relative to maintenance.	Training and monitoring - timely use of video during emergencies.

9.3 Access Management

Access management is the application of roadway design and traffic operations considerations to the location and design of access from the highway to adjacent land uses. The objective is to improve roadway safety and efficient operations while providing reasonable access to the adjacent land use.

Access Management Techniques

More specifically, access management is defined in the Transportation Research Board *2003 Access Management Manual*, as the "systematic control of the location, spacing, design, and operation of driveways, median openings, interchanges, and street connections to a roadway." Access management supports efficient traffic flow and increased capacity, congestion management, and the improved safety on a corridor. Controlled access to/from properties is achieved through the following techniques. Business owners should be properly consulted during the planning and implementation of each technique so that they are comfortable with the resulting access to their properties.

Driveway Consolidation

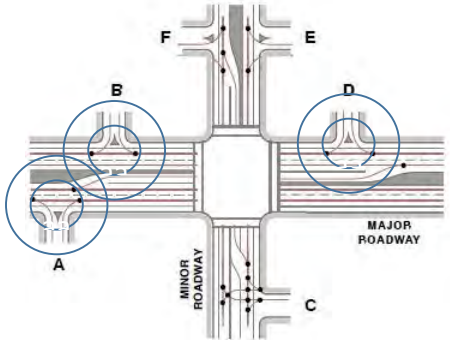
Traditional driveway density allowances are based on generally lower traffic volumes and observed roadway speeds. On highway corridors with commercial frontage, reducing the density of driveways above and beyond these standards, can improve safety and efficiency by creating shared driveways, relocating driveways to side streets, or eliminating barriers between parking lots to promote cross-access.

Property Frontage (feet)	Number of Driveways
0 to 50	1
50 to 165	2
165 to 500	3
Over 500	4

Source: ITE Guidelines for Driveway Location and Design, 1987.

Table 9-5. Traditional Driveway Density Recommendation

Turning Movement Restrictions Near Intersections



The number and types of conflict points at the intersection of a driveway and a public road influence the safety of motorists. The goal is to minimize the number of conflict points, as more conflict points increase the risk of a crash. Businesses located on the corner of an intersection typically have access on both the main street and side street. Applying this restriction would deny left turns into and out of main street driveway, and divert that traffic to the side street. The tradeoffs of shifting the turning movement to another location along the roadway should always be considered.

Formalize Curbs

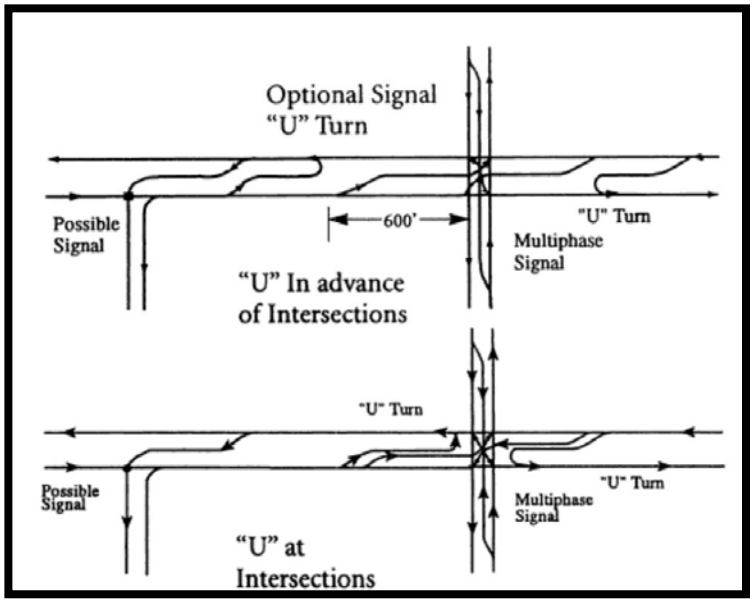
Many businesses have driveways extending the entire business frontage without any formal curb. In this technique a frontage is reconfigured for appropriate driveway widths, to channelize and improve the control of access and egress from properties or groups of properties. Through the installation of curbs where none exist, protected space for people on foot is also more easily defined.

U-Turns at Signalized Intersections

Providing U-turn opportunities at signalized intersections allows alternative access management strategies which can, in turn, allow for increased capacity. U-turns can be facilitated using any of the following three techniques at signalized intersections:

- Left turning and U-turning vehicles share the same left-turn lane.
- Left-turn lanes can be provided for U-turning vehicles in advance of signalized intersections. This avoids concentrating development-related turning traffic at the signal. A few concepts are shown in **Figure 9-1**, below.
- Dual left-turn lanes can be provided at signalized intersections with the inner lane dedicated to U-turns.

Figure 9-1. U-Turn Concepts



Access Management Recommendations

The following recommendations concentrate on reducing the number of direct access points to Oro-Dam Boulevard and Olive Highway to increase capacity and improve safety. **Figure 9-2**, **Figure 9-3** and **Figure 9-4** show the locations on SR 162 where each or any combination of the first three techniques (driveway consolidation, turning movement restrictions, and formalizing curbs) can be used.

U-turns are currently prohibited at all signalized intersections on the Study corridor, requiring motorists to make long detours. We recommend that future roadway designs and modifications allow U-turns at signalized intersections having lower left-turn volumes, including but not limited to the following:

- Oro-Dam Boulevard/5th Street
- Oro-Dam Boulevard/Veatch Street
- Oro-Dam Boulevard/Myers Street
- Olive Highway/Medical Center Drive
- Olive Highway/Lower Wyandotte Road
- Olive Highway/ Foothill Boulevard

Figure 9-2. Access Management Recommendations (Panel 1)

Figure 9-3. Access Management Recommendations (Panel 2)

Figure 9-4. Access Management Recommendations (Panel 3)

10 Preferred Alternative

The individual components of the preferred overall transportation alternative for SR 162 have been described in previous chapters of this Corridor Plan. This chapter introduces the Preferred Alternative as a whole; provides preliminary planning level cost estimates for each component of the Preferred Alternative; and discusses the associated safety, emissions reduction, and travel time savings benefits. Layout sheets covering the length of the corridor have been compiled to identify the designated areas/places for each of the recommended Preferred Alternative improvement components. These sheets are included in **Appendix B** and are intended to be used as an aid for future implementation and development planning. Recommendations which can be implemented in the interim are discussed in Chapter 11, which explains the overall implementation plan for the Preferred Alternative.

The Preferred Alternative presented in this chapter is intended to serve as the long-term vision for the corridor and is the result of extensive analysis, stakeholder coordination, and public input. Each recommended improvement is intended to help further the goal of this project: to provide safer and more efficient long-term mobility for both motorized and active transportation modes. This goal has been the guiding principle through each phase of this project, including alternatives development, analysis, and public outreach.

It should be noted that the process of developing the Preferred Alternative considered local economic conditions and the needs of local residents for safe travel via non-auto modes in the overall packaging of improvements to create a holistic and integrated corridor design. Additionally, challenges with the existing SR 162 right-of-way and the cost/effort to obtain additional land were also considered in arriving at this Preferred Alternative, especially for some intersections where roundabouts were considered.

Despite the constraints, the resulting Preferred Alternative is nonetheless comprehensive. As described in this chapter, the set of recommendations comprising the Preferred Alternative will improve vehicle travel capacity and safety, optimize transit operations for better transit service, increase transit user comfort, and significantly improve the safety, connectivity, and overall experience of the pedestrian and the bicyclist.

10.1 Preferred Alternative Overview

As the corridor changes over time, it will require increased capacity, safety enhancements, and more efficient operations for all modes. The Preferred Alternative for SR 162 will fulfill these requirements while creating an improved overall corridor aesthetic. All components of the Preferred Alternative have been categorized according to the type of improvement and compiled in **Table 10-2**, along with preliminary planning level cost estimates.

The Preferred Alternative includes multiple recommended enhancements to the existing transit network. These are included in this Corridor Plan as suggested improvements for BCAG to consider going forward.

Cross-sections showing the Preferred Alternative for Olive Highway and Oro-Dam Boulevard are included in **Figures 10-1** & **10-2.** These cross-sections should be used as guides for the general long-term layout of the corridor. Cross-sections highlighting interim configurations for Olive Highway and Oro Dam Boulevard are included in Chapter 11.

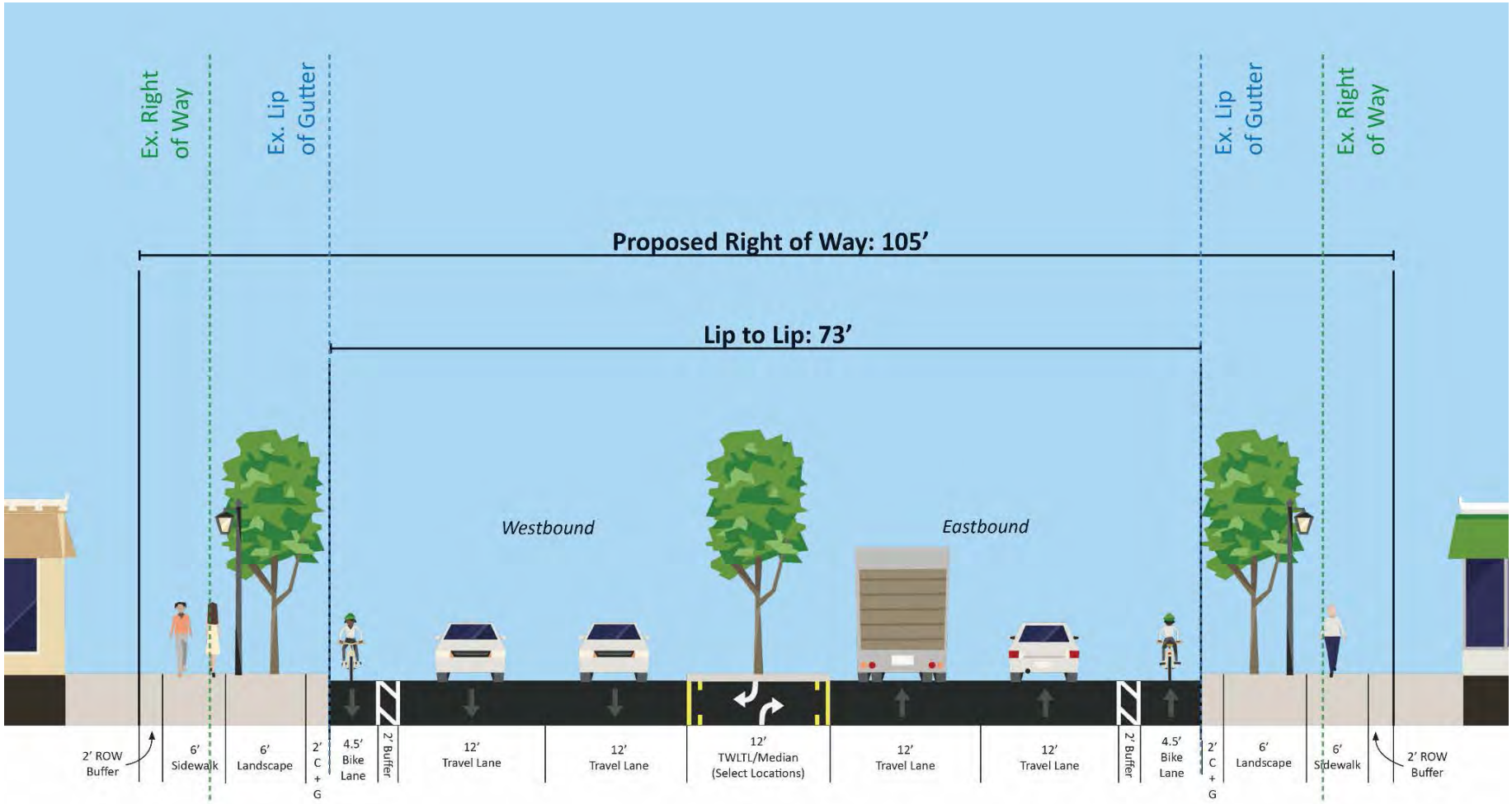


FIGURE 10-1. ORO-DAM BOULEVARD PREFERRED ALTERNATIVE CROSS-SECTION

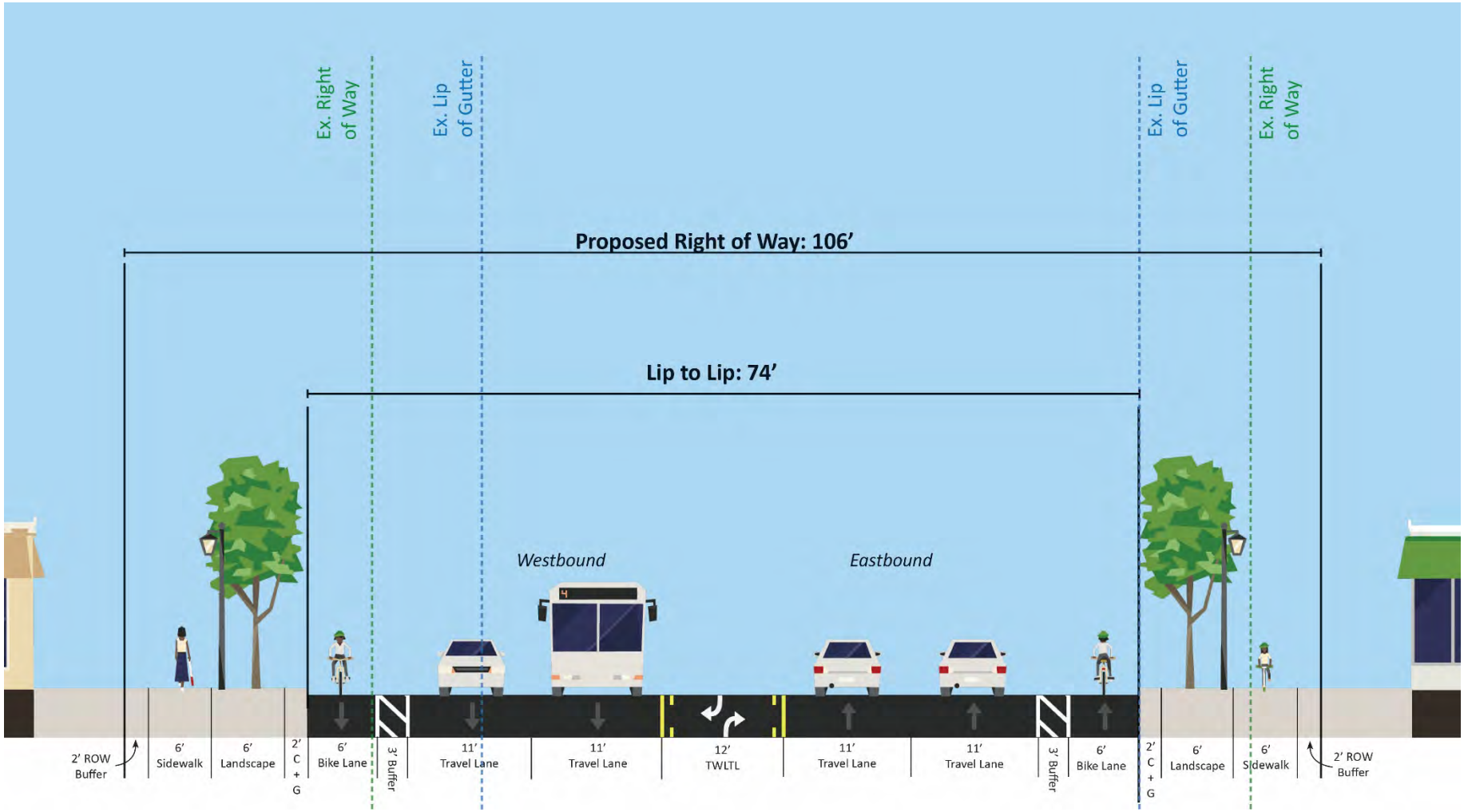


FIGURE 10-2. OLIVE HIGHWAY PREFERRED ALTERNATIVE CROSS-SECTION

10.2 Cost Estimates

Preliminary planning level cost estimates were developed for each improvement included in the Preferred Alternative to aid prioritization and programming. These cost estimates were developed using 2015 construction dollar values. The quantities have been generalized based on planning-level conceptual designs. It is not feasible at this time to address all potential work items that would be included in the construction documents. The estimates are based on industry standard unit costs and estimated right of way costs in the Oroville area. The assumed planning level unit costs for major work elements are presented in **Table 10-1**.

Table 10-2 includes preliminary cost estimates for all recommendations in the Preferred Alternative by type (i.e., Roadway, Bicycle and Pedestrian Transit, and ITS/TSM). All cost estimates assume that the improvements will be packaged into larger-scale projects.

Cost estimates were not developed for improvements which could vary significantly due to a number of variables, including the technology selected and the scope or length of implementation. It is recommended that detailed cost estimates for these improvements be developed upon the determination of such variables.

More detailed cost estimates for significant scale recommended improvements of the Preferred Alternative are included in **Appendix C**.

Units of Measurement:
SF – Square Feet
LF – Linear Feet
EA – Each
LS – Lump Sum

CONSTRUCTION UNIT COSTS		
MATERIAL	PRICE	UNIT
AC PAVING	$ 10.00	SF
AC PAVEMENT REHAB	$ 7.50	SF
CURB & GUTTER	$ 45.00	LF
PCC SIDEWALK	$ 15.00	SF
SLOPE GRADING	$ 500.00	LF
K-RAIL / GUARDRAIL	$ 500.00	LF
STREET LIGHTING	$ 200.00	LF
PEDESTRIAN LIGHTING	$ 250.00	LF
LANDSCAPE	$ 40.00	LF
LANDSCAPE RETAINING WALL	$ 200.00	LF
SIGNAL INTERCONNECT	$ 100.00	LF
PEDESTRIAN RAMPS	$ 40.00	LF
MEDIAN CURB	$ 25.00	LF
OPTIMIZE SIGNAL TIMING	$ 5,000.00	EA
MEDIAN ISLAND	$ 15.00	SF
RELOCATE FIRE HYDRANT	$ 3,250.00	EA
SHADE TREE	$ 5.00	LF
SLURRY SEAL	$ 0.25	SF
BUS PAD WITH SHELTER	$ 25,000.00	EA
PEDESTRIAN CROSSING TREATMENT (P.H.B)	$ 100,000.00	EA
5 LANE STRIPING	$ 3.50	LF
4 LANE STRIPING	$ 3.00	LF
2' BUFFERED BIKE PATH STRIPING	$ 1.50	LF
3' BUFFERED BIKE PATH STRIPING	$ 1.75	LF
CROSSWALK STRIPING	$ 3.25	SF
THERMOPLASTIC PRESHAPED SYMBOLS	$ 250.00	EA
REMOVE STRIPING	$ 7.00	SF
BIKE POCKET STRIPING	$ 1.00	LF
MIXED BIKE LANE & RIGHT TURN LANE STRIPING	$ 0.50	LF
INSTALL CATCH BASIN	$ 3,000.00	EA
INSTALL STORM DRAIN LATERAL	$ 100.00	LF
INSTALL GUARDRAIL	$ 100.00	LF
RIGHT-OF-WAY ACQUISITION	$ 25.00	SF
NEW/RELOCATE SIGN AND POST	$ 350.00	EA
RELOCATE BUSINESS SIGN	$ 7,500.00	EA
RELOCATE OVERHEAD UTILITIES	$ 500.00	LF
BIKE DETECTION LOOP	$ 800.00	EA
TRANSIT SIGNAL PRIORITY SYSTEM	$ 15,000.00	EA
EMERGENCY PREEMPTION SYSTEM	$ 15,000.00	EA
SIGNAL COORDINATION	$ 40,000.00	EA

TABLE 10-1. PLANNING LEVEL UNIT COSTS

Recommendation	Description	Planning Level Cost Estimates
Roadway Improvements (See Ch. 6)		
Retroreflective Back Plates	Install retroreflective back plates on all traffic signal heads along the corridor	$ 50,000.00
Separated Dual Lefts (Striping)	Install striping to separate dual lefts from thru movements (Oro Dam Blvd/Olive Highway intersection; Feather River Drive/Oro Dam Blvd Intersection)	$ 100.00
Right of Way	Right of way acquisition	$ 9,749,400.00
Olive Highway		
Roadway Improvements	Widen roadway to include two westbound lanes, center turn lane, two eastbound lanes from east of Lower Wyandotte Rd. to Oro Dam Blvd.	$ 1,615,800.00
	Extend the raised median between Oro Dam Blvd & Fay Way	$ 19,600.00
Intersection Improvements	Remove marked crosswalk at Fay Way intersection	$ 3,800.00
	Increase EB & WB left-turn pocket lengths at Medical Center Drive	$ 800.00
	Increase EB & WB Left-Turn Pocket lengths at Lower Wyandotte Rd	$ 1,600.00
	Add eastbound and westbound thru lanes at Lower Wyandotte Road intersection; Add eastbound thru lane and convert existing westbound right turn lane into westbound thru/right lane at Medical Center Drive intersection	$ 1,600.00
	Allow u-turns at Olive Highway/Medical Center Drive; Olive Highway/Lower Wyandotte Rd; Olive Highway/Foothill Blvd	$ 84,600.00
	Modify traffic signals for roadway widening/reconfiguration & ADA Compliance	$ 2,400,000.00
Oro-Dam Boulevard		
Roadway Improvements	Restripe roadway to include two 12' wide eastbound and westbound thru lanes, a 12' center turn lane (landscaped where possible) and buffered bike lanes	$ 507,800.00
Intersection Improvements	Add second westbound left turn lane at Feather River/Oro Dam Blvd	$ 75,000.00
	Add eastbound right-turn pocket at Feather River/Oro Dam Blvd	$ 70,800.00
	Increase left-turn pocket lengths on EB, WB, and SB Legs of 5th Avenue/Oro Dam Blvd	$ 2,400.00
	Increase length of right-turn pocket on WB approach Oro Dam/Lincoln Street	$ 800.00
	Increase lengths of left turn pockets on WB approach Oro Dam/Lincoln Street	$ 1,600.00
	Increase length of left turn pocket on the EB and NB approaches Oro Dam/Lincoln Street	$ 10,600.00
	Increase length of left turn pockets on NB and SB approaches Oro Dam/Myers Street	$ 1,600.00
	Allow u-turns at Oro Dam/5th; Oro Dam/Veatch; Oro Dam/Myers	$ 84,600.00
	Modify traffic signals for roadway widening/reconfiguration & ADA Compliance	$ 3,800,000.00

TABLE 10-2. PREFERRED ALTERNATIVE PRELIMINARY COST ESTIMATES

Recommendation	Description	Planning Level Cost Estimates
Bicycle & Pedestrian Improvements (See Ch. 7)		
Sidewalk Gap Closure	Widen existing sidewalks to 6' width along entire corridor; construct new 6' sidewalks to close existing sidewalk gaps	$ 8,046,500.00
Connection to Feather River Trail	Create bicycle/pedestrian facility links to Feather River Trail	$ 95,000.00
Clear Travel Paths	Remove all sidewalk obstructions along the corridor*	$ 11,606,500.00
ADA Upgrades at Traffic Signals	Upgrade all signalized intersections to conform with ADA standards	$ 427,300.00
Spencer Avenue Crosswalk Treatment	Install Double Pedestrian Activated Hybrid Beacon & Z-Crosswalk at Spencer Avenue & Oro Dam Boulevard intersection	$ 218,900.00
Safety Lighting at Marked Crosswalks	Install safety lighting at all marked crosswalks	$ 703,700.00
Side Street Crosswalks	Install high visibility crosswalks on all sidestreet and signalized approaches along the SR 162 corridor	$ 80,600.00
Pedestrian Scale Lighting	Install pedestrian scale lighting throughout length of the corridor	$ 4,355,600.00
Shade Trees	Plant shade trees along the length of the corridor between the travel lane and the sidewalk	$ 2,211,300.00
Buffered Bike Lanes	Install buffered bike lanes on Olive Highway (6' bike lane & 3' buffer) and Oro Dam Blvd (4.5' bike lane & 2' buffer)	$ 77,600.00
Community Wayfinding	Develop and adopt a comprehensive wayfinding system	$ 250,000.00
Bicycle Detection	Install bicycle detection systems at all signalized intersections	$ 20,200.00
Bicycle Intersection Treatments	Install one of the following bicycle intersection treatment options: 1. Bike Pocket 2. Two-Staged Turn Box	$ 26,400.00
ITS & TSM Improvements (See Ch. 9)		
Traffic Signal Optimization	Optimize signal timings and phasing (corridor-wide)	$ 86,000.00
Traffic Signal Coordination	Coordinate signals to allow for more efficient movement of vehicles (corridor-wide)	$ 2,695,400.00
Incident Management	Develop an incident management task force/agreement	--
Emergency Vehicle Preemption	Install emergency vehicle preemption at all signalized intersections	$ 258,400.00
Access Management	Consolidate, restrict, or formalize access points along the corridor with development/redevelopment projects	--

*Clear travel paths include the relocation of storm drain system elements required due to new curb alignments

TABLE 10-2. PREFERRED ALTERNATIVE PRELIMINARY PLANNING LEVEL COST ESTIMATES (CONT'D)

Transit Improvements (See Ch. 8)			
Benches, Shelters, Trash Receptacles	Install benches, shelters, and trash receptacles at all tranist stop locations	$	312,700.00
Transit Vehicle Tracking App	Provide a smart phone app for transit riders to track when their bus is coming in real time		--
Transit Signal Priority	Install transit signal priority system on traffic signals and on all buses operated by B-Line	$	258,400.00
Transit Security	Deploy video surveillance and emergency call buttons at transit center		--
Automated Passenger Counts	Monitor boarding activity and passenger loads on corridor routes		--
Realignment of Route 25	Realign route 25 to extend south to the new Walmart location	$	85,500.00
7th Avenue Stop	Relocate 7th Avenue stop further east to 5th Avenue, nearer the signalized intersection	$	600.00
5th Avenue Stop	Relocate 5th Avenue stop further east to Veatch Avenue, nearer a signalized intersection	$	39,100.00
Meyers Avenue Stop	Relocate the Meyers Avenue Stop closer to Meyers Avenue (further east, nearer a signalized intersection)	$	600.00
Fay Way Stops	Remove the Fay Way eastbound and westbound stops as these are very close to the Medical Center Drive stops	$	1,100.00
Foothill Boulevard Stop	Relocate the westbound Foothill Blvd stop closer to the Foothill Boulevard signal	$	39,100.00
Medical Center Drive Stop	Relocate Medical Center Drive Eastbound and Westbound stops closer to Medical Center Drive (nearer the signal)	$	39,700.00
Transit System Enhancements	Install Automated Passenger Counting equipment on transit vehicles; deploy surveillance and emergency call buttons at transit center.		--
		PREFERRED ALTERNATIVE TOTAL:	**$ 50,418,700.00**

TABLE 10-2. PREFERRED ALTERNATIVE PRELIMINARY PLANNING LEVEL COST ESTIMATES (CONT'D)

10.3 Preferred Alternative Benefits

The Preferred Alternative for the SR 162 corridor will create many benefits for all corridor users. Identifying and assessing the benefits of each component assists in the prioritization process and implementation. Using models developed by Caltrans, the beneficial impacts of implementing the components of the Preferred Alternative can be measured, estimated, and monetized. Near-term safety and cost benefits are expected to come in the form of crash reductions from re-striping the existing roadway to increase turning capacity, reducing travel speeds, and adding bike lanes. Anticipated GHG emissions reductions and associated benefits are described in more detail. Decreased travel times on the corridor are expected, especially during peak-hour commutes. The most significant benefits that are likely to result from the implementation of the Preferred Alternative are described below, in terms of safety and user/environmental benefits. (Detailed tables showing the analysis used to produce these estimates are included in **Appendix D**.)

Safety

Ensuring that transportation networks and options are safe for all roadway users is a top priority for this project. The following aspects of the Preferred Alternative are aimed at improving safety.

Pedestrian Safety

The pedestrian environment along the entire corridor will be greatly improved, especially in terms of pedestrian safety. According to the TIMs accident database, over the past five years, a total of 25 injury-causing accidents involving pedestrians, and 2 pedestrian fatalities, have occurred along the corridor. Based on these figures and utilizing the Caltrans ATP B/C tool, the recommendations included in the Preferred Alternative to improve pedestrian safety could save up to $53.3 million over the next 20 years, in connection with costs associated with crash reductions alone.

Bicycle Safety

The Preferred Alternative includes numerous bicycle safety improvements, including the addition of bicycle lanes with a painted "buffer zone" throughout the length of the corridor. Location specific intersection bike lane approach and bicycle turning/crossing treatments are also recommended. According to the TIMs accident database, over the past five years 10 injury-causing accidents involving bicyclists, and 1 bicyclist fatality, have occurred along the corridor. Based on these figures and the Caltrans ATP B/C tool, the recommendations included in the Preferred Alternative would save up to $8 million over the next 20 years in crash reduction costs alone.

Corridor-Wide Crash Reduction Factors

Crash Reduction Factors (CRFs) represent the expected crash reduction percentage after implementing a given countermeasure. CRFs are developed by the Federal Highway Administration (FHWA). **Table 10-3** and **Table 10-4** show the corresponding CRFs for each countermeasure included in the Preferred Alternative.

Countermeasures highlighted in green indicate those that may be fully or partially implemented in the short-term improvements.

Olive Highway

Preferred Alternative		
Intersection Improvements	**Crash Type**	**Crash Reduction Factors (%)**
Increase EB & WB Left-Turn Pocket Lengths (Lower Wyandotte)	All	15
Increase EB & WB Left-Turn Pocket Lengths (Medical Center Drive)	All	15
Emergency Vehicle Preemption	Emergency Vehicle Crashes	70
Replace Existing Walk/Don't Walk Signals with Pedestrian Countdown Signal	Ped Fatal/Injury	25
Safety Lighting at Marked Crosswalks	Ped Fatal Ped Injury	78 42
Bicycle Intersection Treatments	All Bicycle Crashes	36
High Visibility Crosswalks	All	25
Retroreflective Backplates	All	15
Traffic Signal Optimization	All Fatal/Injury	8 12
Traffic Signal Coordination	All	15
Segment Improvements		**Crash Reduction Factors (%)**
Sidewalk Gap Closures	All Pedestrian Crashes	74
Segment Lighting	All Night-time	6 20
Additional Thru Lane	All	31
Buffered Bike Lanes	All Bicycle Crashes	36
Sidewalk Gap Closures	All Pedestrian Crashes	74
Additional Thru Lane	All	31

- Applicable to Short-Term

All = All Intersection/Segment Crash Types

TABLE 10-3. OLIVE HIGHWAY APPLICABLE CRASH REDUCTION FACTORS

Oro-Dam Boulevard

Preferred Alternative		
Intersection Improvements	**Crash Type**	**Crash Reduction Factors (%)**
Additional WB Left Turn Lane Feather River Blvd/Oro Dam Blvd (With Painted Separation)	All	50
Additional EB right-turn pocket Feather River/Oro Dam Blvd (With Painted Separation)	All	30
Increase Left-Turn Pocket Lengths on EB, WB, and SB legs of 5th Avenue/Oro Dam Blvd	All	15
Increase Right-Turn Pocket Length on WB Approach Oro Dam/Lincoln Street	All	15
Increase Left-Turn Pocket Lengths on WB approach Oro Dam/Lincoln Street	All	15
Increase Left-Turn Pocket Lengths on EB and NB	All	15
Increase Left Turn Pocket Lengths on NB and SB approaches Oro Dam/Myers Street	All	15
Emergency Vehicle Preemption	Emergency Vehicle Crashes	70
Separated Dual Lefts (Striping) (Feather River	Left-Turn	57
Replace Existing Walk/Don't Walk Signals with Pedestrian Countdown Signal	Pedestrian Fatal/Injury	25
Safety Lighting at Marked Crosswalks	Pedestrian Fatal Pedestrian Injury	78 42
Bicycle Intersection Treatments	All Bicycle Crashes	36
High Visibility Crosswalks	All	25
Retroreflective Backplates	All	15
Traffic Signal Optimization	All Fatal/Injury	8 12
Traffic Signal Coordination	All	15
Segment Improvements	**Crash Type**	**Crash Reduction Factors (%)**
Sidewalk Gap Closures	All Pedestrian Crashes	74
Segment Lighting	All Night-time	6 20
Buffered Bike Lanes	All Bicycle Crashes	36
Sidewalk Gap Closures	All Pedestrian Crashes	74

- Applicable to Short-Term

All = All Intersection/Segment Crash Types

TABLE 10-4. ORO-DAM APPLICABLE CRASH REDUCTION FACTORS

User / Environmental Benefits

In order to quantify benefits enabled by the Preferred Alternative, an estimate of annual Vehicle Hours Traveled (VHT) and annual Vehicle Miles Traveled (VMT) was developed for a no-build scenario and for the Preferred Alternative for 2015 and 2035. (Annual VHTs and annual VMTs are required inputs for the Caltrans Corridor B/C tool, which was used to quantify benefits.) Annual VHTs and annual VMTs were estimated by multiplying existing and future PM peak hour volumes by 365 to represent total annual PM peak hour traffic. The adjusted VHTs and VMTs were inputted into the Caltrans Corridor B/C tool to gauge corridor-wide benefits generated during the PM peak hour for the next 20 years. This method produced estimated benefits of *travel time savings, vehicle operating cost savings, and emissions reductions*. (Detailed tables showing the analysis used to produce these estimates are included in **Appendix D**.) These estimated benefits are intended to provide a rough idea of the magnitude of user/environmental benefits generated by the Preferred Alternative. It is probable that this analysis has underestimated benefits. A detailed analysis based on VHTs and VMTs which represent all annual traffic, not just the PM peak hour, would reveal the full extent of user/environmental benefits generated by the preferred alternative.

Travel Time Savings

The total travel time savings generated by the Preferred Alternative over the next 20 years amounts to approximately 737,480,310 person-hours during the PM peak hour alone, which translates into roughly $4.2 billion in travel time cost savings. As the benefit of the Preferred Alternative continues to increase over the 20-year period, travel time savings continue to increase. In the first year, an estimated 2.9 million person-hours, or $27 million, will be saved throughout the corridor. Over the next 19 years this annual figure increases to 70 million person-hours, or $315 million in travel time cost savings.

Vehicle Operating Cost Savings

Similar to travel time savings, vehicle operation cost savings continue to increase nearly every year for the next 20 years after the Preferred Alternative is implemented. In the first year, a total of $4.6 million will be saved throughout the corridor during the PM peak hour. The total savings per year are estimated to reach as high as $27 million. In total, the Preferred Alternative is estimated to save $361 million in vehicle operating costs during the PM peak hour. These estimates include cost savings on fuel-related (gasoline and diesel, including taxes) and non-fuel costs per mile.

Emissions Reductions

Improving traffic flow with a variety of component improvements including traffic signal optimization and coordination, the Preferred Alternative will help reduce emissions by reducing vehicle idling, acceleration and deceleration between traffic signals. These improvements will help to significantly reduce GHG emissions throughout the corridor. In the PM peak hour alone, a total of 3.7 million tons of CO_2 will be saved over 20 years as a result of the implemented Preferred Alternative. This reduction translates to an estimated $62.5 million in associated emissions costs over 20 years.

11 Interim Implementation Plan

11.1 Implementation Strategy

The Preferred Alternative, detailed in Chapter 10, is intended to act as the long-term vision for the SR 162 corridor and the implementation of all recommendations will take place over many years. In order to facilitate the timely implementation of the Preferred Alternative the overall implementation strategy includes two logical sets of actions.

- **Interim:** Short-term strategies and recommendations that can be implemented reasonably quickly, with relatively small investments; supporting strategies necessary to maintain acceptable traffic operations and establish real multi-modal alternatives throughout the corridor.

- **Long-Term:** Long-Term strategies and recommendations which build off of the recommendations in the interim period. This includes strategies and recommendations which require larger investments, cooperation from numerous agencies, as well as those that may require the acquisition of Right-Of-Way.

The Interim Implementation Plan identifies components of the Preferred Alternative that could be implemented in the interim period. Because these are conceptual plans, changes to the implementation strategy are possible, and unanticipated project coordination and funding realities, among other variables, are likely to shape the path to implementation of the Preferred Alternative.

All recommendations included in the Interim Implementation Plan are discussed in the following section and compiled in **Table 11-1** on pages 11-10 & 11-11.

11.2 Interim Implementation Plan

Many of the design features in the Preferred Alternative can be implemented in a near-term timeframe. The following actions can be implemented with less investment, and will "lay the ground work" for long-term Preferred Alternative actions which require more time, funding, and effort.

Olive Highway Re-striping

Description – Re-stripe Olive Highway to accommodate one westbound lane, one center turn lane, two eastbound lanes and one buffered bike lane in each direction. Remove marked crosswalk at Fay Way. This roadway configuration would not require the acquisition of additional right-of-way as the restriping occurs within the existing pavement width (**Figure 11-1**).

Intent - Providing separated facilities for bicyclists will provide a safer and more comfortable alternative travel mode. One additional eastbound lane will maintain vehicle operations at policy levels.

Next Steps – Requires no change in right-of-way, only a re-striping of the roadway and could be integrated with routine or managed roadway re-striping or re-surfacing projects, to reduce costs.

