DECEMBER 2022

San Pablo Avenue Multimodal Corridor Study

Contra Costa County Phase 2 Summary

WCCTAC

CONTRA COSTA
transportation
authority

Kimley»Horn
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September 2022

CONTRA COSTA transportation authority

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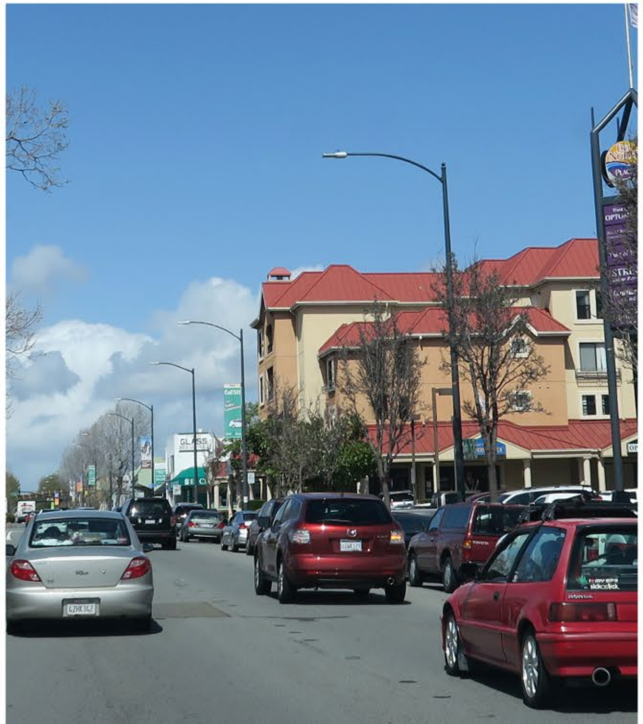

Topics

1. Phase 1 Background
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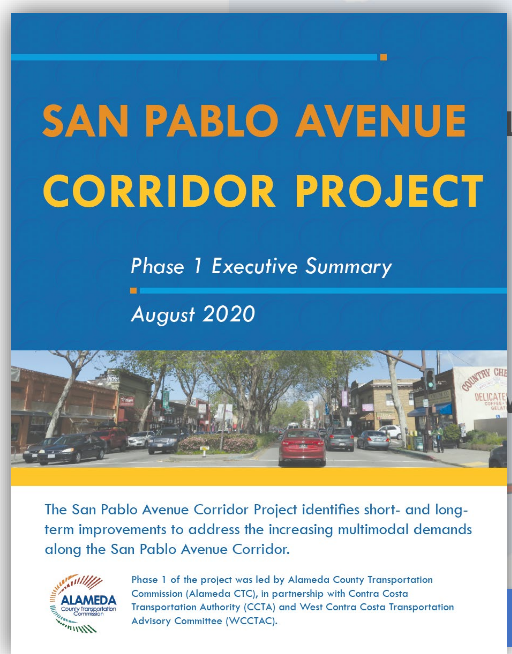
Previous Planning Efforts

San Pablo Avenue Corridor Project Phase 1 Summary

- Started in Fall 2017 and concluded in Fall 2019
- Effort led by Alameda CTC with financial support and involvement by WCCTAC and CCTA
- Study area extended between downtown Oakland and Hilltop Mall
- Project Efforts:
    - Assessed existing conditions
    - Identified corridor needs
    - Developed concepts for a typical roadway cross-section width
    - Evaluated alternative feasibility
    - Conducted public engagement activities, including surveys, focus groups, and open houses



SAN PABLO AVENUE CORRIDOR PROJECT

Phase 1 Executive Summary

August 2020

The San Pablo Avenue Corridor Project identifies short- and long-term improvements to address the increasing multimodal demands along the San Pablo Avenue Corridor.

Phase 1 of the project was led by Alameda County Transportation Commission (Alameda CTC), in partnership with Contra Costa Transportation Authority (CCTA) and West Contra Costa Transportation Advisory Committee (WCCTAC).

San Pablo Avenue Corridor Study Area

Phase 1 Outreach in Contra Costa County

Round 1 (Fall 2017-Summer 2018)

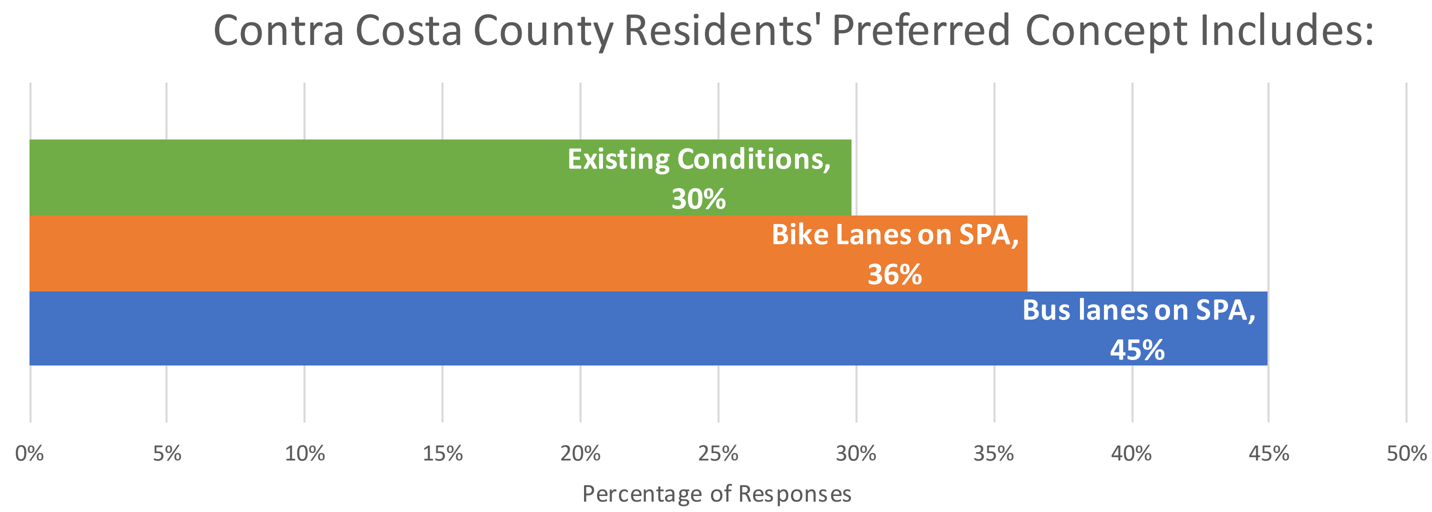
- **515 map-based survey engagements** (3 languages)
- **Merchant loading survey**
- **Focus group meetings**
  - Bus-riders and seniors & people with disabilities

Round 2 (Spring 2019)

- **597 online & 51 intercept surveys**
- **3 Pop-up events**
- **Community meeting**
- **Focus group meetings**
  - Bus-riders, seniors & people with disabilities, bicyclists

What did we hear from the community in Phase 1?

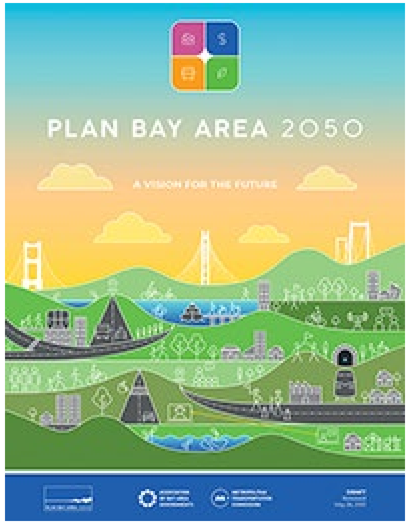
- Safety improvements needed now; concerns over delaying them
- Concerns about effects on business access (loss of parking/loading, additional congestion)
- Reduction in number of lanes would reduce speeding and calm traffic
- Concerns about construction disruption to community and businesses

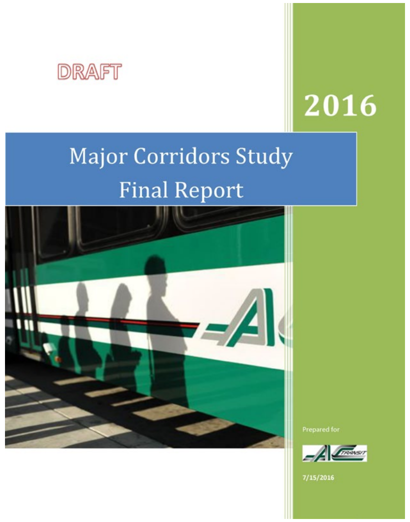


Note: Percentages do not add to 100% since one option included both bike and bus lanes

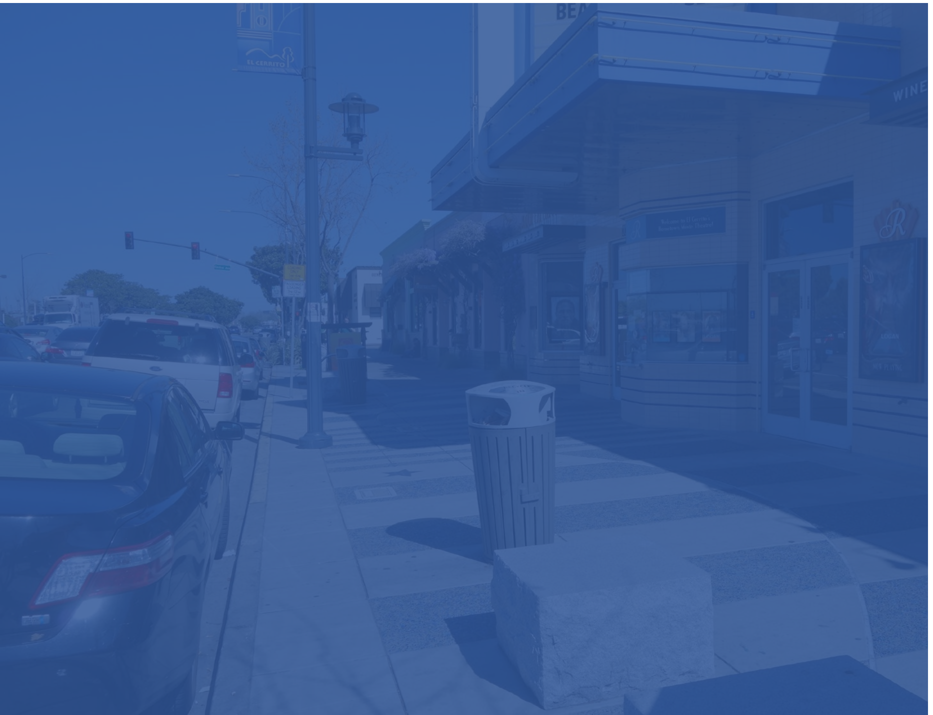
Previous study recommendations

- San Pablo Avenue identified for BRT in previous studies
  - Plan Bay Area 2050
  - AC Transit Major Corridors Study
  - WCCTAC High-Capacity Transit Study
- Bus lanes were most preferred solution in Contra Costa County from Phase 1 Outreach





Phase 2 Purpose & Process



Corridor Study Purpose

Improve multimodal mobility, efficiency, and safety to sustainably meet current and future transportation needs and help support strong growth along the corridor while still maintaining local contexts.

Goals

- Effectively and efficiently accommodate anticipated **growth**
- Improve **comfort and quality** of trips for all users
- Enhance **safety** for all travel modes
- Support **economic development** and adopted **land use policies**
- Promote **equitable** transportation and design solutions

Phase 2 Project Process

Study Need:

Complete a Contra Costa County-focused **technical analysis** to address questions raised by public and WCCTAC board during Phase 1

Desired Study Outcome:

Identify **viable alternatives** that can be advanced in **future project phases** and that can be **referenced** in ongoing and future projects on the corridor

Process:

- Identify concept alternatives for specific locations
- Assess feasibility and implications on connectivity
- Quantitatively evaluate transit and auto performance
- Consider outreach feedback received in Phase 1
- Summarize evaluation findings

Phase 2 - Agency Partners and Study Limits

Phase 2 Project Process

- **Spring 2021** — Concept Development and Feasibility Assessment
- **Spring 2021** — WCCTAC TAC & Board
- **Summer/Fall 2021** — Transit Assessment and Focus Area Development
- **Fall/Winter 2021** — Traffic Analysis and Microsimulation Modeling
- **Spring 2022** — Concepts Evaluation
- **Spring/Summer 2022** — WCCTAC TAC & Board

Corridor Conditions Today

Conditions on the corridor today

Overlapping Local and Rapid Bus service provides bus service every 7 minutes south of Macdonald. Rapid service extends to Contra Costa College.

Bike lanes only in some segments in the City of San Pablo, far northern segment in Richmond near Hilltop Mall, and very short new segment constructed in El Cerrito (approx. 20% of corridor)

Long gaps between pedestrian crossings and many uncontrolled crossings (e.g., multiple 0.4 mile gaps in protected crossings in El Cerrito)

Sidewalks are continuous, but narrow and not well buffered from traffic in some locations

Used as an alternative to I-80 for longer-distance trips; 1/3 of trips on San Pablo Ave are just passing through

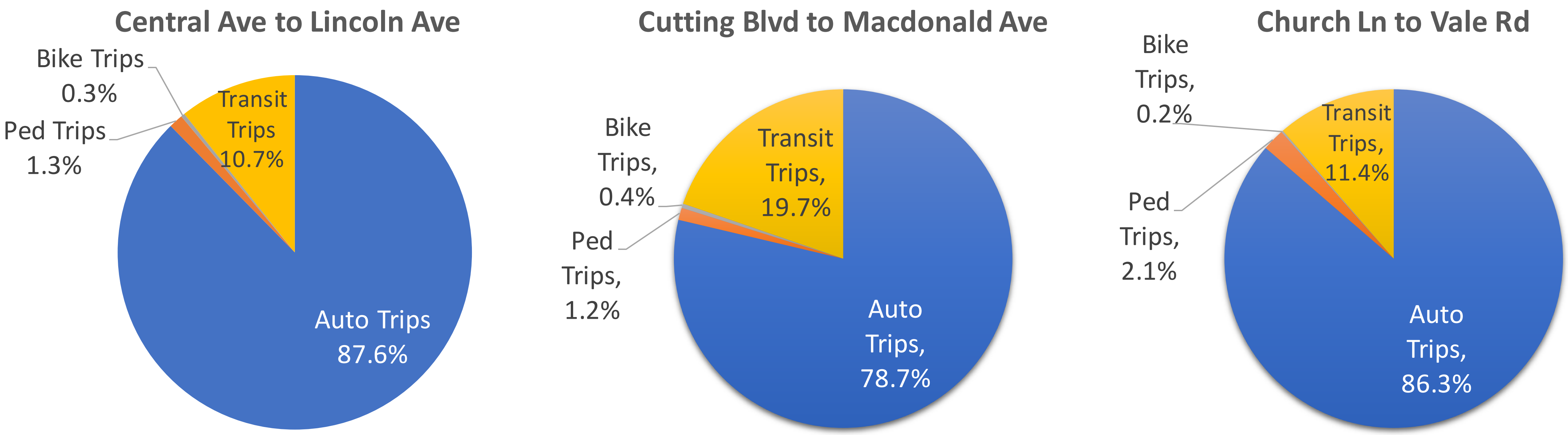
Existing curb-to-curb widths

Parking on the corridor today

- On-street parking on both sides of San Pablo Avenue on most blocks
- Many commercial properties have off-street parking
- Pre-pandemic parking occupancy was low (<60% on most blocks)
    - Area around El Cerrito Plaza BART Station had highest utilization

Existing Parking Locations

Mode split on the corridor today



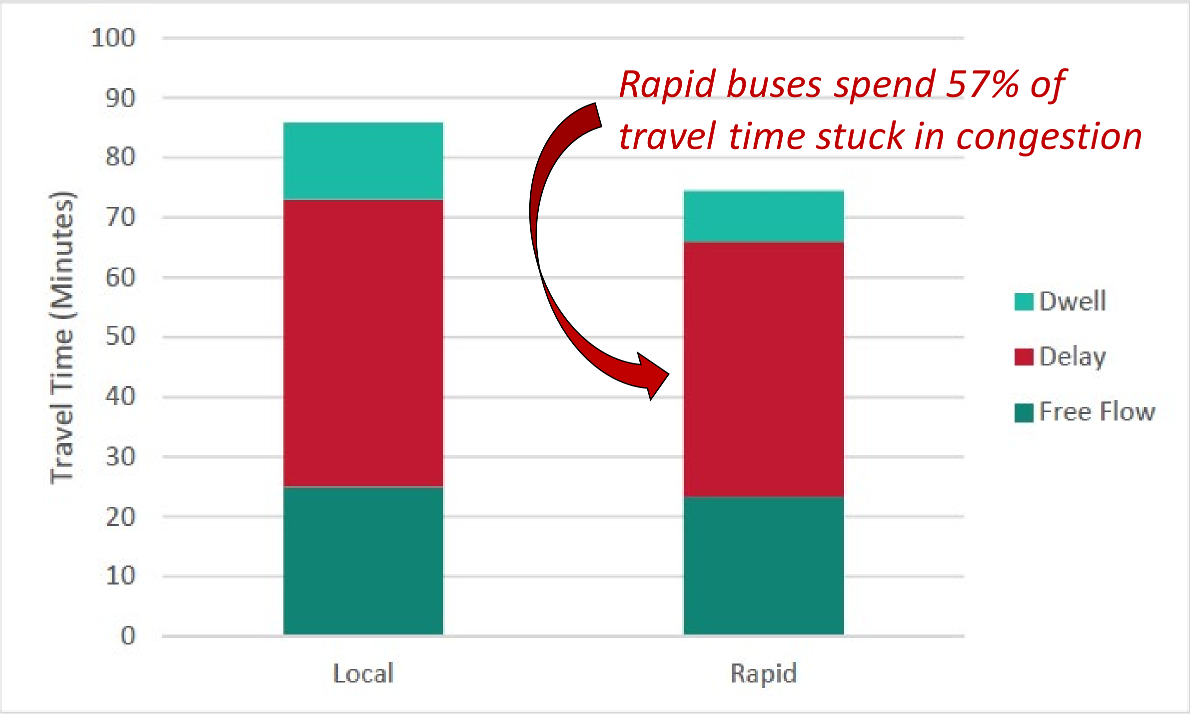
Note: Transit trips include trips on 72 series routes only and do not include BART or other bus routes
Represents pre-Covid conditions

Source: Kimley-Horn

Transit on the corridor today

- Well-utilized today
  - 12,500 daily bus riders (approx. half in Contra Costa County)
  - More riders on 72-series routes than any other AC Transit route (14% of the entire system ridership)
- Bus speeds are about 30% slower than auto speeds and speeds for both have consistently been degrading
- Improving transit in this corridor is an equitable solution
  - 77% of 72-series passengers are non-white
  - 61% of 72-series passengers make less than $50,000 per year

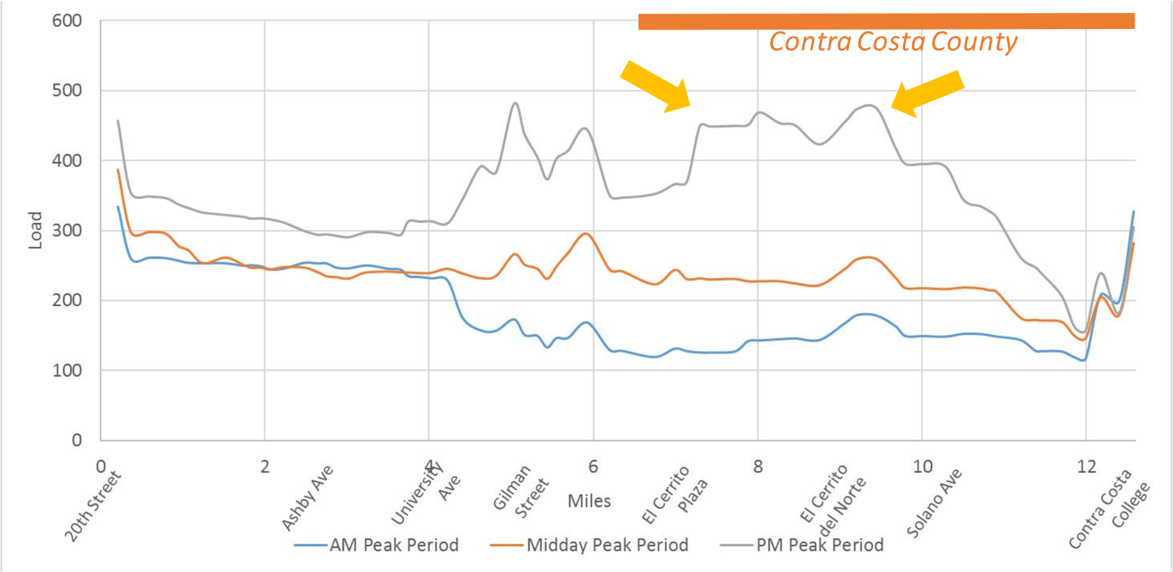
PM Peak Period Northbound Bus Travel Time



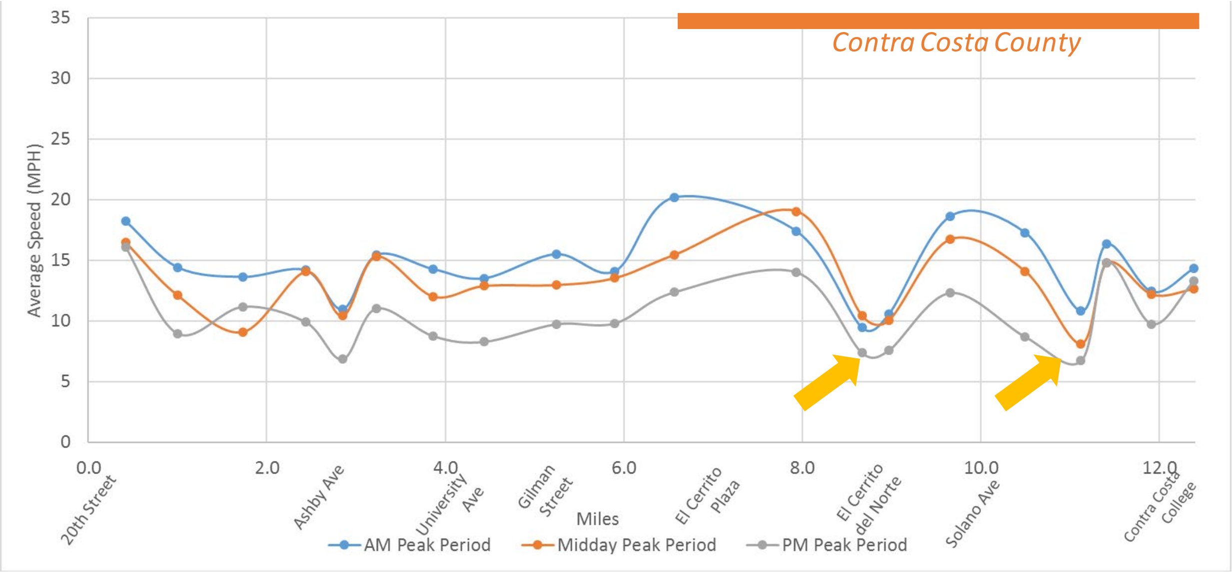
Sources: San Pablo Avenue Speed and Delay Study (Kimley-Horn); AC Transit 2017-2018 on-board passenger survey; AC Transit Short Range Transit Plan, 2019-2029