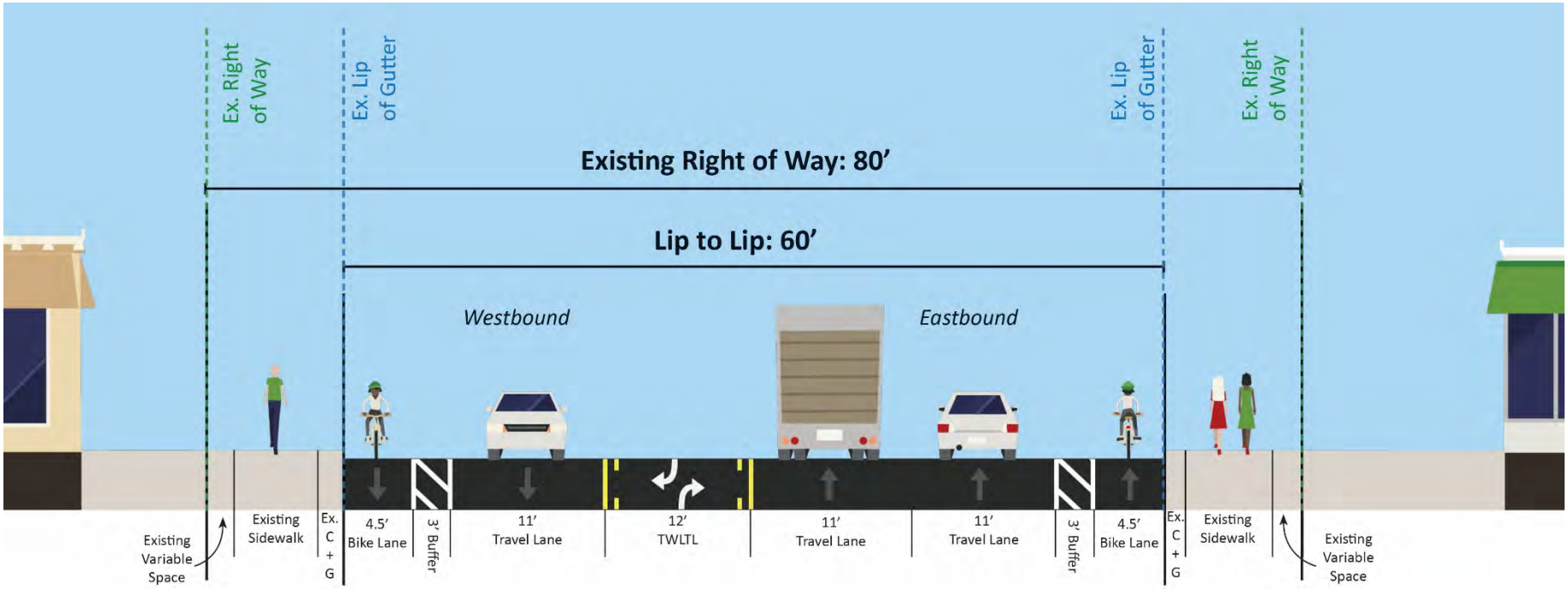


FIGURE 11-1. INTERIM OLIVE HIGHWAY CONFIGURATION

Oro-Dam Boulevard Re-striping

Description – Re-stripe Oro-Dam Boulevard to add buffered bicycle lanes within the existing pavement width. The existing shoulder provides most of the space for these facilities on Oro-Dam Boulevard (**Figure 11-2**).

Intent – The addition of bicycle facilities on Oro-Dam Boulevard was deemed an important issue by residents. Buffered bike lanes are desired by residents, and will help provide a safer environment.

Next Steps - Requires no change in right-of-way, requires re-striping of the roadway to accommodate bicycle lanes. Requires more detailed striping design.

Sidewalk Gap Closure

Description – Sidewalk gaps are closed by constructing six foot wide sidewalks where sidewalk gaps currently existing (shown in green on **Figure 11-3**). Existing sidewalk obstructions requiring minimal investment are to be removed.

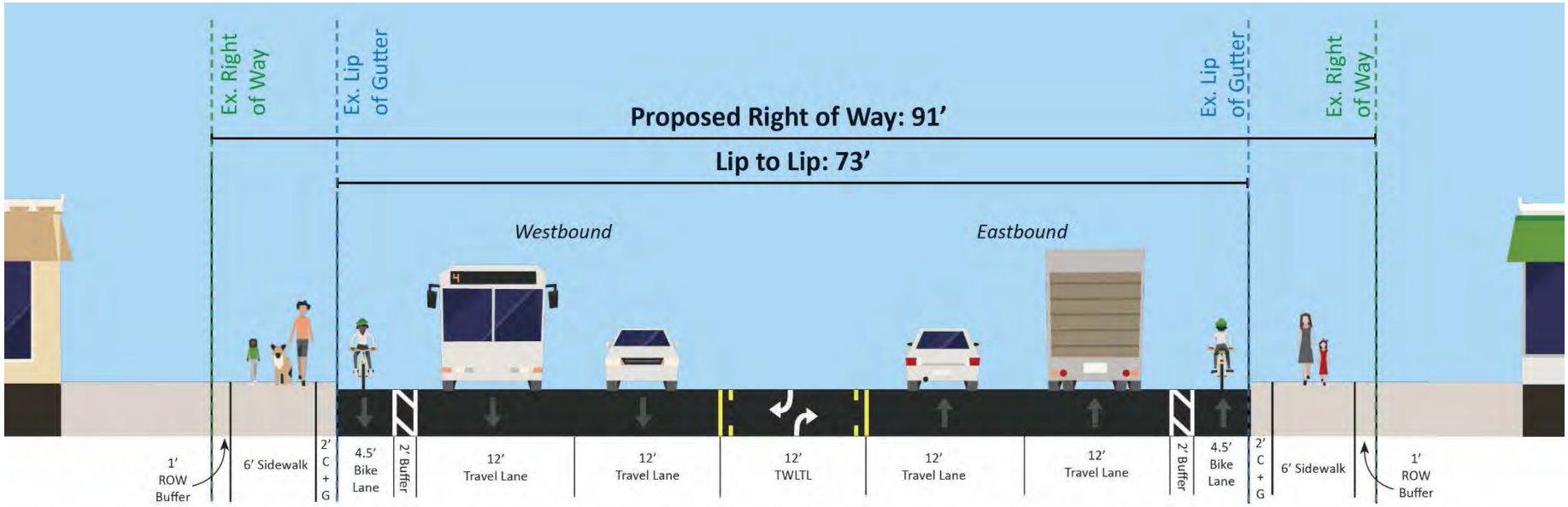


FIGURE 11-2. INTERIM ORO-DAM BOULEVARD CONFIGURATION

Intent – Providing a continuous and improved sidewalk network on Oro-Dam Boulevard and Olive Highway will create a safer and more welcoming environment for pedestrians and wheelchair users.

Next Steps – Sidewalk construction and obstruction removal in this first phase would likely only occur in areas where the roadway is not planned for widening (e.g., on Oro-Dam Blvd). For new development fronting the SR 162 right-of-way, responsibility for new sidewalks should rest with the developer.

Traffic Signal Modifications

Description – Existing Traffic Signals are to be relocated outside of the sidewalk where necessary and modified to accommodate the additional lane on Olive Highway.

Intent – Pedestrian travel paths are improved by relocating traffic signal poles which are currently located in the sidewalk. Traffic signals can adequately accommodate additional lanes on Olive Highway.

Next Steps – Relocation of signal poles should be coordinated with the lane reconfiguration and other corridor-wide improvement projects.

FIGURE 11-3. SIDEWALK GAP CLOSURES & OBSTRUCTION REMOVALS (SIDEWALKS IDENTIFIED FOR INTERIM CONSTRUCTION ARE SHOWN IN GREEN)

Cross Street Approach Crosswalks

Description – High-visibility crosswalks are to be installed on all side street approaches and signalized approaches to Oro-Dam Boulevard and Olive Highway, where crosswalks do not currently exist.

Intent – High-visibility crosswalks will help to improve pedestrian safety and address the public's clearly voiced safety concerns. High-visibility crosswalks help alert drivers to a crossing.

Next Steps – The precise timing may be coordinated with signal updates and re-striping/re-surfacing projects, or implemented independently of other projects dependent on funding availability.

Connection to Feather River Trail

Description – Formalize pedestrian accessible links from Oro-Dam Boulevard to the existing Feather River Trail, west of SR 70, are created (See **Figure 11-3**).

Intent – Creating links between existing active transportation networks and the improved pedestrian environment along SR 162 will help to improve overall network connectivity and encourage active transportation for multiple uses.

Next Steps – Linking the Feather River Trail with SR 162 may be completed in a variety of ways. Further study of the most efficient and practical way of creating this connection should be initiated.

Spencer Avenue Crossing Treatment

Description – Two Pedestrian Hybrid Beacon (PHB) signals are to be installed at this pedestrian crossing in conjunction with the installation of a Z-crosswalk. These PHB signals should be coordinated with the corresponding through movements on the upstream traffic signals (**Figure 11-4**).

Intent – This location does not currently meet warrants for a full traffic signal and an uncoordinated pedestrian signal would greatly effect traffic operations. This solution provides pedestrians with an improved crossing option, and has a minor effect on traffic operations due to the coordination with upstream signals.

Next Steps – This treatment would require coordination with adjacent traffic signals. Future analysis of the crosswalk placement, Pedestrian Hybrid Beacon justification, and enhanced pedestrian treatment warrants should consider the latent or unserved pedestrian crossing demand and the significant current safety issues at this location. Minor impacts to traffic operations on Oro-Dam Boulevard would occur. Consideration should also be given to locating the PHB signal poles in areas which will avoid relocation in the long-term due to widened sidewalks and pedestrian accommodations.

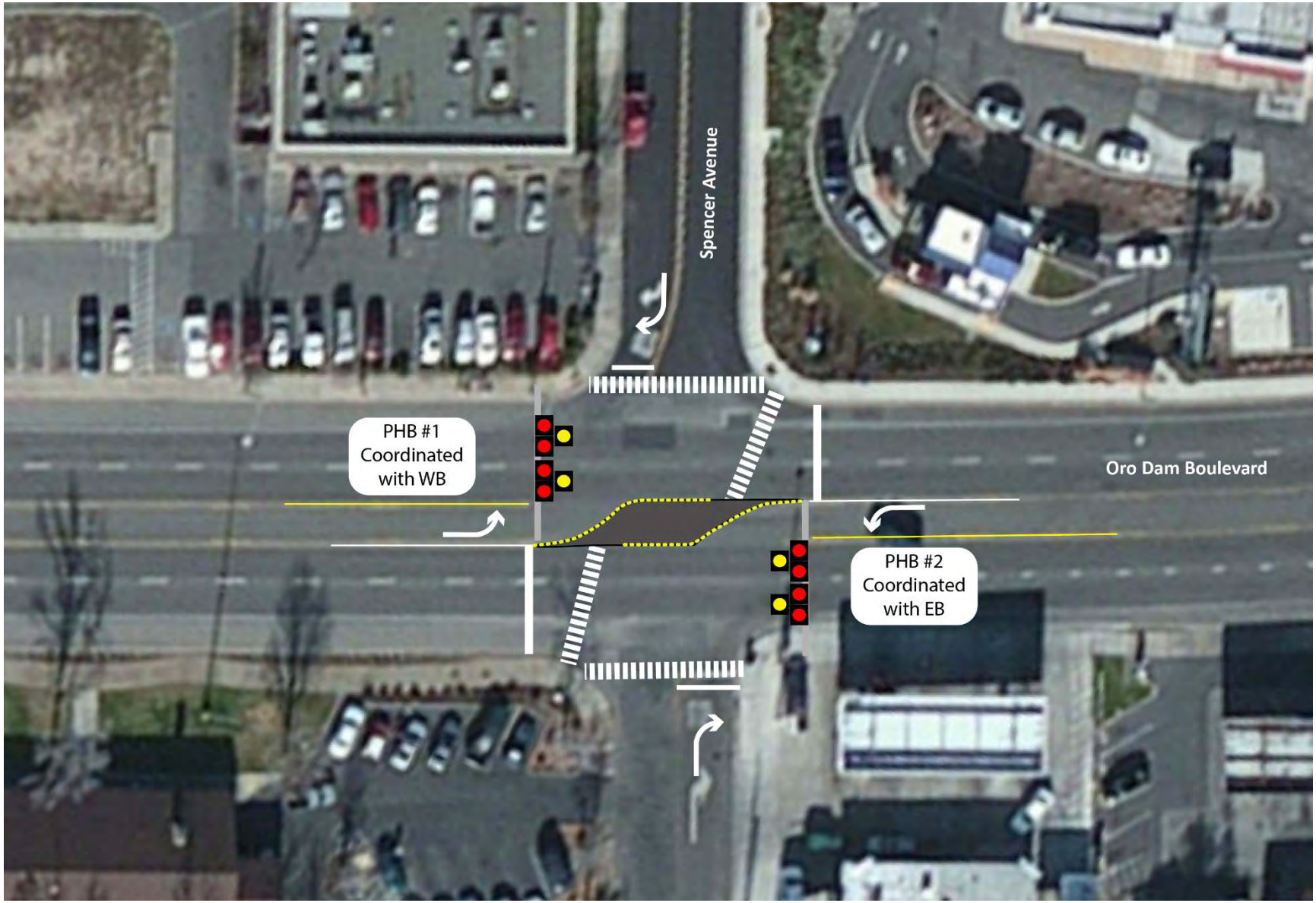


FIGURE 11-4. SPENCER AVENUE PEDESTRIAN CROSSING TREATMENT (DOUBLE PEDESTRIAN HYBRID BEACON Z-CROSSWALK CONCEPT)

Safety Lighting at Marked Crosswalks

Description – Pedestrian-scale safety lighting should be installed at all marked crosswalks throughout the corridor where it is does not currently exist.

Intent – This strategy will make pedestrians more visible to motorists and will improve crosswalk safety.

Next Steps – The installation of safety lighting at marked crosswalks should coincide with the installation of any new marked crosswalk and/or signal modifications or updates. If desired, safety lighting may be installed independently.

Bicycle Intersection Approach Treatments

Description – Either a mixed bike lane/right-turn lane or bike pocket is to be installed on the SR 162 approaches at all major intersections along the corridor. The selection of the appropriate bicycle approach treatment will depend on available space and other existing conditions.

Intent – Providing dedicated space for bicyclists at intersections will help to improve bicyclist safety and inform both motorists and bicyclists of their appropriate areas within the roadway.

Next Steps – A dedicated bike pocket and two-staged left turn box is the preferred alternative but may require additional Right-of-Way. A mixed bike lane/right turn lane may be used in the short-term if existing Right-of-Way is insufficient (See **Figures 7-8** to **7-10**).

Bicycle Detection at Traffic Signals

Description – Install bicycle detection at signals in coordination with signal upgrades and modifications.

Intent – Bicycle detection makes traffic signals more responsive to bicyclists. This treatment is also required by Caltrans directives.

Next Steps – Incorporate bicycle detection with other planned traffic signal modifications.

Community Wayfinding

Description – Implement a sign-based walking and bicycling wayfinding system which guides roadway users to their destinations and points of interest.

Intent – The system of signs will help to promote active transportation. Motorists will also benefit from these wayfinding improvements.

Next Steps – The City will need to develop and adopt a comprehensive wayfinding plan and signage standards for the SR 162 corridor (and other key corridors throughout Oroville), prior to implementation.

Realignment of Route 25

Description – The current Route 25 will be realigned to access the new Wal-Mart location on Cal Oak Road.

Intent – Maintains access to Wal-Mart for transit users. This realignment also increases the potential for park & ride usage at adjacent parking lots.

Next Steps – BCAG will need to time this realignment with the opening of the new Wal-Mart location.

Traffic Signal Optimization & Coordination

Description – Optimize and coordinate traffic signal operations on the SR 162 corridor, as described in Chapter 9. With the aid of signal optimization technology, improve the timing, phasing, and coordination of traffic signals.

Intent – Optimizing traffic signals will reduce residual queuing and promote smoother traffic flow. Improve overall traffic flow on the corridor and ensure efficient operation of individual traffic signals.

Next Steps – Plan an interconnect system for the corridor. Radio communication should be considered.

Traffic Signal Head Retro-reflective Back Plates

Description – Install rectangular metal backplates with a retro-reflective border on all signal heads.

Intent – Backplates with a retro-reflective border help to improve daytime and nighttime visibility of the traffic signal head, and the mid-range visibility of intersections at night, improving safety for motorists.

Next Steps – Timing of this installation could be dependent upon available funding and scheduled signal upgrades. In order to increase efficiency, this project can be incorporated into a larger traffic signal project.

Separated Dual Left Turns (Striping)

Description – Install striping treatments to create greater separation between dual lefts and through movements where they exist throughout the corridor (Lincoln St./Oro-Dam Blvd.; Olive Hwy./Oro-Dam Blvd., etc.).

Intent – Better delineation and improved safety at intersections.

Next Steps – Re-striping at these locations can be incorporated into routine re-striping and/or resurfacing programs for Oro-Dam Boulevard and Olive Highway.

Transit Stop Reorganization & Improvements

Description – Transit Stops on the corridor are to be relocated or removed according to recommendations in Chapter 8. Benches, shelters, and trash receptacles are to be installed at stops which are not relocated, where space permits.

Intent – Relocating transit stops nearer traffic signals will encourage safer pedestrian crossings at proper locations. Higher quality transit stops will help to create a more attractive transit network and increase ridership.

Next Steps – BCAG may wish to determine the appropriateness of installing shelters, benches, and trash receptacles at each existing stop.

11.3 Cost Estimates

Preliminary planning level cost estimates were developed for each improvement included in the Interim Implementation Plan to aid prioritization and programming. These cost estimates were developed using 2015 construction dollar values. The quantities have been generalized based on planning-level conceptual designs. It is not feasible at this time to address all potential work items that would be included in the construction documents. The estimates are based on industry standard unit costs and estimated right of way costs in the Oroville area.

Table 11-1 includes preliminary cost estimates for all recommendations in the Interim Implementation Plan by type (i.e., Roadway, Bicycle and Pedestrian Transit, and ITS/TSM). All cost estimates assume that the improvements will be packaged into larger-scale projects.

More detailed cost estimates for significant scale recommended improvements of the Interim Implementation Plan are included in **Appendix C**.

Recommendation	Description	Planning Level Cost Estimates
Roadway Improvements (See Ch. 6)		
Retroreflective Back Plates	Install retroreflective back plates on all traffic signal heads along the corridor	$ 50,000.00
Separated Dual Lefts (Striping)	Install striping to separate dual lefts from thru movements (Oro Dam Blvd/Olive Highway intersection)	$ 100.00
Olive Highway		
Roadway Improvements	Restripe Olive Highway between Oro-Dam Blvd and Lower Wyandotte Road to have two eastbound lanes, a center-turn lane, one westbound lane and new buffered bike lanes. (Addition of one travel Lane)	$ 105,700.00
Intersection Improvements	Add eastbound thru lane at Medical Center Drive intersection & drop lane at Lower Wyandotte Road intersection	--
	Remove marked crosswalk at Fay Way intersection	$ 3,800.00
	Modify signals to accommodate additional eastbound thru lane and to remove sidewalk obstructions	$ 800,000.00
Oro-Dam Boulevard		
Roadway Improvements	Restripe Oro Dam Blvd between Olive Highway and SR70 to include two 12' wide eastbound and westbound thru lanes, a 12' center turn lane, and buffered bike lanes	$ 44,000.00
Intersection Improvements	Modify signals to remove existing sidewalk obstructions	$ 1,300,000.00
Bicycle & Pedestrian Improvements (See Ch. 7)		
Sidewalk Gap Closure	Close existing sidewalk gaps along entire corridor	$ 2,829,000.00
Network Connectivity	Create bicycle/pedestrian links to existing key destinations such as Feather River Trail and locals schools	$ 95,000.00
Clear Travel Paths	Remove or relocate all sidewalk obstructions requiring minor investments along SR 162	$ 98,100.00
Side Street Crosswalks	Install high visibility crosswalks on all sidestreet and signalized approaches along the SR 162 corridor	$ 80,600.00
Spencer Avenue Crosswalk Treatment	Install Double Pedestrian Activated Hybrid Beacon & Z-Crosswalk at Spencer Avenue & Oro Dam Boulevard intersection	$ 218,900.00
Safety Lighting at Marked Crosswalks	Install safety lighting at all marked crosswalks	$ 703,700.00
Buffered Bike Lanes	Stripe in buffered bike lanes along both Olive Highway (4.5' bike lane & 3' buffer) and Oro Dam Blvd (4.5' bike lane & 2' buffer)	$ 51,700.00
Bicycle Intersection Treatments	Install one of the following bicycle intersection treatment options: 1. Mixed Bike Lane & Right Turn Lane 2. Bike Pocket	$ 18,000.00
Bicycle Detection	Install bicycle detection at all signalized intersections	$ 3,900.00
Community Wayfinding	Develop and adopt a comprehensive wayfinding system	$ 250,000.00

TABLE 11-1. INTERIM IMPROVEMENTS & PRELIMINARY PLANNING LEVEL COST ESTIMATES

Recommendation	Description	Planning Level Cost Estimates
Transit Improvements (See Ch. 8)		
Realignment of Route 25	Realign route 25 to extend south to the new Walmart location	$ 85,500.00
7th Avenue Stop	Relocate 7th Avenue stop further east to 5th Avenue, nearer the signalized intersection	$ 600.00
5th Avenue Stop	Relocate 5th Avenue stop further east to Veatch Avenue, nearer a signalized intersection	$ 39,100.00
Meyers Avenue Stop	Relocate the Meyers Avenue Stop closer to Meyers Avenue (further east, nearer a signalized intersection)	$ 600.00
Fay Way Stops	Remove the Fay Way eastbound and westbound stops as these are very close to the Medical Center Drive stops	$ 1,100.00
Medical Center Drive Stop	Relocate Medical Center Drive Eastbound and Westbound stops closer to Medical Center Drive (nearer the signal)	$ 39,700.00
Benches, Shelters, Trash Receptacles	Install benches, shelters, and trash receptacles at all transit stops not planned to be relocated	$ 117,300.00
Foothill Boulevard Stop	Relocate the westbound Foothill Blvd stop closer to the Foothill Boulevard signal	$ 39,100.00
Transit Vehicle Tracking App	Provide a smart phone app for transit riders to track when their bus is coming in real time	--
ITS & TSM Improvements (See Ch. 9)		
Traffic Signal Optimization	Optimize signal timings and phasing (corridor-wide)	$ 86,000.00
Traffic Signal Coordination	Coordinate signals to allow for more efficient movement of vehicles (corridor-wide)	$ 2,695,400.00
Access Management	Consolidate, restrict, or formalize access points along the corridor with development/redevelopment projects	--

INTERIM IMPROVEMENTS TOTAL: $ 9,756,900.00

TABLE 11-1. INTERIM IMPROVEMENTS & PRELIMINARY PLANNING LEVEL COST ESTIMATES

11.4 Interim Improvement Funding

The following funding opportunities were identified as the most probable funding sources for many of the interim improvements included in this chapter.

- Active Transportation Program (ATP)
- Highway Safety Improvement Program (HSIP)
- State Highway Operation and Protection Program (SHOPP) and Minor Program
- Congestion Mitigation and Air Quality (CMAQ)

These funding sources are awarded through Caltrans typically following a competitive grant application process or SHOPP programming and may provide significant levels of funding for many interim improvements. **Table 11-2** highlights the most applicable funding sources for each interim improvement. A full discussion of all funding options is included in Chapter 12.

Recommendation	Applicable Funding Sources
Roadway Improvements	
Retroreflective Back Plates	SHOPP/HSIP
Separated Dual Lefts (Striping)	SHOPP/HSIP
Olive Highway	
Roadway Improvements	CMAQ
Intersection Improvements	CMAQ/SHOPP
Oro-Dam Boulevard	
Roadway Improvements	CMAQ/SHOPP/ATP
Intersection Improvements	CMAQ/SHOPP
Bicycle & Pedestrian Improvements	
Sidewalk Gap Closure	CMAQ/ATP
Connection to Feather River Trail	CMAQ/ATP
ADA Upgrades at Traffic Signals	CMAQ/SHOPP
Spencer Avenue Crosswalk Treatment	CMAQ/ATP/HSIP
Safety Lighting at Marked Crosswalks	SHOPP/ATP/HSIP
Side Street Crosswalks	ATP/SHOPP/HSIP
Transit Benches & Trash Receptacles	CMAQ
Pedestrian Scale Lighting	ATP
Shade Trees	ATP
Buffered Bike Lanes	CMAQ/ATP/HSIP
Community Wayfinding	ATP
Bicycle Detection	CMAQ/SHOPP/ATP
Bicycle Intersection Treatments	CMAQ/ATP/HSIP

Recommendation	Applicable Funding Sources
Transit Improvements	
Benches, Shelters, Trash Receptacles	CMAQ
Transit Vehicle Tracking App	CMAQ
Transit Signal Priority	CMAQ
7th Avenue Stop	CMAQ
5th Avenue Stop	CMAQ
Meyers Avenue Stop	CMAQ
Foothill Boulevard Stop	CMAQ
Medical Center Drive Stop	CMAQ
Transit System Enhancements	CMAQ
ITS/TSM Improvements	
Traffic Signal Optimization	CMAQ/SHOPP
Traffic Signal Coordination	CMAQ/SHOPP
Incident Management	CMAQ

TABLE 11-2. APPLICABLE FUNDING SOURCES

11.5 Incorporating Preferred Alternative Essentials

The City of Oroville and Caltrans may desire to implement projects which serve the corridor for a longer period of time than those included in the preceding Interim Implementation Plan but also avoid large-scale Right-of-Way acquisitions associated with the Preferred Alternative. This may include modifying travel and bicycle lane widths but future designs should maintain the final number of travel lanes detailed in the Preferred Alternative. Omission of certain Preferred Alternative recommendations, such as street trees, in this kind of interim project may also occur with the understanding that any omitted recommendations may be implemented at a later date. Cross-sections representing the components which are essential to the corridor plan are included in **Figures 11-5** & **11-6**.

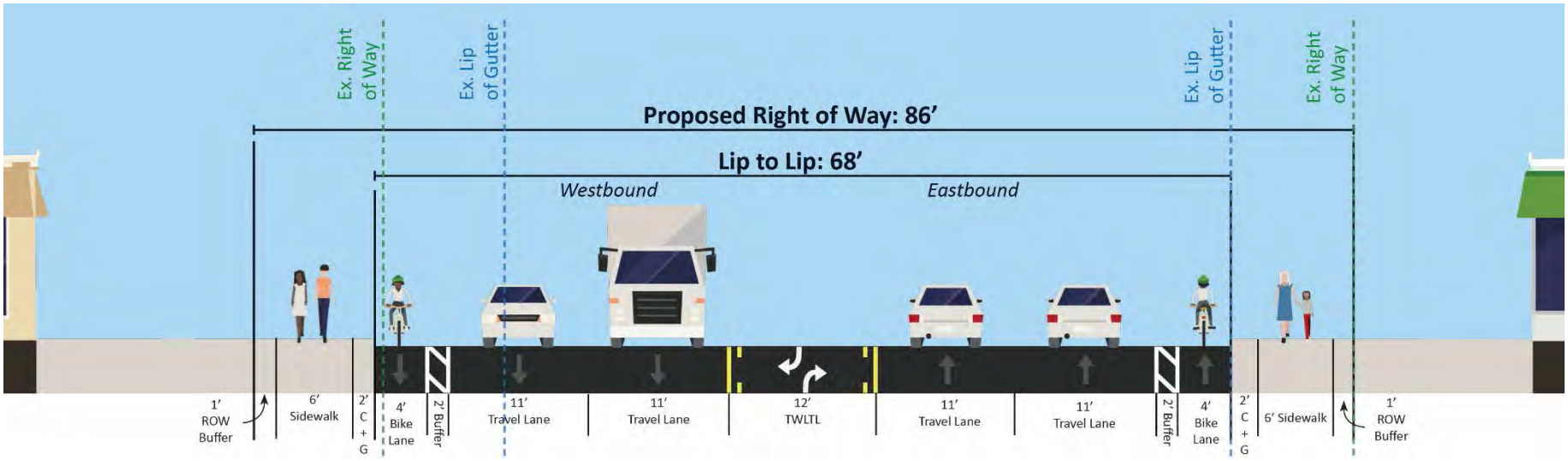


FIGURE 11-5. ESSENTIAL OLIVE HIGHWAY CONFIGURATION

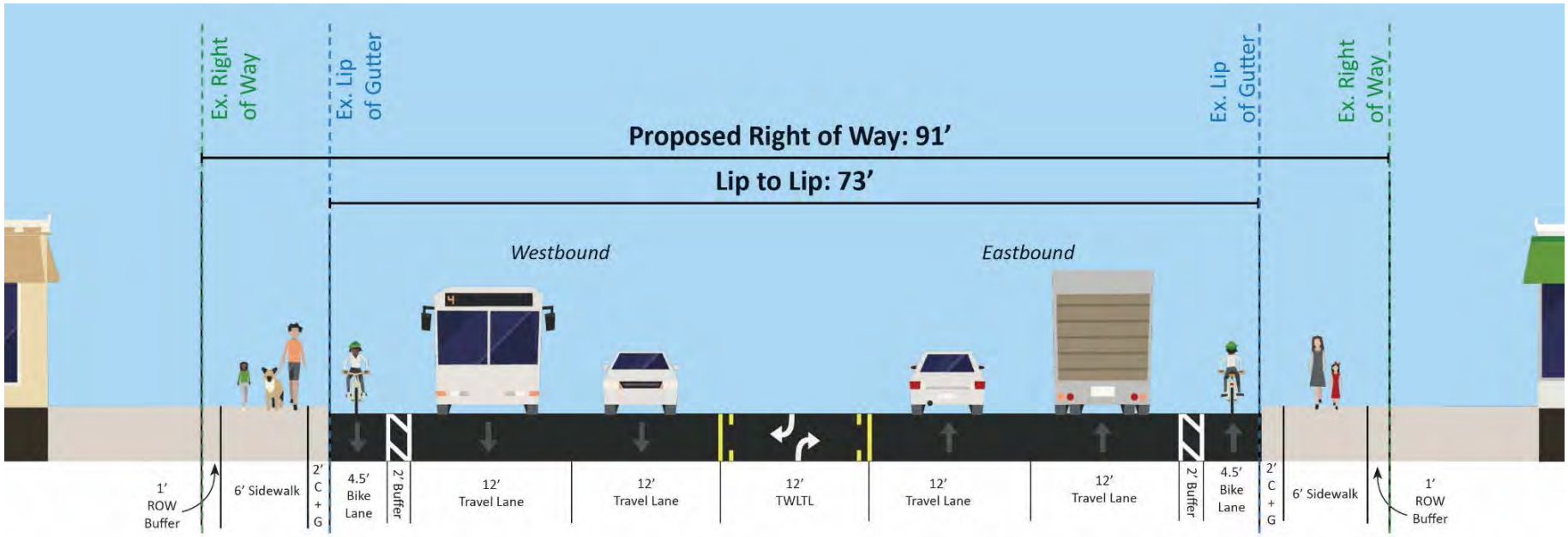


FIGURE 11-6. ESSENTIAL ORO-DAM BOULEVARD CONFIGURATION

12 FUNDING OPPORTUNITIES

A variety of options exist to further plan, design and construct the recommended transportation improvements on SR162, including funding from federal, state, regional, local, and private sources. This section identifies potential funding streams for associated projects.

12.1 Federal Sources

Fixing America's Surface Transportation (FAST) Act


One Hundred Fourteenth Congress
of the
United States of America

AT THE FIRST SESSION

Begun and held at the City of Washington on Tuesday, the sixth day of January, two thousand and fifteen

An Act

To authorize funds for Federal-aid highways, highway safety programs, and transit programs, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SECTION 1. SHORT TITLE; TABLE OF CONTENTS.

(a) SHORT TITLE.—This Act may be cited as the "Fixing America's Surface Transportation Act" or the "FAST Act".

In December 2015, the FAST Act replaced Moving Ahead for Progress in the 21st Century (MAP-21). State and local governments can move forward with qualified projects knowing that they will have a federal funding partner for at least five years. The new law makes changes and reforms to many programs including the ones described hereafter, including streamlining the approval processes for new transportation projects and providing new safety tools. The FAST Act allows local entities that are direct recipients of Federal dollars to use different design publications than the one used by a State DOT.

More information: *https://www.transportation.gov/fastact*

Surface Transportation Block Grant (STBGP)

U.S. Department of Transportation
Federal Highway Administration

The FAST Act expanded the existing Surface Transportation Program (STP) into the Surface Transportation Block Grant Program (STBGP), which places more decision-making power in the hands of state and local governments. The list of uses eligible for program funds is simplified, and there are more ways that funds can be used for local roads and rural minor collectors. The Transportation Alternatives Program (TAP) is a set-aside program of this block grant, requiring 55 percent of program funds be distributed within each state on the basis of population. In California, STBGP is allocated through the Regional Surface Transportation Program (RSTP). The TAP program is allocated through the Active Transportation Program (ATP).

More information on STBGP:
http://www.dot.ca.gov/hq/transprog/federal/rstp/Official_RSTP_Web_Page.htm

More information on ATP:
http://www.dot.ca.gov/hq/LocalPrograms/atp/index.html

Highway Safety Improvement Program (HSIP)

HSIP is a data-driven funding program, and eligible projects must be identified through crash analysis or other similar metrics. Examples of eligible projects include bicycle and pedestrian safety improvements,

enforcement activities, traffic calming projects, and crossing treatments for active transportation users in school zones. All HSIP projects must be consistent with the state's Strategic Highway Safety Plan. In California, HSIP is administered by Caltrans. Through HSIP the FAST Act eliminates the ability of states to shift funds designated for infrastructure safety programs to other activities. It also designates several new safety improvements eligible for funding, including vehicle-to-infrastructure communication and improved physical separation between pedestrians and motor vehicles. The law and HSIP also require that U.S. DOT review data and reports to Congress on roadway infrastructure improvements that enhance commercial motor vehicle safety.

The recently developed Systemic Safety Analysis Report Program (SSARP) provides assistance to local agencies in performing collision analysis, identifying safety issues on their roadway networks, and developing a list of systemic low-cost counter measures that can be used to prepare future HSIP applications.

More information: *http://dot.ca.gov/hq/LocalPrograms/hsip.html* *http://www.dot.ca.gov/hq/LocalPrograms/HSIP/SSARP.htm*

Partnership for Sustainable Communities

Founded in 2009, the Partnership for Sustainable Communities is a joint project of the Environmental Protection Agency (EPA), the U.S. Department of Housing and Urban Development (HUD), and the U.S. Department of Transportation (USDOT). The partnership aims to "improve access to affordable housing, provide more transportation options, and lower transportation costs while protecting the environment in communities nationwide." Providing more transportation choices is one of the five Livability Principles that address the need for bicycle and pedestrian infrastructure: The Partnership is not an agency with a regular annual grant program. Nevertheless, it has already led to some new grant opportunities (including the TIGER grants).

More information: *http://www.epa.gov/smartgrowth/partnership/*

Community Development Block Grants (CDGB)

CDBG provides money for streetscape revitalization, including programs and projects with a high ratio of pedestrian improvements. Grantees may use CDBG funds for activities including but not limited to: acquiring real property; reconstructing or rehabilitating housing and other property; building public facilities and improvements, such as streets, sidewalks, and recreational facilities; planning and administrative expenses; providing public services for youths, seniors, disabled, and neighborhood watch. Trails and

greenway projects that enhance accessibility are the best fit for this funding source.

More information: *www.hud.gov/cdbg*

Community Transformation Grants

Community Transformation Grants administered through the Centers for Disease Control (CDC) support community–level efforts to reduce chronic diseases such as heart disease, cancer, stroke, and diabetes. Active transportation infrastructure and programs that promote healthy lifestyles are a good fit for this program, particularly if such improvements benefit groups experiencing the greatest burden of chronic disease.

More information: *http://www.cdc.gov/communitytransformation/*

12.2 State Sources

Active Transportation Program (ATP)

With the consolidation of federal funding sources under the FAST Act, a number of state-funded programs centered on active transportation are now consolidated into a single program. The resulting ATP consolidated the Bicycle Transportation Account, the Safe Routes to Schools Program, and the Recreational Trails Program. ATP authorizing legislation (September, 2013) also includes language to allow the ATP to receive funding from the newly established Cap-and-Trade Program in the future. The California Transportation Commission writes guidelines and allocates funds for the ATP, and the ATP is administered by the Caltrans Division of Local Assistance. Goals of the ATP are:

1) Increase the proportion of trips by bicycling and walking;
2) Increase safety and mobility for active transportation users;
3) Advance regional agency active transport GHG reduction efforts;
4) Enhance public health;
5) Ensure disadvantaged communities share in program benefit;
6) Provide a spectrum of projects for active transportation users.

More information:
http://www.dot.ca.gov/hq/LocalPrograms/atp/index.html

Congestion Mitigation and Air Quality (CMAQ)

The CMAQ program funds transportation projects that contribute to attainment or maintenance of the National Ambient Air Quality Standards (NAAQS). This program focuses on reducing congestion on roadways by increasing efficiency, reducing travel delay, and providing additional transportation options. Federal CMAQ funds are apportioned to each state based on need. Caltrans awards CMAQ funds to eligible projects following a competitive application process.

More Information: *http://www.dot.ca.gov/hq/transprog/federal/cmaq/ Official_ CMAQ_Web_Page.htm*

State Highway Operation and Protection Program (SHOPP) and Minor Program

Caltrans funds the management, preservation, and safety improvements of the State Highway System (SHS) through this program which receives state and federal funding generated by taxes and fees placed on vehicle fuels. The SHOPP Plan identifies goal-based needs for a ten-year period, with the plan being updated every two years. The most recent update occurred in March, 2016.

More Information: *http://www.dot.ca.gov/hq/transprog/shopp.htm*

State Transportation Improvement Program (STIP)

STIP funds projects that may add capacity to the transportation network, consisting of two components, the Caltrans' Interregional Transportation Improvement Program (ITIP) and the Regional Transportation Improvement Program (RTIP). STIP funding is a mix of state, federal, and local taxes and fees. Bicycle and pedestrian projects may be programmed under ITIP and RTIP.

More information: *http://www.catc.ca.gov/programs/stip.htm*

Sustainable Transportation Planning Grant Program

The Sustainable Transportation Planning Grant Program funds projects to improve mobility and lead to the programming and implementation of transportation improvement projects. In the past year, Caltrans awarded $10.0 million in funding to 70 applicants in two sub-categories: Environmental Justice and Community Based Transportation Plans.

More information: *http://www.dot.ca.gov/hq/tpp/grants.html*

Environmental Justice Grant Program (EJ)

EJ promotes the involvement of cities, counties, transit providers, and tribal governments to assist disproportionately impacted and disadvantaged communities by planning transportation projects. EJ

has a clear focus on transportation improvements and community development which improve mobility, access, safety, affordable housing and economic development.

More information:
http://www.dot.ca.gov/hq/tpp/offices/ocp/completed_projects_ej.html

Community Based Transportation Planning (CBTP)

CBTP promotes community involvement and partnership in transportation and land use planning projects. Grants include input, collaboration, and building consensus through an active public engagement process. CBTP supports livable and sustainable community concepts for transportation or mobility to promote community identity and quality of life.

More information:
http://www.dot.ca.gov/hq/tpp/offices/ocp/completed_projects_cbtp.html

Petroleum Violation Escrow Account (PVEA)

A series of federal court decisions against some United States oil companies ordered refunds to the states for price overcharges on crude oil and refined petroleum products during a period of aggressive price controls. Eligible PVEA-funded projects must save energy and provide a direct public benefit within a reason CA Transportation Commission State Transportation Improvement Program (STIP) able time frame. PVEA has been used to fund programs based on public transportation, intelligent bus routing and ride sharing, as well as highway and bridge maintenance. The Caltrans Division of Local Assistance administers funds for transportation-related PVEA projects. PVEA funds do not require a match, and can be used as match for additional federal funds.

More information:
www.dot.ca.gov/hq/LocalPrograms/lam/prog_g/g22state.pdf

Office of Traffic Safety (OTS) Grants

OTS distributes grant funding to new or ongoing traffic safety programs, and is supported by federal funding under the NHSA and MAP-21. Grants establish new traffic safety programs, expand ongoing programs, or address deficiencies in current programs. Bicycle safety is a priority area. Grantees include government agencies, state colleges, state universities, school districts, fire departments, and public emergency services providers. Funds cannot replace existing program expenditures or be used for program maintenance, research, rehabilitation, or construction. Grants are competitive and evaluation criteria include greatest need or problem severity, potential traffic safety impacts, collision statistics and rankings, and OTS grant previous performance. The application deadline is in January. There is no cap to the amount requested as long as all items meet proposal objectives.

More information: *http://www.ots.ca.gov/Grants/Apply/default.asp*

Environmental Enhancement and Mitigation Program (EEMP)

The EEMP provides grant opportunities for projects that indirectly mitigate environmental impacts of new transportation facilities. Projects should fall into one of the following three categories: highway landscaping and urban forestry, resource lands projects, or roadside recreation facilities. Funds are available for land acquisition and construction. The local Caltrans district must support the project. The average award amount is $250,000.

More information:
http://www.dot.ca.gov/hq/LocalPrograms/EEM/homepage.htm

California Strategic Growth Council

The Strategic Growth Council is a state agency that manages the Sustainable Communities Planning Grant and Incentives Program, as well as the Affordable Housing and Sustainable Communities (AHSC) program. Sustainable Communities Planning Grant and Incentives Program has wide-ranging applications, from reductions in greenhouse gas emissions, to improving water quality, to strengthening the economy. AHSC provides funding for land use, housing, transportation, and land preservation. The City of Oroville submitted an application for funds to complete bicycle and pedestrian facilities along Feather River Boulevard during the 2016 funding award cycle.

More information: http://sgc.ca.gov/m_grants.php

12.3 Regional and Local Sources

Developer Impact Fees

As a condition for development approval, municipalities can require developers to provide specific infrastructure improvements including bikeway projects, commonly Class II bicycle facilities for portions of on-street, planned routes, and sidewalks. Funds can provide bicycle parking, shower and locker facilities, signal modifications, transit stop modifications, and storm water management infrastructure modifications. The type of facility should reflect the greatest need for the particular project location and area. Legal challenges to these types of fees have resulted in the requirement to illustrate a clear nexus between the particular project and the mandated improvement cost.

Roadway Construction, Repair, and Upgrade

Planned resurfacing and road diets combine motor vehicle, transit, bicycle, and pedestrian projects into one, multi-modal construction project. To ensure that planned roadway construction projects considers ways to include other modes, an active complete streets policy should be provable, and follow California's 2008 Complete Streets Act and Caltrans' 2014 Deputy Directive 64-R2, requiring the needs of all roadway users.

More information:
http://www.dot.ca.gov/hq/tpp/offices/ocp/complete_streets.html

Utility Projects

By monitoring the capital improvement plans of local utility companies, it may be possible to coordinate upcoming utility projects with the installation of motor vehicle, transit, bicycle, and pedestrian infrastructure within the same area or corridor. Utility companies often mobilize the same type of forces required to construct transportation projects, representing a significant potential cost savings. Joint projects require a great deal of coordination, a careful delineation of scope items, and an approved agreement or memorandum of understanding.

Cable Installation Projects

Cable television and telephone companies sometimes need new cable routes within public right-of-way that most commonly occur in expanding fiber optic networks. It may be possible to reimburse for affected bicycle and pedestrian facilities that mitigate construction impacts. In cases where cable routes cross undeveloped areas, there could be consideration for the installation of new transportation facilities following completion of the cable trenching.

Transit Revenue

Butte Regional Transit (B-Line) services are funded through a variety of sources. Fare box revenue accounts for approximately 20 percent of operating costs, Federal Transit Administration (FTA) Section 5307 pays up to 50 percent of fixed route operating costs in the Chico urbanized area. FTA Section 5311 funds are available for a smaller portion of the rural fixed route service. FTA Section 5310 funds are available for the rural Dial-a-Ride service. Remaining B-Line services are funded by the apportioned TDA funds of local jurisdictions according to a formula outlined in BCAG's Joint Powers Agreement and other competitive grant funds.

Transportation Development Act (TDA)

The TDA provides local agencies with two major sources of funding - the Local Transportation Fund (LTF) and the State Transit Assistance fund (STA). These funds contribute to the development and support of public transportation and are allocated to county areas based on population, taxable sales, and transit performance.

Local Transportation Fund (LTF)

The LTF is derived from sales tax revenue and provide matching funds for the operation of Butte Regional Transit. Cities and Counties have the option of using LTF for local street and road projects, including bicycle and pedestrian projects, if the region can demonstrate there are no unmet transit needs which are reasonable to meet. BCAG provides oversight of the public hearing process used to identify unmet transit needs.

State Transit Assistance (STA) Program

STA funds are derived from a statewide sales tax on gasoline and diesel fuel that accrues into the Public Transportation Account (PTA), where half of the funds are allocated to Caltrans and the other half to RTPAs. Of the RTPA allocation, half is allocated to mass transit projects for needs such as vehicles, equipment, and terminals, and the other half is allocated to transit operators based on fare revenues.

Public-Private Partnerships (P3)

P3s are usually contractual agreements between a local or regional public agency charged with providing transportation infrastructure and/or services, and a private sector entity that is willing to design, build, operate, and/or maintain infrastructure or services. This type of arrangement allows for greater flexibility and speed in the delivery and financing of transportation projects. There are many P3 structures and varying degrees of responsibility and financial risk. FHWA and Caltrans provide tools, programs, and other support materials to assist local agencies in forming P3s.

12.4 Private Sources

PeopleForBikes Community Grant Program

PeopleForBikes, a coalition of bicycle suppliers and retailers, has since its beginning in 1999 awarded $2.9 million in community grants and leveraged an additional $670 million. The community grant program funds bicycle paths and rail trails, mountain bicycle trails, bicycle parks, BMX facilities, and large-scale bicycle advocacy initiatives. Spring 2015 grant awards contributed to

greenway and other infrastructure projects, as well as bicycle parking and bicycle-related programming.

More information:
http://www.peopleforbikes.org/pages/community-grants

The Robert Wood Johnson Foundation (RWJF)

RWJF was established in 1972, and today it is the largest U.S. foundation devoted to improving the health and health care of all Americans. Grants are concentrated in four areas:

- Assure all Americans have access to affordable, basic health care
- Improve care and support for chronic health conditions
- Promote healthy communities and lifestyles
- Reduce personal, social and economic harm of substance abuse

More information: *http://www.rwjf.org/applications/*

Community Action for a Renewed Environment (CARE)

CARE is a competitive grant program that offers an innovative way for a community to organize and take action to reduce toxic pollution in its local environment. Through CARE, a community creates a private partnership to reduce releases of toxic pollutants and minimize people's exposure to them. By providing financial and technical assistance, EPA helps CARE communities ensure a renewed environment. Transportation and "smart-growth" type-projects are eligible. Grants range between $90,000 and $275,000.

More information: *http://www.epa.gov/care/*

Corporate Donations

Corporate donations are often received in the form of liquid investments (i.e. cash, stock, bonds) and in the form of land, recognizing that creating places to bike and walk is a way to build community and attract newcomers. Bicycling and outdoor recreation businesses often support local projects and programs. Corporations typically create funds to facilitate a transaction with the given municipality. Donations are most often received upon the completion of a widely supported capital improvement program, and can improve capital budgets and/or other projects.

Plan4Health Coalition

The APA and the APHA receive funding from the CDC to build local capacity to address population health and promote the inclusion of health in non-traditional sectors such as transportation. Each proposal

must address inactivity, unhealthy diets, and/or health equity. Awards will average $150,000. No more than two awards per state are granted.

More Information:
https://www.apha.org/apha-communities/affiliates/plan-4-health

Other Private Sources

Volunteer programs may be developed to substantially reduce the cost of implementing some bicycle and pedestrian routes, particularly multi-use paths. A college design class may use such a multi-use route as a student project, working with a local landscape architectural or engineering firm. Work parties could be formed to help clear the right of way for a route. A local construction company may donate or discount services beyond what the volunteers can do. A challenge grant program with local businesses may be a good source of local funding, by which the businesses (or residents) can "adopt" a route or segment.

Appendix A – Alternative Right of Way Widths

The following exhibits were created using Caltrans Right of Way maps and assessor's parcel data. Roadway widths corresponding with the Preferred Alternative and the "essential" components are shown to provide a better understanding of the general fit within the corridor.

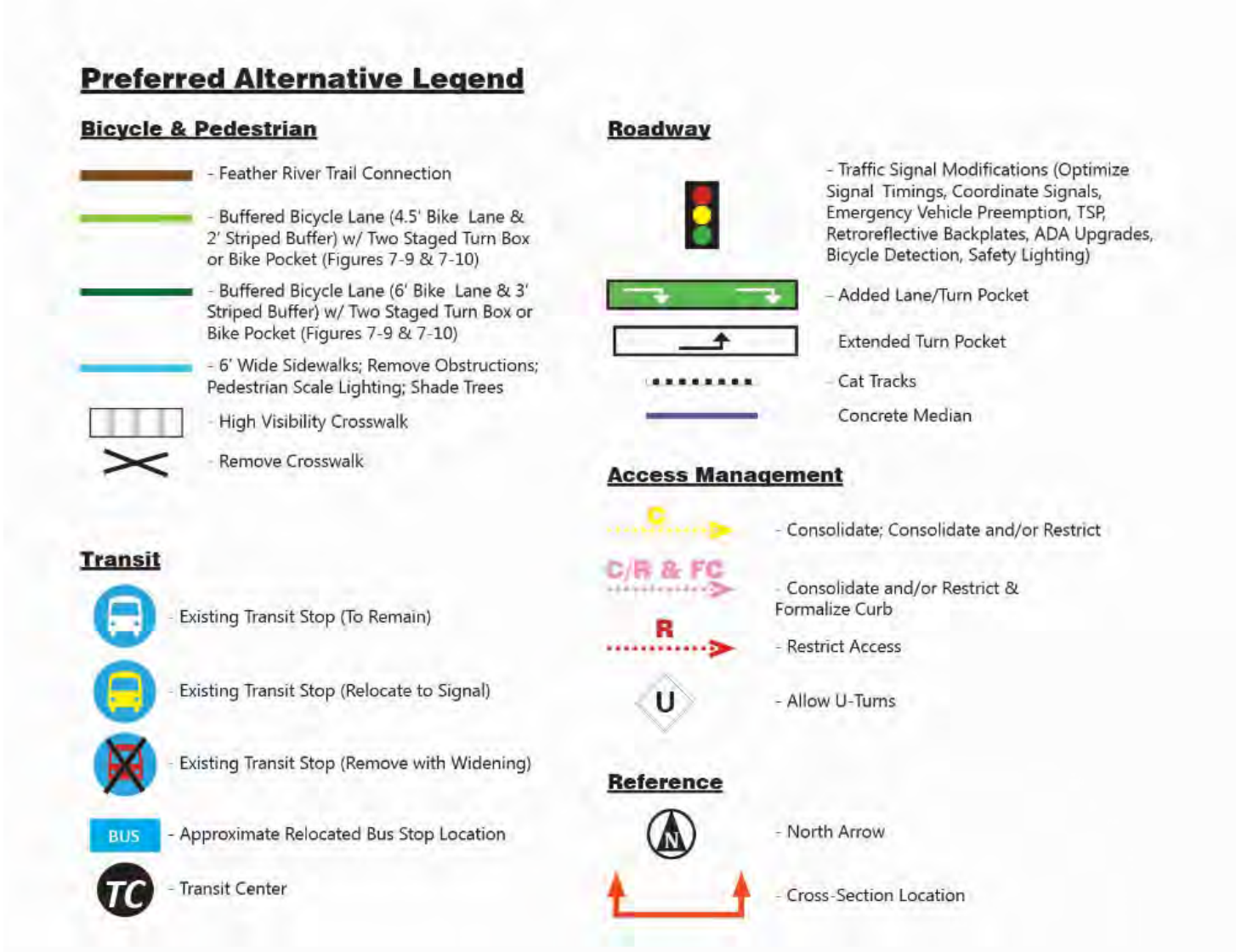

Veatch Ave
Oro Dam Blvd
Oro Dam Blvd
U.P.R.R
Lincoln Ave
Oro Dam Blvd
Meyers Ave
- 91' ROW
- 105' ROW

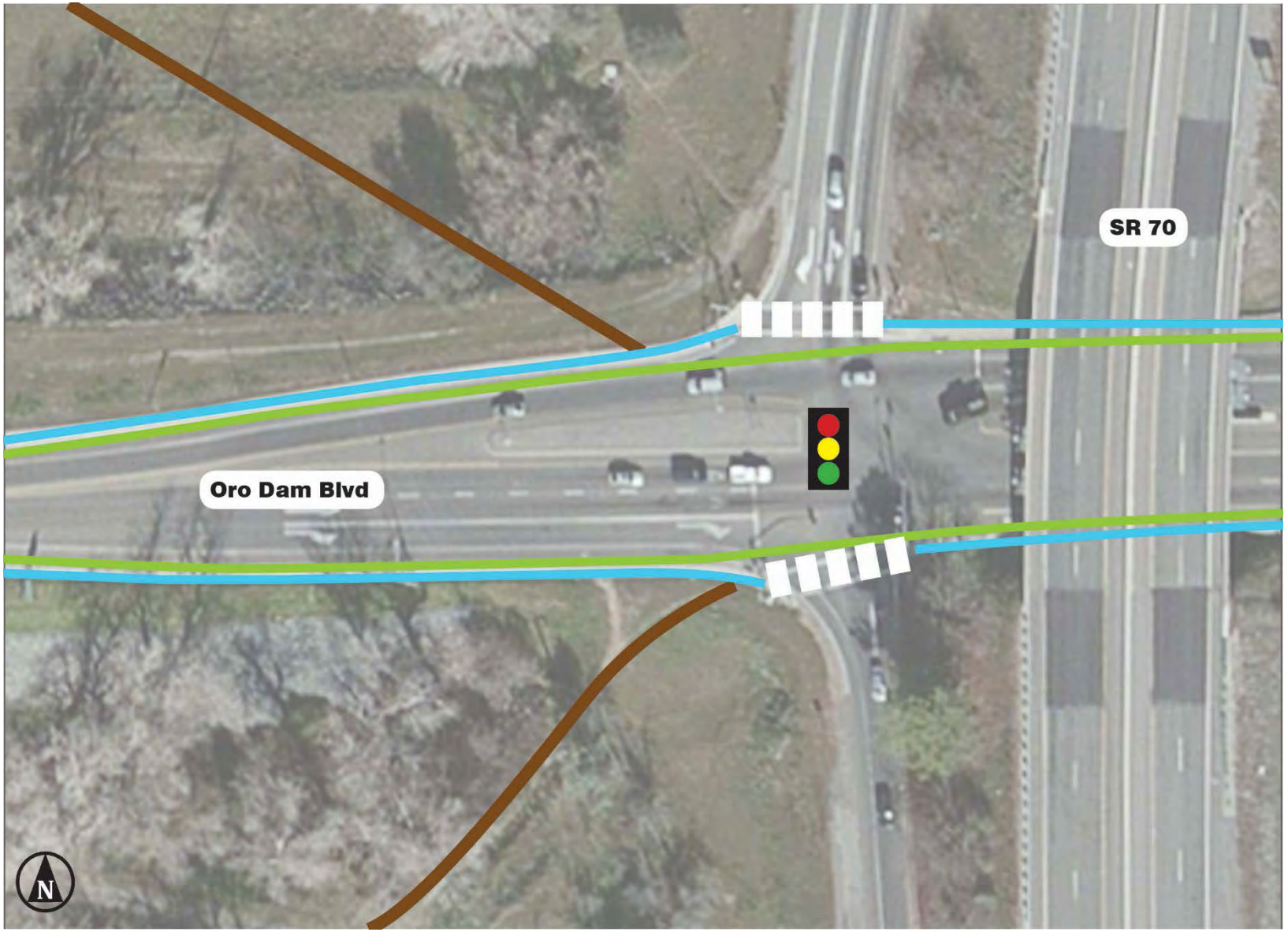

Meyers Ave
Oro Dam Blvd
Spencer Ave
Olive Highway
- 91' ROW
- 105' ROW

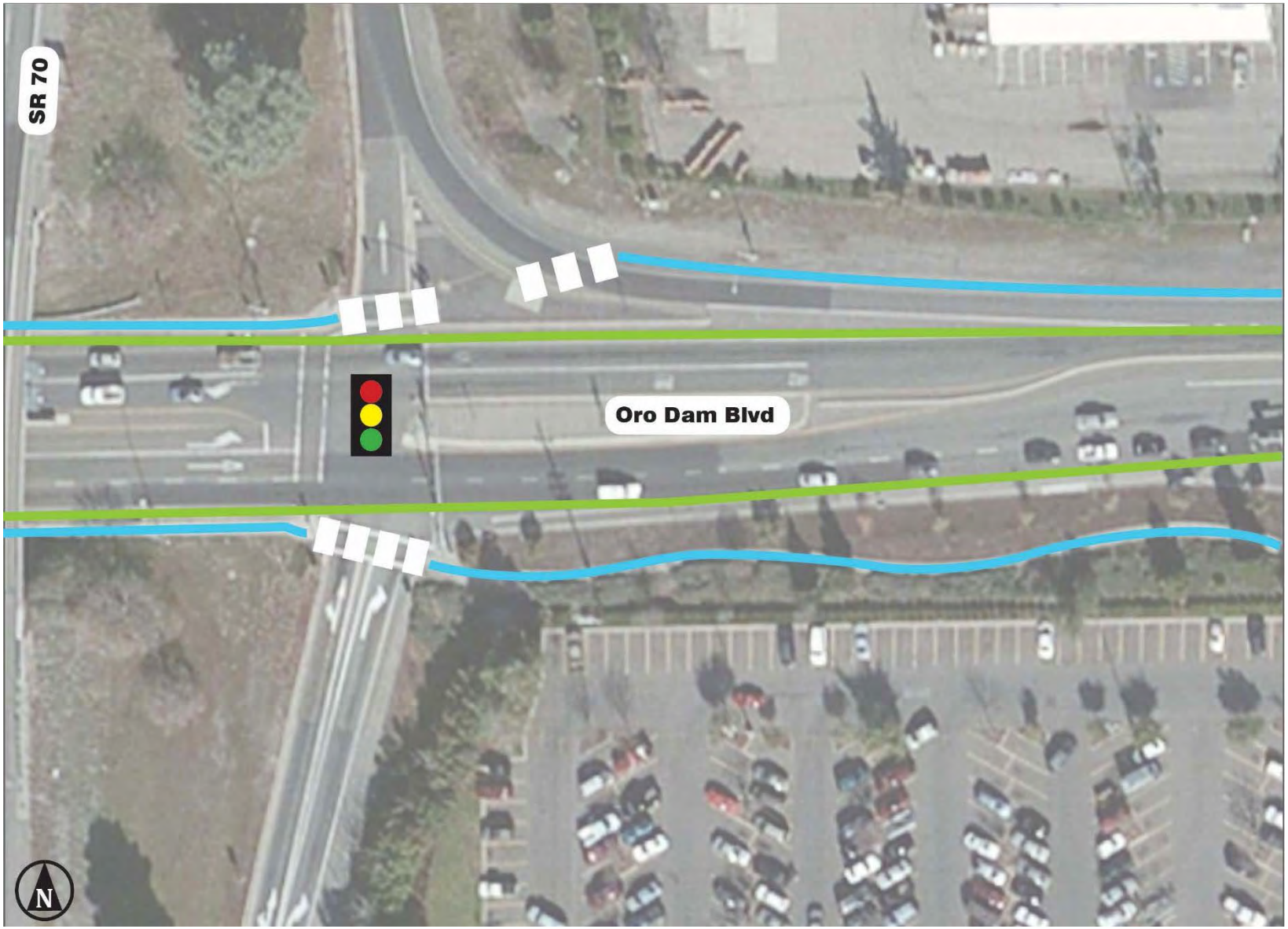

Fay Way
Olive Highway
Medical Center Dr.
Olive Highway
Olive Highway
Lower Wyandotte Rd.
- 86' ROW
- 106' ROW

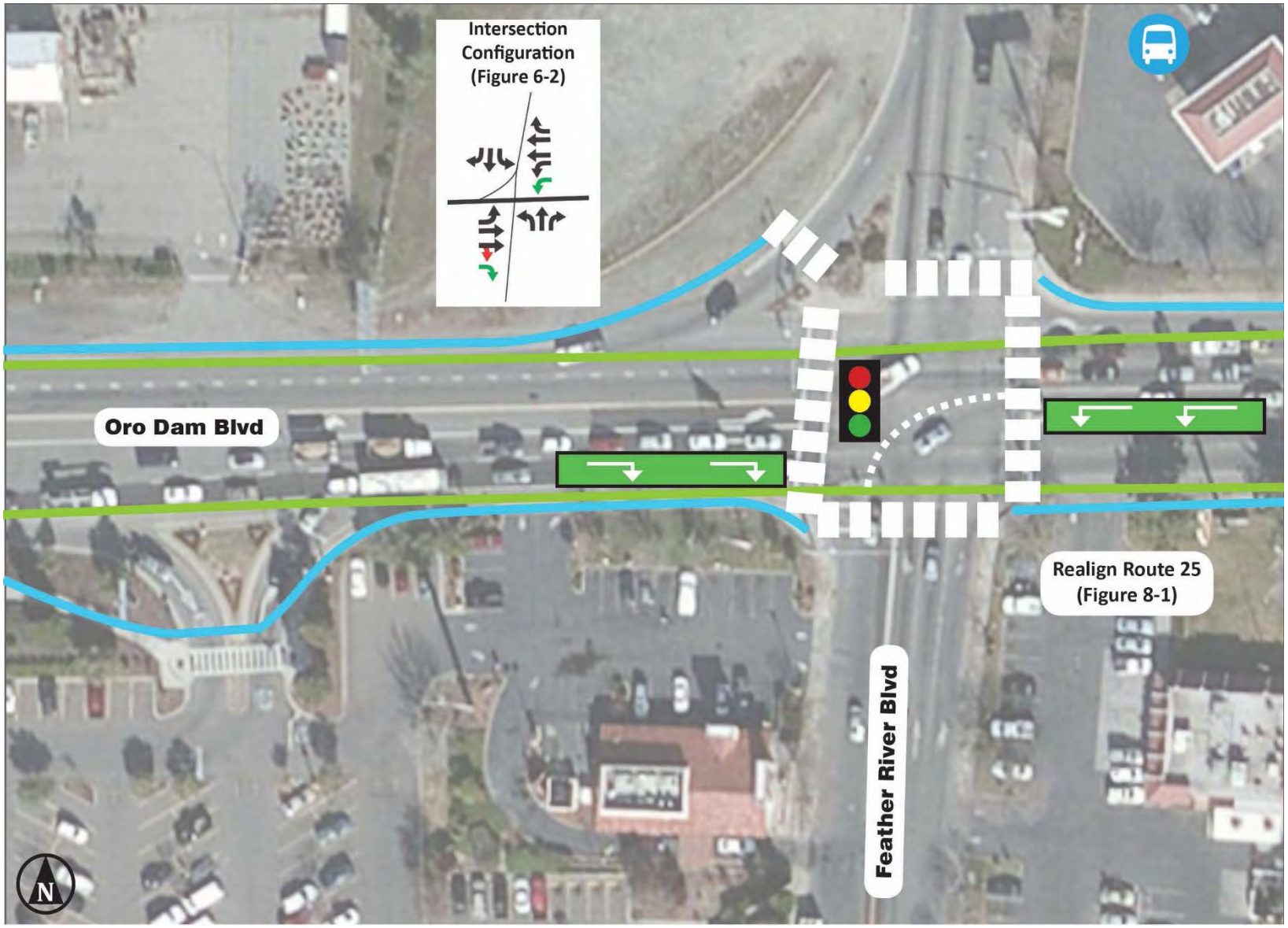

Olive Highway
Olive Highway
Foothill Blvd
- 86' ROW
- 106' ROW

APPENDIX B – PREFERRED ALTERNATIVE LAYOUT SHEETS

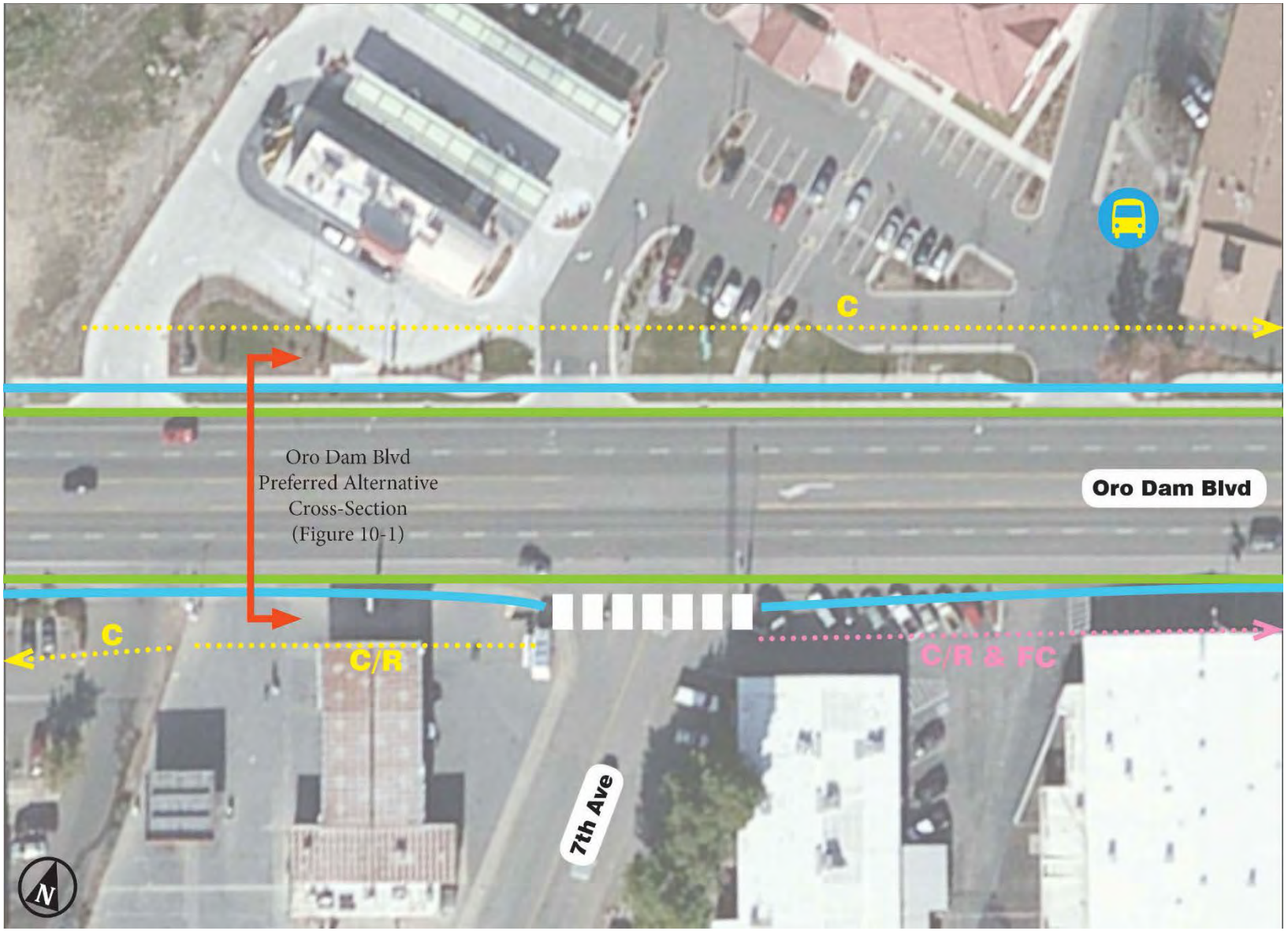


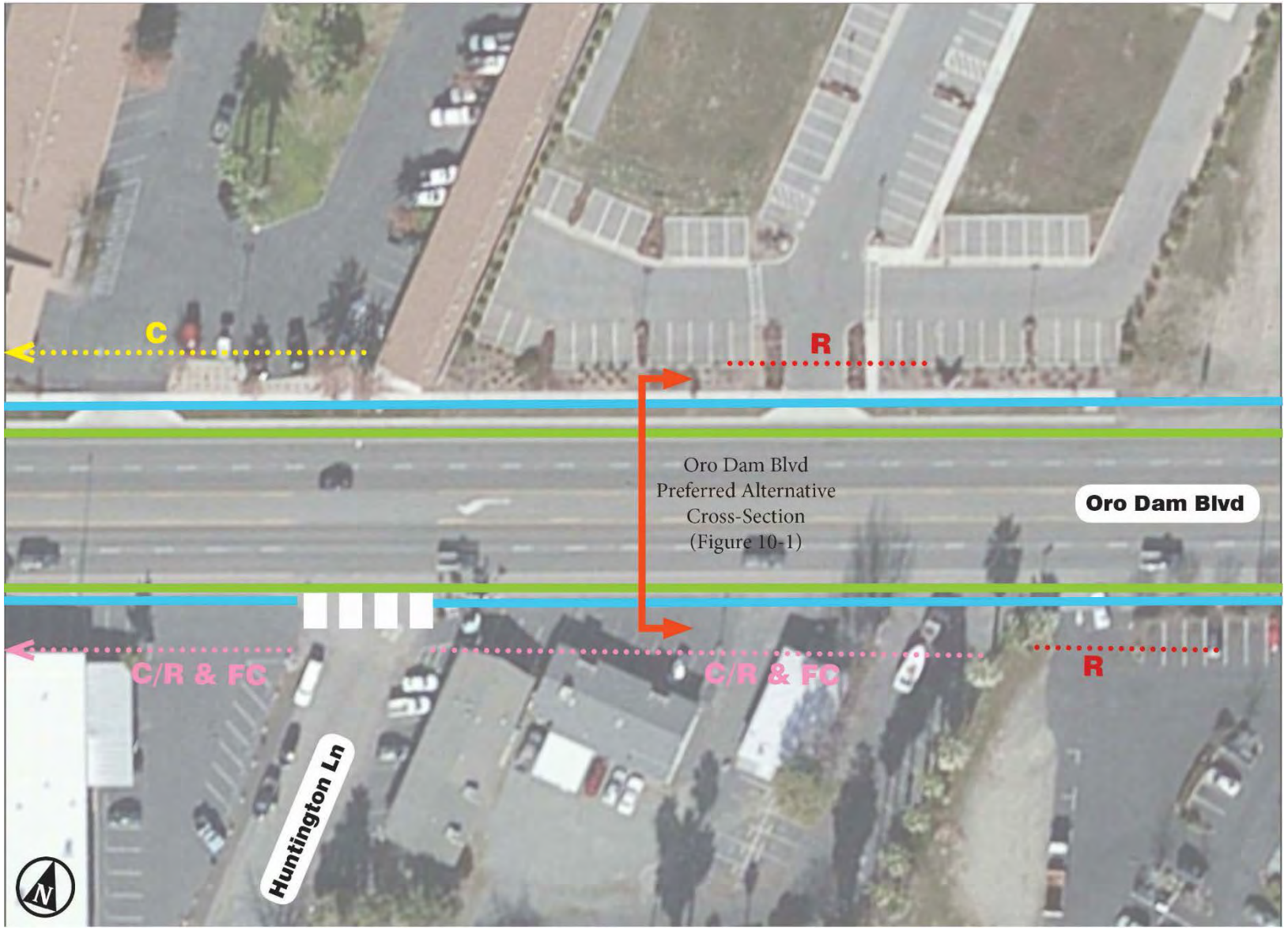

SR 70
Oro Dam Blvd
N


SR 70
Oro Dam Blvd
N


Intersection Configuration (Figure 6-2)
Oro Dam Blvd
Realign Route 25 (Figure 8-1)
Feather River Blvd
N