Where Transit is Most Utilized and Most Impacted by Traffic

Northbound Total Average Load by Weekday Peak Period



Northbound Average Weekday Travel Speed – Line 72R



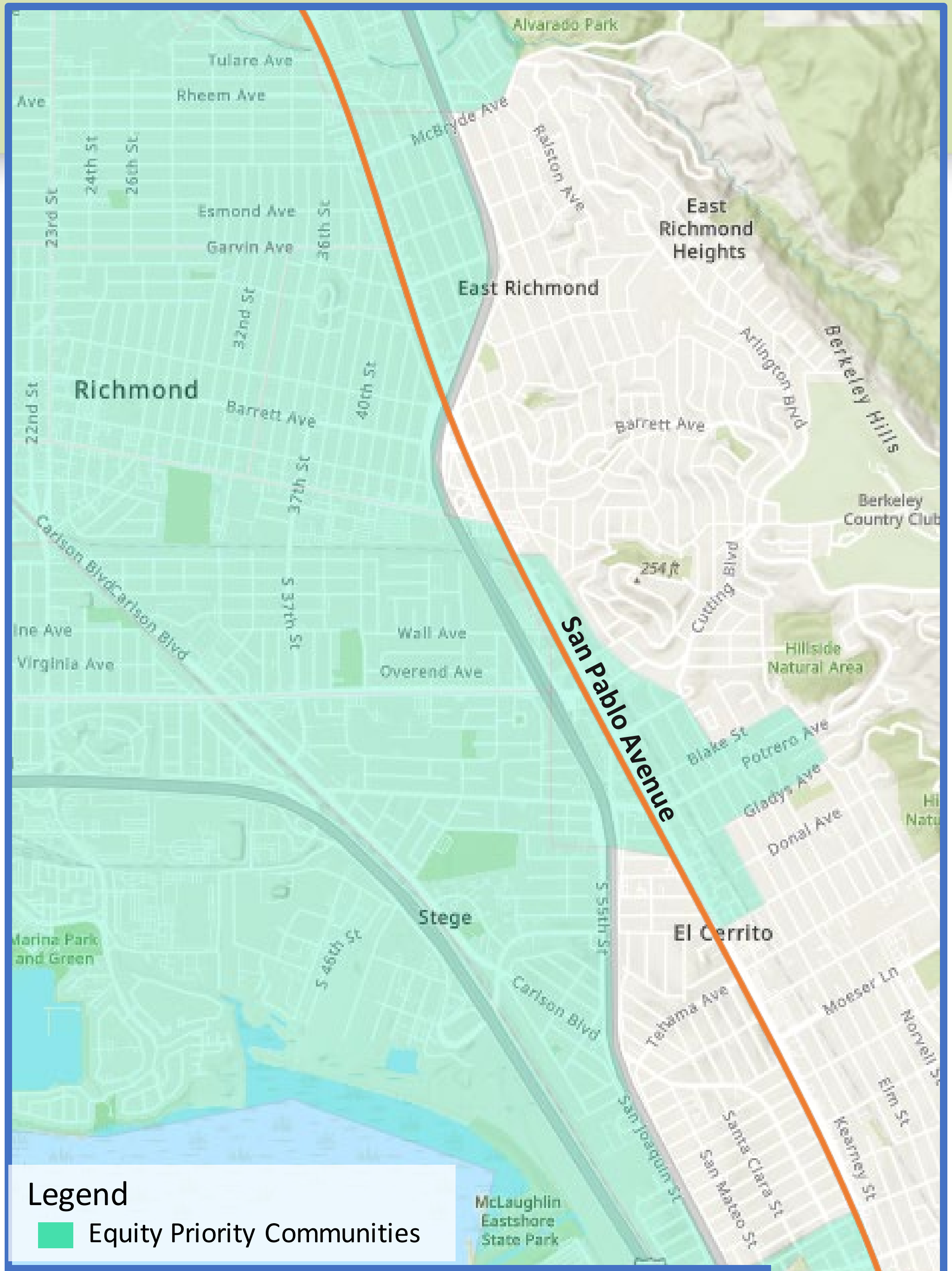
Sources: AC Transit (2017), Kimley-Horn and Associates, Inc.

What will happen to mobility if no changes to San Pablo Avenue are made?

- 69% increase in PM traffic delay by 2035
- 12 minutes of additional Route 72R travel time
- Continued safety issues
  - 225 collisions resulting in injury or fatality between 2015 and 2019 within study area[1]
  - 73 pedestrian or cyclist fatalities or injuries
- Walking and biking will remain difficult
  - Discontinuous bicycle facilities
  - Challenges crossing San Pablo Avenue and side-streets
- Equity Priority Communities will be most impacted
  - 93% of study area within ¼ mile of an equity priority community
  - More difficult/time-consuming to access jobs and recreation

[1]Data Source: SWITRS

Source: Kimley-Horn

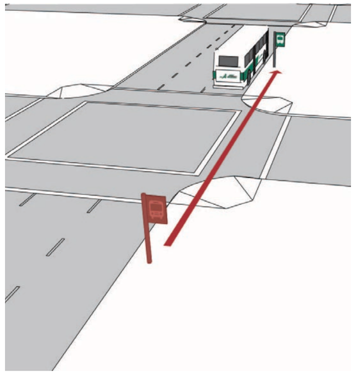


Source: Equity Priority Communities for Plan Bay Area 2050

Potential Improvements

What are the options to improve transit?

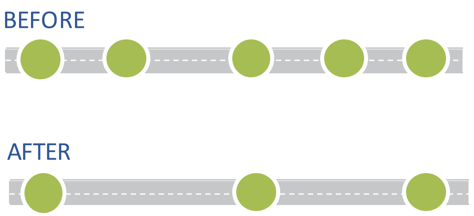
Stop Relocation



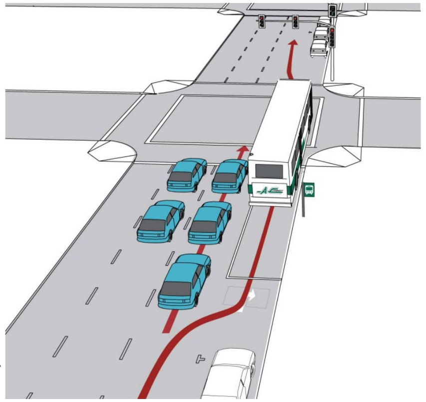
Level Boarding

Image Source: AC Transit

Stop Consolidation



Queue Jumps



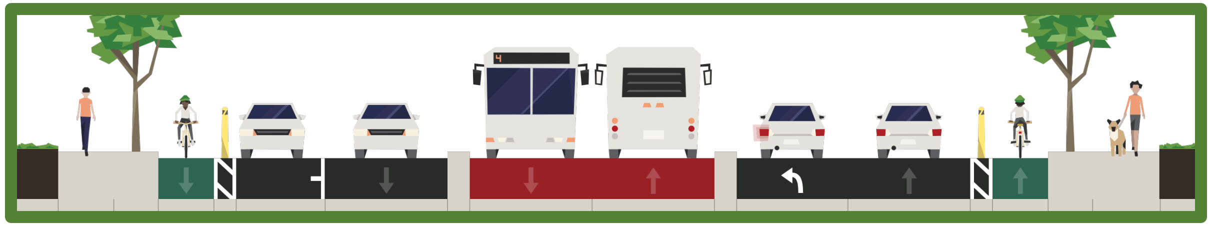
In-Lane Stops

Transit Signal Priority

How could a BRT be configured in this corridor?

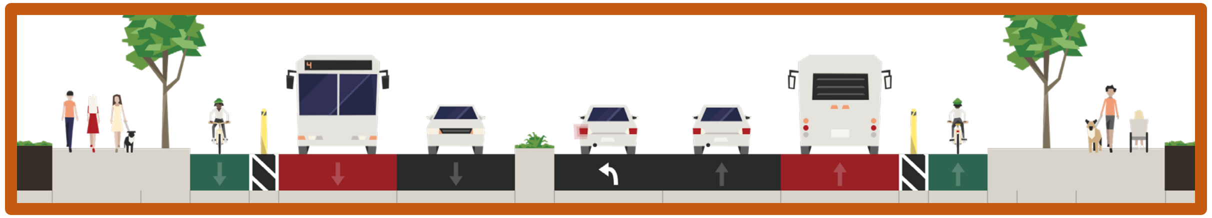
Center-Running Bus Lanes

Image Source: SFMTA



Side-Running Bus Lanes

Image Source: Kimley-Horn



What are the benefits of BRT?

Improved travel time (30% to 45%) and **reliability** (>60%) for buses can allow for more frequent service for same cost

Increased ridership (30%+) and mode shift from auto to transit, reducing greenhouse gas emissions and enhancing mobility, particularly for equity priority communities

Improved **passenger waiting areas**

Energizes level of **economic activity**

What are the challenges of BRT?

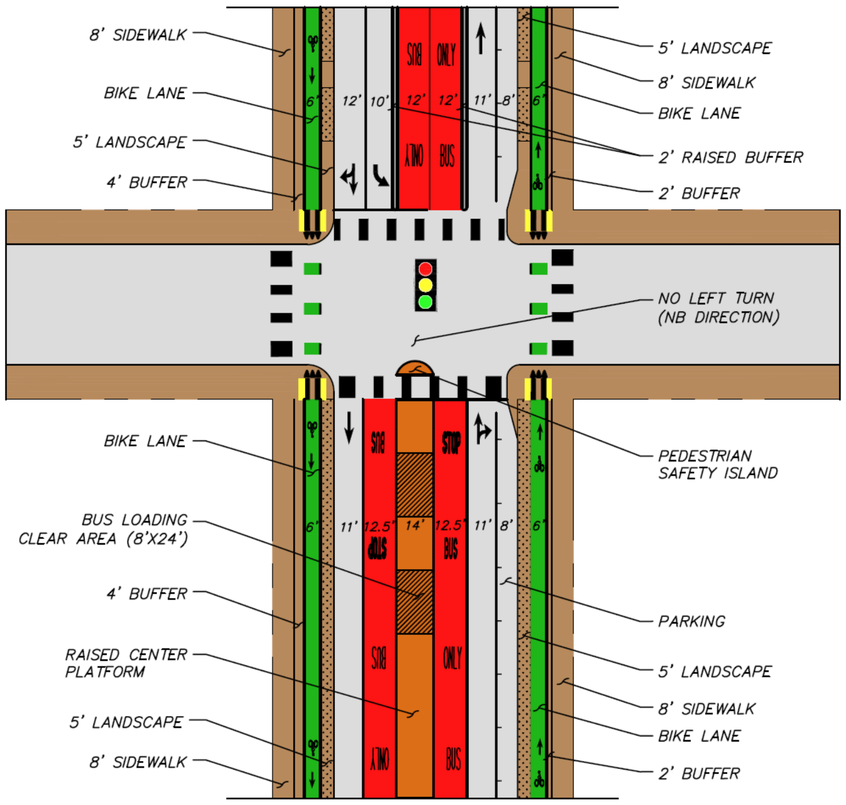
Significant cost to rebuild street

Street reconstruction **temporarily affects access to businesses**

Removal of one through lane reduces capacity for auto vehicles and **may increase diversion**

Stops are placed further apart in order to improve travel speed and reliability for users, which may result in a **longer walk to transit**

How could a center-running BRT be configured in this corridor?



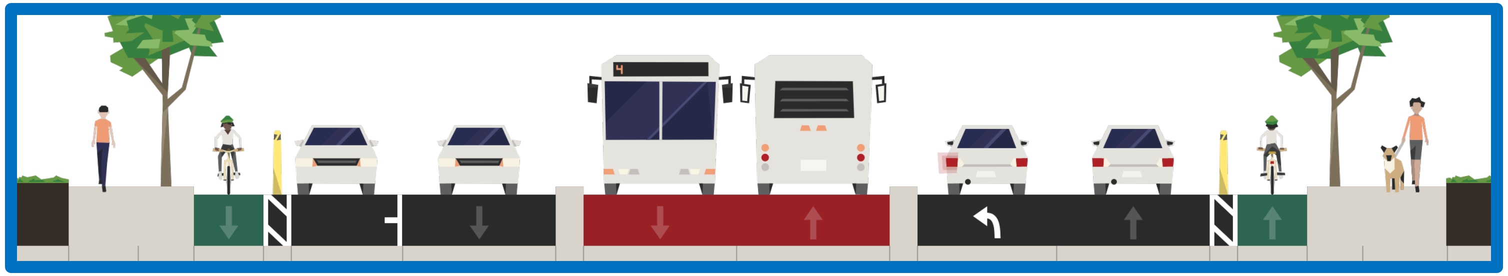
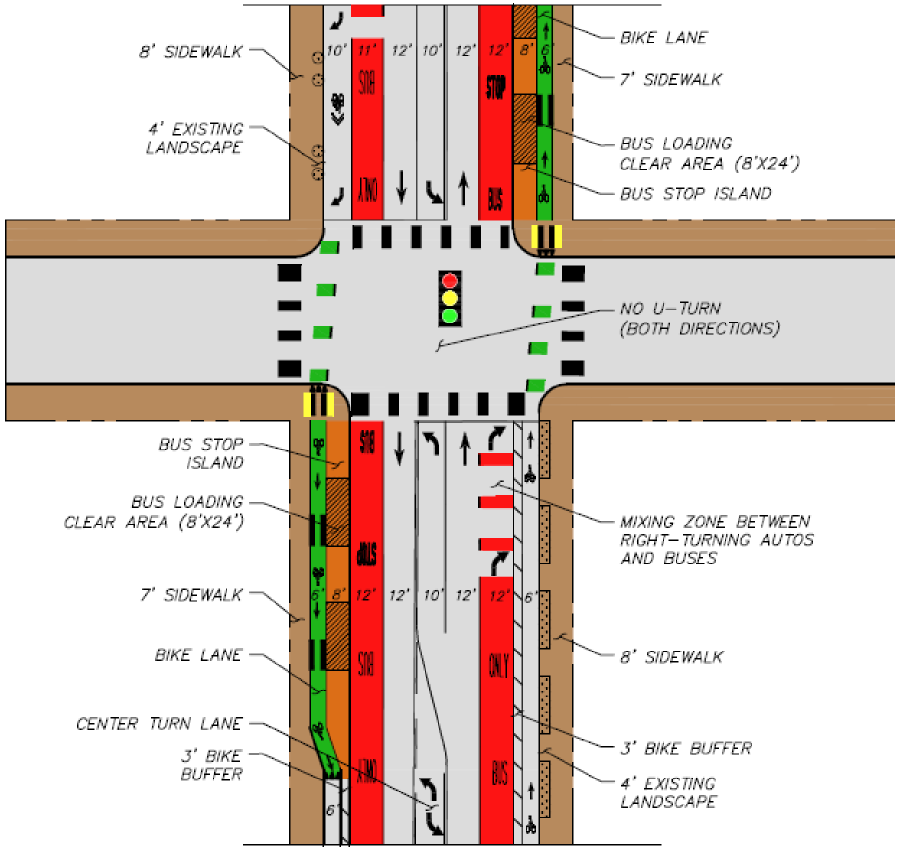


Image Source: Google

Image Source: Kimley-Horn

How could a side-running BRT be configured in this corridor?



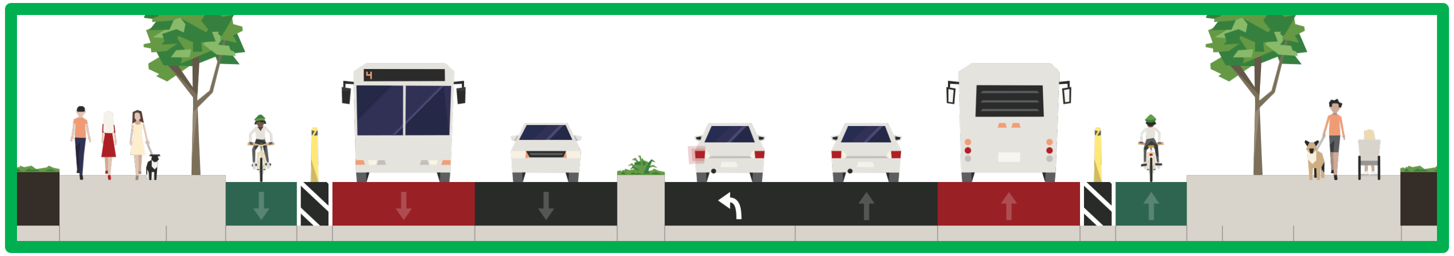


Image Source: Greater Greater Washington

Image Source: Kimley-Horn

Benefits Specific to Center-Running BRT

- Removes conflicts between the bus lane and turning vehicle, parked cars, and bicyclist
- Maximizes transit speed and reliability benefits (approximately 10% faster than side-running)
- Emphasizes permanence of transit solution

Challenges Specific to Center-Running BRT

- Community access is affected by elimination of auto left-turns at unsignalized intersections and at stations
- Eliminates existing medians, including street trees
- May be difficult to be used by non-BRT bus routes operating on corridor

Benefits Specific to Side-Running BRT

- Allows for more flexibility in use of bus lane by non-BRT routes
- Less costly to construct bus lane due to reduced median and signal impacts
- Easier to implement in phases with a shorter construction duration due to less infrastructure required

Challenges Specific to Side-Running BRT

- Increased likelihood of illegal double-parking in the bus lane, affecting bus travel time
- Stations may be more constrained due to sharing space with pedestrians or an adjacent bicycle facility (if provided)
- Does not allow for a time-managed auto/parking lane in El Cerrito

Can you mix and match transit lane configurations across segments/cities?

- Each occurrence where the bus shifts between side-running and center-running or passes through mixed-flow segments, a travel time penalty is incurred
- However, different configurations are acceptable
  - TEMPO BRT is a combination of side-running, center-running, and mixed-flow
- Recommend minimum 1- to 2- mile segments with continuous configuration
  - BART stations are logical transition points as the BRT would likely deviate into the station

Image Source: Google

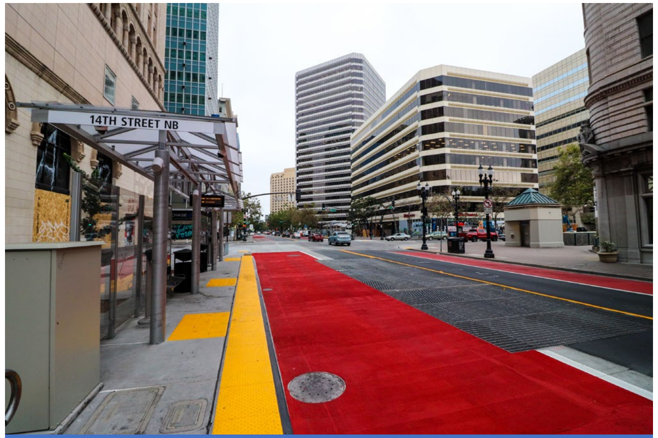


Image Source: Kimley-Horn

What are the implications of converting a traffic lane to transit?

- Additional traffic congestion on San Pablo Avenue → Some drivers will change their mode, route, or time of day with center-running and side-running BRT
- Center-running BRT: localized diversion due to left-turn restrictions

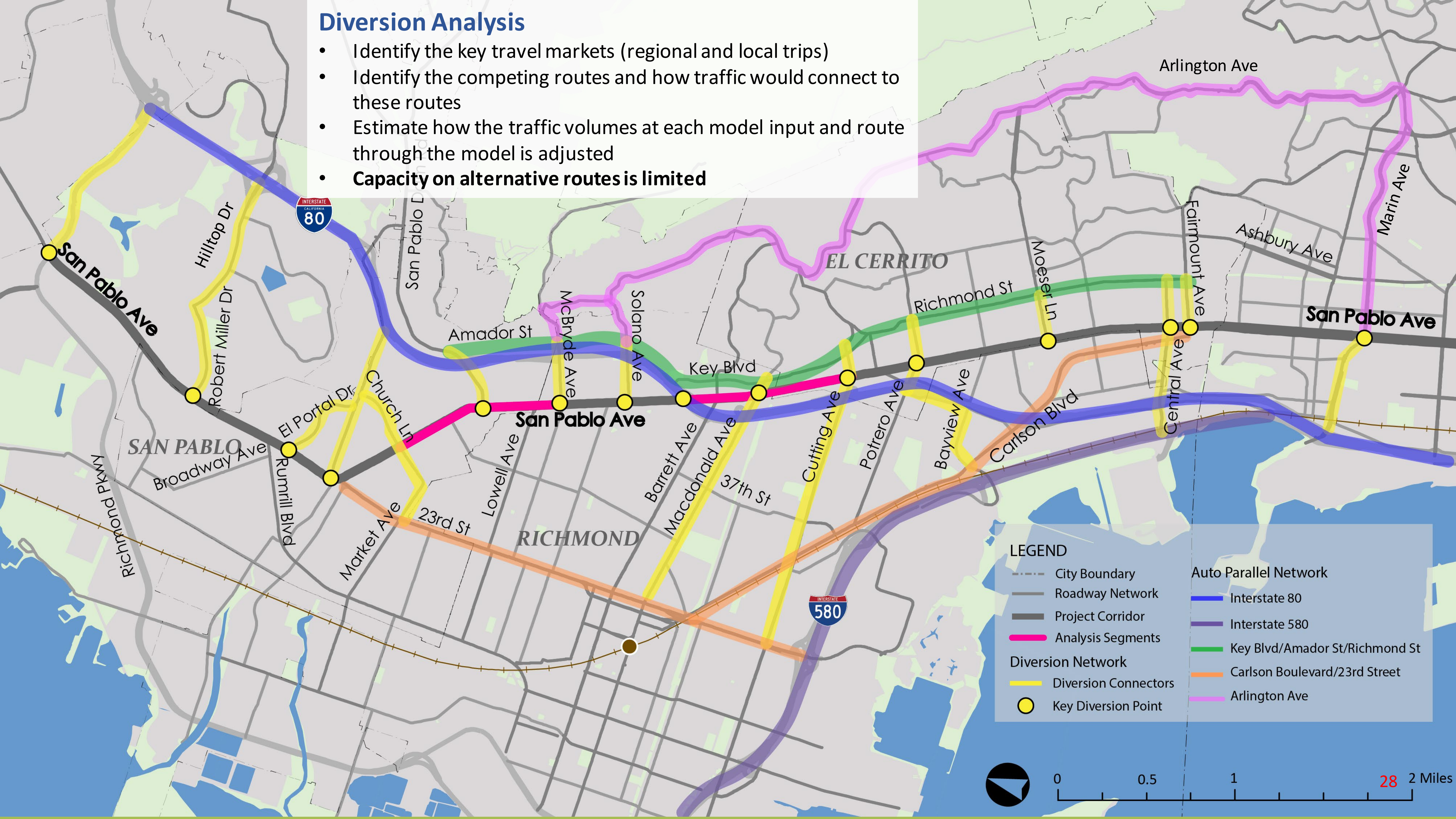
Metric	Center-Running	Side-Running
Auto Diversion	30%-35%	25%-30%

- If all diverted auto traffic went to I-80, would increase peak hour volumes on I-80 by about 4%
- Local traffic may divert to local streets; however, local diversion routes will experience diversion even with no changes to San Pablo Avenue and may not support significant additional diversion
- Opportunity for traffic calming on diversion streets

Source: Kimley-Horn

Diversion Analysis

- Identify the key travel markets (regional and local trips)
- Identify the competing routes and how traffic would connect to these routes
- Estimate how the traffic volumes at each model input and route through the model is adjusted
- **Capacity on alternative routes is limited**



How does a bus lane affect bus and auto travel time?

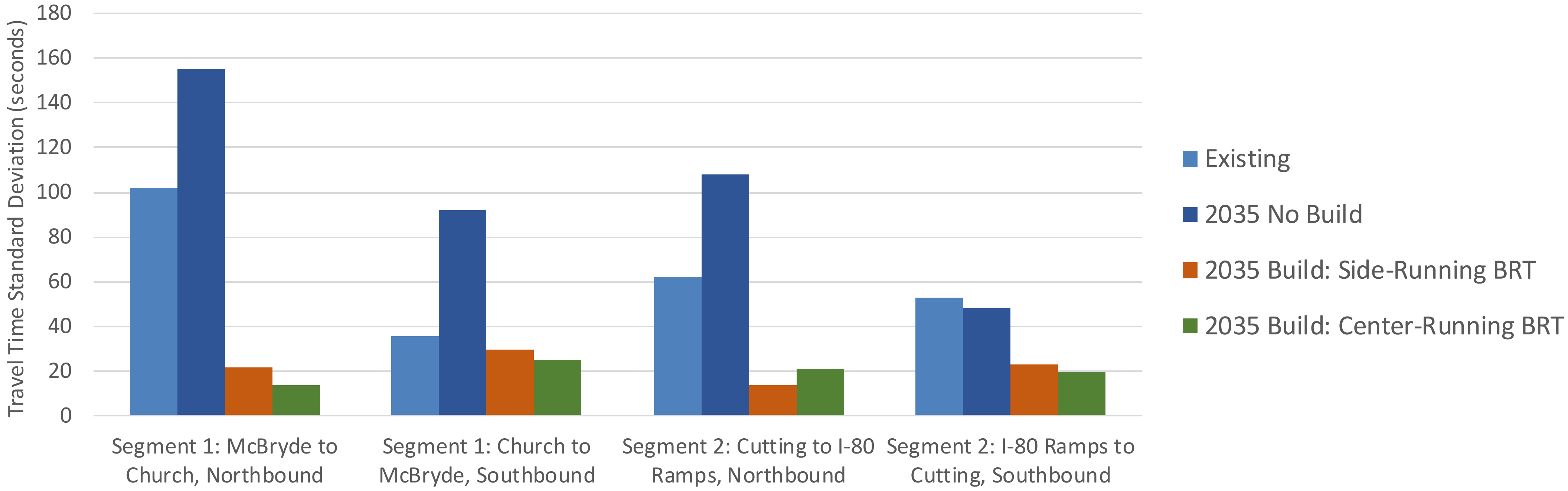
- By only implementing transit signal priority projects, bus remains **slower** than auto in peak direction and peak period
- With dedicated bus lanes, bus becomes **faster** than auto in peak direction and peak period, even accounting for stops

Metric	Center-Running	Side-Running
Change in **bus** travel times (peak direction)	↓ 30%-45%	↓ 25%-40%
Change in **auto** travel times	↑ 0%-45%	↑ 0%-35%
Bus speed relative to auto	Bus is 25%-55% faster than auto	Bus is 15%-40% faster than auto

Source: Kimley-Horn

Transit ridership and reliability findings

- Bus travel time variability improves by over 50%-80% with both center and side-running options ➡ Buses arrive more consistently and waits are shorter
- 30%-35% increase in ridership typical with high-quality BRT
  - Travel demand model in project Phase 1 projected a 35%-45% ridership increase with BRT



Source: Kimley-Horn

Bicycle + Parking Options

What are the options to improve walking conditions?