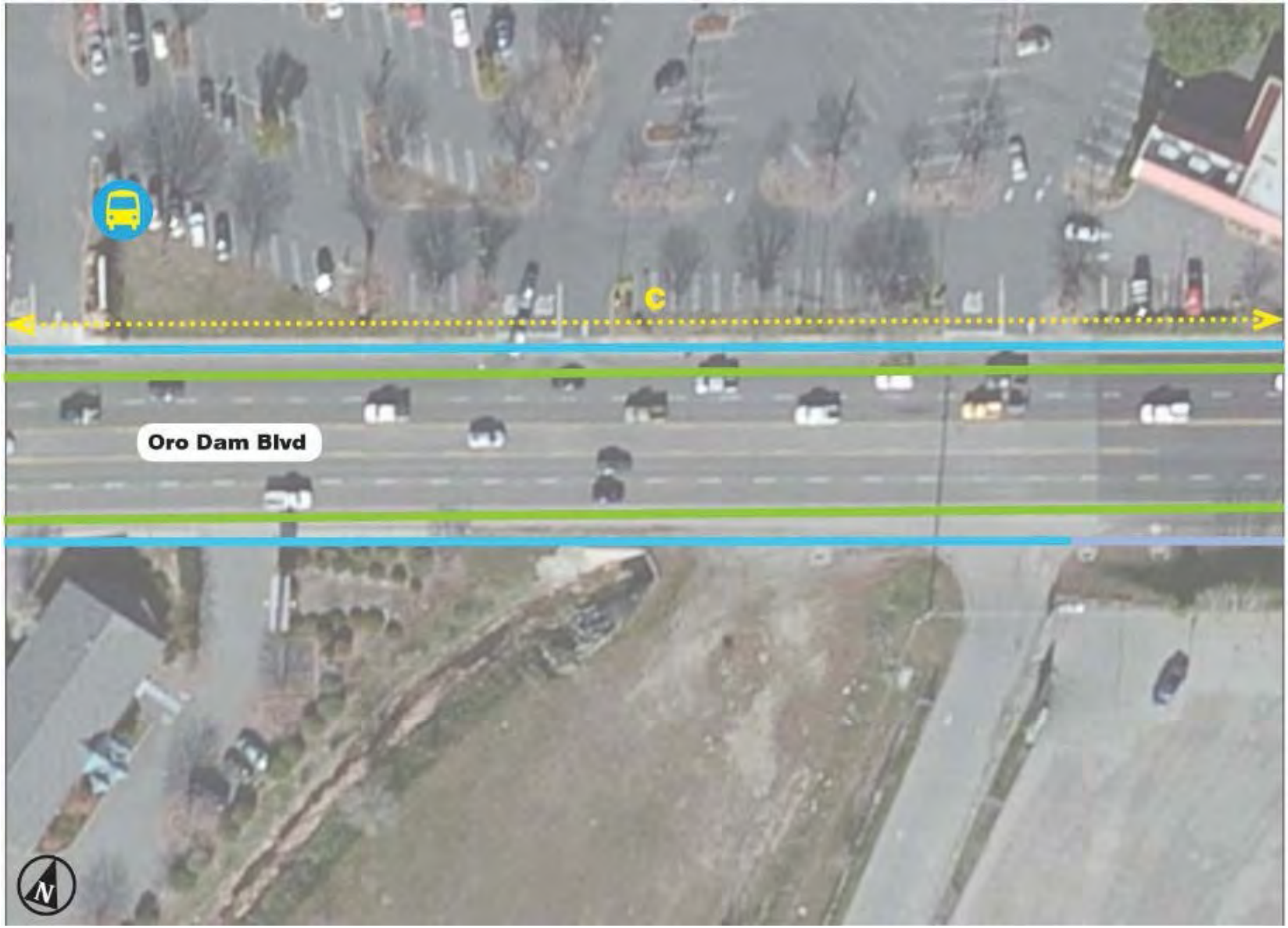

Oro Dam Blvd
C
N

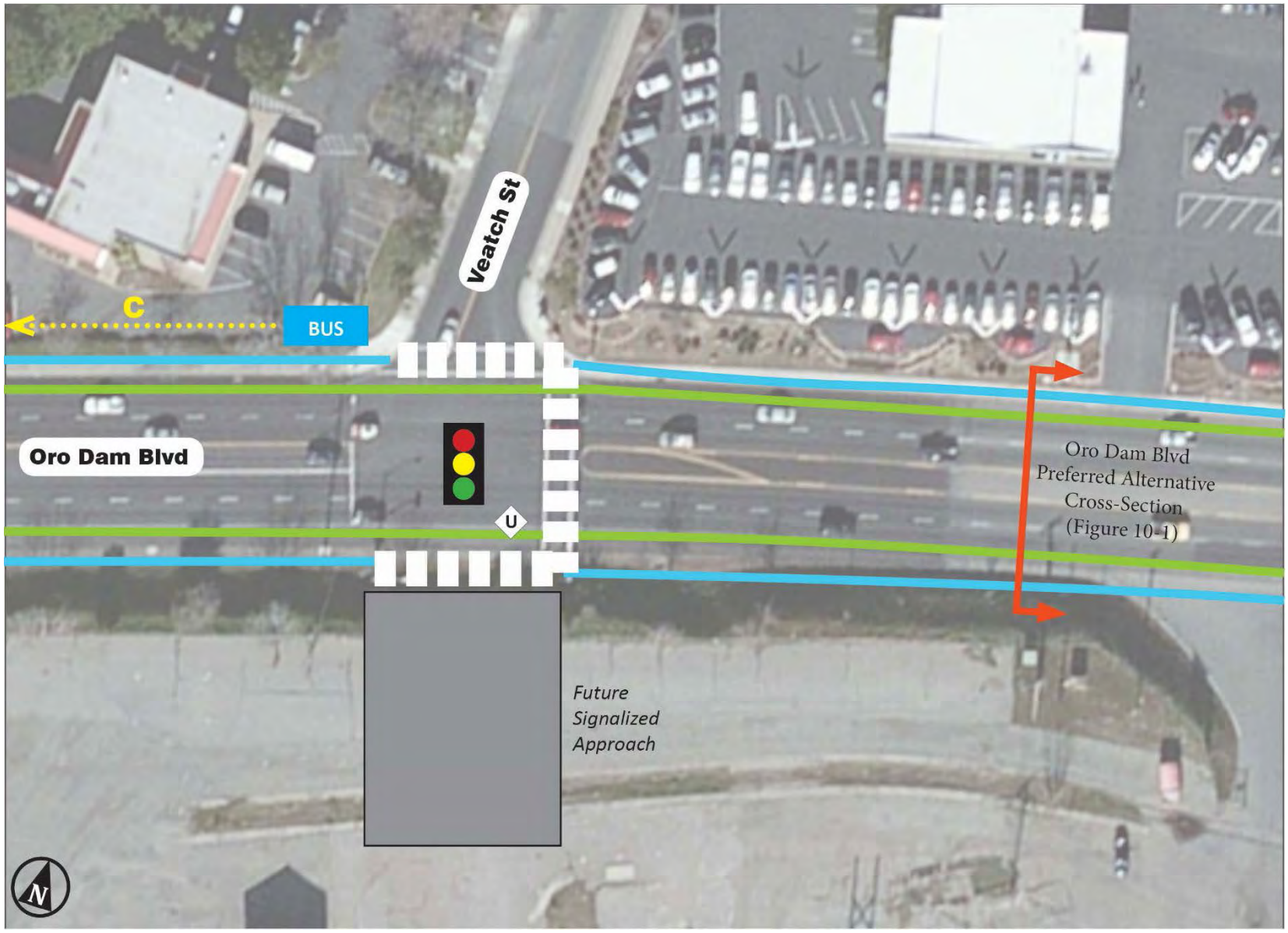

C
Oro Dam Blvd
Preferred Alternative
Cross-Section
(Figure 10-1)
Oro Dam Blvd
C
C/R
C/R & FC
7th Ave
N


C
R
Oro Dam Blvd
Preferred Alternative
Cross-Section
(Figure 10-1)
Oro Dam Blvd
C/R & FC
C/R & FC
R
Huntington Ln
N

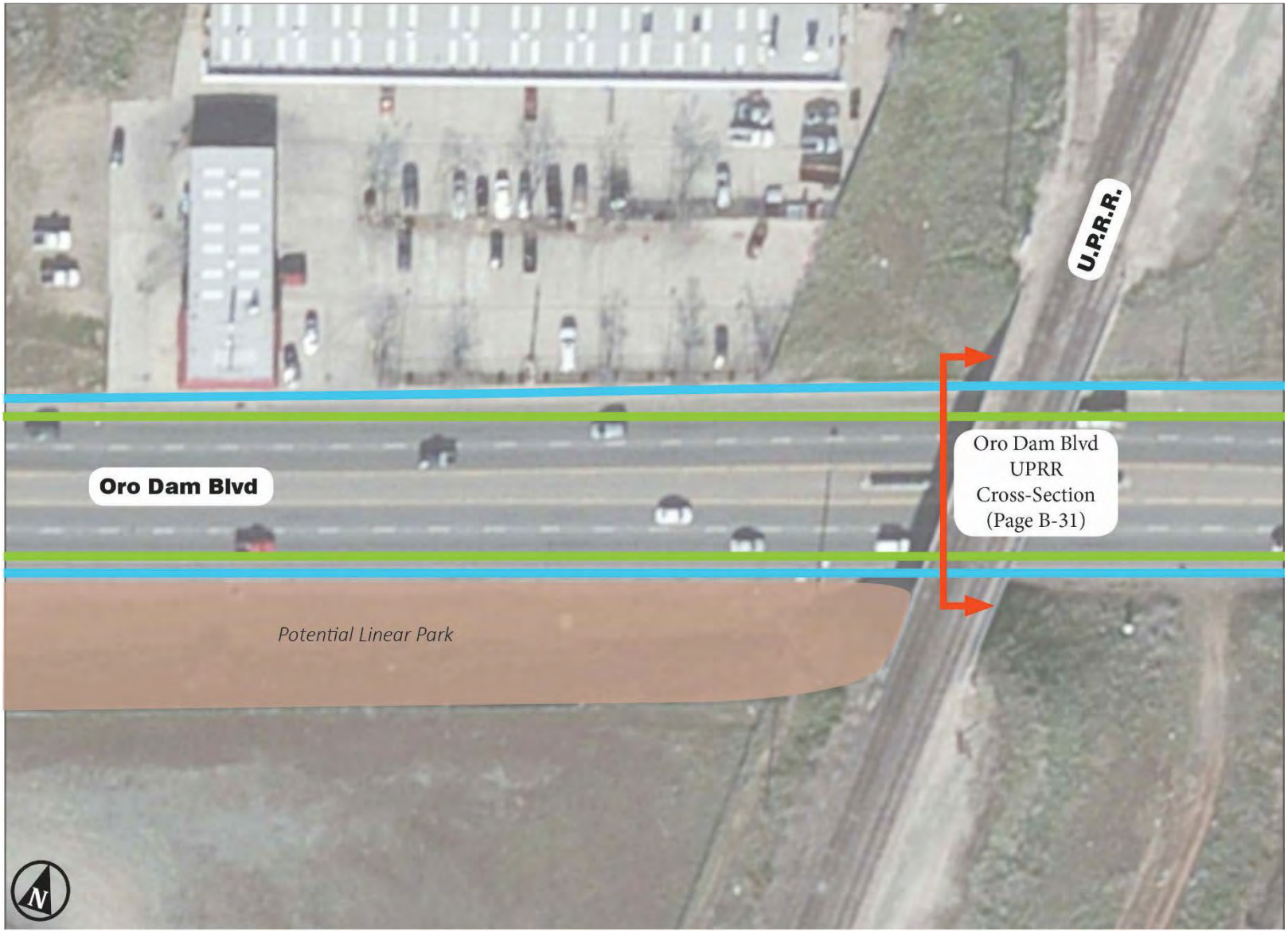

BUS
R
Oro Dam Blvd
5th Ave
N


C
C
Oro Dam Blvd
C/R & PC
N

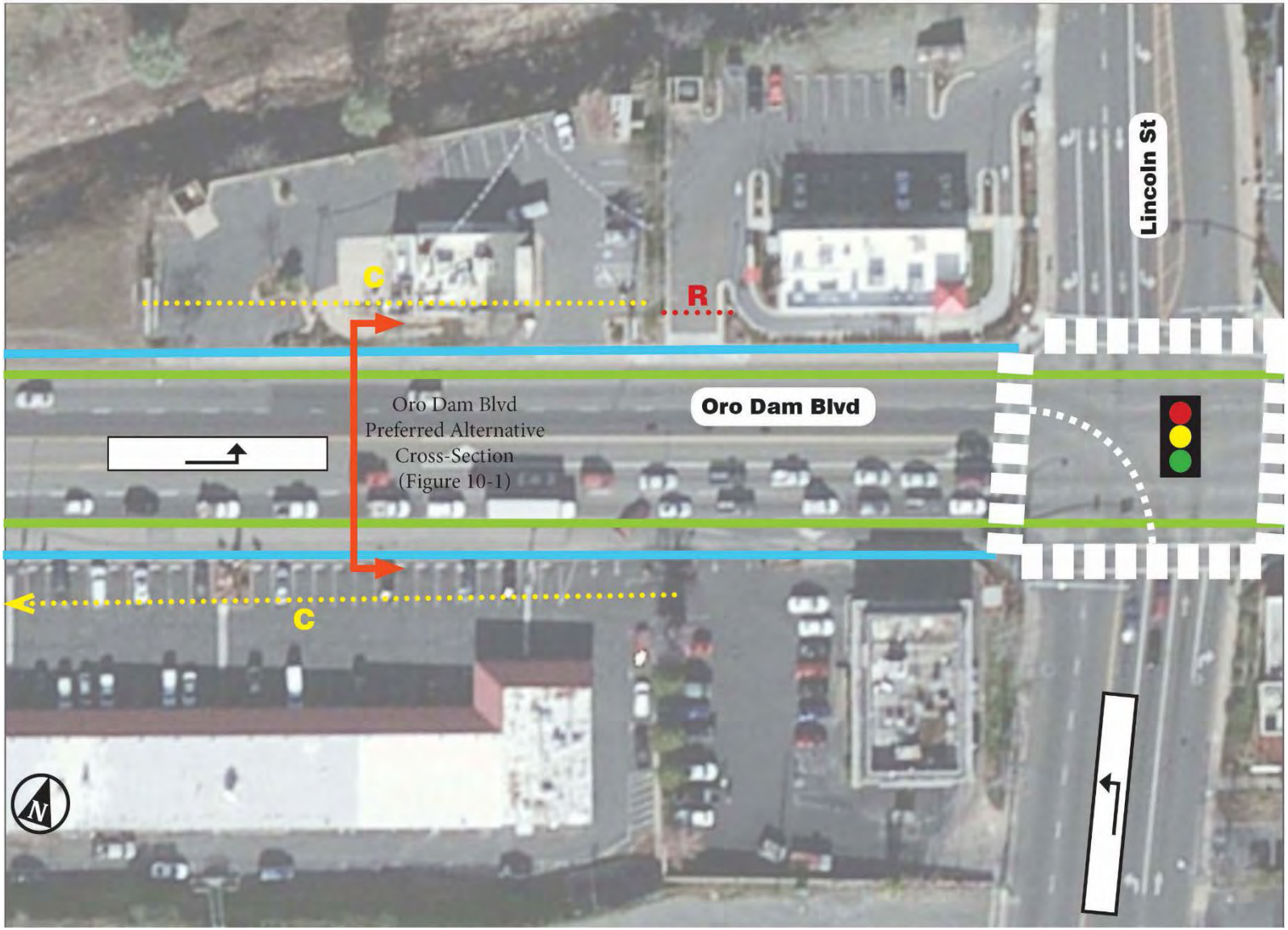

Oro Dam Blvd
N

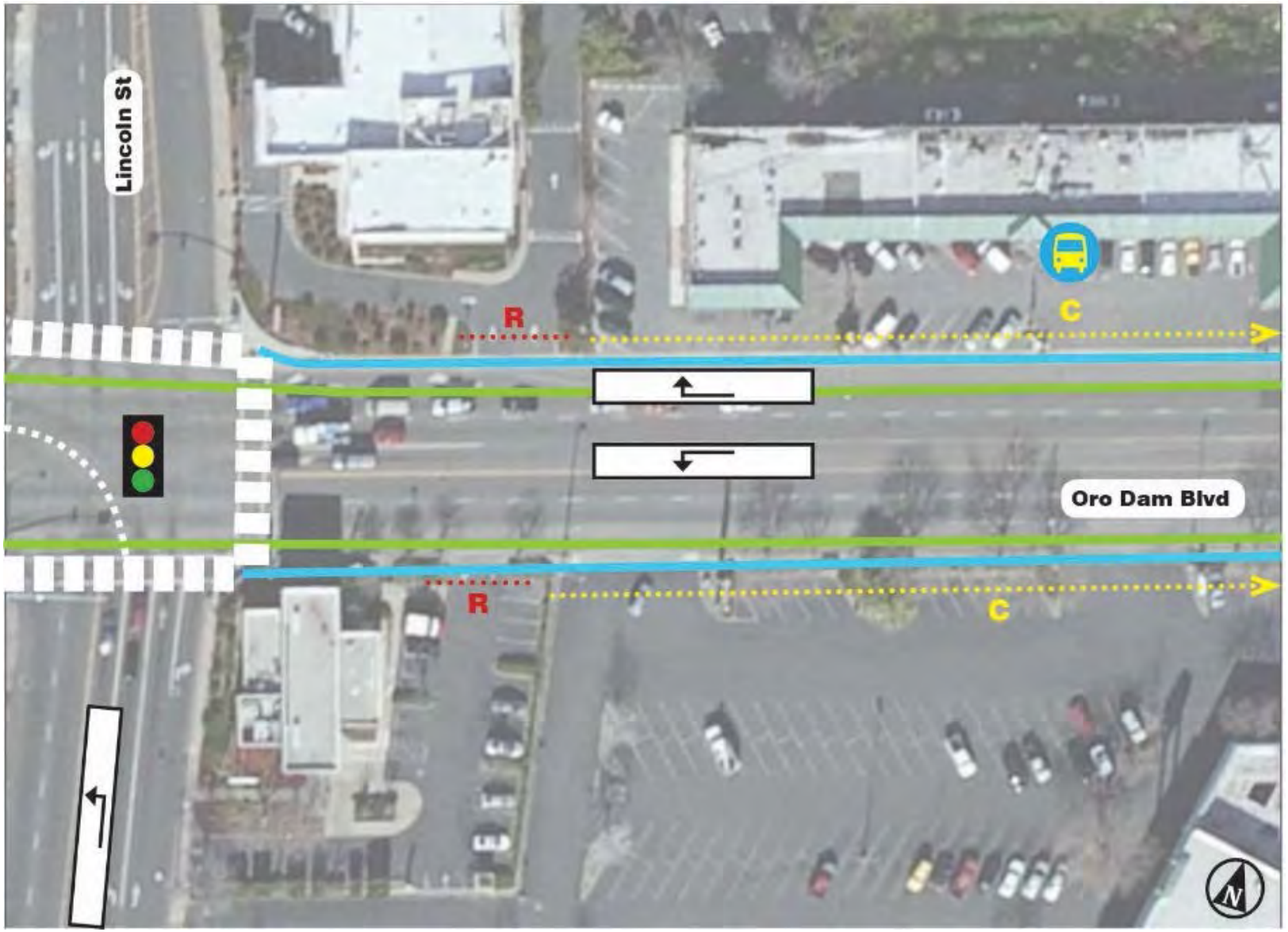

Veatch St
C
BUS
Oro Dam Blvd
U
Oro Dam Blvd
Preferred Alternative
Cross-Section
(Figure 10-1)
Future
Signalized
Approach
N

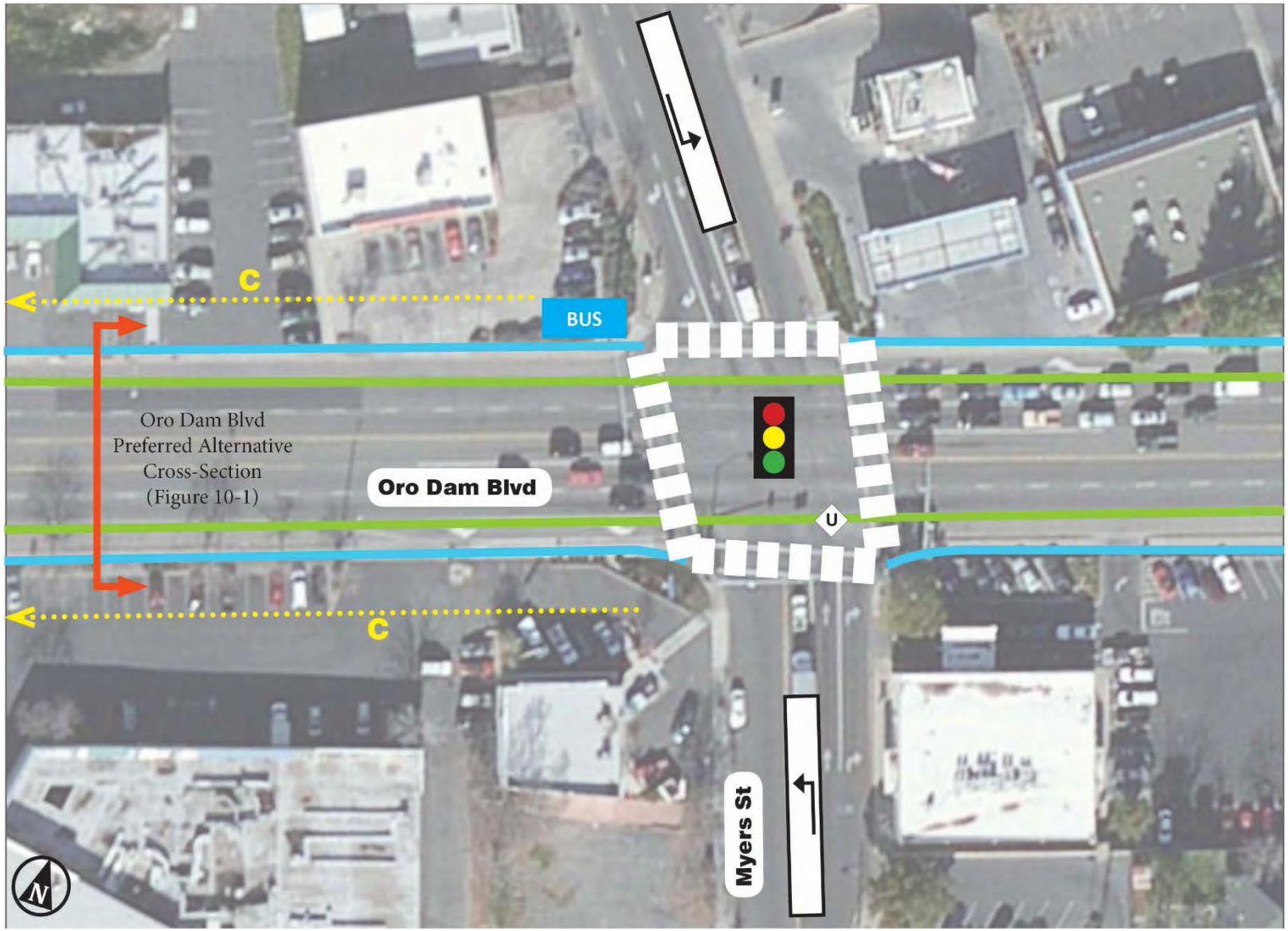

C
Oro Dam Blvd
Potential Linear Park
N

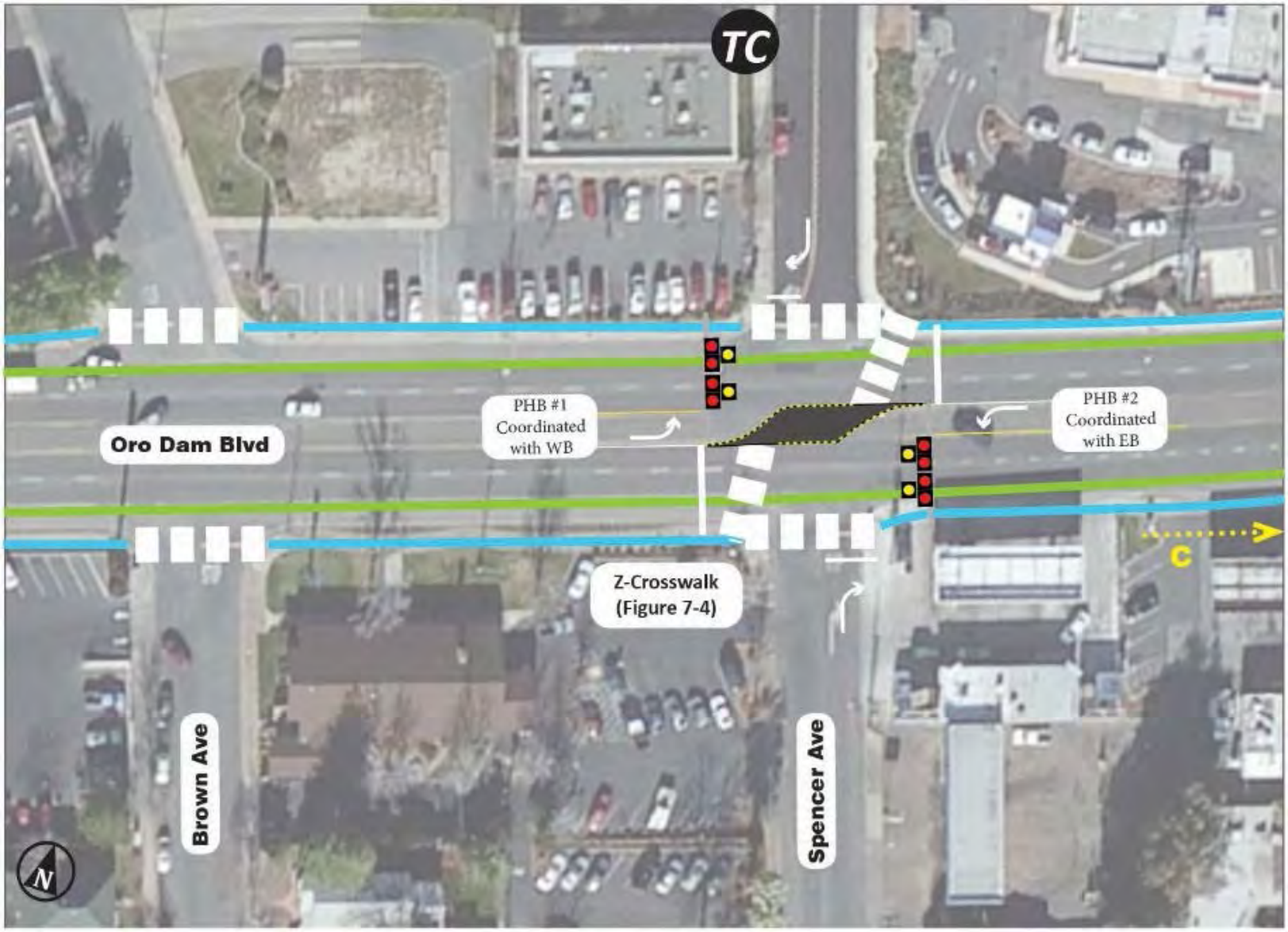

U.P.R.R.
Oro Dam Blvd
Oro Dam Blvd
UPRR
Cross-Section
(Page B-31)
Potential Linear Park
N

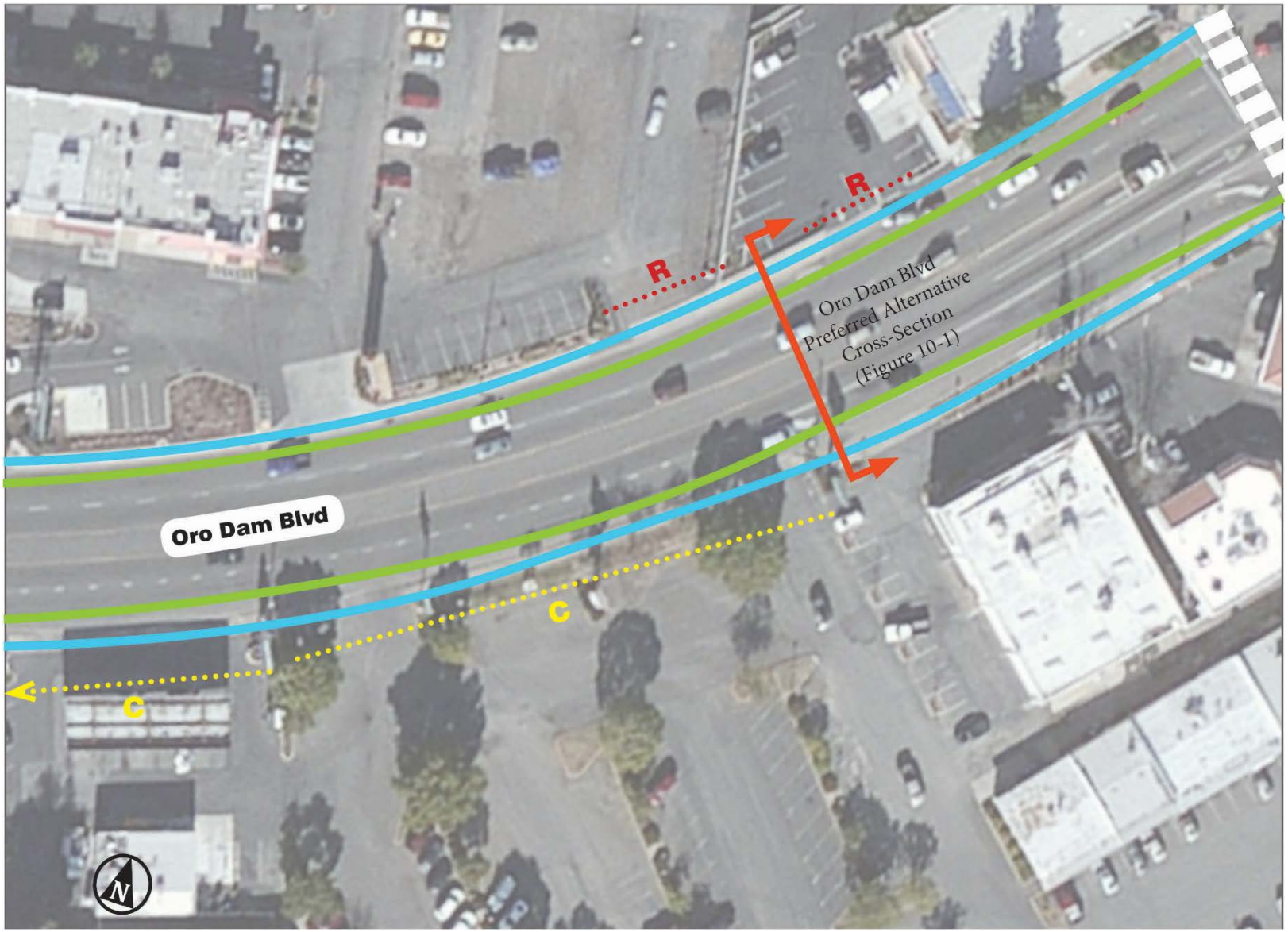

Oro Dam Blvd
C
N


Lincoln St
C
R
Oro Dam Blvd
Oro Dam Blvd
Preferred Alternative
Cross-Section
(Figure 10-1)
C
N


Lincoln St
R
C
Oro Dam Blvd
R
C
N

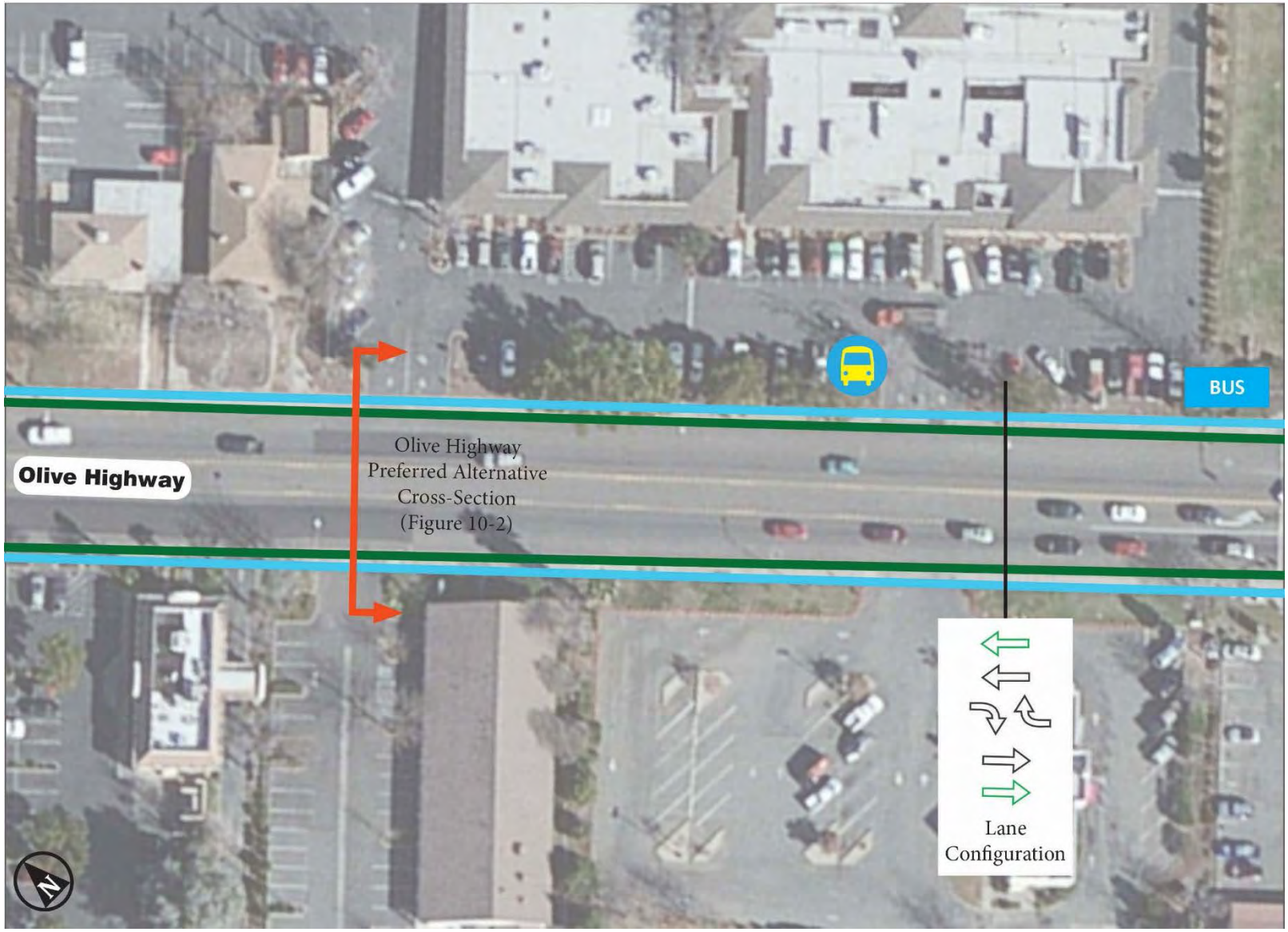

C
BUS
Oro Dam Blvd
Preferred Alternative
Cross-Section
(Figure 10-1)
Oro Dam Blvd
U
C
Myers St
N

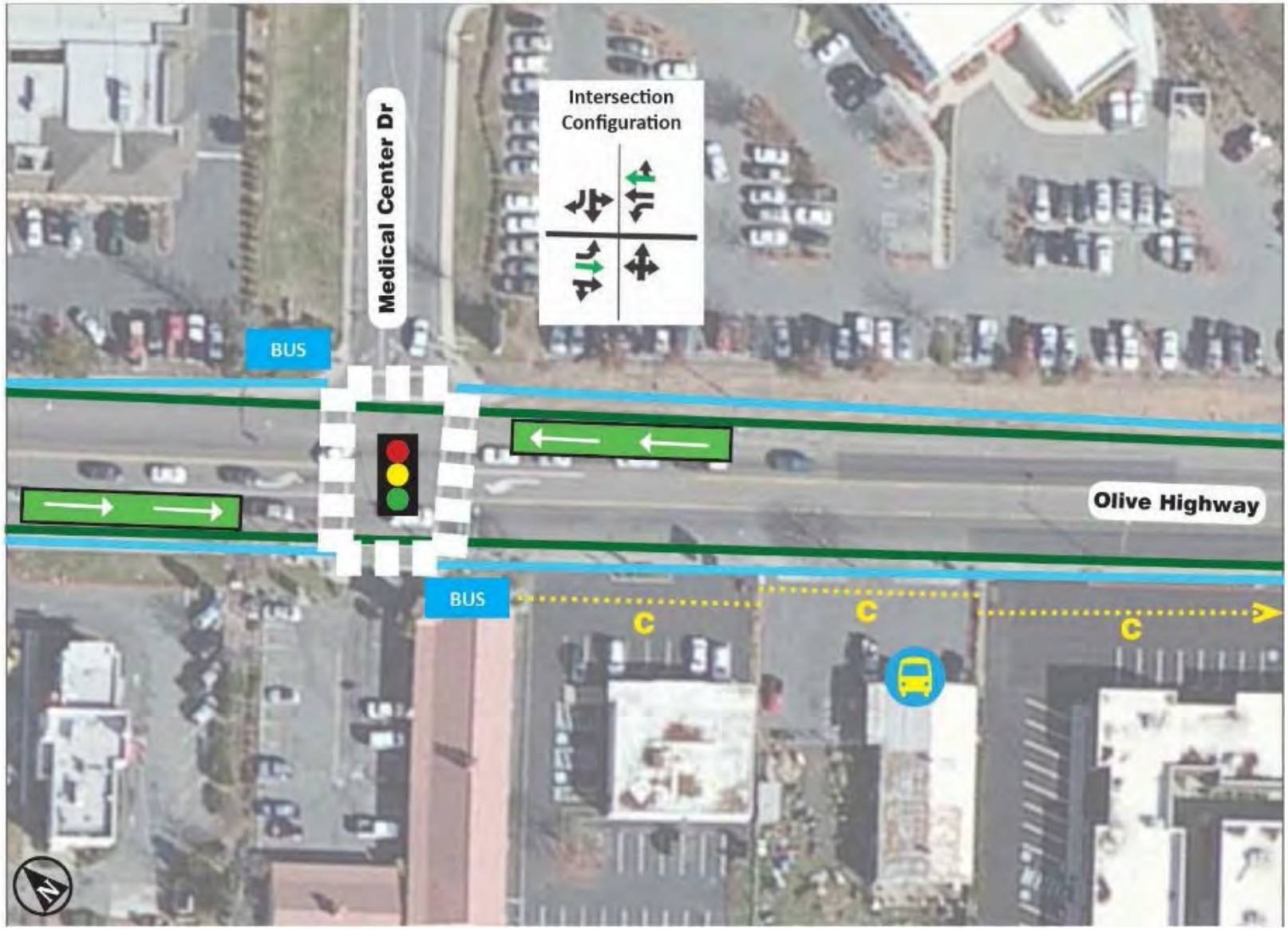

TC
PHB #1
Coordinated
with WB
PHB #2
Coordinated
with EB
Oro Dam Blvd
Z-Crosswalk
(Figure 7-4)
C
Brown Ave
Spencer Ave
N