- Widen sidewalks
- Provide landscape buffers
- Provide bulbouts to shorten crosswalks
- Install high-visibility crosswalks
- Upgrade curb ramps to meet ADA standards
- Install pedestrian lighting, particularly at crossings and bus stops
- Improve sidewalk conditions
- Add new crossings
- Improve safety of crossings with signalization (pedestrian hybrid beacons) and rapid rectangular flashing beacons

Pedestrian Lighting

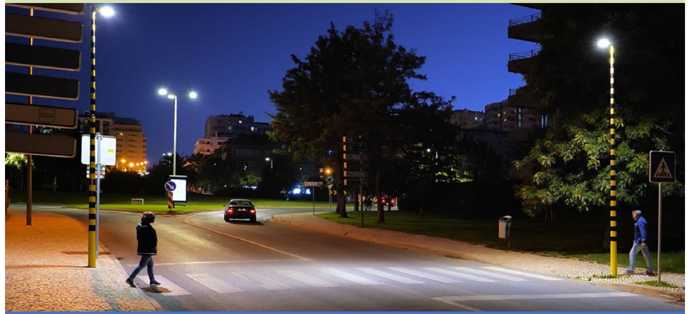


Image Source: Schreder

Signalization

Image Source: Carmanah

Widen sidewalks and provide landscape buffers

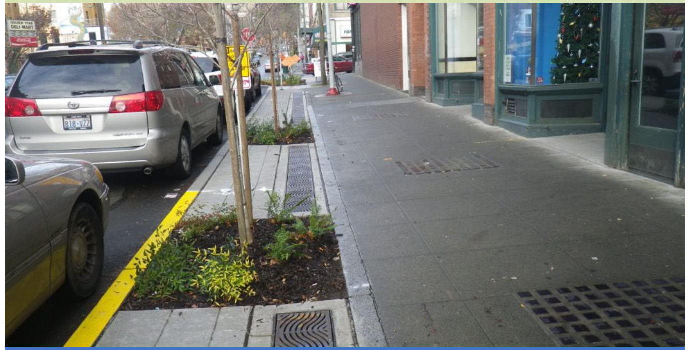


Image Source: NACTO

Shortened crosswalks

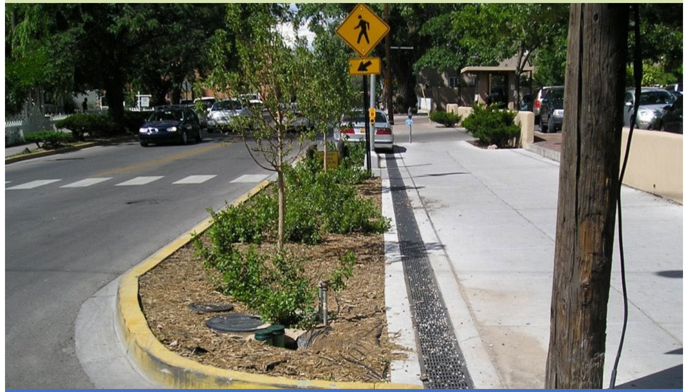


Image Source: NACTO

What are the options to improve biking conditions?

- New protected bicycle lanes (cycle tracks)
- Improved bicycle crossing markings
- New signalized bicycle crossings (pedestrian hybrid beacons or signals)
- Protected intersection treatments
- Transit islands to avoid bus-bike conflicts at bus stops

New signalized bicycle crossings

Image Source: Google

Protected intersection treatments

Image Source: City of San Luis Obispo

New & protected bike facilities and crossings

Image Source: CATSIP

What options are feasible for bicycle facilities?

Class II Bike Lane

Image Source: City of Temple City

Buffered Class II Bike Lane

Image Source: Clairemont Times

Protected Class IV Cycle Track

Image Source: NACTO

Shared Bus and Bike Lane

Image Source: NACTO

Can a low-stress bicycle facility be provided on San Pablo Avenue?

- Significant number of driveways and intersections will require crossing bicycle facility
- Right-turn lanes will be needed at major intersections
  - Will require bicycle facility to be shared with autos, buses, or narrow pedestrian facility
- Projected to remain at Level of Stress 4 for cyclists (high level of stress)
- Lower stress options may be available on parallel streets south of McBryde Avenue

Images Source: Google

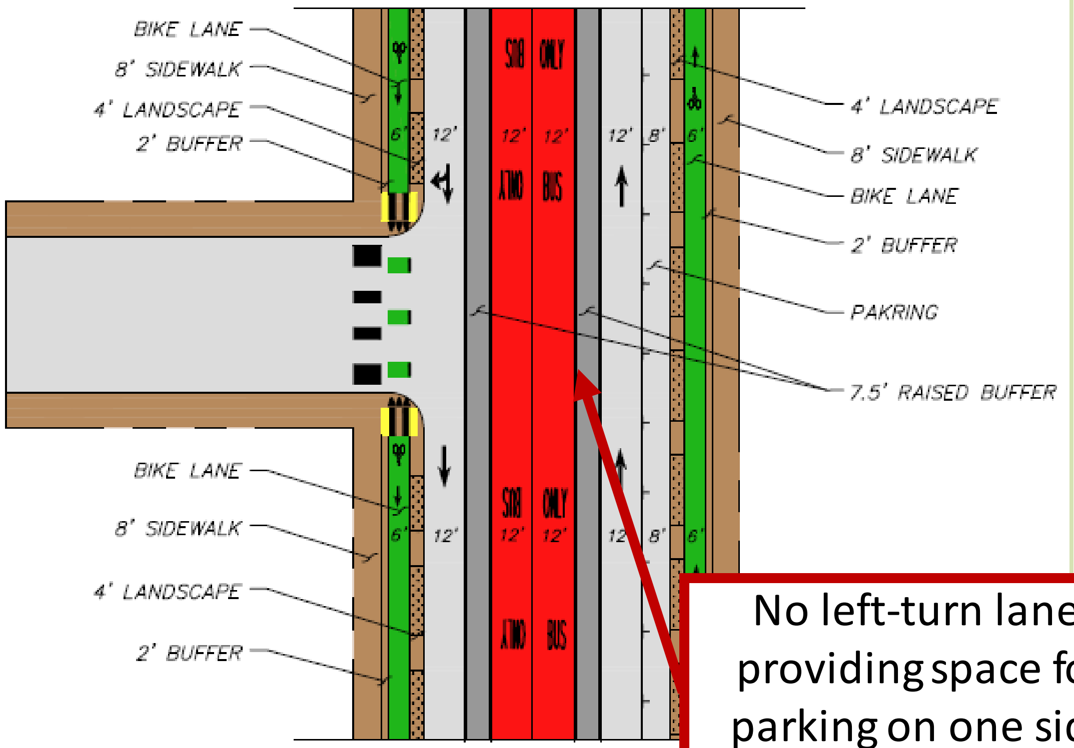
What are the options for a lower-stress parallel bikeway?

Source: San Pablo Avenue Phase 1 Evaluation Report

Legend
- Parallel Bikeway
- Proposed/Existing Bike Facilities on San Pablo Ave
- City Boundary

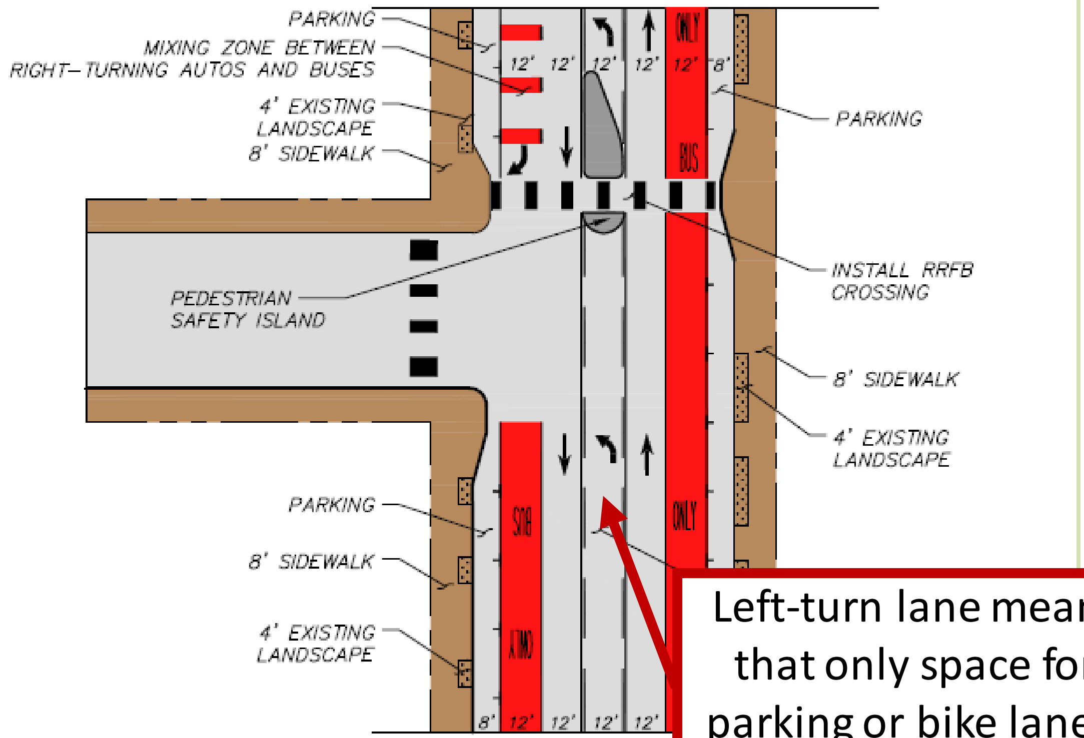
How does center-running BRT vs side-running BRT transit compare for bikes?

Center-Running BRT



No left-turn lane, providing space for parking on one side and bike lanes

Side-Running BRT (with parking)



Left-turn lane means that only space for parking or bike lanes, not both

Source: Kimley-Horn

Parking and Bike Options

Center-Running

- Options range from:
  - **Parking Prioritized:** Preserve most parking on both sides of the street where it exists today with some bike facilities on San Pablo and/or bike connectivity via a parallel route
  - **Bicycle Prioritized:** Provide a Class IIB/Class IV bike facility throughout, with parking on at least one side of the street in most areas. Bicycle facility, improved but remains higher-stress