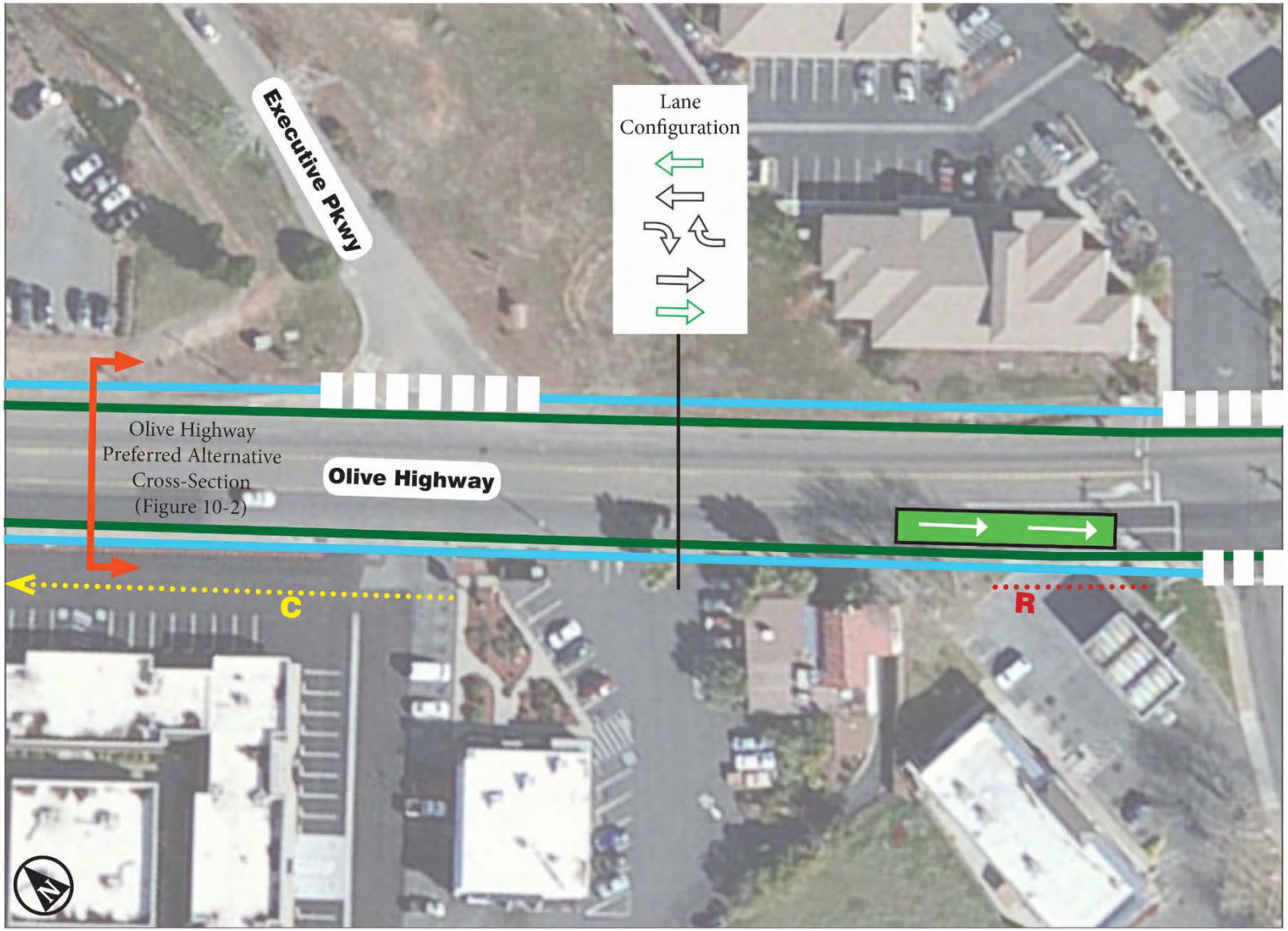

R
R
Oro Dam Blvd
Preferred Alternative
Cross-Section
(Figure 10-1)
Oro Dam Blvd
C
C
N

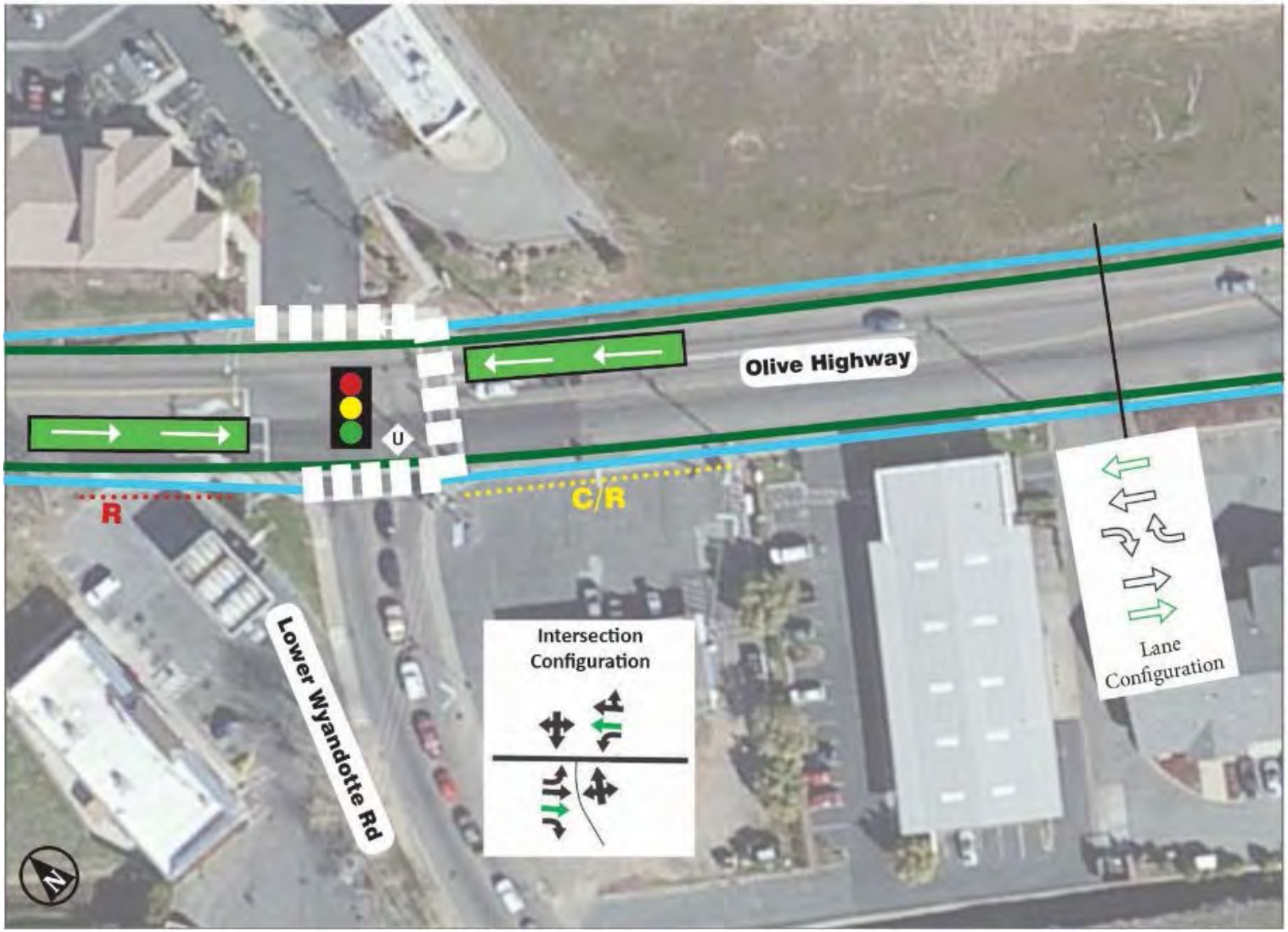

R
Olive Highway
Olive Highway
Preferred Alternative
Cross-Section
(Figure 10-2)
C/R
Oro Dam Blvd
N

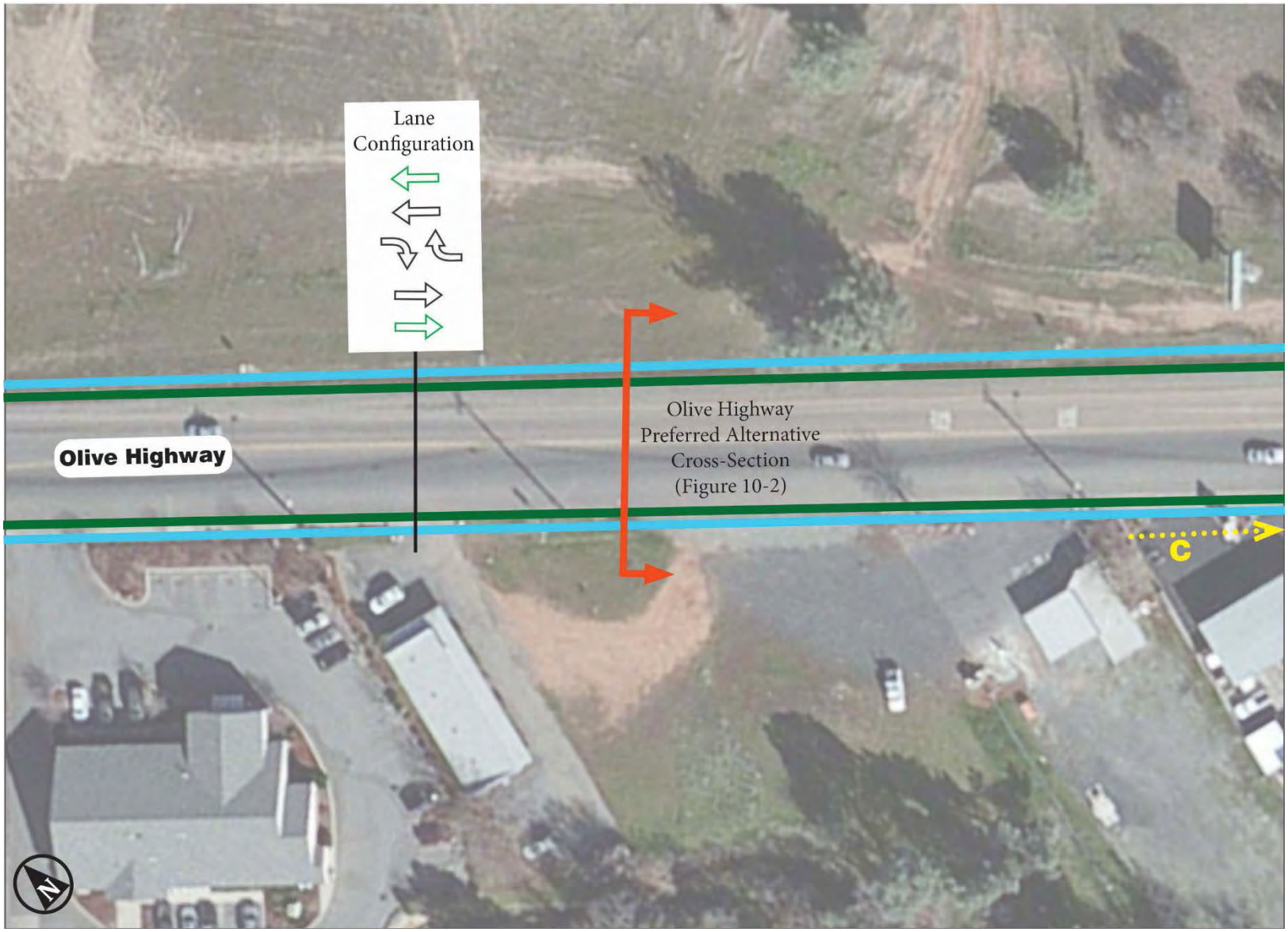

Fay Way
Lane Configuration
Olive Highway
C/R
N

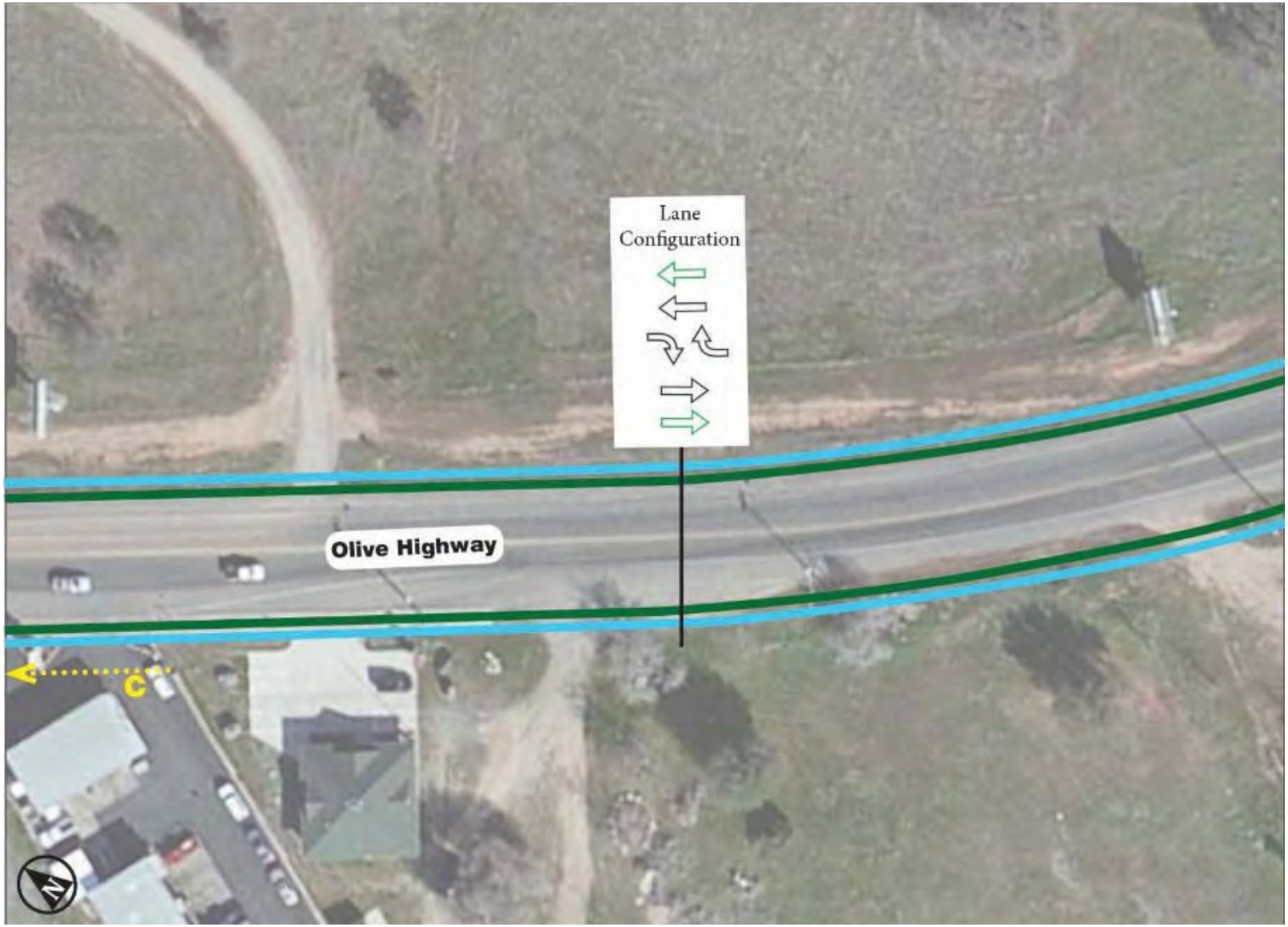

BUS
Olive Highway
Olive Highway
Preferred Alternative
Cross-Section
(Figure 10-2)
Lane
Configuration
N

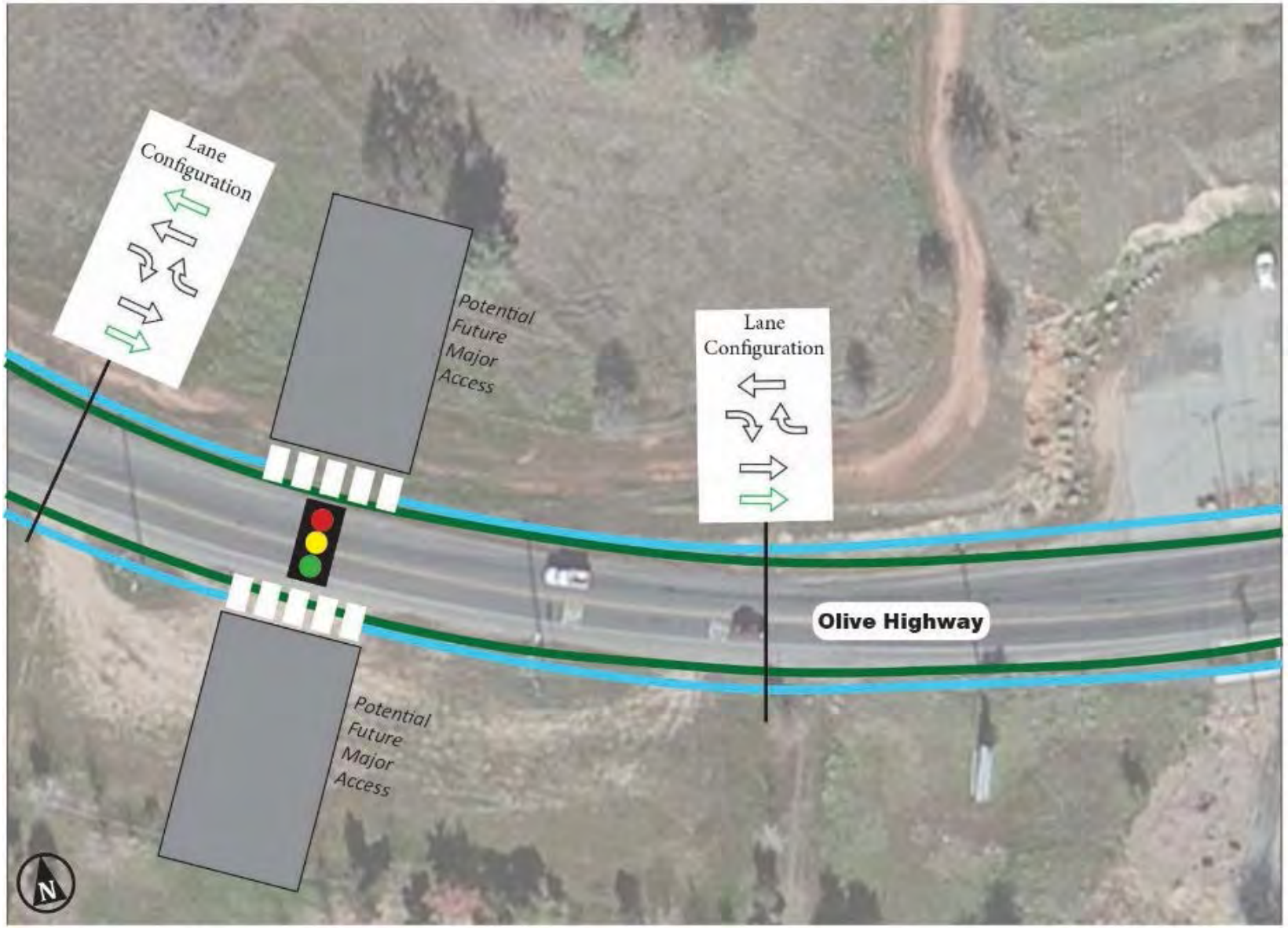

Medical Center Dr
Intersection Configuration
BUS
BUS
Olive Highway
C
C
C
N

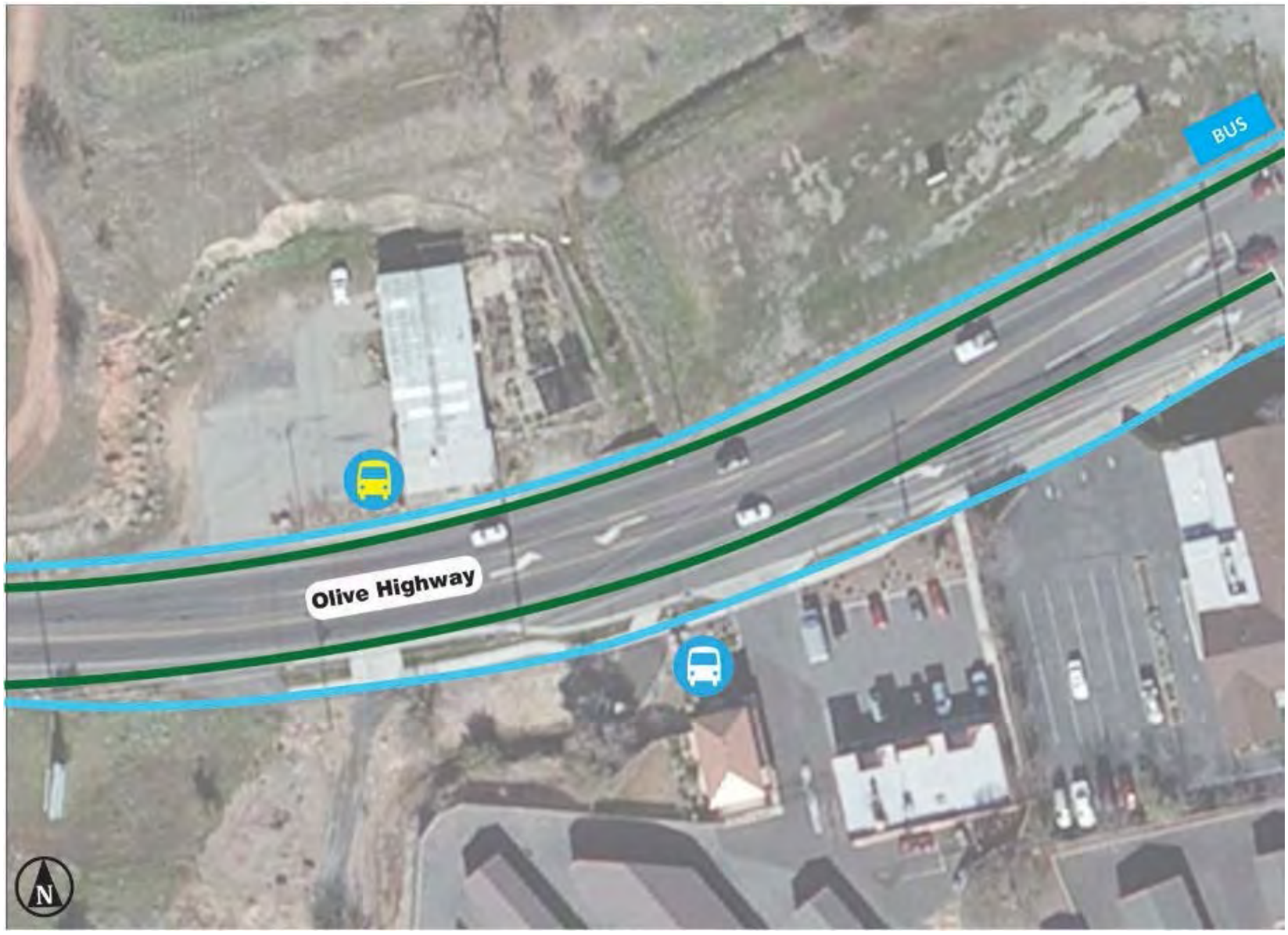

Executive Pkwy
Lane Configuration
Olive Highway Preferred Alternative Cross-Section (Figure 10-2)
Olive Highway
C
R

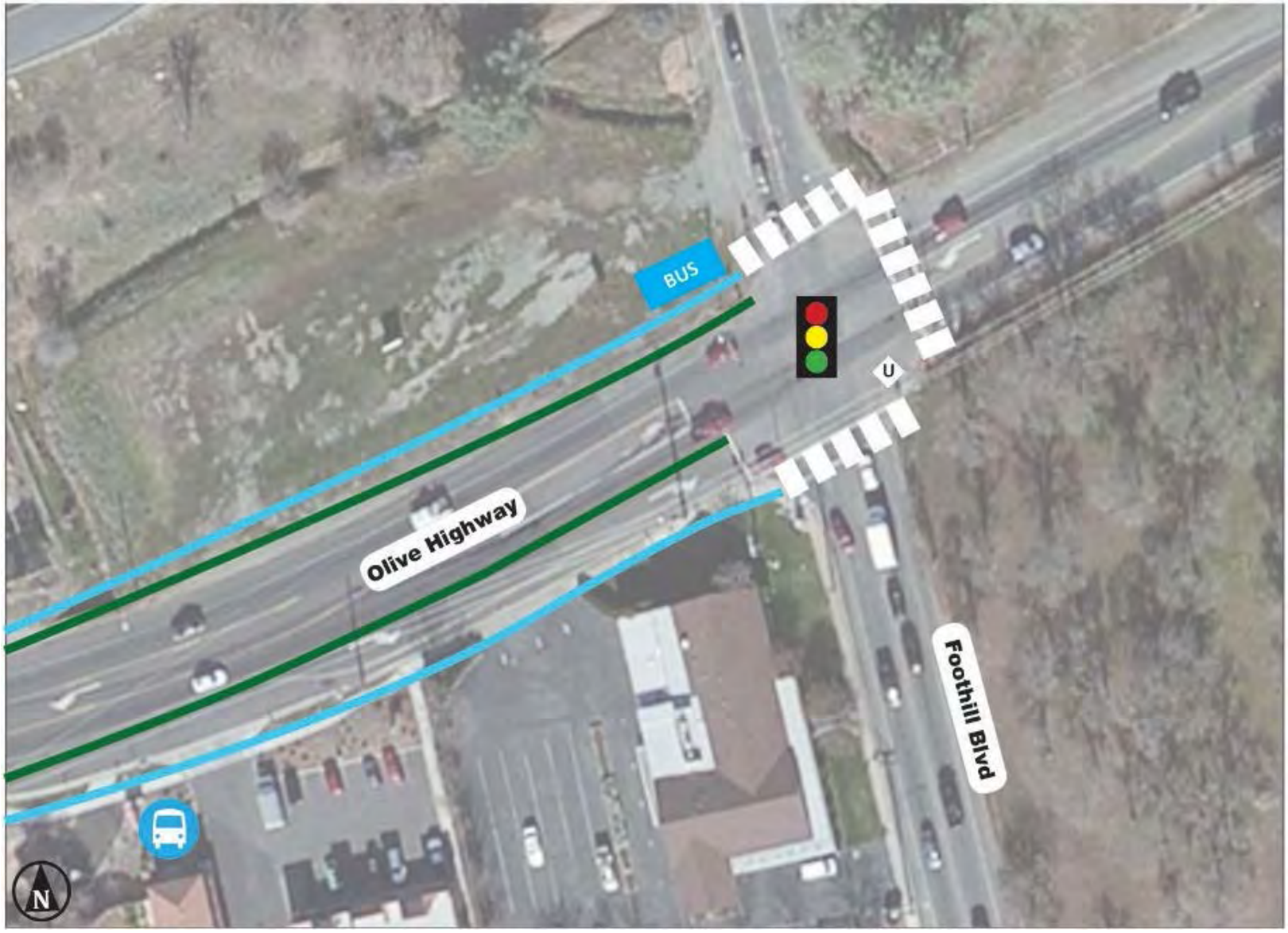

Olive Highway
U
R
C/R
Lower Wyandotte Rd
Intersection Configuration
Lane Configuration
N


Lane Configuration
Olive Highway
Olive Highway Preferred Alternative Cross-Section (Figure 10-2)
C
N

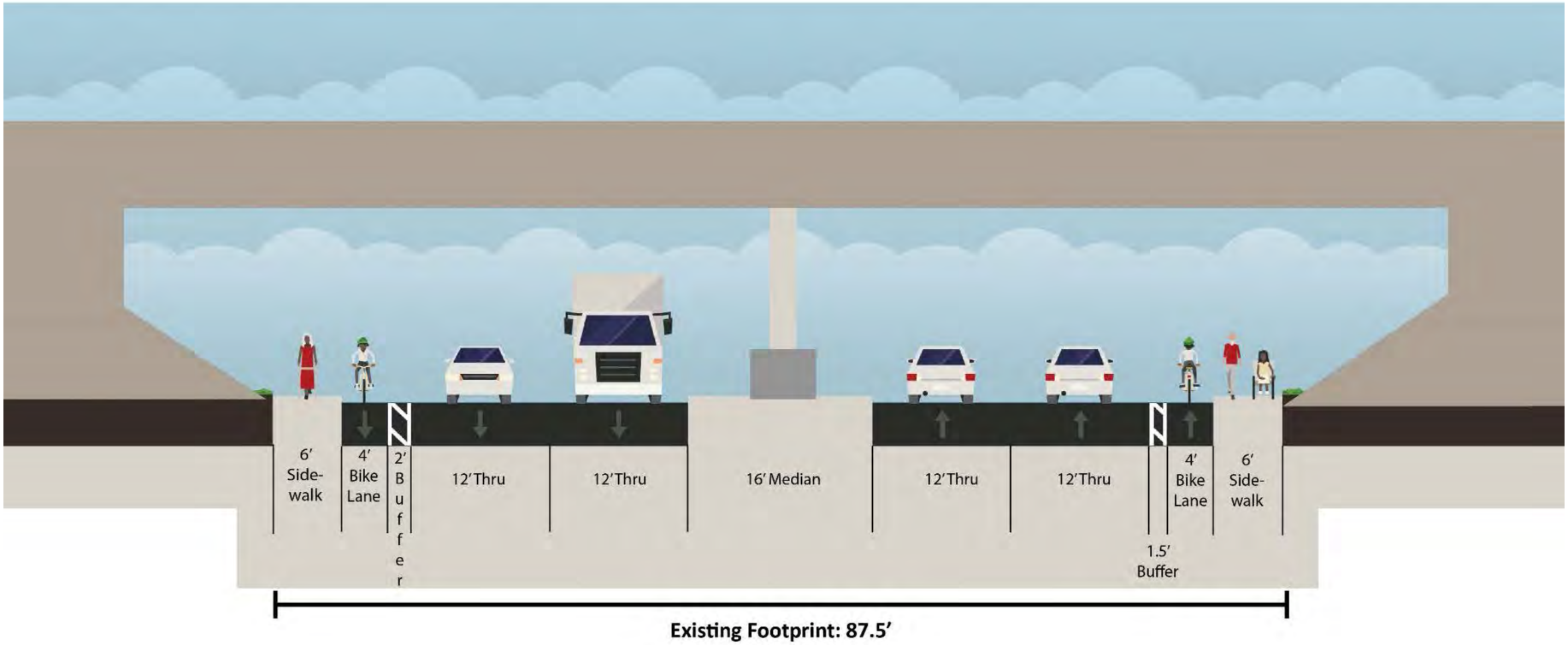

Lane
Configuration
Olive Highway


Lane Configuration
Potential Future Major Access
Lane Configuration
Olive Highway
Potential Future Major Access
N


BUS
Olive Highway
N


BUS
Olive Highway
Foothill Blvd
U
N

Oro Dam Boulevard UPRR Cross-Section



APPENDIX C – COST ESTIMATES

The assumed planning level unit costs for major work elements are presented in **Tables C-1** through **C-2**.

Detailed Cost estimates for all intersection and roadway segment improvements in the Preferred Alternative and Interim Improvements are included in **Tables C-3** and **C-4**.

CONSTRUCTION UNIT COSTS			
MATERIAL	**PRICE**		**UNIT**
AC PAVING	$	8.00	SF
AC PAVEMENT REHAB	$	6.00	SF
CURB & GUTTER	$	45.00	LF
PCC SIDEWALK	$	12.00	SF
SLOPE GRADING	$	500.00	LF
K-RAIL / GUARDRAIL	$	500.00	LF
STREET LIGHTING	$	200.00	LF
PEDESTRIAN LIGHTING	$	250.00	LF
LANDSCAPE	$	40.00	LF
LANDSCAPE RETAINING WALL	$	200.00	LF
DRAINAGE IMPROVEMENTS	$	300.00	LF
PEDESTRIAN RAMPS	$	30.00	LF
MEDIAN CURB	$	24.00	LF
OPTIMIZE SIGNAL	$	5,000.00	LF
MEDIAN ISLAND	$	12.00	SF
RELOCATE FIRE HYDRANT	$	3,250.00	EA
SHADE TREE	$	5.00	LF
PCC PAVING	$	15.00	SF
BUS PAD WITH SHELTER	$	25,000.00	EA
PEDESTRIAN CROSSING TREATMENT (HAWK)	$	575,000.00	EA
5 LANE STRIPING	$	3.50	LF
4 LANE STRIPING	$	3.00	LF

CONSTRUCTION UNIT COSTS			
MATERIAL	**PRICE**		**UNIT**
2' BUFFERED BIKE PATH STRIPING	$	1.50	LF
3' BUFFERED BIKE PATH STRIPING	$	1.70	LF
CROSSWALK STRIPING	$	3.20	SF
THERMOPLASTIC PRESHAPED SYMBOLS	$	250.00	EA
REMOVE STRIPING	$	7.00	SF
BIKE POCKET STRIPING	$	0.80	LF
MIXED BIKE LANE & RIGHT TURN LANE STRIPING	$	0.40	LF
INSTALL CATCH BASIN	$	3,000.00	EA
INSTALL STORM DRAIN LATERAL	$	100.00	LF
INSTALL GUARDRAIL	$	100.00	LF
RIGHT-OF-WAY ACQUISITION	$	25.00	SF
RELOCATE SIGN POST	$	350.00	EA
RELOCATE BUSINESS SIGN	$	7,500.00	EA
RELOCATE OVERHEAD UTILITIES	$	500.00	LF
BIKE DETECTION SYSTEM	$800		EA
SIGNAL COORDINATION	$	40,000.00	EA

ITEM	PRICE		UNIT
SOFT COSTS (INCLUDED IN COSTS)	23%		
CONTINGENCY	25%		
PERMITTING	$	75,000.00	LS
R/W ENGR/APPRAISAL/JUST COMPENSATION (I-80 / UPRR)	$	150,000.00	LS
R/W ENGR/APPRAISAL/JUST COMPENSATION (DISC DR/PRATER WAY)	$	175,000.00	LS/EA

Units of Measurement:

SF – Square Feet EA – Each

LF – Linear Feet LS – Lump Sum

TABLE C-1. PLANNING LEVEL CONSTRUCTION UNIT COSTS

SHORT TERM INTERSECTION SIGNAL IMPROVEMENTS			
LOCATION	PRICE		UNIT
Oro Dam Blvd/I-70	$	300,000	LS
Oro Dam Blvd/Feather River Blvd	$	200,000	LS
Oro Dam Blvd/5th Ave	$	200,000	LS
Oro Dam Blvd/ Veatch St	$	200,000	LS
Oro Dam Blvd/Lincoln St	$	200,000	LS
Oro Dam Blvd/ Myers St	$	200,000	LS
Oro Dam Blvd/ Spencer*	$	200,000	LS
Oro Dam Blvd/Olive Hwy	$	200,000	LS
Olive Hwy/Medical Center Dr	$	200,000	LS
Olive Hwy/Lower Wyandotte Rd	$	200,000	LS
Olive Hwy/Foothill Blvd	$	200,000	LS

LONG TERM INTERSECTION SIGNAL IMPROVEMENTS			
LOCATION	PRICE		UNIT
Oro Dam Blvd/I-70	$	500,000	LS
Oro Dam Blvd/Feather River Blvd	$	400,000	LS
Oro Dam Blvd/5th Ave	$	400,000	LS
Oro Dam Blvd/ Veatch St	$	400,000	LS
Oro Dam Blvd/Lincoln St	$	400,000	LS
Oro Dam Blvd/ Myers St	$	400,000	LS
Oro Dam Blvd/Olive Hwy	$	400,000	LS
Olive Hwy/Medical Center Dr	$	400,000	LS
Olive Hwy/Lower Wyandotte Rd	$	400,000	LS
Olive Hwy/Foothill Blvd	$	400,000	LS

*Includes Cost for Double H.A.W.K. Z-Crosswalk Pedestrian Crossing Treatment (Figure 7-4)

TABLE C-2. SHORT TERM AND LONG TERM INTERSECTION SIGNAL IMPROVEMENTS

Preferred Alternative Detailed Cost Estimates

Segment/Intersection	Recommended Improvement	Cost Estimate	Sub-Total
Oro Dam Blvd Corridor	Two 12' wide eastbound and westbound thru lanes, a 12' center lane (landscaped where possible) and buffered bike lanes	$ 463,800.00	$ 3,230,700.00
	Install pedestrian scale lighting	$ 2,597,700.00	
	Plant shade trees between the travel lane and sidewalk	$ 52,000.00	
	Consolidate, restrict, or formalize curb at access points along the corridor	$ -	
	Install benches, shelters, and trash receptacles at all new or relocated transit stop locations	$ 117,200.00	
Oro Dam/I-70	ADA Upgrades	$ 29,900.00	$ 123,700.00
	Install transit signal priority system	$ 46,900.00	
	Install emergency preemption system	$ 46,900.00	
Oro Dam - I-70 to Feather River Blvd	Improvements behind existing back of sidewalk[3]	$ 100,100.00	$ 100,100.00
Oro Dam/Feather River Blvd	Add additional westbound left turn lane[2]	$ 75,000.00	$ 284,100.00
	Add additional eastbound right-turn pocket	$ 70,800.00	
	Bike pocket	$ 1,200.00	
	Install bike detection loop	$ 1,300.00	
	Install transit signal priority system	$ 23,500.00	
	Install emergency preemption system	$ 23,500.00	
	Sidewalk construction	$ 37,200.00	
	ADA Upgrades	$ 14,700.00	
	Relocate storm drain drop inlet	$ 6,300.00	
	Improvements behind existing back of sidewalk[3]	$ 30,600.00	
Oro Dam - Feather River Blvd to 7th Ave	Sidewalk construction	$ 316,500.00	$ 1,509,300.00
	Relocate storm drain drop inlet	$ 31,300.00	
	Improvements behind existing back of sidewalk[3]	$ 1,161,500.00	

TABLE C-3. PREFERRED ALTERNATIVE COST ESTIMATES (TABLE 1)

Segment/Intersection	Recommended Improvement	Cost Estimate	Sub-Total
Oro Dam/7th Ave	Sidewalk construction	$ 16,900.00	$ 113,500.00
	ADA Upgrades	$ 6,700.00	
	Relocate storm drain drop inlet	$ 6,300.00	
	Improvements behind existing back of sidewalk[3]	$ 83,600.00	
Oro Dam - 7th Ave to Hungtington Ln	Sidewalk construction	$ 147,700.00	$ 750,900.00
	Relocate storm drain drop inlet	$ 6,300.00	
	Improvements behind existing back of sidewalk[3]	$ 596,900.00	
Oro Dam/Hungtington Ln	Sidewalk construction	$ 16,900.00	$ 104,800.00
	ADA Upgrades	$ 6,700.00	
	Improvements behind existing back of sidewalk[3]	$ 81,200.00	
Oro Dam - Hungtington Ln to 5th Ave	Sidewalk construction	$ 232,100.00	$ 802,500.00
	Improvements behind existing back of sidewalk[3]	$ 570,400.00	
Oro Dam/5th Ave	Increase the left-turn pocket lengths on the eastbound, westbound, and southbound legs	$ 2,400.00	$ 277,300.00
	Relocate storm drain drop inlet	$ 18,800.00	
	Bike pocket	$ 1,200.00	
	Install bike detection loop	$ 2,500.00	
	Install transit signal priority system	$ 23,500.00	
	Install emergency preemption system	$ 23,500.00	
	Sidewalk construction	$ 16,900.00	
	ADA Upgrades	$ 20,000.00	
	Improvements behind existing back of sidewalk[3]	$ 140,300.00	
	Allow U-Turns	$ 28,200.00	
Oro Dam - 5th Ave to Veatch Ave	Sidewalk construction	$ 611,800.00	$ 2,529,300.00
	Relocate storm drain drop inlet	$ 25,000.00	
	Improvements behind existing back of sidewalk[3]	$ 1,892,500.00	

TABLE C-3. PREFERRED ALTERNATIVE COST ESTIMATES (TABLE 2)

Segment/Intersection	Recommended Improvement	Cost Estimate	Sub-Total
Oro Dam/Veatch Ave	Install transit signal priority system	$ 23,500.00	$ 134,700.00
	Install emergency preemption system	$ 23,500.00	
	Sidewalk construction	$ 22,200.00	
	ADA Upgrades	$ 13,300.00	
	Allow U-Turns	$ 28,200.00	
	Improvements behind existing back of sidewalk[3]	$ 24,000.00	
Oro Dam - Veatch Ave to Lincoln Ave	Sidewalk construction	$ 991,500.00	$ 4,764,000.00
	Relocate storm drain drop inlet	$ 75,000.00	
	Improvements behind existing back of sidewalk[3]	$ 3,697,500.00	
Oro Dam/ Lincoln Ave	ADA Upgrades	$ 800.00	$ 189,600.00
	Increase the right-turn pocket length on westbound approach	$ 800.00	
	Increast the left-turn pocket length on the westbound approach	$ 1,600.00	
	Increase the left-turn pocket lengths on the eastbound and northbound approaches	$ 10,600.00	
	Bike pocket	$ 1,200.00	
	Install bike detection loop	$ 2,500.00	
	Install transit signal priority system	$ 23,500.00	
	Install emergency preemption system	$ 23,500.00	
	Sidewalk construction	$ 13,300.00	
	Relocate storm drain drop inlet	$ 12,500.00	
	Improvements behind existing back of sidewalk[3]	$ 99,300.00	
Oro Dam - Lincoln Ave to Meyers Ave	ADA Upgrades	$ 238,000.00	$ 1,404,600.00
	Sidewalk construction	$ 299,600.00	
	Relocate storm drain drop inlet	$ 12,500.00	
	Improvements behind existing back of sidewalk[3]	$ 854,500.00	

TABLE C-3. PREFERRED ALTERNATIVE COST ESTIMATES (TABLE 3)

Segment/Intersection	Recommended Improvement	Cost Estimate	Sub-Total
Oro Dam/Meyers Ave	Increase the left-turn pocket lengths on the northbound and southbound approaches	$ 1,600.00	$ 159,200.00
	Bike pocket	$ 1,200.00	
	Install bike detection system	$ 2,500.00	
	Install transit signal priority system	$ 23,500.00	
	Install emergency preemption system	$ 23,500.00	
	Sidewalk construction	$ 16,900.00	
	ADA Upgrades	$ 13,300.00	
	Allow U-Turns	$ 28,200.00	
	Relocate storm drain drop inlet	$ 6,300.00	
	Improvements behind existing back of sidewalk[3]	$ 42,200.00	
Oro Dam - Meyers Ave to Brown Ave	Sidewalk construction	$ 84,400.00	$ 361,300.00
	Improvements behind existing back of sidewalk[3]	$ 276,900.00	
Oro Dam/Brown Ave	Sidewalk construction	$ 16,900.00	$ 118,200.00
	ADA Upgrades	$ 13,300.00	
	Improvements behind existing back of sidewalk[3]	$ 88,000.00	
Oro Dam - Brown Ave to Spencer Ave	Sidewalk construction	$ 95,000.00	$ 345,400.00
	Improvements behind existing back of sidewalk[3]	$ 250,400.00	
Oro Dam/Spencer Ave	Sidewalk construction	$ 16,900.00	$ 133,500.00
	ADA Upgrades	$ 13,300.00	
	Improvements behind existing back of sidewalk[3]	$ 103,300.00	
Oro Dam - Spencer Ave to Olive Hwy	Relocate storm drain drop inlet	$ 12,500.00	$ 1,397,300.00
	Sidewalk construction	$ 305,900.00	
	Improvements behind existing back of sidewalk[3]	$ 1,078,900.00	

TABLE C-3. PREFERRED ALTERNATIVE COST ESTIMATES (TABLE 4)

Segment/Intersection	Recommended Improvement	Cost Estimate	Sub-Total
Oro Dam/Olive Hwy	Install transit signal priority system	$ 23,500.00	$ 92,800.00
	Install emergency preemption system	$ 23,500.00	
	Sidewalk construction	$ 21,100.00	
	ADA Upgrades	$ 20,000.00	
	Improvements behind existing back of sidewalk[3]	$ 4,700.00	
Olive Hwy Corridor	Widen the roadway to include two eastbound lanes, a center-turn lane, two westbound lanes, and two buffered bike lanes (Addition of two driving lanes)	$ 1,615,700.00	$ 3,512,900.00
	6' bike land & 3' buffer	$ 25,900.00	
	Install pedestrian scale lighting	$ 1,757,900.00	
	Plant shade trees between the travel lane and sidewalk	$ 35,200.00	
	Consolidate, restrict, or formalize curb at access points along the corridor	$ -	
	Install benches, shelters, and trash receptacles at all new or relocated transit stop locations	$ 78,200.00	
Olive Hwy - Oro Dam to Fay Wy	Extend/construct raised median between Oro Dam & Fay Wy.	$ 19,600.00	$ 998,200.00
	Sidewalk construction	$ 168,800.00	
	Slope Grading	$ 105,500.00	
	Improvements behind existing back of sidewalk[3]	$ 704,300.00	
Olive Hwy/Fay Wy	Sidewalk construction	$ 8,500.00	$ 473,300.00
	ADA Upgrades	$ 7,300.00	
	Slope Grading and Fay Way Improvements	$ 336,800.00	
	Improvements behind existing back of sidewalk[3]	$ 120,700.00	
Olive Hwy - Fay Wy to Medical Center Dr	Sidewalk construction	$ 400,800.00	$ 2,305,800.00
	Slope Grading	$ 390,700.00	
	Relocate storm drain drop inlet	$ 25,000.00	
	Improvements behind existing back of sidewalk[3]	$ 1,489,300.00	

TABLE C-3. PREFERRED ALTERNATIVE COST ESTIMATES (TABLE 5)

Segment/Intersection	Recommended Improvement	Cost Estimate	Sub-Total
Olive Hwy/Medical Center Dr	Increase eastbound and westbound left turn pocket lengths	$ 800.00	$ 263,600.00
	Add additional eastbound thru lane and convert existing westbound right turn lane into westbound thru/right lane	$ 800.00	
	Relocate storm drain drop inlet	$ 12,500.00	
	Bike pocket	$ 1,200.00	
	Install bike detection loop	$ 2,500.00	
	Install transit signal priority system	$ 23,500.00	
	Install emergency preemption system	$ 23,500.00	
	Sidewalk construction	$ 12,700.00	
	ADA Upgrades	$ 13,300.00	
	Allow U-Turns	$ 28,200.00	
	Improvements behind existing back of sidewalk[3]	$ 144,600.00	
Olive Hwy - Medical Center Dr to Lower Wyandotte Rd	Sidewalk construction	$ 358,600.00	$ 2,117,400.00
	Relocate storm drain drop inlet	$ 18,800.00	
	Improvements behind existing back of sidewalk[3]	$ 1,740,000.00	
Olive Hwy/Lower Wyandotte Rd	Increase eastbound and westbound left turn pocket	$ 1,600.00	$ 378,300.00
	Add additional eastbound and westbound thru lanes	$ 800.00	
	Bike pocket	$ 1,200.00	
	Install bike detection loop	$ 2,500.00	
	Install transit signal priority system	$ 23,500.00	
	Install emergency preemption system	$ 23,500.00	
	Sidewalk construction	$ 9,500.00	
	ADA Upgrades	$ 10,000.00	
	Allow U-Turns	$ 28,200.00	
	Improvements behind existing back of sidewalk[3]	$ 215,000.00	
	Relocate overhead utilities	$ 62,500.00	

TABLE C-3. PREFERRED ALTERNATIVE COST ESTIMATES (TABLE 6)

Segment/Intersection	Recommended Improvement	Cost Estimate	Sub-Total
Olive Hwy - Lower Wyandotte Rd to Foothill Blvd	Sidewalk construction	$ 970,400.00	$ 7,455,700.00
	Relocate storm drain drop inlet	$ 18,800.00	
	Improvements behind existing back of sidewalk[3]	$ 4,669,600.00	
	Relocate overhead utilities	$ 1,796,900.00	
Olive Hwy/Foothill Blvd	Bike pocket	$ 1,200.00	$ 235,400.00
	Install bike detection loop	$ 2,500.00	
	Install transit signal priority system	$ 23,500.00	
	Install emergency preemption system	$ 23,500.00	
	Sidewalk construction	$ 8,500.00	
	ADA Upgrades	$ 6,700.00	
	Allow U-Turns	$ 28,200.00	
	Improvements behind existing back of sidewalk[3]	$ 102,200.00	
	Relocate overhead utilities	$ 39,100.00	
Transit Specific Improvements	Install Transit Signal Priority system on traffic signals and on all buses operated by B-Line	$ -	$ -
ITS Specific Improvements	Develop an Incident Management task force/agreement		Caltrans/City of Oroville

TABLE C-3. PREFERRED ALTERNATIVE COST ESTIMATES (TABLE 7)

Preferred Alternative Approximate Cost: $50,500,000

[1] Assumed widening of sidewalk along existing alignment would

[2] Cost estimate includes the restriping of 350' of Feather River Drive to accommodate 2 south bound lanes

[3]This item consists of all improvements located beyond the back of the existing sidewalk due to widening (ex. Right of way acquisition, landscaping, curbing, paving, irrigation relocation, etc.)

[4] Additional lane striping accounted for in Olive Highway corridor improvement

FIGURE C-1. PREFERRED ALTERNATIVE FOOTNOTES

Interim Planning Level Cost Estimates

Segment/Intersection		Recommended Improvement	Cost Estimate	Sub-Total
Oro Dam Blvd Corridor		Two 12' wide eastbound and westbound thru lanes, a 12' center lane and buffered bike lanes	$ 44,000.00	$ 2,363,600.00
		4.5' bike lane & 2' buffer	$ 38,500.00	
		Install benches, shelters, and trash receptacles at all new or relocated transit stop locations	$ 78,200.00	
		Comprehensive wayfinding system	$ 150,000.00	
		Install retroreflective back plates on all traffic signal heads along the corridor	$ 45,000.00	
		Optimize signal timings and phasing	$ 62,500.00	
		Signal interconnect	$ 1,445,400.00	
		Coordinate signals to allow for more efficient movement of vehicles	$ 500,000.00	
Oro Dam/I-70		Create link to Feather River Trail	$ 95,000.00	$ 399,200.00
		Sidewalk construction/Expansion within ROW[1]	$ 104,600.00	
		Install high visibility crosswalks	$ 7,300.00	
		Slurry seal	$ 2,200.00	
		Bike pocket	$ 1,300.00	
		Install bike detection loop	$ 1,300.00	
		Install safety lighting	$ 187,500.00	
Oro Dam - I-70 to Feather River Blvd		Sidewalk construction/Expansion within ROW	$ 148,900.00	$ 148,900.00
Oro Dam/Feather River Blvd		Sidewalk construction/Expansion within ROW[1]	$ 6,700.00	$ 68,900.00
		Remove/relocate sidewalk obstructions	$ 5,100.00	
		Install high visibility crosswalks	$ 8,400.00	
		Install safety lighting	$ 46,900.00	
		Slurry seal	$ 800.00	
		Mixed bike lane & right turn lane	$ 1,000.00	
Oro Dam - Feather River Blvd to 7th Ave		Sidewalk construction/Expansion within ROW[1]	$ 183,700.00	$ 211,900.00
		Remove/relocate sidewalk obstructions	$ 28,200.00	
Oro Dam/7th Ave		Sidewalk construction/Expansion within ROW[1]	$ 27,100.00	$ 61,000.00
		Install high visibility crosswalks	$ 2,600.00	
		Install safety lighting	$ 31,300.00	

TABLE C-4. INTERIM IMPROVEMENTS COST ESTIMATE (TABLE 1)

Segment/Intersection		Recommended Improvement	Cost Estimate	Sub-Total
Oro Dam - 7th Ave to Hungtington Ln		Sidewalk construction/Expansion within ROW[1]	$ 93,600.00	$ 94,200.00
		Relocate 7th Ave transit stop further east to 5th Ave, nearer the signalized intersection	$ 600.00	
Oro Dam/Hungtington Ln		Sidewalk construction/Expansion within ROW[1]	$ 17,900.00	$ 51,100.00
		Install high visibility crosswalks	$ 1,900.00	
		Install safety lighting	$ 31,300.00	
Oro Dam - Hungtington Ln to 5th Ave		Sidewalk construction/Expansion within ROW[1]	$ 115,800.00	$ 115,800.00
Oro Dam/5th Ave		Sidewalk construction/Expansion within ROW[1]	$ 9,500.00	$ 65,900.00
		Install high visibility crosswalks	$ 8,600.00	
		Install safety lighting	$ 46,900.00	
		Mixed bike lane & right turn lane	$ 900.00	
Oro Dam - 5th Ave to Veatch Ave		Sidewalk construction/Expansion within ROW[1]	$ 256,700.00	$ 306,000.00
		Remove/relocate sidewalk obstructions	$ 10,200.00	
		Relocate 5th Ave transit stop further east to Veatch Ave, nearer a signalized intersection	$ 39,100.00	
Oro Dam/Veatch Ave		Sidewalk construction/Expansion within ROW[1]	$ 32,600.00	$ 69,400.00
		Install high visibility crosswalks	$ 5,500.00	
		Install safety lighting	$ 31,300.00	
Oro Dam - Veatch Ave to Lincoln Ave		Sidewalk construction/Expansion within ROW[1]	$ 689,700.00	$ 699,900.00
		Remove/relocate sidewalk obstructions	$ 10,200.00	
Oro Dam/ Lincoln Ave		Sidewalk construction/Expansion within ROW[1]	$ 17,900.00	$ 77,100.00
		Install high visibility crosswalks	$ 9,200.00	
		Install safety lighting	$ 46,900.00	
		Slurry seal	$ 1,300.00	
		Mixed bike lane & right turn lane	$ 1,800.00	
Oro Dam - Lincoln Ave to Myers Ave		Sidewalk construction/Expansion within ROW[1]	$ 111,100.00	$ 118,400.00
		Remove/relocate sidewalk obstructions	$ 6,700.00	
		Relocate the Myers Ave transit stop closer to Meyers Ave (further east, nearer a signalized intersection)	$ 600.00	

TABLE C-4. INTERIM IMPROVEMENTS COST ESTIMATE (TABLE 2)

Segment/Intersection		Recommended Improvement	Cost Estimate	Sub-Total
Oro Dam/Myers Ave		Sidewalk construction/Expansion within ROW[1]	$ 3,400.00	$ 46,000.00
		Install high visibility crosswalks	$ 8,200.00	
		Install safety lighting	$ 31,300.00	
		Slurry seal	$ 1,300.00	
		Mixed bike lane & right turn lane	$ 1,800.00	
Oro Dam - Myers Ave to Brown Ave		Sidewalk construction/Expansion within ROW[1]	$ 12,700.00	$ 12,700.00
Oro Dam/Brown Ave		Install high visibility crosswalks	$ 2,300.00	$ 33,600.00
		Install safety lighting	$ 31,300.00	
Oro Dam - Brown Ave to Spencer Ave		Remove/relocate sidewalk obstructions	$ 5,100.00	$ 5,100.00
Oro Dam/Spencer Ave		Remove/relocate sidewalk obstructions	$ 5,100.00	$ 57,600.00
		Install high visibility crosswalks	$ 2,300.00	
		Install double pedestrian activated hybrid beacon & Z-Crosswalk	$ 18,900.00	
		Install safety lighting	$ 31,300.00	
Oro Dam - Spencer Ave to Olive Hwy		Sidewalk construction/Expansion within ROW[1]	$ 90,800.00	$ 95,900.00
		Remove/relocate sidewalk obstructions	$ 5,100.00	
Oro Dam/Olive Hwy		Sidewalk construction/Expansion within ROW[1]	$ 5,800.00	$ 73,800.00
		Remove/relocate sidewalk obstructions	$ 7,300.00	
		Install high visibility crosswalks	$ 8,800.00	
		Install safety lighting	$ 46,900.00	
		Slurry seal	$ 1,500.00	
		Bike pocket	$ 2,100.00	
		Install bike detection loop	$ 1,300.00	
		Install striping to separate dual left turn lanes from thru movements	$ 100.00	

TABLE C-4. INTERIM IMPROVEMENTS COST ESTIMATE (TABLE 3)

Segment/Intersection		Recommended Improvement	Cost Estimate	Sub-Total
Olive Hwy Corridor		Restripe between Oro Dam and Lower Wyandotte Rd to have two eastbound lanes, a center-turn lane, one westbound lane and new buffereed bike lanes (Addition of one driving lane)	$ 10,900.00	$ 1,036,500.00
		4.5' bike lane & 3' buffer	$ 13,200.00	
		Comprehensive wayfinding system	$ 100,000.00	
		Install benches, shelters, and trash receptacles at all new or relocated transit stop locations	$ 39,100.00	
		Install retroreflective back plates on all traffic signal heads along the corridor	$ 5,000.00	
		Slurry seal	$ 94,800.00	
		Signal interconnect	$ 750,000.00	
		Optimize signal timings and phasing	$ 23,500.00	
Olive Hwy - Oro Dam to Fay Wy		Sidewalk construction/Expansion within ROW[1]	$ 51,100.00	$ 56,200.00
		Remove/relocate sidewalk obstructions	$ 5,100.00	
Olive Hwy/Fay Wy		Sidewalk construction/Expansion within ROW[1]	$ 9,100.00	$ 47,200.00
		Remove marked crosswalk	$ 3,800.00	
		Install high visibility crosswalks	$ 3,000.00	
		Install safety lighting	$ 31,300.00	
Olive Hwy - Fay Wy to Medical Center Dr		Remove the Fay Wy eastbound and west bound transit stops as these are very close to the Medical Center Dr stops	$ 1,100.00	$ 112,400.00
		Sidewalk construction/Expansion within ROW[1]	$ 111,300.00	
Olive Hwy/Medical Center Dr		Sidewalk construction/Expansion within ROW[1]	$ 3,700.00	$ 97,600.00
		Additional eastbound thru lane[4]	$ -	
		Install high visibility crosswalks	$ 5,400.00	
		Install safety lighting	$ 46,900.00	
		Bike pocket	$ 600.00	
		Install bike detection loop	$ 1,300.00	
		Relocate Medical Center Dr eastbound and westbound transit stops closer to Medical Center Dr (nearer the signal)	$ 39,700.00	

TABLE C-4. INTERIM IMPROVEMENTS COST ESTIMATE (TABLE 4)

Segment/Intersection		Recommended Improvement	Cost Estimate	Sub-Total
Olive Hwy - Medical Center Dr to Lower Wyandotte Rd		Sidewalk construction/Expansion within ROW[1]	$ 63,900.00	$ 63,900.00
Olive Hwy/Lower Wyandotte Rd		Sidewalk construction/Expansion within ROW[1]	$ 13,100.00	$ 47,800.00
		Additional eastbound thru lane[4]	$ -	
		Install high visibility crosswalks	$ 2,900.00	
		Install safety lighting	$ 31,300.00	
		Mixed bike lane & right turn lane	$ 500.00	
Olive Hwy - Lower Wyandotte Rd to Foothill Blvd		Sidewalk construction/Expansion within ROW[1]	$ 640,500.00	$ 650,500.00
		Remove/relocate sidewalk obstructions	$ 10,000.00	
Olive Hwy/Foothill Blvd		Sidewalk construction/Expansion within ROW[1]	$ 7,800.00	$ 83,300.00
		Additional eastbound thru lane	$ -	
		Install high visibility crosswalks	$ 4,200.00	
		Install safety lighting	$ 31,300.00	
		Mixed bike lane & right turn lane	$ 900.00	
		Relocate westbound Foothill Blvd stop closer to the Foothill Blvd signal	$ 39,100.00	
Transit Specific Improvements		Realign Route 25 to extend south to the new Walmart location	$ 85,500.00	$ 85,500.00
		Provide smart phone app for transit riders so they can correctly plan their trips based upon updated information	$ -	
		Provide smart phone app for transit riders to track when their buses coming in real time	$ -	
		Deployment of video surveillance and emergency call buttons at transit center	$ -	
		Monitor boarding activity and passenger loads on corridor routes	$ -	

TABLE C-4. INTERIM IMPROVEMENTS COST ESTIMATE (TABLE 5)

Interim Improvements Approximate Cost: $10,000,000

[1] Assumed widening of sidewalk along existing alignment would

[2] Cost estimate includes the restriping of 350' of Feather River Drive to accommodate 2 south bound lanes

[3]This item consists of all improvements located beyond the back of the existing sidewalk due to widening (ex. Right of way acquisition, landscaping, curbing, paving, irrigation relocation, etc.)

[4] Additional lane striping accounted for in Olive Highway corridor improvement

FIGURE C-2. INTERIM IMPROVEMENTS COST ESTIMATE FOOTNOTES

APPENDIX D – USER/ENVIRONMENTAL BENEFIT

Pedestrian Safety

ESTIMATED SAFETY BENEFITS FROM POTENTIAL CRASH REDUCTION

	SIGNALIZED INTERSECTION COUNTERMEASURES				UNSIGNALIZED INTERESECTION COUNTERMEASURES			
Countermeasures	Install pedestrian countdown signal heads	Install pedestrian crossing	Install advance stop bar before crosswalk (bicycle box)	Install pedestrian overpass/ underpass	Install raised medians/ refuge islands	Install pedestrian crossings (new signs and markings only	Install pedestrian crossing (with enhanced safety measures/ curb extensions	Install pedestrian signal
Applicable Countermeasures	Y	Y	N	N	N	Y	0	Y
Crash Reduction Factors (CRFs)	25%	25%	15%	75%	45%	25%	35%	55%
Service Life	20	20	10	20	20	10	20	20
1st year	$514,776	$514,776	$0	$0	$0	$514,776	$0	$1,132,508

	ROADWAY COUNTERMEASURES						
Countermeasures	Install bike lanes	Install sidewalk/ pathway (to avoid walking along roadways	Install pedestrian crossing (with enhanced safety measures	Install Pedestrian crossing	OTHER REDUCTION FACTOR	Average of 3 highest countermeasures	Annual Benefits
Applicable Countermeasures	0	Y	0	0	0		
Crash Reduction Factors (CRFs)	35%	80%	30%	35%	10%		
Service Life	20	20	10	10	20		
1st year	$0	$1,647,284	$0	$0	$0	$1,098,189	$1,098,189

	Fatal	Injury	PDO	Total
Frequency	0.4	5	0	5.4
Cost/crash	$4,130,347	$81,393	$7,624	

Assumption:

For Other Reduction Factor countermeasure, EAB assumes 20 years service life.

Bicycle Safety

ESTIMATED SAFETY BENEFITS FROM POTENTIAL CRASH REDUCTION

	SIGNALIZED INTERSECTION COUNTERMEASURES				UNSIGNALIZED INTERESECTION COUNTERMEASURES			
Countermeasures	Install pedestrian countdown signal heads	Install pedestrian crossing	Install advance stop bar before crosswalk (bicycle box)	Install pedestrian overpass/ underpass	Install raised medians/ refuge islands	Install pedestrian crossings (new signs and markings only	Install pedestrian crossing (with enhanced safety measures/ curb extensions	Install pedestrian signal
Applicable Countermeasures	0	0	Y	0	0	0	0	0
Crash Reduction Factors (CRFs)	25%	25%	15%	75%	45%	25%	35%	55%
Service Life	20	20	10	20	20	10	20	20
1st year	$0	$0	$148,328	$0	$0	$0	$0	$0

	ROADWAY COUNTERMEASURES						
Countermeasures	Install bike lanes	Install sidewalk/ pathway (to avoid walking along roadways	Install pedestrian crossing (with enhanced safety measures	Install Pedestrian crossing	OTHER REDUCTION FACTOR	Average of 3 highest countermeasures	Annual Benefits
Applicable Countermeasures	Y	0	0	0	0		
Crash Reduction Factors (CRFs)	35%	80%	30%	35%	10%		
Service Life	20	20	10	10	20		
1st year	$346,100	$0	$0	$0	$0	$164,809	$164,809

	Fatal	Injury	PDO	Total
Frequency	0.2	2	0	2.2
Cost/crash	$4,130,347	$81,393	$7,624	

Assumption:
For Other Reduction Factor countermeasure, EAB assumes 20 years service life.

Travel Time Savings

The analysis completed using the Caltrans Corridor B/C tool to estimate user/environmental benefits is included below. Each table represents the outputs generated from the Caltrans Corridor B/C tool.

VMT and VHT used for this analysis are estimates of the annual VMT and VHT during the PM peak hour only. VMTs and VHTs were generated for a no-build scenario and a scenario representing a full build out of the preferred alternative.

Year	ANNUAL VHT (veh-hours/yr)		AVERAGE VEH OCC (persons/vehicle)		ANNUAL PERSON-TRIPS (trips/yr)		AVERAGE TRAVEL TIME (hours)		PERCENT TRUCKS (%)		TIME BENEFIT ($/yr)				Total Per-Hrs of Time Saved
	No Build	Build	No Build	Build	No Build	Build	No Build	Build	No Build	Build	Existing Users	New (Induced)	Constant Dollars	Present Value	
1	51,198,368	48,760,350	1.20	1.20	1	1	61,438,041.00	58,512,420.00	2.0%	2.0%	$37,518,164	$0	$37,518,164	$27,414,155	2,925,621
20	149,878,125	90,859,450	1.20	1.20	1	1	179,853,750.00	109,031,340.00	2.0%	2.0%	$908,226,586	$0	$908,226,586	$314,988,029	70,822,410
1	51,198,368	48,760,350	1.20	1.20	1	1	61,438,041.00	58,512,420.00	2.0%	2.0%	$37,518,164	$0	$37,518,164	$27,414,155	2,925,621
2	56,392,039	50,976,092	1.20	1.20	1	1	67,670,446.74	61,171,310.53	2.0%	2.0%	$83,344,923	$0	$83,344,923	$58,557,037	6,499,136
3	61,585,710	53,191,834	1.20	1.20	1	1	73,902,852.47	63,830,201.05	2.0%	2.0%	$129,171,682	$0	$129,171,682	$87,263,760	10,072,651
4	66,779,382	55,407,576	1.20	1.20	1	1	80,135,258.21	66,489,091.58	2.0%	2.0%	$174,998,441	$0	$174,998,441	$113,675,650	13,646,167
5	71,973,053	57,623,318	1.20	1.20	1	1	86,367,663.95	69,147,982.11	2.0%	2.0%	$220,825,200	$0	$220,825,200	$137,926,768	17,219,682
6	77,166,725	59,839,061	1.20	1.20	1	1	92,600,069.68	71,806,872.63	2.0%	2.0%	$266,651,959	$0	$266,651,959	$160,144,257	20,793,197
7	82,360,396	62,054,803	1.20	1.20	1	1	98,832,475.42	74,465,763.16	2.0%	2.0%	$312,478,718	$0	$312,478,718	$180,448,674	24,366,712
8	87,554,068	64,270,545	1.20	1.20	1	1	105,064,881.16	77,124,653.68	2.0%	2.0%	$358,305,477	$0	$358,305,477	$198,954,313	27,940,227
9	92,747,739	66,486,287	1.20	1.20	1	1	111,297,286.89	79,783,544.21	2.0%	2.0%	$404,132,236	$0	$404,132,236	$215,769,505	31,513,743
10	97,941,411	68,702,029	1.20	1.20	1	1	117,529,692.63	82,442,434.74	2.0%	2.0%	$449,958,995	$0	$449,958,995	$230,996,910	35,087,258
11	103,135,082	70,917,771	1.20	1.20	1	1	123,762,098.37	85,101,325.26	2.0%	2.0%	$495,785,754	$0	$495,785,754	$244,733,790	38,660,773
12	108,328,753	73,133,513	1.20	1.20	1	1	129,994,504.11	87,760,215.79	2.0%	2.0%	$541,612,513	$0	$541,612,513	$257,072,276	42,234,288
13	113,522,425	75,349,255	1.20	1.20	1	1	136,226,909.84	90,419,106.32	2.0%	2.0%	$587,439,272	$0	$587,439,272	$268,099,616	45,807,804
14	118,716,096	77,564,997	1.20	1.20	1	1	142,459,315.58	93,077,996.84	2.0%	2.0%	$633,266,031	$0	$633,266,031	$277,898,414	49,381,319
15	123,909,768	79,780,739	1.20	1.20	1	1	148,691,721.32	95,736,887.37	2.0%	2.0%	$679,092,791	$0	$679,092,791	$286,546,861	52,954,834
16	129,103,439	81,996,482	1.20	1.20	1	1	154,924,127.05	98,395,777.89	2.0%	2.0%	$724,919,550	$0	$724,919,550	$294,118,951	56,528,349
17	134,297,111	84,212,224	1.20	1.20	1	1	161,156,532.79	101,054,668.42	2.0%	2.0%	$770,746,309	$0	$770,746,309	$300,684,686	60,101,864
18	139,490,782	86,427,966	1.20	1.20	1	1	167,388,938.53	103,713,558.95	2.0%	2.0%	$816,573,068	$0	$816,573,068	$306,310,278	63,675,380
19	144,684,454	88,643,708	1.20	1.20	1	1	173,621,344.26	106,372,449.47	2.0%	2.0%	$862,399,827	$0	$862,399,827	$311,058,332	67,248,895
20	149,878,125	90,859,450	1.20	1.20	1	1	179,853,750.00	109,031,340.00	2.0%	2.0%	$908,226,586	$0	$908,226,586	$314,988,029	70,822,410
Total														$4,272,662,261	737,480,310

Formulas:

Avg. Annual Volume = Avg. Daily Traffic x Number of Days in Model Year
vehicles / yr

Travel Time = AVO x Avg. Annual Volume x Affected Length / Speed
vehicle-hrs / yr vehicles / yr x miles miles/hour

TT Savings = Travel Time Reduction x Avg. Value of Time
$ / year $/hour
Avg. Value of Time (varies by vehicle type)

Induced = Change in Trips x Change in Travel Time * 0.5

Vehicle Operating Costs

Year	TOTAL VMT (veh-miles/yr)		TOTAL VHT (veh-hrs/yr)		AVERAGE SPEED (mph)		PERCENT TRUCKS (%)		BENEFITS ($/yr)		Constant Dollars	Present Value
	No Build	Build	No Build	Build	No Build	Build	No Build	Build	Fuel Costs	Non-Fuel Costs		
1	858,635,125	877,553,075	51,198,368	48,760,350	16.8	18.0	2.0%	2.0%	$12,152,976	($5,775,650)	$6,377,326	$4,659,850
20	1,078,589,600	1,176,909,650	149,878,125	90,859,450	7.2	13.0	2.0%	2.0%	$87,041,153	($30,017,111)	$57,024,042	$19,776,883

1	858,635,125	877,553,075	51,198,368	48,760,350	16.8	18.0	2.0%	2.0%	$12,152,976	($5,775,650)	$6,377,326	$4,659,850
2	870,211,676	893,308,684	56,392,039	50,976,092	15.4	17.5	2.0%	2.0%	$11,263,360	($7,051,517)	$4,211,844	$2,959,185
3	881,788,228	909,064,293	61,585,710	53,191,834	14.3	17.1	2.0%	2.0%	$22,837,363	($8,327,383)	$14,509,980	$9,802,423
4	893,364,779	924,819,903	66,779,382	55,407,576	13.4	16.7	2.0%	2.0%	$26,144,793	($9,603,249)	$16,541,544	$10,745,071
5	904,941,330	940,575,512	71,973,053	57,623,318	12.6	16.3	2.0%	2.0%	$38,210,763	($10,879,116)	$27,331,647	$17,071,266
6	916,517,882	956,331,121	77,166,725	59,839,061	11.9	16.0	2.0%	2.0%	$50,604,868	($12,154,982)	$38,449,886	$23,092,005
7	928,094,433	972,086,730	82,360,396	62,054,803	11.3	15.7	2.0%	2.0%	$41,381,072	($13,430,848)	$27,950,223	$16,140,557
8	939,670,984	987,842,339	87,554,068	64,270,545	10.7	15.4	2.0%	2.0%	$54,375,308	($14,706,715)	$39,668,593	$22,026,562
9	951,247,536	1,003,597,949	92,747,739	66,486,287	10.3	15.1	2.0%	2.0%	$54,182,622	($15,982,581)	$38,200,041	$20,395,314
10	962,824,087	1,019,353,558	97,941,411	68,702,029	9.8	14.8	2.0%	2.0%	$60,052,821	($17,258,448)	$42,794,374	$21,969,487
11	974,400,638	1,035,109,167	103,135,082	70,917,771	9.4	14.6	2.0%	2.0%	$59,884,289	($18,534,314)	$41,349,975	$20,411,510
12	985,977,189	1,050,864,776	108,328,753	73,133,513	9.1	14.4	2.0%	2.0%	$59,715,756	($19,810,180)	$39,905,576	$18,940,879
13	997,553,741	1,066,620,386	113,522,425	75,349,255	8.8	14.2	2.0%	2.0%	$80,539,845	($21,086,047)	$59,453,798	$27,133,937
14	1,009,130,292	1,082,375,995	118,716,096	77,564,997	8.5	14.0	2.0%	2.0%	$80,614,930	($22,361,913)	$58,253,017	$25,563,381
15	1,020,706,843	1,098,131,604	123,909,768	79,780,739	8.2	13.8	2.0%	2.0%	$65,087,103	($23,637,779)	$41,449,324	$17,489,765
16	1,032,283,395	1,113,887,213	129,103,439	81,996,482	8.0	13.6	2.0%	2.0%	$64,938,324	($24,913,646)	$40,024,678	$16,239,066
17	1,043,859,946	1,129,642,822	134,297,111	84,212,224	7.8	13.4	2.0%	2.0%	$86,756,637	($26,189,512)	$60,567,125	$23,628,536
18	1,055,436,497	1,145,398,432	139,490,782	86,427,966	7.6	13.3	2.0%	2.0%	$86,851,476	($27,465,379)	$59,386,098	$22,276,723
19	1,067,013,049	1,161,154,041	144,684,454	88,643,708	7.4	13.1	2.0%	2.0%	$86,946,315	($28,741,245)	$58,205,070	$20,993,942
20	1,078,589,600	1,176,909,650	149,878,125	90,859,450	7.2	13.0	2.0%	2.0%	$87,041,153	($30,017,111)	$57,024,042	$19,776,883

Total	$361,316,344

Formulas:

Vehicle-Miles Traveled = Affected Length x Avg. Annual Volume

veh-miles/yr miles vehicles/yr

Fuel Cost = VMT x Fuel Consumption x Fuel Price

dollars gallons/mile $/gallon

Non-Fuel Cost = VMT x Cost Per Mile

dollars $/miles

Benefit = Existing Cost - New Cost

Emissions Benefits

Year	TOTAL VMT (veh-miles/yr)		TOTAL VHT (veh-hrs/yr)		AVERAGE SPEED (mph)		PERCENT TRUCKS (%)		AVERAGE VOLUME (vehicles/yr)		RUNNING EMISSIONS ($/yr)		STARTING EMISSIONS ($/yr)		Constant Dollars	Present Value	CO_2 EMISSIONS SAVED	
	No Build	Build	No Build	Build	No Build	Build	No Build	Build	No Build	Build	No Build	Build	No Build	Build			tons/yr	PV $/yr
1	858,635,125	877,553,075	51,198,368	48,760,350	16.8	18.0	2.0%	2.0%	0	0	$31,119,273	$29,910,757	$0	$0	$1,208,516	$883,051	39,924	$786,126
20	1,078,589,600	1,176,909,650	149,878,125	90,859,450	7.2	13.0	2.0%	2.0%	0	0	$64,564,294	$52,873,286	$0	$0	$11,691,008	$4,054,635	287,618	$3,916,048
1	858,635,125	877,553,075	51,198,368	48,760,350	16.8	18.0	2.0%	2.0%	0	0	$31,119,273	$29,910,757	$0	$0	$1,208,516	$883,051	39,924	$786,126
2	870,211,676	893,308,684	56,392,039	50,976,092	15.4	17.5	2.0%	2.0%	0	0	$32,826,920	$31,747,154	$0	$0	$1,079,766	$758,630	37,107	$716,623
3	881,788,228	909,064,293	61,585,710	53,191,834	14.3	17.1	2.0%	2.0%	0	0	$35,091,725	$32,659,393	$0	$0	$2,432,332	$1,643,196	75,156	$1,423,517
4	893,364,779	924,819,903	66,779,382	55,407,576	13.4	16.7	2.0%	2.0%	0	0	$37,459,584	$34,640,154	$0	$0	$2,819,430	$1,831,448	85,893	$1,595,590
5	904,941,330	940,575,512	71,973,053	57,623,318	12.6	16.3	2.0%	2.0%	0	0	$39,930,632	$35,626,042	$0	$0	$4,304,590	$2,688,634	125,574	$2,287,866
6	916,517,882	956,331,121	77,166,725	59,839,061	11.9	16.0	2.0%	2.0%	0	0	$42,512,121	$36,633,237	$0	$0	$5,878,884	$3,530,705	166,313	$2,971,827
7	928,094,433	972,086,730	82,360,396	62,054,803	11.3	15.7	2.0%	2.0%	0	0	$43,573,226	$38,801,073	$0	$0	$4,772,152	$2,755,799	135,890	$2,381,494
8	939,670,984	987,842,339	87,554,068	64,270,545	10.7	15.4	2.0%	2.0%	0	0	$39,991,549	$34,115,837	$0	$0	$5,875,713	$3,262,575	179,006	$3,076,792
9	951,247,536	1,003,597,949	92,747,739	66,486,287	10.3	15.1	2.0%	2.0%	0	0	$41,074,340	$35,139,597	$0	$0	$5,934,744	$3,168,608	178,444	$3,008,140
10	962,824,087	1,019,353,558	97,941,411	68,702,029	9.8	14.8	2.0%	2.0%	0	0	$44,594,402	$37,884,720	$0	$0	$6,709,682	$3,444,571	197,531	$3,265,873
11	974,400,638	1,035,109,167	103,135,082	70,917,771	9.4	14.6	2.0%	2.0%	0	0	$45,802,855	$39,015,637	$0	$0	$6,787,219	$3,350,362	197,044	$3,195,166
12	985,977,189	1,050,864,776	108,328,753	73,133,513	9.1	14.4	2.0%	2.0%	0	0	$47,040,888	$40,174,229	$0	$0	$6,866,659	$3,259,208	196,556	$3,125,970
13	997,553,741	1,066,620,386	113,522,425	75,349,255	8.8	14.2	2.0%	2.0%	0	0	$50,949,049	$41,361,218	$0	$0	$9,587,831	$4,375,761	265,025	$4,133,814
14	1,009,130,292	1,082,375,995	118,716,096	77,564,997	8.5	14.0	2.0%	2.0%	0	0	$52,326,838	$42,577,347	$0	$0	$9,749,491	$4,278,404	265,338	$4,059,105
15	1,020,706,843	1,098,131,604	123,909,768	79,780,739	8.2	13.8	2.0%	2.0%	0	0	$53,738,583	$45,822,935	$0	$0	$7,915,648	$3,340,050	215,121	$3,227,607
16	1,032,283,395	1,113,887,213	129,103,439	81,996,482	8.0	13.6	2.0%	2.0%	0	0	$55,185,148	$47,164,775	$0	$0	$8,020,373	$3,254,077	214,709	$3,159,474
17	1,043,859,946	1,129,642,822	134,297,111	84,212,224	7.8	13.4	2.0%	2.0%	0	0	$59,626,812	$48,539,857	$0	$0	$11,086,955	$4,325,259	286,453	$4,134,144
18	1,055,436,497	1,145,398,432	139,490,782	86,427,966	7.6	13.3	2.0%	2.0%	0	0	$61,232,490	$49,949,043	$0	$0	$11,283,447	$4,232,611	286,841	$4,060,136
19	1,067,013,049	1,161,154,041	144,684,454	88,643,708	7.4	13.1	2.0%	2.0%	0	0	$62,877,982	$51,393,218	$0	$0	$11,484,764	$4,142,431	287,230	$3,987,445
20	1,078,589,600	1,176,909,650	149,878,125	90,859,450	7.2	13.0	2.0%	2.0%	0	0	$64,564,294	$52,873,286	$0	$0	$11,691,008	$4,054,635	287,618	$3,916,048
Total																$62,580,015	3,722,773	$58,512,756

Formulas:

Vehicle-Miles Traveled = Affected Length x Avg. Annual Volume

veh-miles/yr miles vehicles/yr

Hwy Emissions Cost = (VMT x Rate x Cost/Mile) by Emissions Type

Transit Em Cost = (Veh-Miles x Rate x Cost/Mile) by Em Type

APPENDIX E – INTERIM IMPROVEMENT LAYOUT SHEETS

Interim Improvements Legend

Bicycle & Pedestrian

- Feather River Trail Connection
- Buffered Bicycle Lane (4.5' Bike Lane & 2' Striped Buffer) w/ Bike Pocket or Mixed Turn Lane/Bike Lane (Figures 7-8 & 7-9)
- Buffered Bicycle Lane (4.5' Bike Lane & 3' Striped Buffer) w/ Bike Pocket or Mixed Turn Lane/Bike Lane (Figures 7-8 & 7-9)
- New 6' Sidewalk
- High Visibility Crosswalk
- Remove Crosswalk

Transit

- Existing Transit Stop (To Remain)
- Existing Transit Stop (Relocate to Signal)
- Existing Transit Stop (Remove with Widening)
- BUS - Approximate Relocated Bus Stop Location
- TC - Transit Center

Roadway

- Traffic Signal Modifications (Optimize Signal Timings, Coordinate Signals, Retroreflective Backplates, Safety Lighting)
- Added Lane/Turn Pocket
- Cat Tracks
- Concrete Median

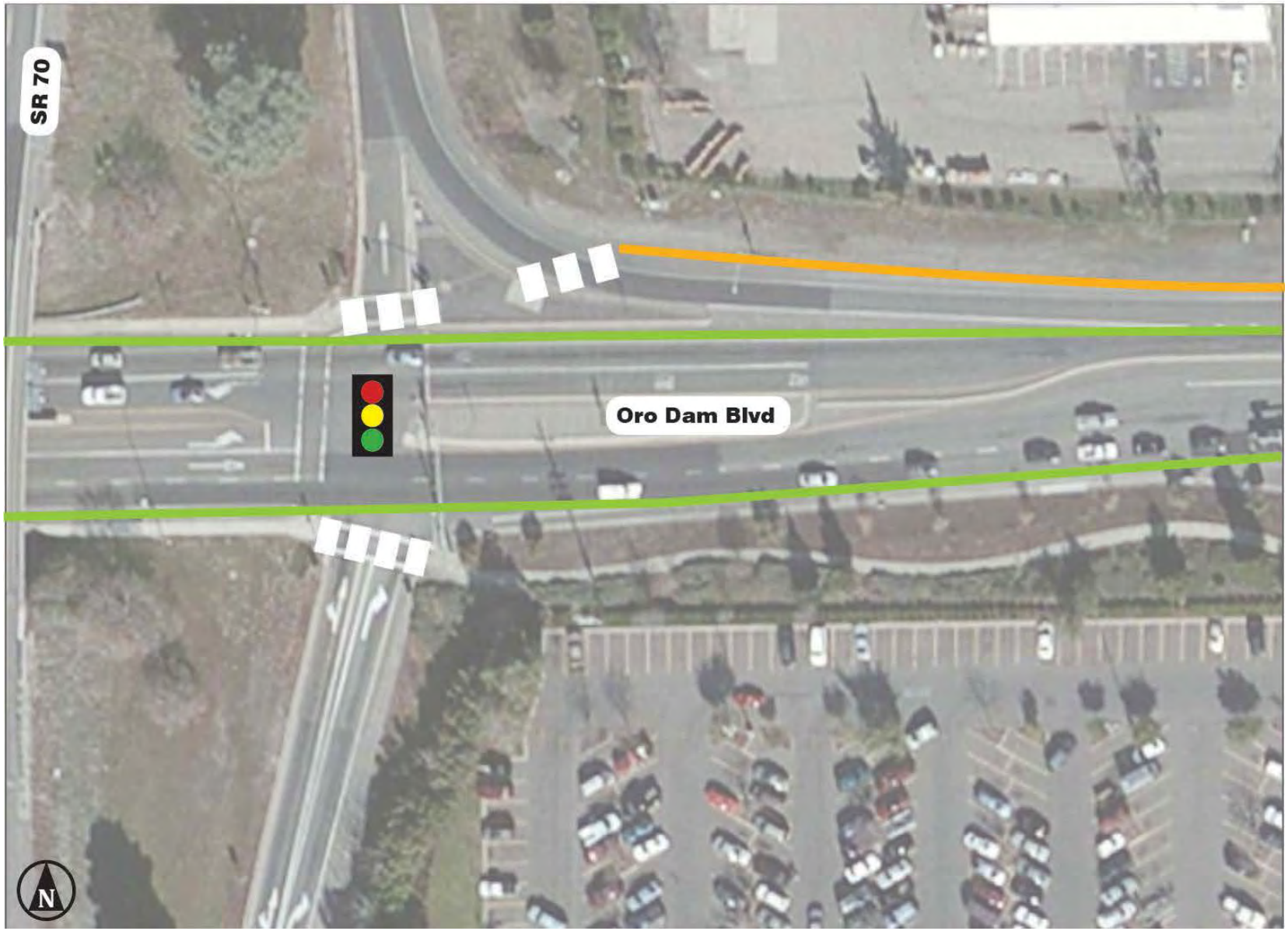
Access Management

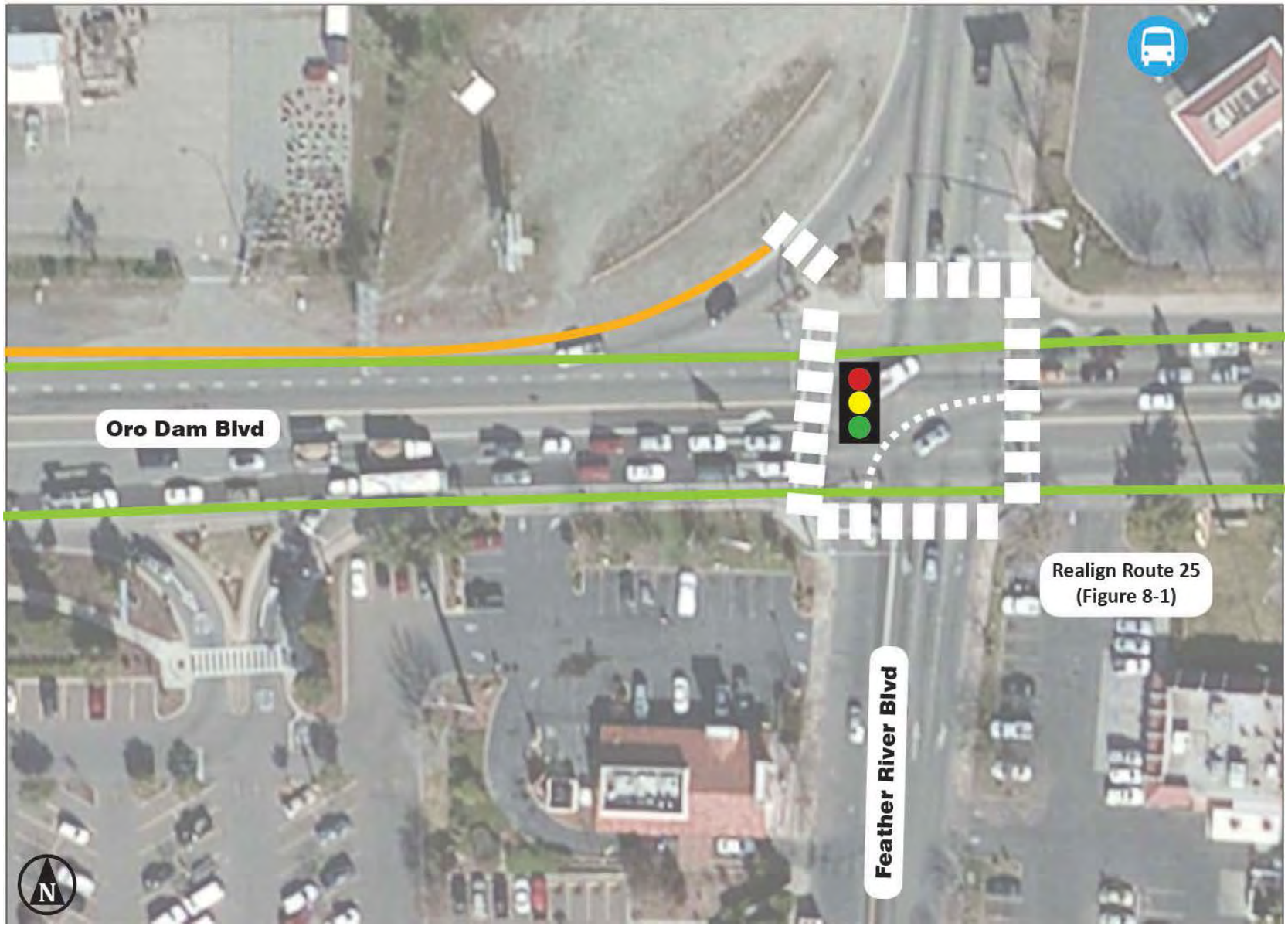
- C - Consolidate; Consolidate and/or Restrict
- C/R & FC - Consolidate and/or Restrict & Formalize Curb
- R - Restrict Access

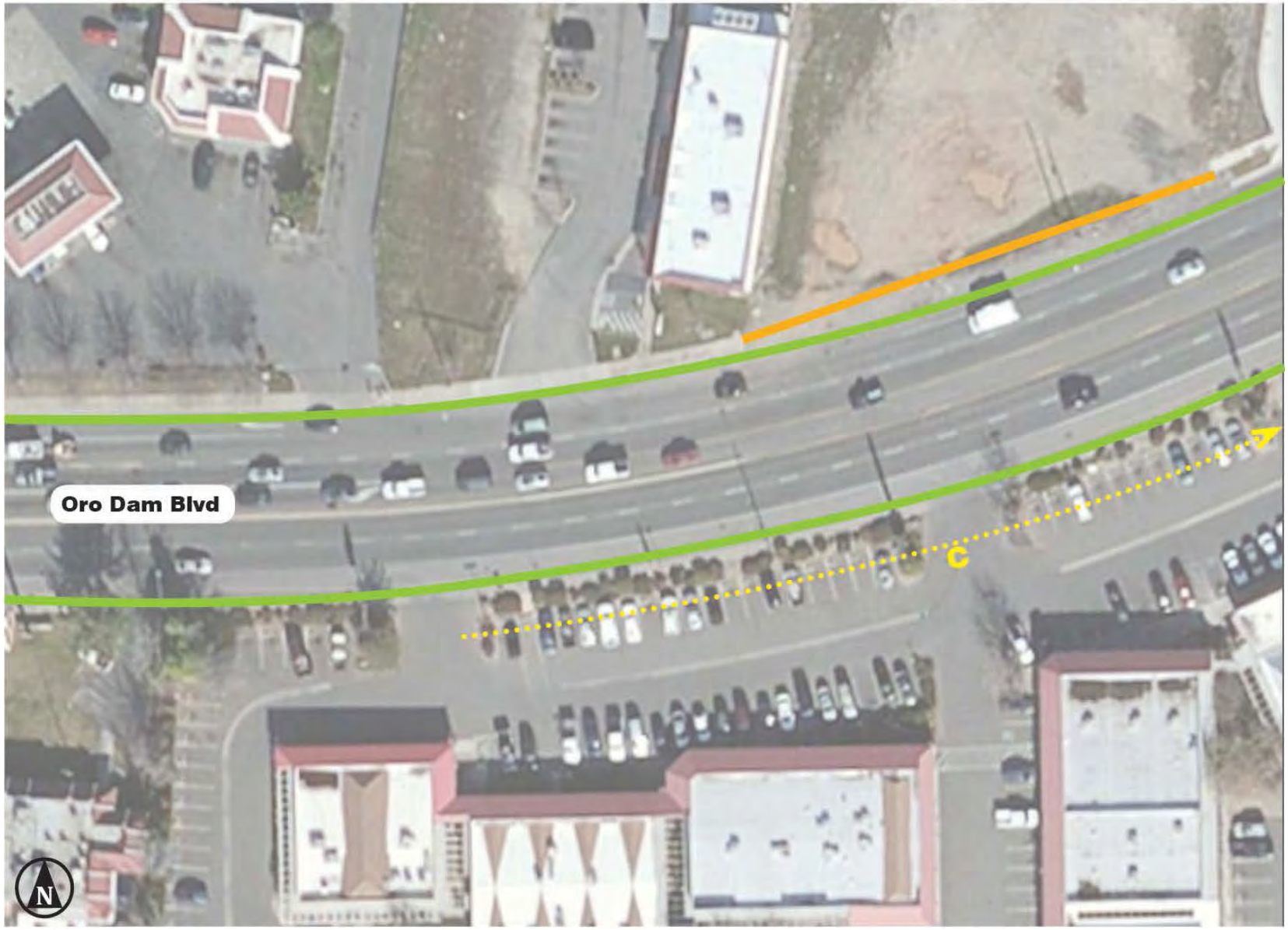
Reference

- North Arrow
- Cross-Section Location


SR 70
Oro Dam Blvd
N

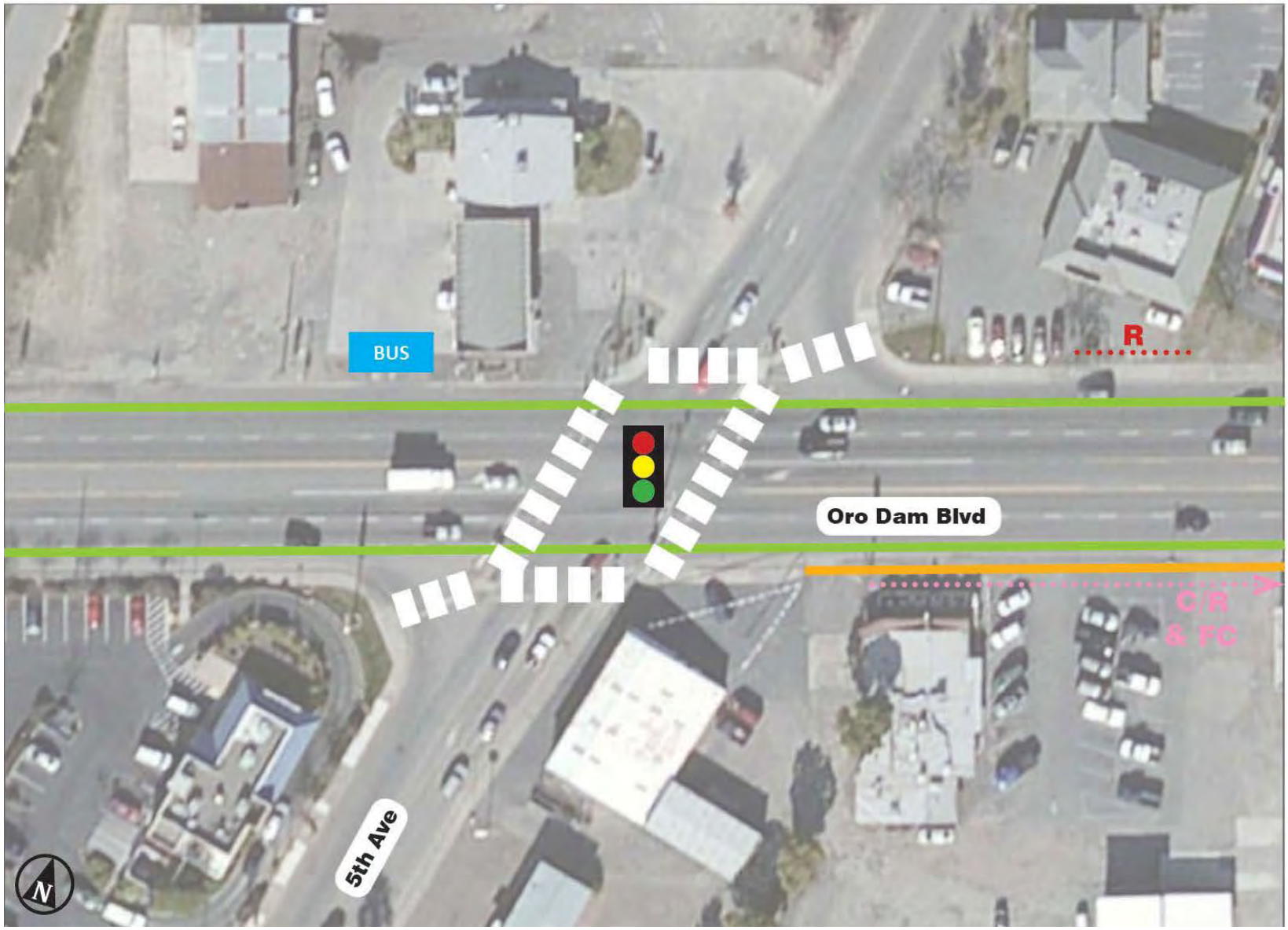

SR 70
Oro Dam Blvd
N


Oro Dam Blvd
Realign Route 25
(Figure 8-1)
Feather River Blvd
N

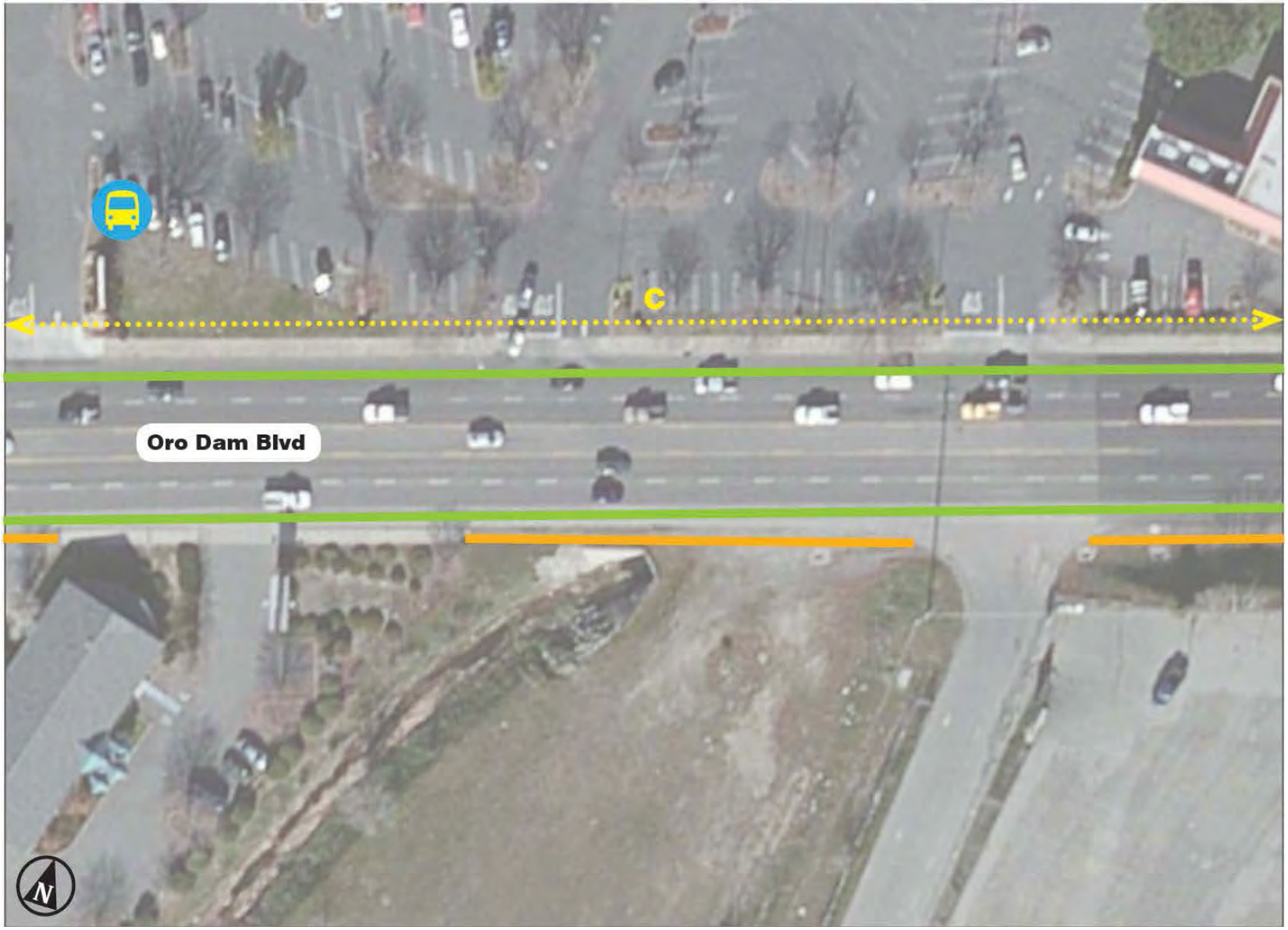

Oro Dam Blvd
N


C
Interim Oro-Dam
Blvd Configuration
(Figure 11-2)
Oro Dam Blvd
C
C/R
C/R & FC
7th Ave
N


C
R
Interim Oro-Dam
Blvd Configuration
(Figure 11-2)
Oro Dam Blvd
C/R & FC
C/R & FC
R
Huntington Ln
N


BUS
R
Oro Dam Blvd
C/R
& FC
5th Ave
N


C
C
Oro Dam Blvd
C/R & FC
N


Oro Dam Blvd
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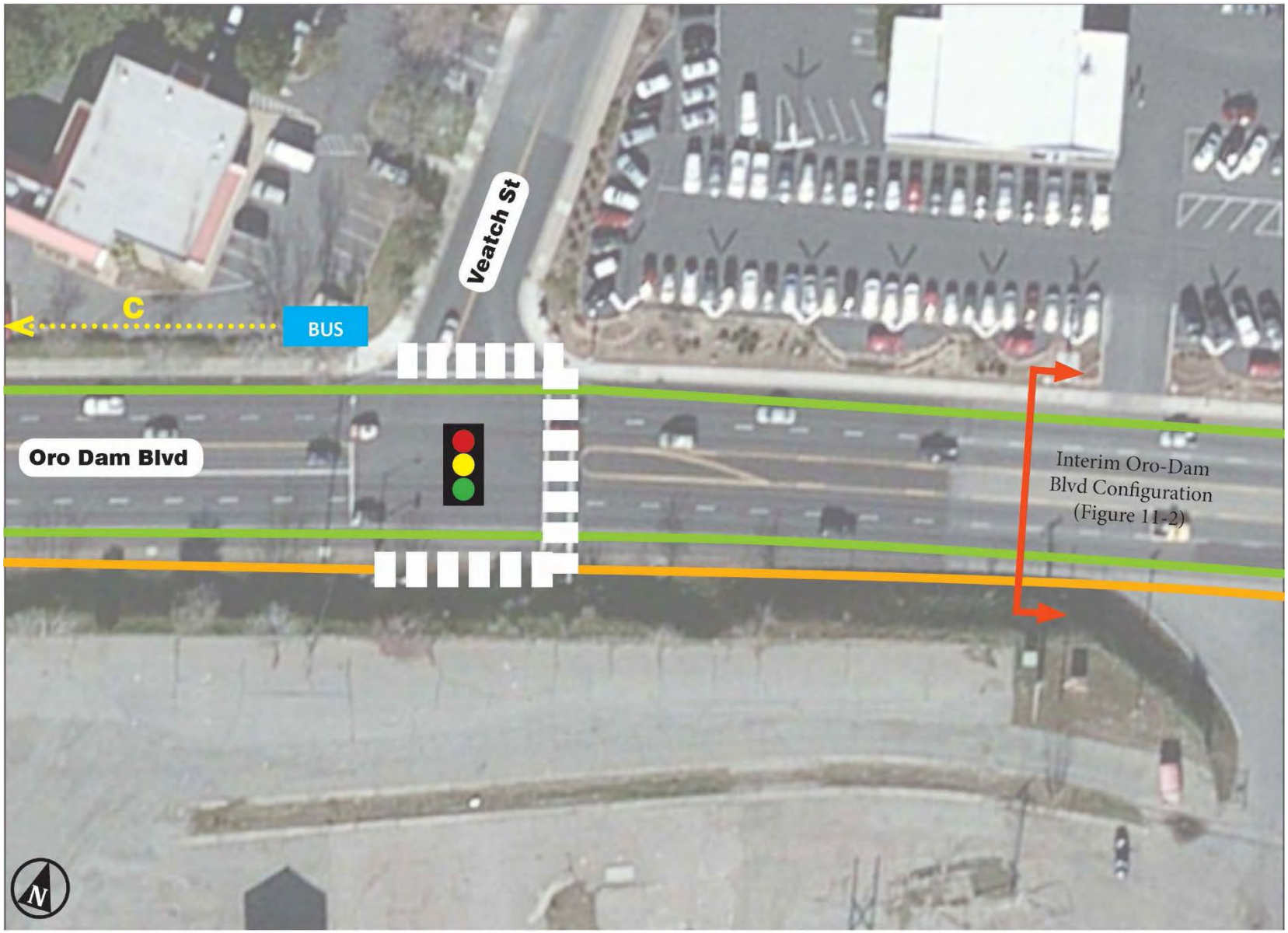
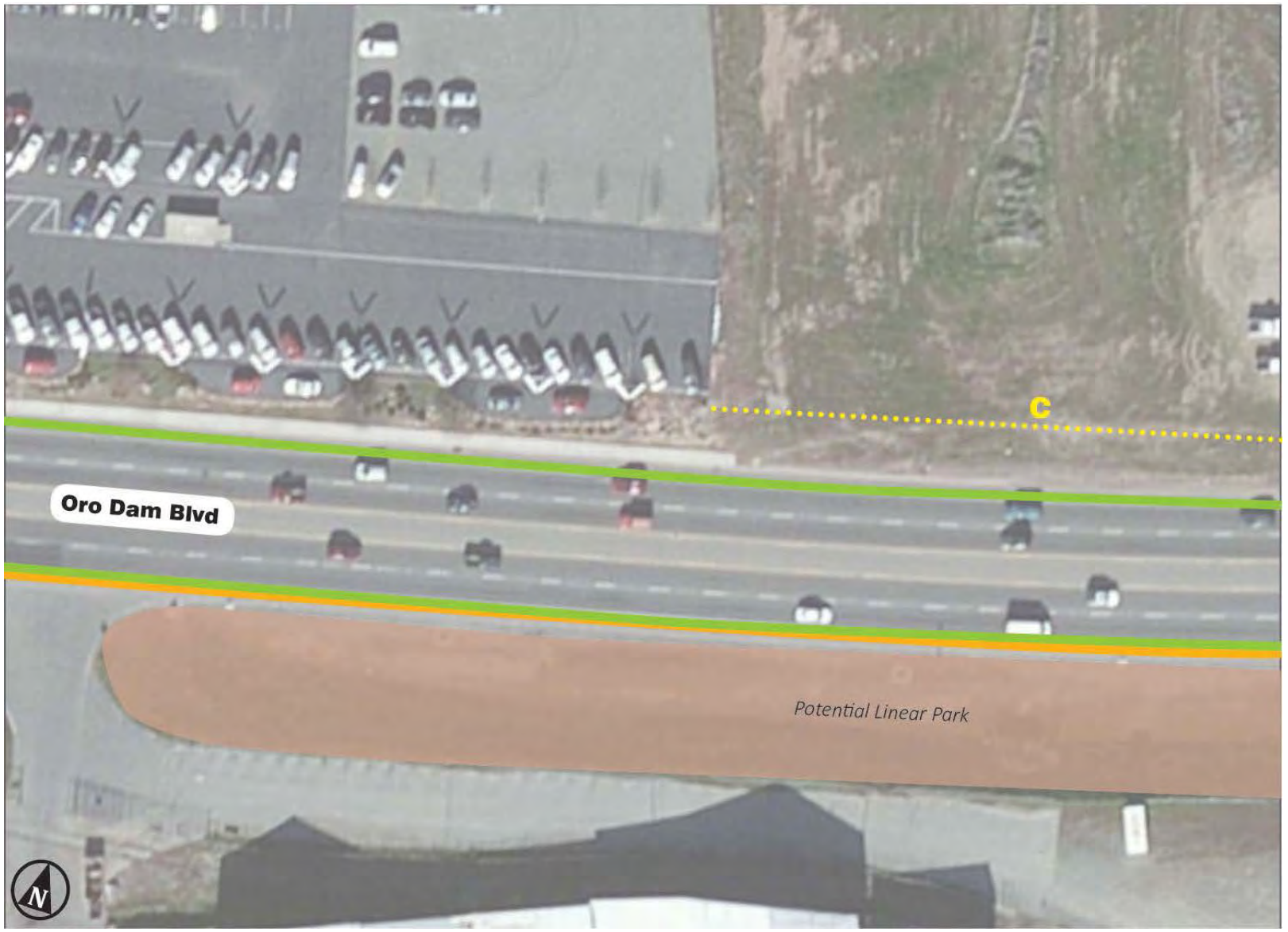
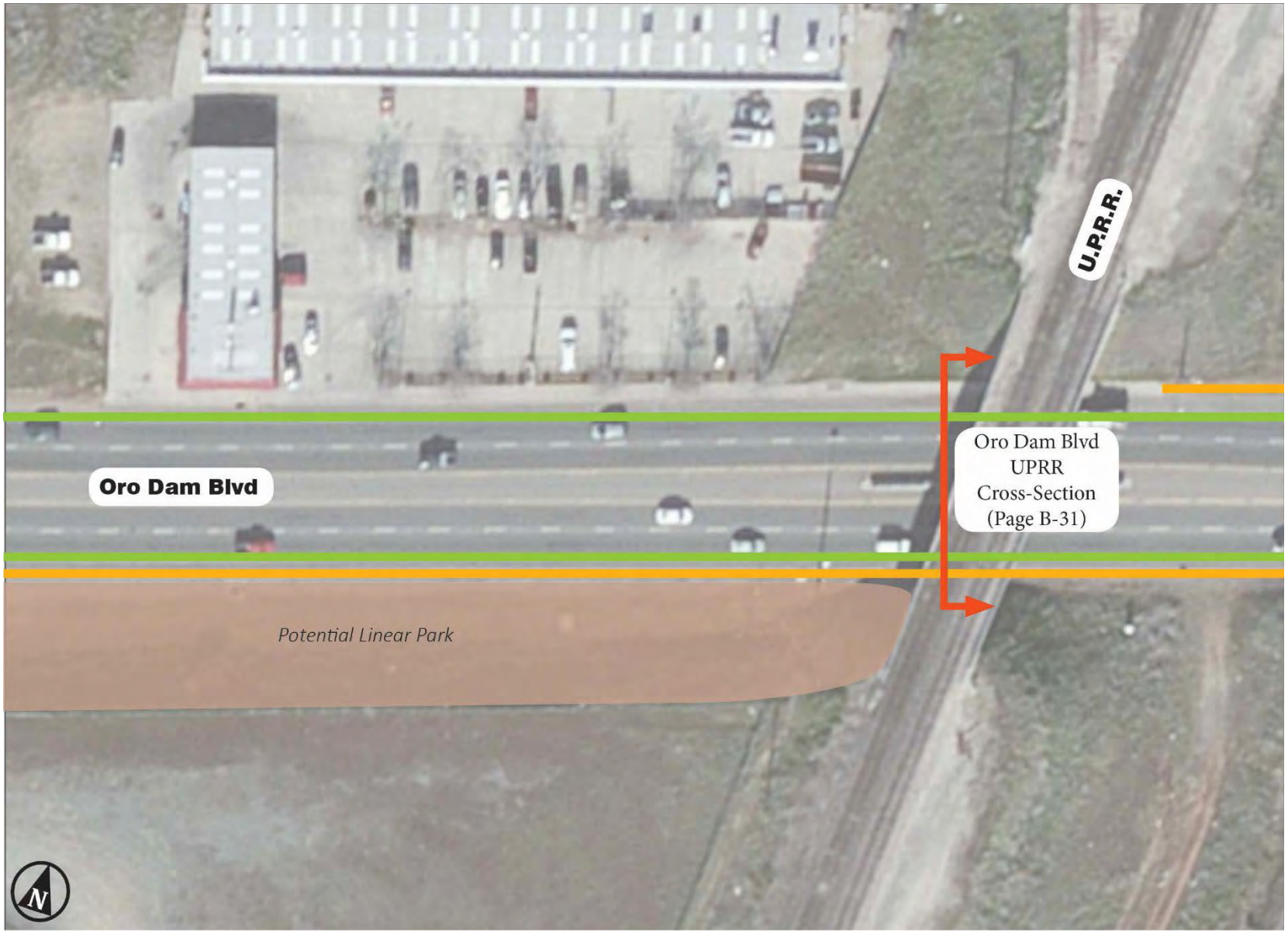
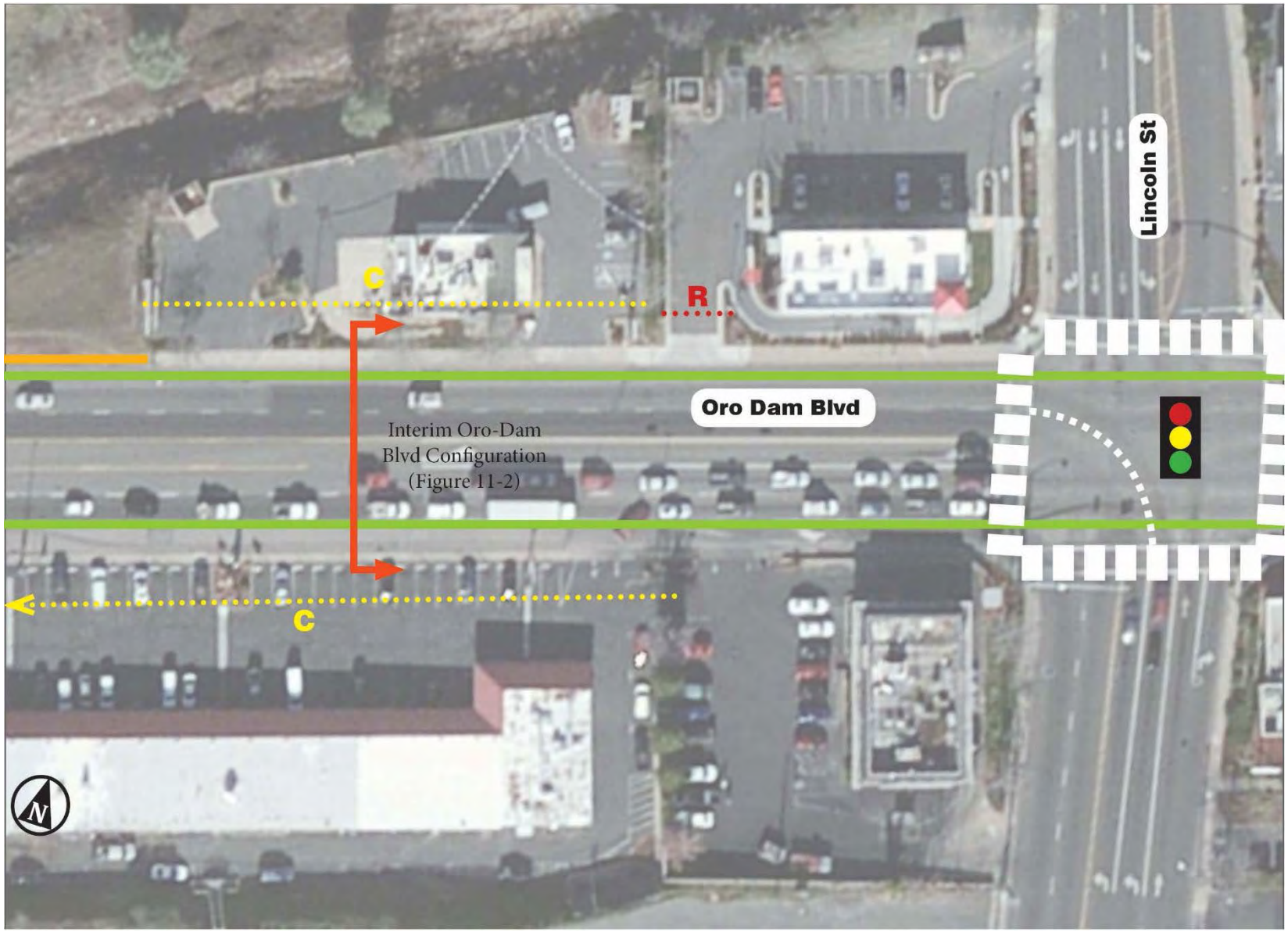