Side-Running

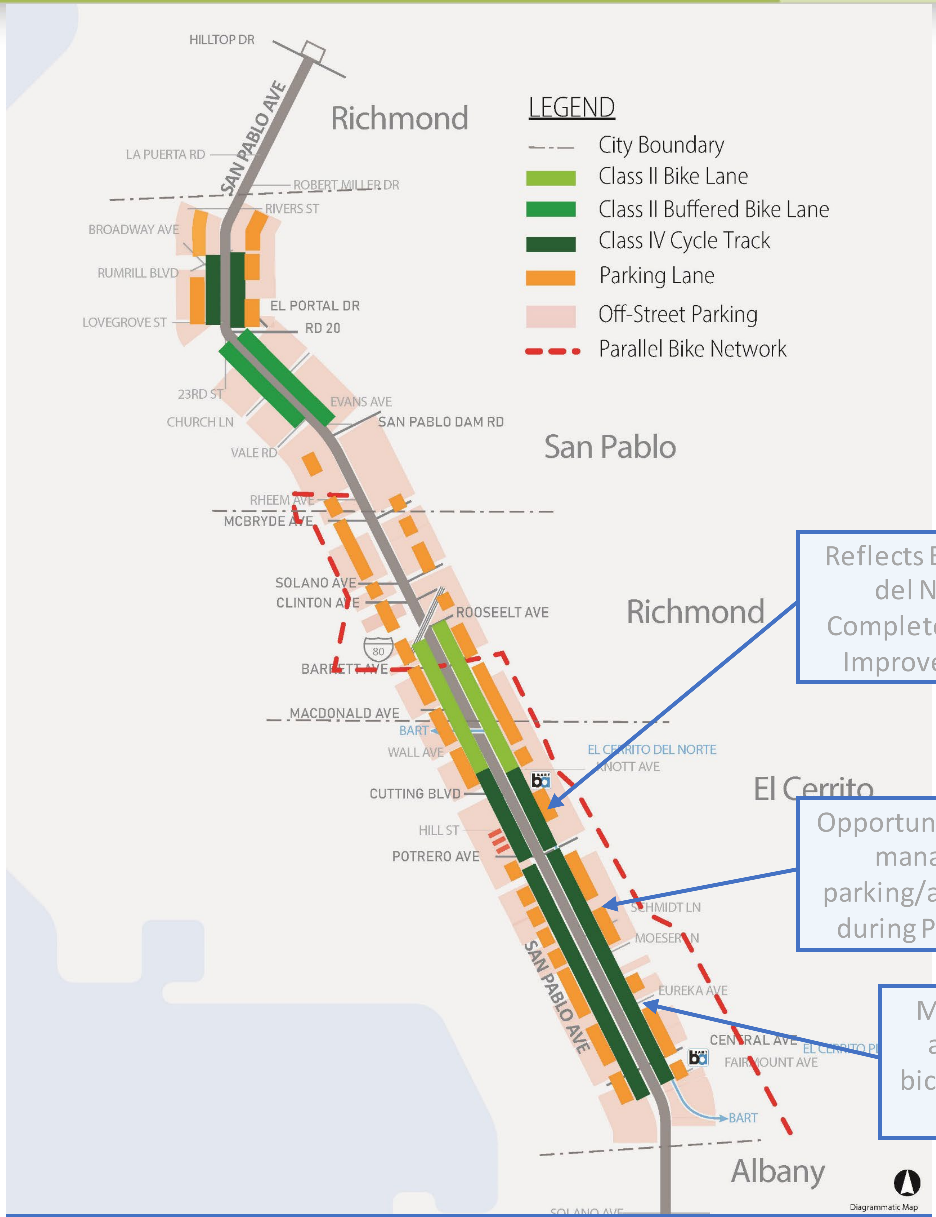
- Options range from:
  - **Parking Prioritized:** Preserve most parking on both sides of the street where it exists today with bike connectivity via a parallel route and/or shared with the bus lane
  - **Bicycle Prioritized:** Provide a Class IV bike facility throughout, with most parking removed. Bicycle facility, improved but remains higher-stress

See maps depicting range of options for parking and bicycle provision on San Pablo Avenue in Council Memo

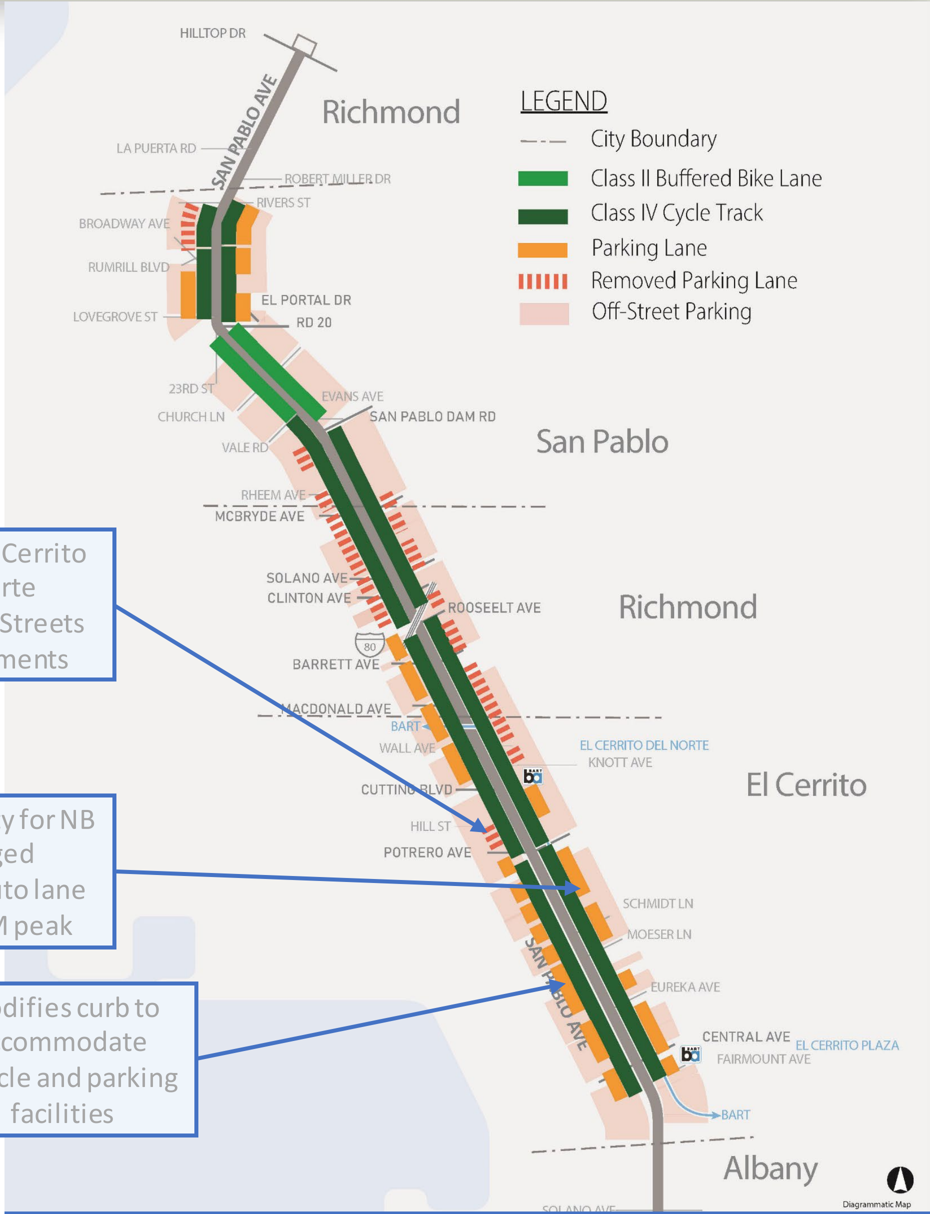
Parking/Bike Options

Center-Running

- Options range from:
  - **Parking Prioritized:** Preserve parking on both sides of the street where it exists today with some bike facilities on San Pablo and/or bike connectivity via a parallel route
  - **Bicycle Prioritized:** Provide a Class IIB/Class IV bike facility throughout, with parking on at least one side of the street in most areas



Center-Running BRT with Parking Prioritized



Center-Running BRT with Bicycle Prioritized

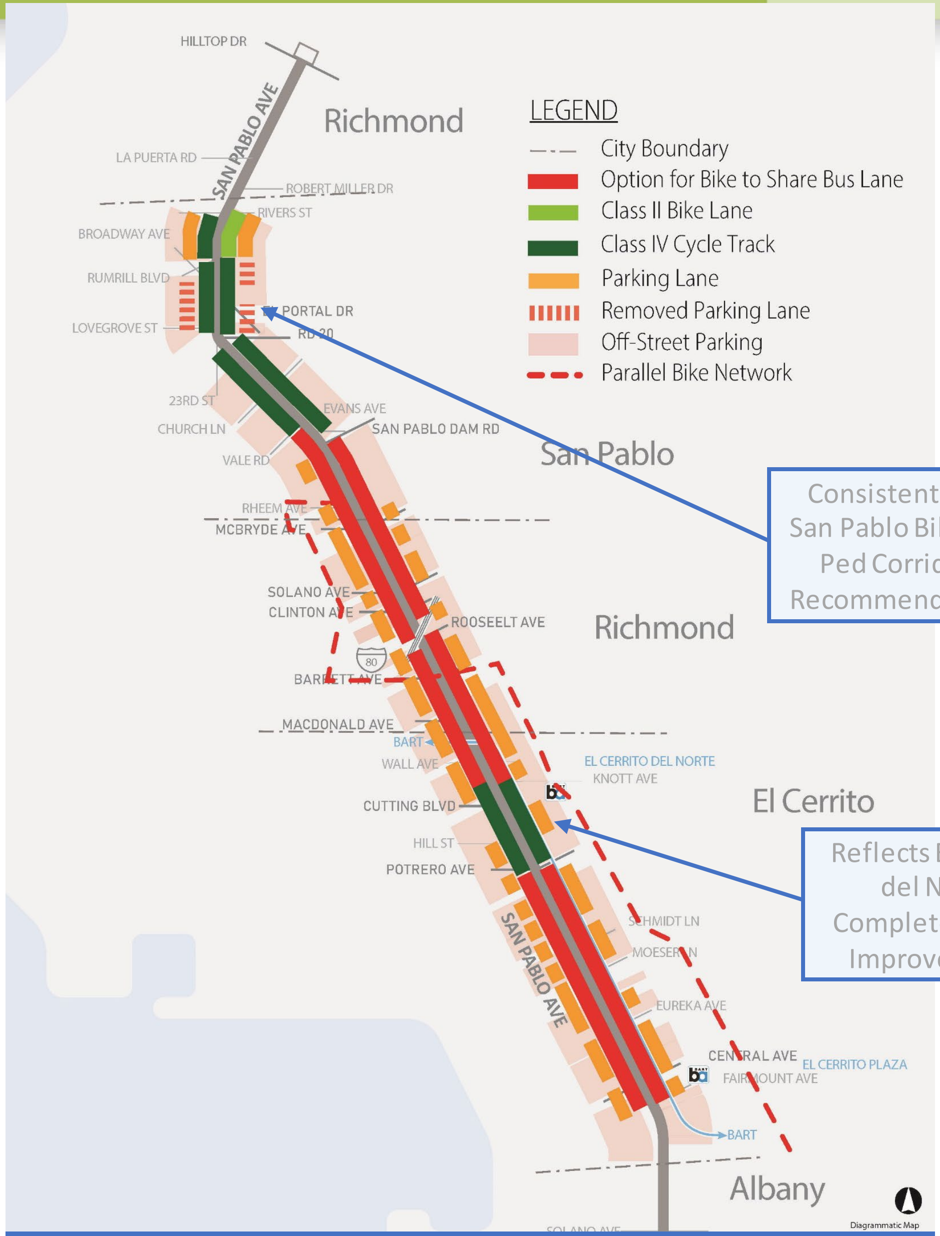
Source: Kimley-Horn

Parking/Bike Options

Side-Running

- Options range from:
  - **Parking Prioritized:** Preserve parking on both sides of the street where it exists today with bike connectivity via a parallel route and/or shared with the bus lane
  - **Bicycle Prioritized:** Provide a Class IV bike facility throughout, with most parking removed

Source: Kimley-Horn



Side-Running BRT with Parking Prioritized

Side-Running with Bicycle Prioritized

Key Takeaways

Comparison of Transit Solutions

☑ Better than existing
⊘ No change
☒ Worse than existing

Metric	No-Build	Center-Running		Side-Running	
		Maximize **Bicycle**	Maximize **Parking**	Maximize **Bicycle**	Maximize **Parking**
Transit Performance	☒	☑☑☑	☑☑☑	☑☑	☑
Auto Performance	☒	☒☒☒	☒☒☒	☒☒	☒☒
Pedestrian Safety	☒	☑☑	☑☑☑	☑☑	☑☑☑
Bicycle Connectivity & Comfort	☒	☑☑	☑	☑☑	☑
Parking and Loading	⊘	☒☒	☒	☒☒	☒
Community and Business Access	☒	☒	☒	☒	☒
Ease of Implementation	⊘	☒☒☒	☒☒	☒☒	☒
Cost per Mile	⊘	$$$$	$$-$$$	$$-$$$	$-$$

Key Takeaways

Without improvements, congestion will significantly increase (69% increase in delays), impacting mobility options

Center-running bus lanes provide 30%-45% transit travel time savings and would be approximately 10% faster than side-running

Side-running bus lanes avoid some of the implementation challenges of center-running and can be easily used by all bus routes in the corridor

Center-running bus lanes provide greatest opportunity for both parking and bike lanes throughout the corridor. Side-running allows for either/or in most segments

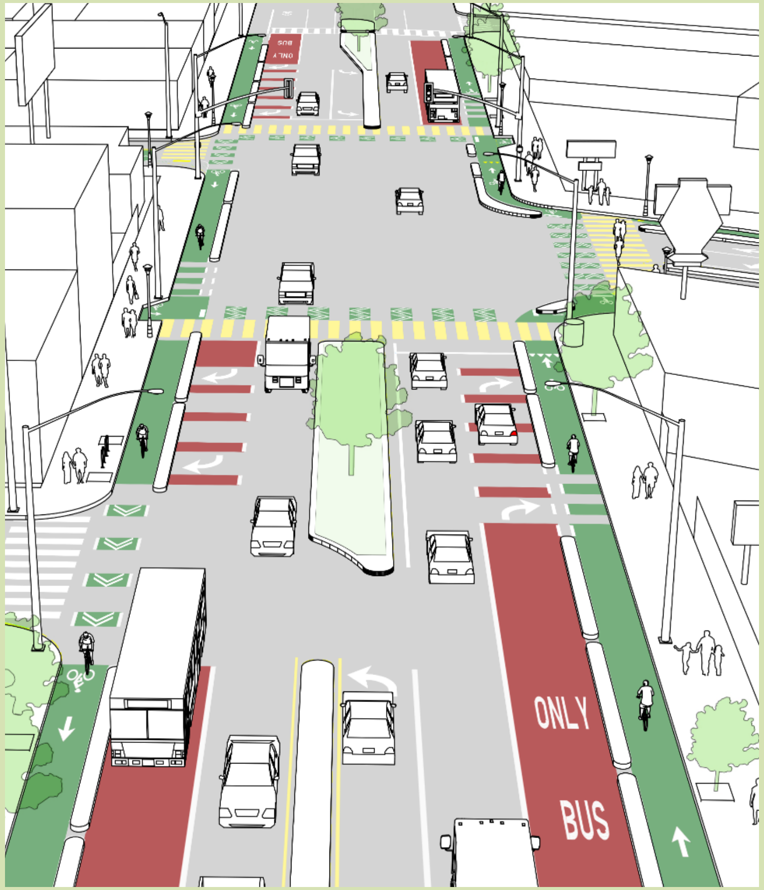
A low-stress bike facility cannot be provided but parallel route options are limited in the northern portion

On-street parking is currently plentiful and redundant, but new, more dense development will change the role of on-street parking

There is community support for improvements in the corridor, but no consensus thus far on the type of improvements

How does this relate to what's happening in Alameda County?

Near-Term Design Concept



- Safety Enhancements Throughout Corridor
  - Focused on pedestrian safety and accessibility and bicycle crossings
  - Bus bulbs provide additional space at bus stops and to allow in-lane stopping for transit
- Oakland, Emeryville, and South Berkeley Demonstration Project
  - Convert auto lane to bus lane
  - Convert parking lane to protected bike lane
    - Parking and loading moved to side streets in most locations
  - Protected intersections and other bicycle treatments
  - Evaluation phase after project implementation
- Continue planning efforts in Berkeley and Albany
  - In the meantime, provide bike improvements on parallel network

Next Steps

What are some options on what to do next?

Less

1. Do not advance corridor-wide improvements
2. Implement safety enhancements, such as pedestrian crossing improvements and ADA upgrades
3. Advance a near-term project, similar to Alameda County
   - Safety enhancements
   - Side-running bus lanes
4. Advance a Long-Term Project
   - Safety enhancements
   - Center- or side-running bus lanes
   - Bicycle and/or parking improvements

More

Next Steps

- ❑ Engagement
- ❑ Concept Design
- ❑ Funding Plan

Additional variant: Identify a phasing strategy and focus initial efforts on a first phase segment

San Pablo Avenue Multimodal Corridor Study

Technical Materials Summary

WCCTAC

CONTRA COSTA transportation authority

Kimley»Horn
Expect More. Experience Better.

TABLE OF CONTENTS

Introduction

The San Pablo Avenue Multimodal Corridor Project Phase 2 evaluated ways to improve bus service and pedestrian and bicycle safety on San Pablo Avenue in Contra Costa County, within the cities of El Cerrito, Richmond, and San Pablo.

An overview of the project and key findings from Phase 2 is provided in the Executive Summary Presentation at the beginning of this document. This Technical Materials Summary section serves as a supplement to that presentation and provides additional detail and information on some of the analysis topics covered in the presentation.

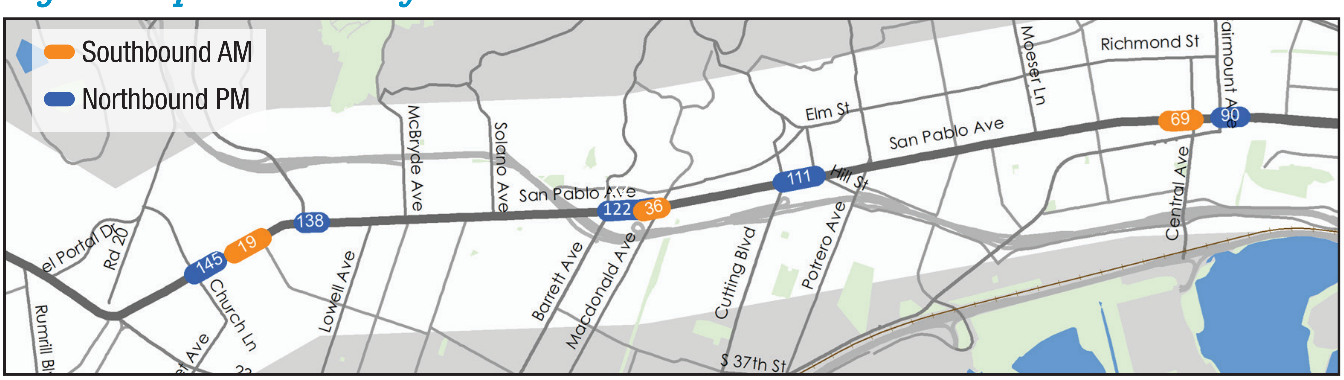
Corridor Conditions Today

Transit Performance

Transit service on San Pablo Avenue currently experiences delay due to the congestion and signal operations on the corridor. *See slide 21 of the presentation for more detail on the existing transit service delay.*

A 2019 Speed and Delay analysis measured bus delay on the corridor using automatic vehicle locator (AVL) data. The corridor was separated into segments in the northbound and southbound directions. The analysis calculated the average speed and non-dwell delay for each segment during the peak AM period, for segments in the southbound direction, and peak PM period, for segments in the northbound direction. The segments with the lowest speed and highest amount of delay were identified for further on-the-ground evaluation as to the cause of the delays. **Figure 1** shows the location of these segments and **Tables 1** and **2** show their speed and delay of these identified segments. The average speed of the buses ranged from 3.4 to 8.1 miles per hour (mph) in the southbound direction and from 3.2 to 8.5 mph in the northbound direction.

Figure 1: Speed and Delay Field Observation Locations



Note: Segment numbers correspond to segment IDs included in Tables 1 and 2

Table 1: Southbound Segments with Lowest Speeds and Highest Delay

SB Segment ID	Segment Location	City	Average Moving Speed (mph)	Average Non-Dwell Delay (sec)
19	Approaching Vale Rd	San Pablo	8.1	46
35/36	Approaching Macdonald	Richmond	3.4/5.6	48
69	Approaching Central Ave	El Cerrito	6.9	43

Data Source: April 2019 CAD/AVL data provided by AC Transit

Table 2: Northbound Segments with Lowest Speeds and Highest Delay

NB Segment ID	Segment Location	City	Average Moving Speed (mph)	Average Non-Dwell Delay (sec)
90	Approaching Fairmount Ave	El Cerrito	6	40
111	Approaching Cutting Blvd	El Cerrito	3.4	50
122	Approaching Barrett Ave	Richmond	8.5	58
137/138	Approaching San Pablo Dam Rd	San Pablo	3.2/5.3	48
145/146/147	Approaching Church Ln	San Pablo	6.2/3.6/6.5	61

Data Source: April 2019 CAD/AVL data provided by AC Transit

After determining the top delay segment locations, field observations were performed to understand the contributing factors of the delay. The field observations took place at the eight segment locations along San Pablo Avenue within Contra Costa County, shown in **Figure 1**, in October 2021, January 2022, and February 2022. To record the time of the bus's movement, the field observer stood on San Pablo Avenue and recorded the time that the bus was in motion, merging into or out of a stop, stopped at a bus stop, and stopped at a traffic light. For each of the eight segments observed, data for multiple buses was recorded to generate average travel data.

Collectively, for all observed locations, the buses spent more than 70% of the travel time in congestion during the AM peak period, and over 80% in the PM peak period. In the AM peak period, an average of 58% of the time was stopped at a red light, followed by 13% of the time stopped for passenger loading, as shown in **Figure 2**. In the PM peak period, stopping at a red light accounted for 47% of the bus's total travel time, followed by queuing for 14% of the time, as shown in **Figure 3**.

Figure 2: Causes of Southbound AM Bus Delay

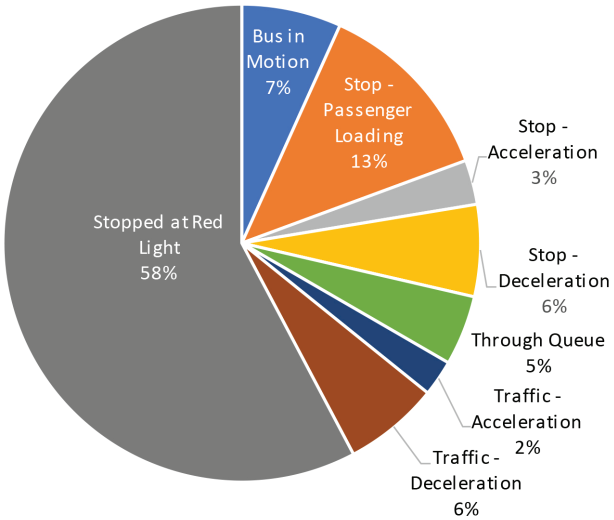
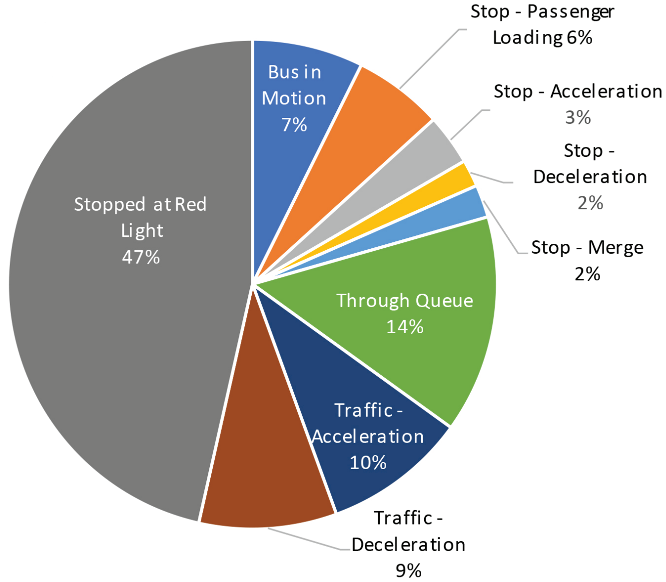


Figure 3: Causes of Northbound PM Bus Delay



Source: Kimley-Horn field observations in October 2021, January 2022, and February 2022

Bus travel speed can be enhanced through a range of solutions with differing timelines and costs. An initial effort could include relocating stops to the far-side of intersections. This would allow buses to take advantage of corridor signal coordination and clear the intersection before stopping to pick-up and drop-off passengers. An additional improvement could be enhancing Transit Signal Priority (TSP) at the signalized intersections along San Pablo Avenue. TSP allows for the bus to communicate its location to the signal, which can prompt the signal to hold a green light longer for the bus to clear the intersection or can start the green phase earlier for the bus. TSP is already implemented on San Pablo Avenue, although adjusting parameters and optimizing signal coordination to allow for greater bus priority may be able to reduce the length of time that a bus is dwelling at a red light. Examples of operational changes include: 1) Establishing green bands based on bus instead of auto progression; 2) Increasing the magnitude of early-green/extended-green timings; 3) Expanding the number of buses that can trigger TSP and eliminate lock-out periods; 4) Monitoring TSP performance to identify maintenance needs/refinements.