Veatch St
C
BUS
Oro Dam Blvd
Interim Oro-Dam Blvd Configuration (Figure 11-2)
N

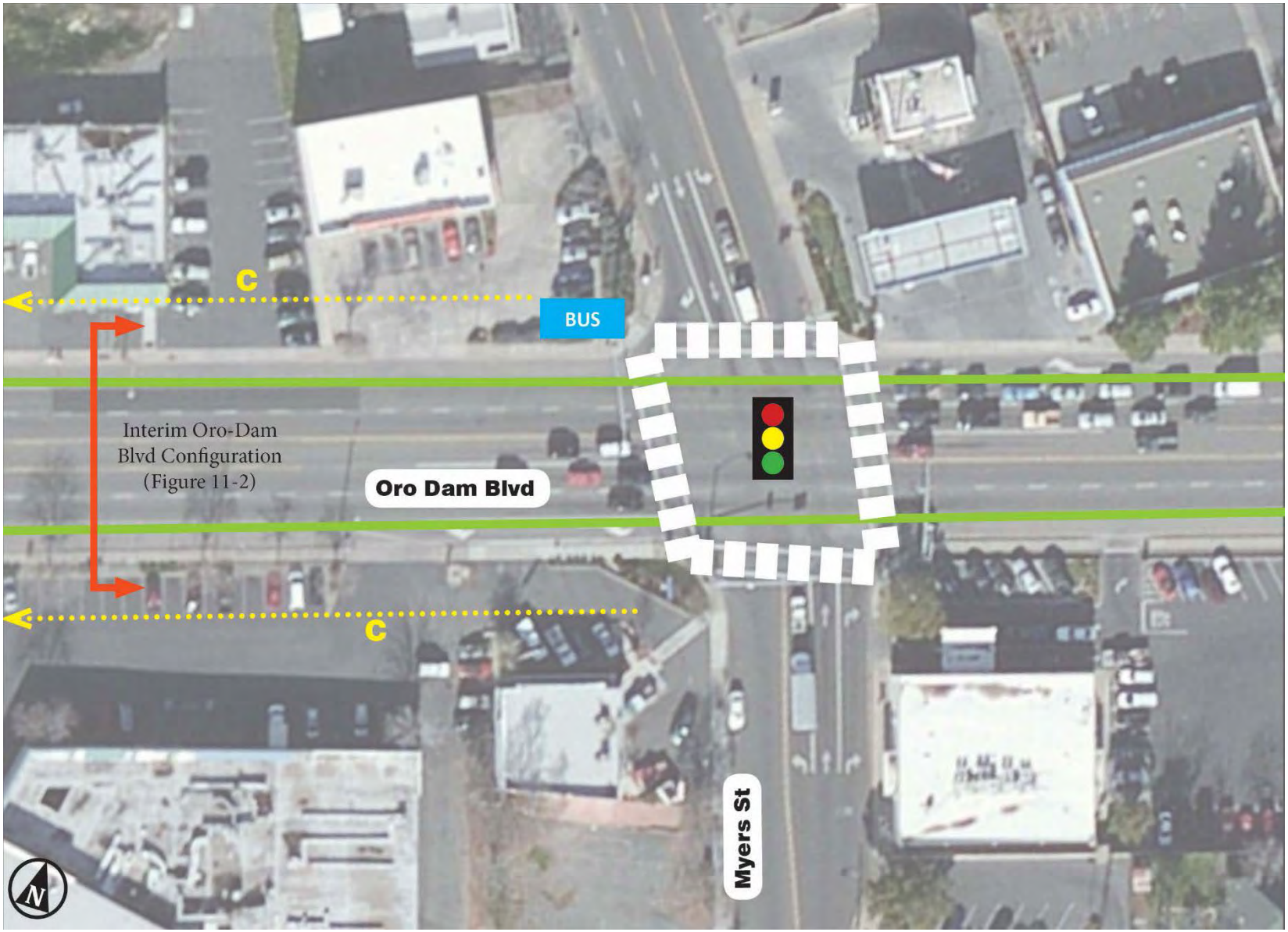

C
Oro Dam Blvd
Potential Linear Park
N

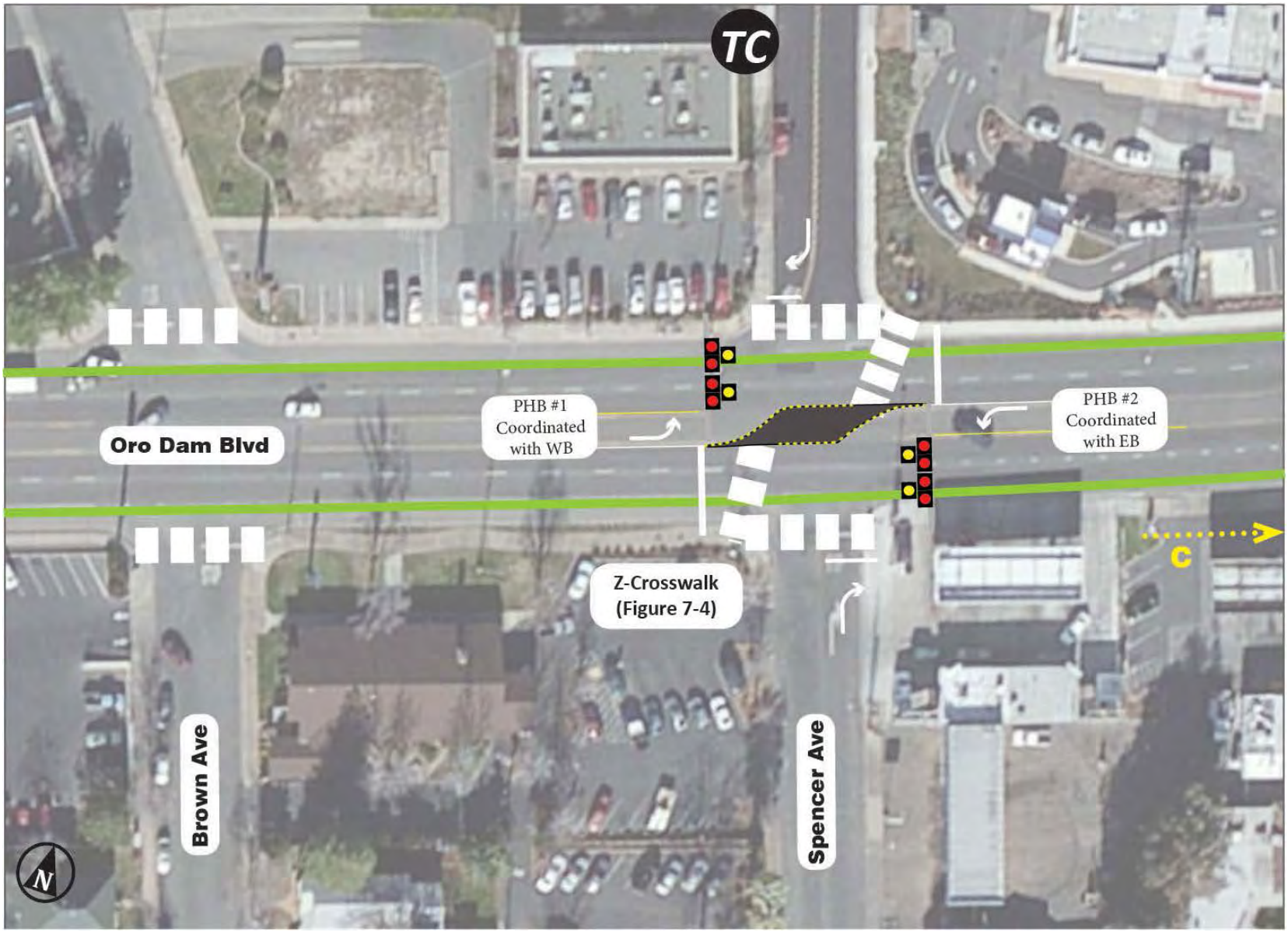

U.P.R.R.
Oro Dam Blvd
Oro Dam Blvd
UPRR
Cross-Section
(Page B-31)
Potential Linear Park
N

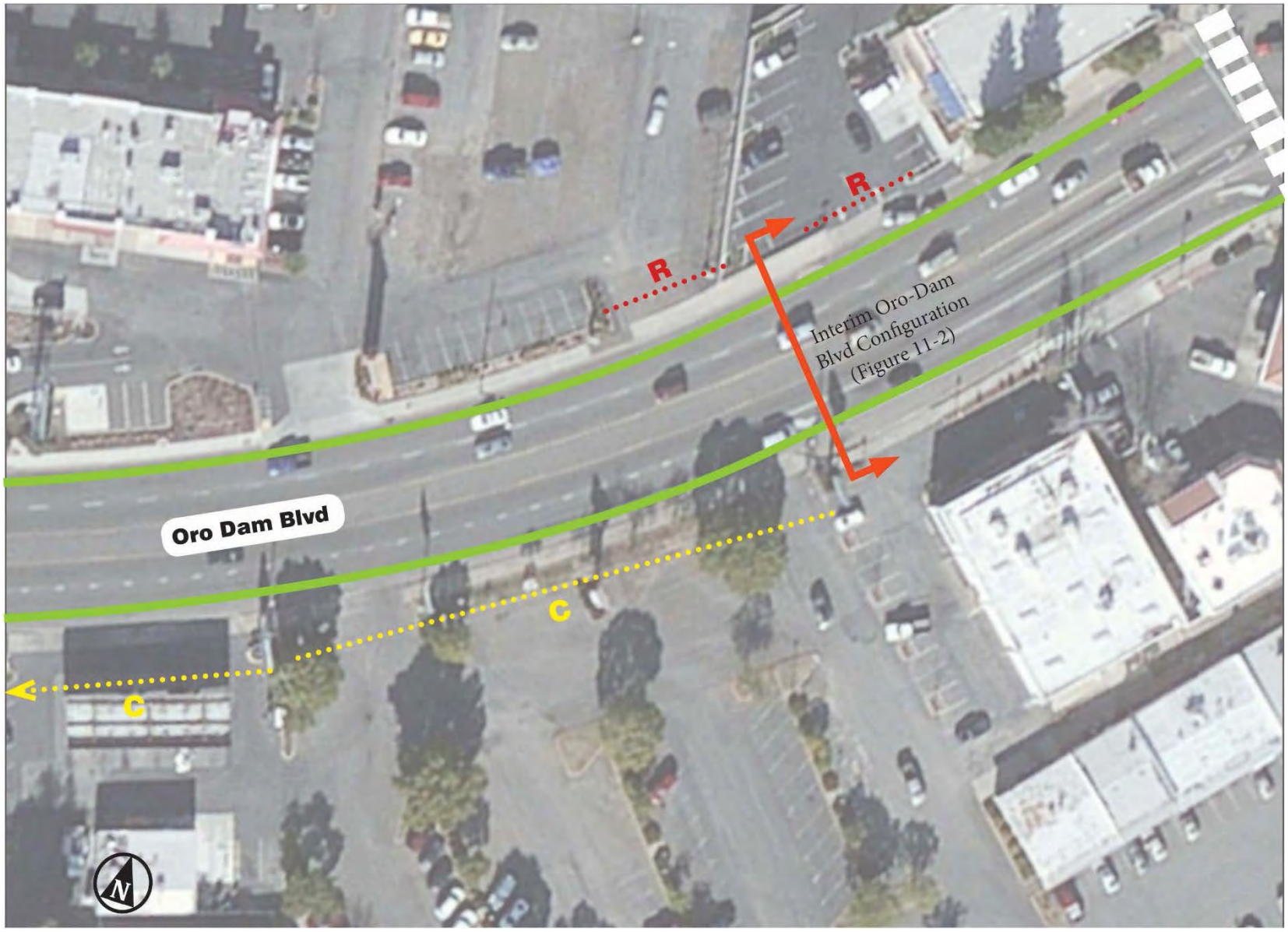

Oro Dam Blvd
C
N


Lincoln St
C
R
Oro Dam Blvd
Interim Oro-Dam
Blvd Configuration
(Figure 11-2)
C
N


Lincoln St
R
C
Oro Dam Blvd
R
C
N

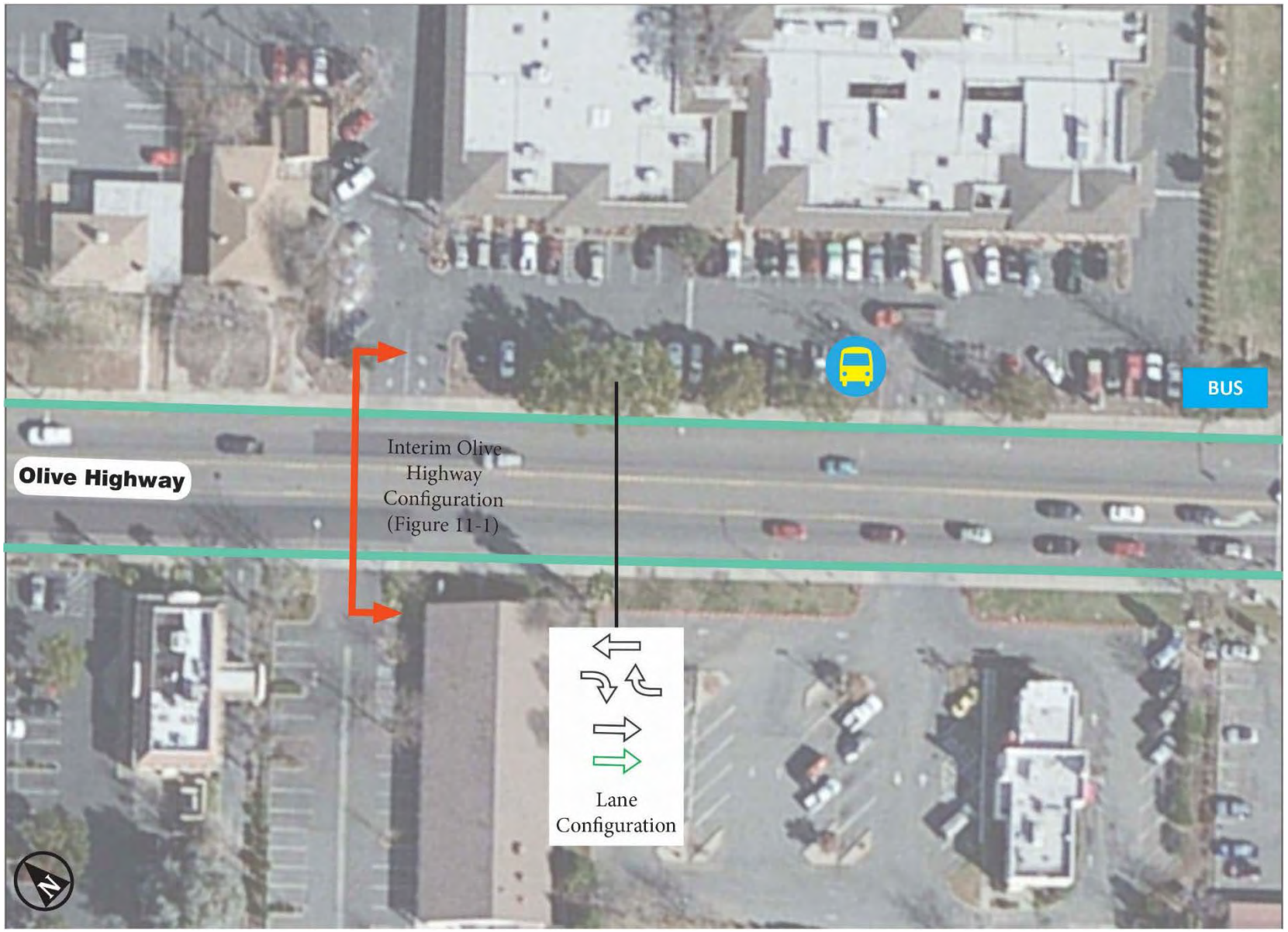

C
BUS
Interim Oro-Dam
Blvd Configuration
(Figure 11-2)
Oro Dam Blvd
C
Myers St
N

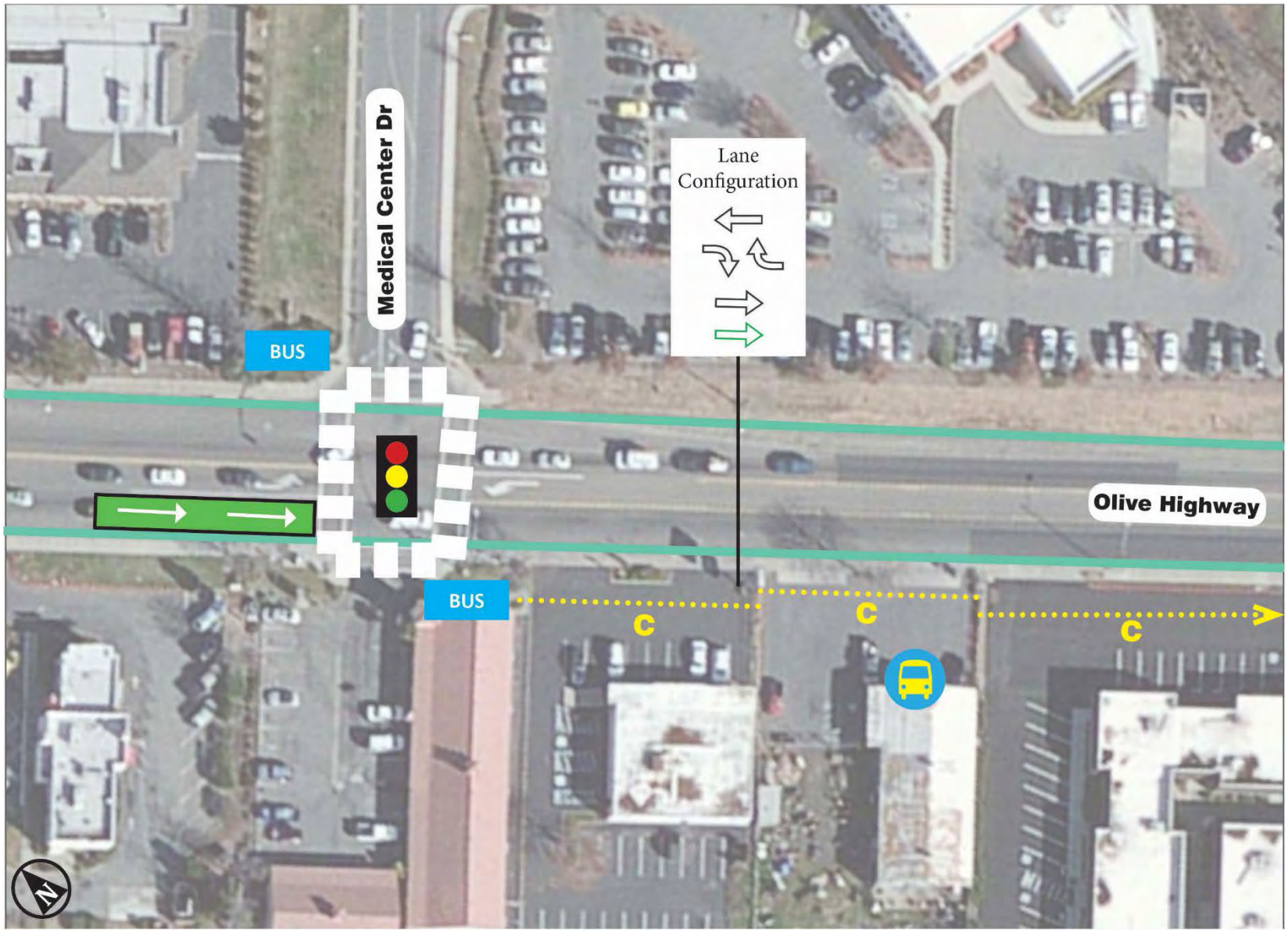

TC
Oro Dam Blvd
PHB #1
Coordinated
with WB
PHB #2
Coordinated
with EB
Z-Crosswalk
(Figure 7-4)
C
Brown Ave
Spencer Ave
N

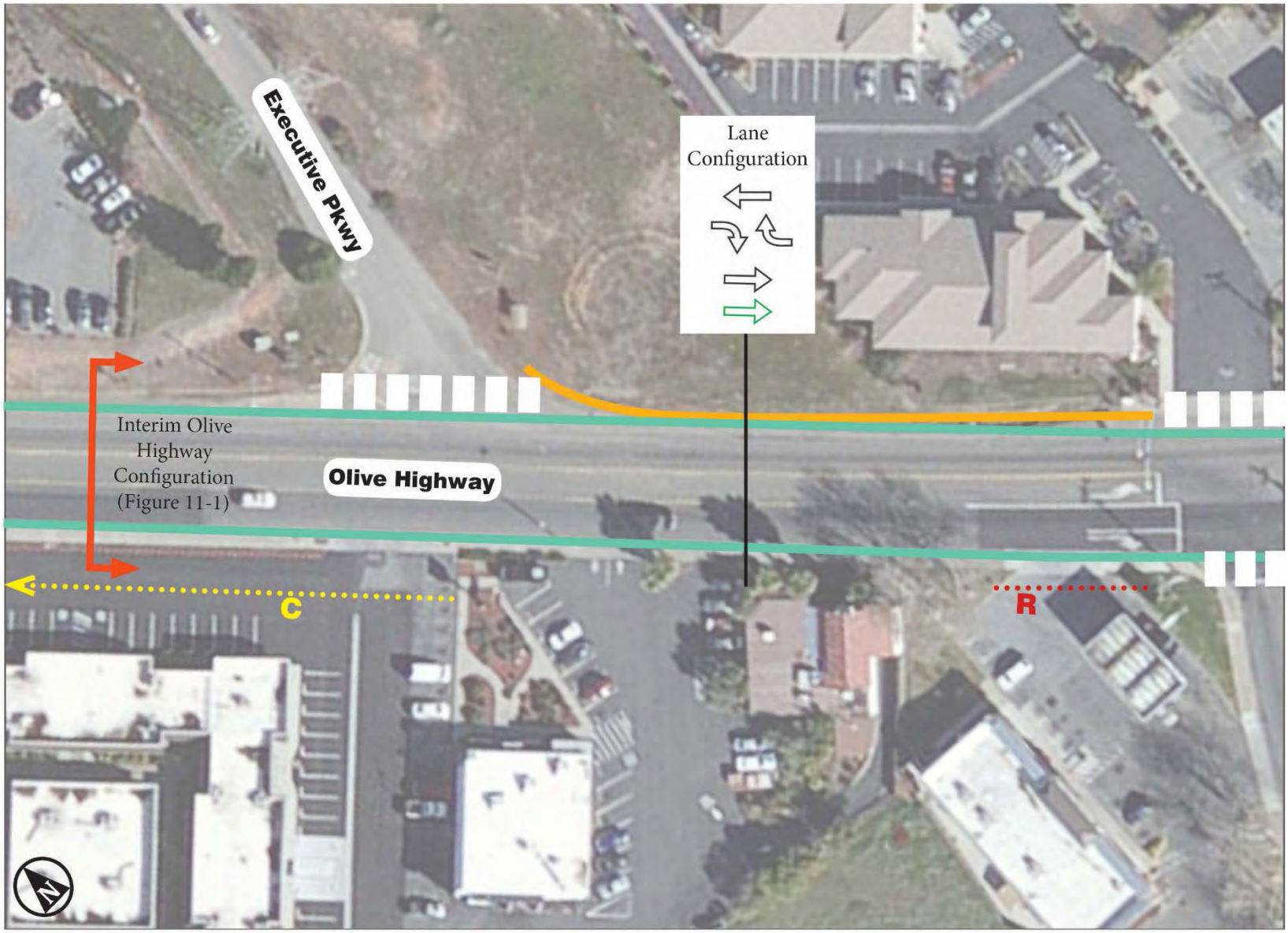

R
R
Interim Oro-Dam Blvd Configuration (Figure 11-2)
Oro Dam Blvd
C
C
N

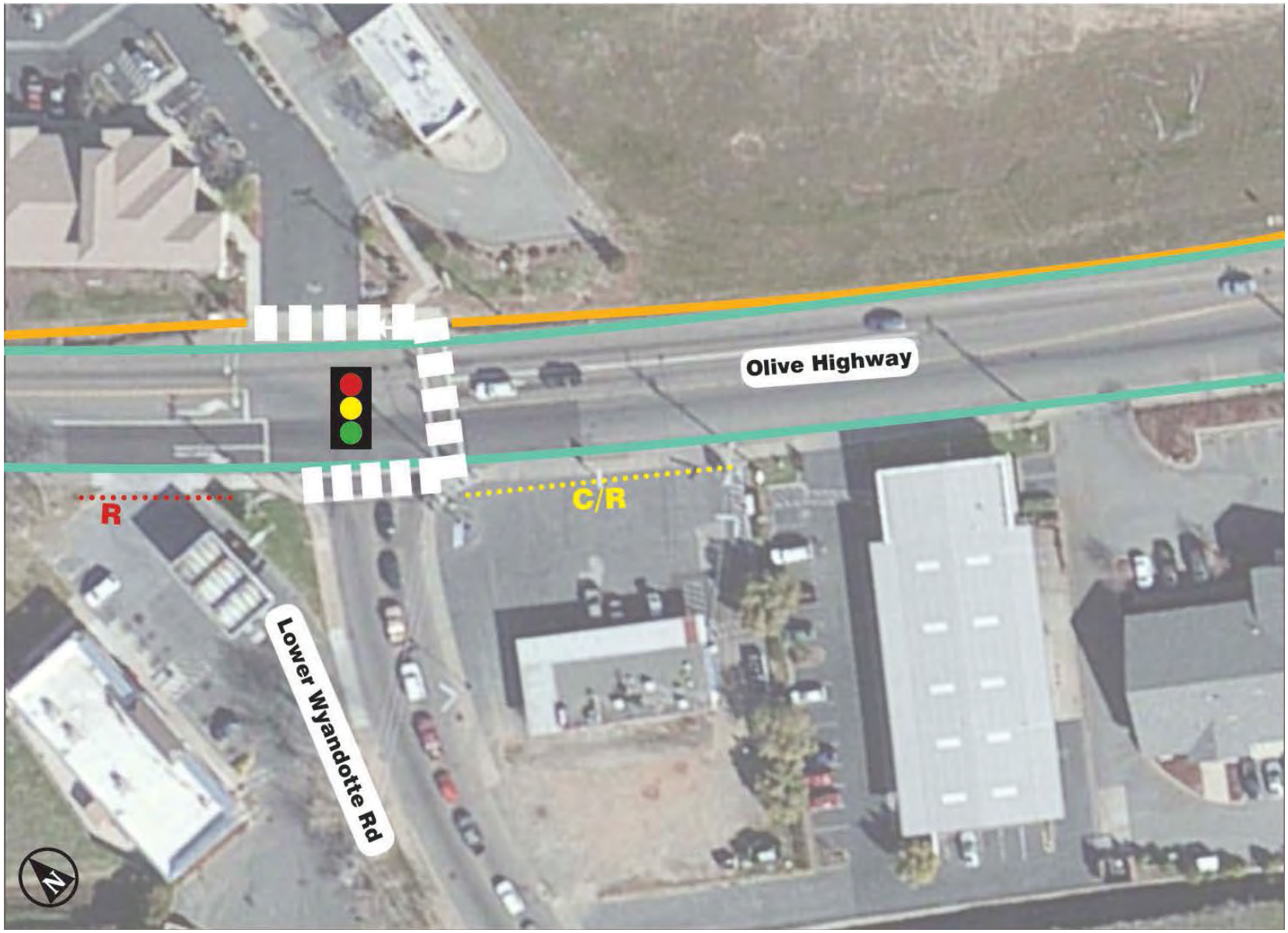

R
Olive Highway
Interim Olive Highway Configuration (Figure 11-1)
C/R
Oro Dam Blvd
N


Fay Way
Olive Highway
C/R
Lane Configuration
N


BUS
Olive Highway
Interim Olive Highway Configuration (Figure 11-1)
Lane Configuration
N

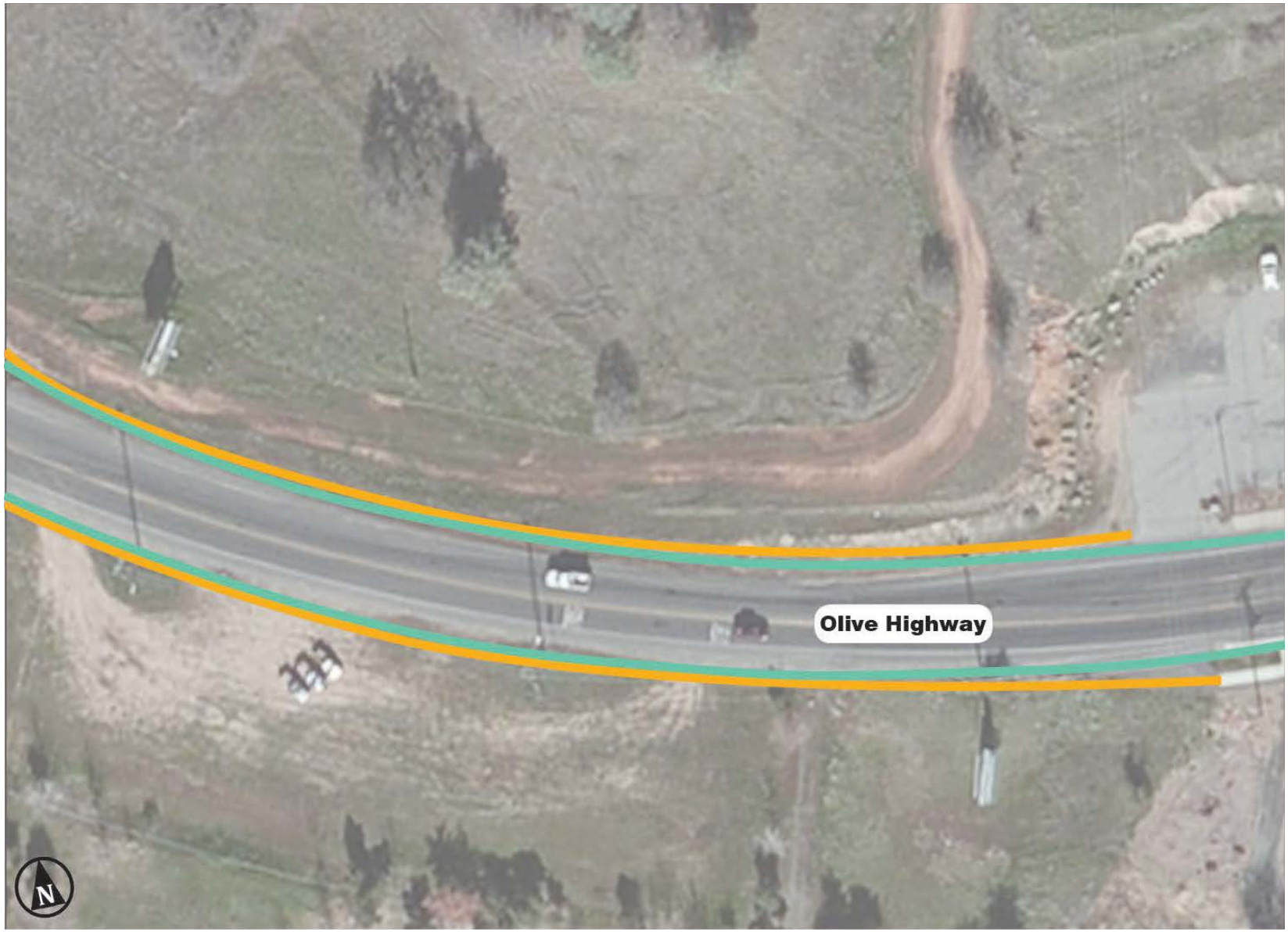

Medical Center Dr
Lane Configuration
BUS
BUS
Olive Highway
C
C
C
A
N


Executive Pkwy
Lane Configuration
Interim Olive Highway Configuration (Figure 11-1)
Olive Highway
C
R


Olive Highway
R
C/R
Lower Wyandotte Rd
N


Olive Highway
C
N


Olive Highway
A
C
N


Olive Highway
N


BUS
Olive Highway
N


BUS
Olive Highway
Foothill Blvd
N