Another alternative is to consolidate stops so that they are spaced every 1/3 of a mile. Currently, stops along San Pablo Avenue range in spacing from 1/8 mile to a 1/2 mile apart. Consolidating bus stops would allow for the bus to stop less frequently while still ensuring that passengers are able to access a stop. Relocating near-side stops to far-side locations provide safety benefits for users, as well as can make TSP more effective at signalized intersections. Finally, dedicated transit lanes, either center-running or side-running, would allow for the buses to bypass congestion and traffic by having their own dedicated lane. Some of the other recommendations, like TSP or signal timing enhancements, could be layered with this improvement to increase the benefit.

BRT Stop Configurations

The presentation provides an overview of the center-running and side-running bus lane configuration options, as well as the benefits and challenges with each. The sections below provide more detail on potential bus stop configurations with both center-running and side-running bus lane configuration options.

Center-running BRT Station Configuration Options

Center-running BRT station platforms are placed in the median and accessed via crosswalks at existing or new signals. By having the stations in the center of the roadway, there is no conflict between buses and through cyclists at stations. It also avoids the potential for illegal parking or loading activity impacting bus maneuvers into and out of station areas.

There are three options for center-running BRT stations placement with varying configurations for bus boarding/alighting operation. The options include left-side boarding, right-side boarding, and contra-flow bus service and are shown in **Figure 4**.

1) Left-side Boarding Stations

Left-side boarding allows both route directions to use the same stop. By having only one station platform at an intersection, a left-turn lane can be preserved in one direction. Since standard bus vehicles only have right-side boarding doors, the stations and BRT lanes can only be used by BRT vehicles. As a result, local bus stops remain on the curb. A single platform allows for a wider station for users and more intuitive wayfinding.

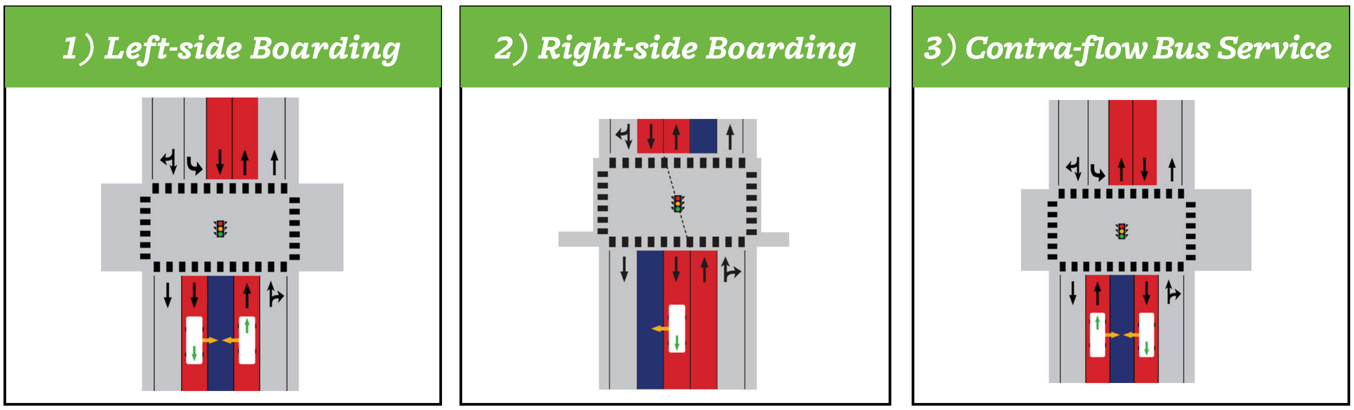
2) Right-side Boarding Stations

Right-side boarding requires two station platforms at an intersection to accommodate each route direction. The two stations are located on the opposite sides of the intersection and require the removal of the left-turn lanes in both directions. Since boarding takes place on the right-side of the bus, any buses on the corridor can use the stations. The station placement requires a full lane offset across the intersection, which requires the bus to reduce its speed in those locations.

3) Contra-flow Bus Service

Contra-flow bus service allows both directions to use the same stop, while also allowing for right-side boarding at the stations. Contra-flow service provides the benefit of having one station platform per intersection, thus preserving one auto left-turn lane. It also uses right-side boarding and allows any bus on the corridor to use the stations and BRT lanes. A single platform allows for a wider station for users and more intuitive wayfinding. Contra-flow bus service would require additional space and vertical separation between the auto lanes and BRT lanes since they are traveling in opposite directions. Contra-flow operation can occur just at stations (the buses switch over immediately before/after the station) or throughout the alignment.

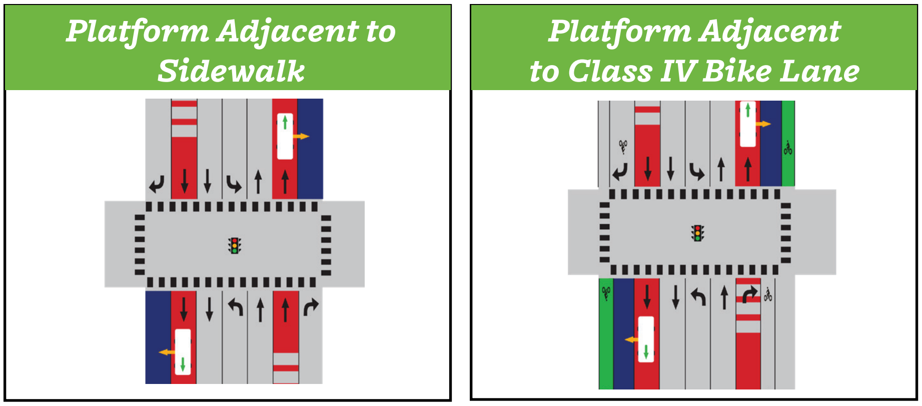
Figure 4: Center-running BRT Station Platform Options



Side-running BRT Station Placement Options

Side-running BRT stations platforms are placed adjacent to the sidewalk on a bus bulb. When there is a Class IV bike lane present, the station platform is located on a bus island that separates the transit lane and the bike lane. The bus island placement would shadow the right-turn lane, where applicable, or the Class IV bike lane. By having the stations on the outside lane, buses can use right-side boarding and the stations can be used by other local routes on the corridor. Additional, non BRT, bus stops may be required for local or school routes with more frequent stop spacing. The two station platform options are shown in **Figure 5.**

Figure 5: Side-running BRT Station Platform Options



Potential Improvements

Study Segments

The study area extends on San Pablo Avenue between the southern Contra Costa County border, between El Cerrito and Albany, and Hilltop Mall in Richmond. Seven segments with consistent curb-to-curb widths were identified within the study area. It is noted that the segments do not extend the full length of the study area; proposed improvements are envisioned to extend through design transitions. The location and existing typical roadway curb-to-curb widths for each segment are shown in **Figure 6** and include:

- Segment 1. Fairmount Avenue to Eureka Avenue (81 feet)
- Segment 2. Schmidt Lane to Potrero Avenue (83 feet)
- Segment 3. Wall Avenue to I-80 (80 feet)
- Segment 4. Solano Avenue to Rheem Avenue (76 feet)
- Segment 5. Vale Road to Road 20 (70 feet)
- Segment 6.Lovegrove Street to Rumrill (83 feet)
- Segment 7. Lake Street to Rivers Street (86 feet)

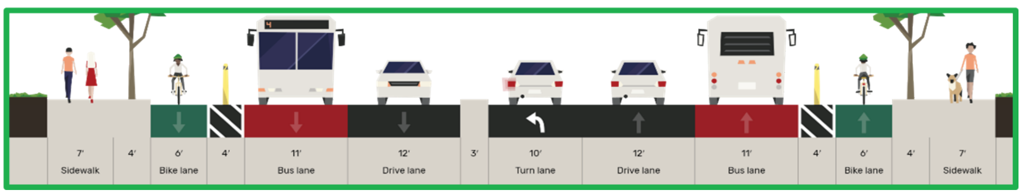
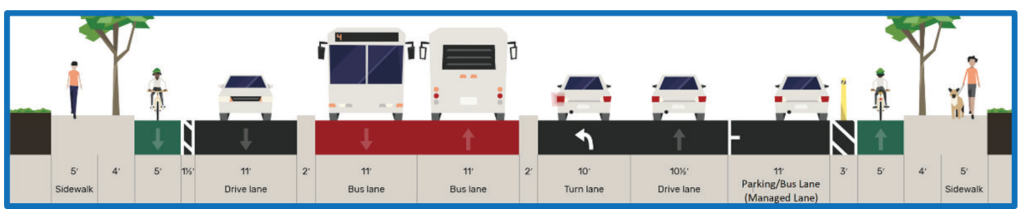
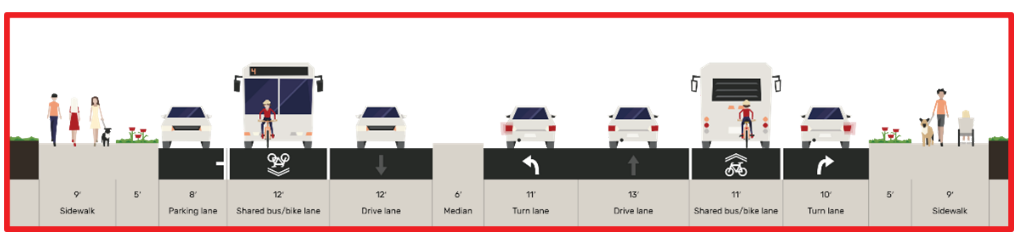
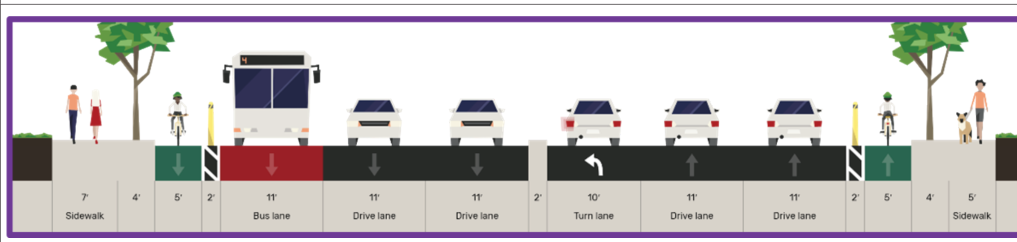
Figure 6: Segment Prototype Locations

Design Alternatives by Segment

Five initial cross-section design alternatives were developed for each of the seven study segments. Each alternative complied with the basic tenets of staying within existing ROW, not diminishing pedestrian environment, and maintaining or enhancing existing bike facilities where they exist today.

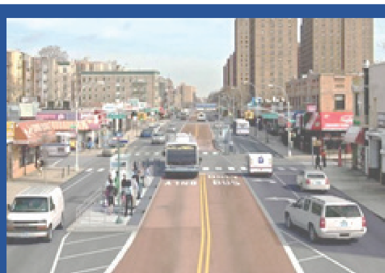
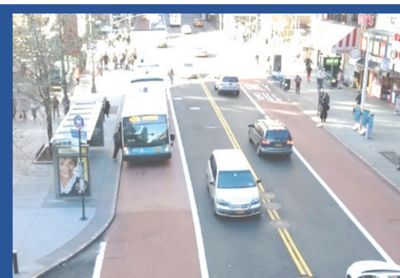
From the initial five cross-sections, the stakeholder agencies selected three geometries for each segment for further prototype design development. The three geometries selected were based on previous planning efforts, individual jurisdictional priorities, and continuity between segments. While the three geometries selected varied across segments, they had consistent themes and modal priorities. Each selected geometry aligns with a generalized corridor-level alternative. To allow for consistent reference, a naming scheme using colors was applied to the corridor-level alternatives. The Green and Red Alternatives include a side-running transit lane. The Blue Alternative includes a center-running transit lane design. Some unique northern segments with higher auto volumes and priorities were assigned to a Purple Alternative. The four alternatives with representative cross-sections and detailed characteristics are shown in **Table 3**.

Table 3: Alternatives and Cross-Sections

<table>
<tr><th>Alternative Description</th><th>Representative Cross-Section (Specific Dimensions vary by Segment)</th></tr>
<tr><td>Green Alternative
• Side-running transit lane; single auto lane in each direction; replace on-street parking with Class IV bike lane; allows retention of on-street parking in SB direction in Segment 2</td><td>
</td></tr>
<tr><td>Blue Alternative
• Center-running transit lane; replace on-street parking with Class IV bike lane; opportunity for managed parking and auto lane in the NB direction for segments wider than 83 feet</td><td>
</td></tr>
<tr><td>Red Alternative
• Side-running transit lane; maintain existing parking for all segments (except for Segment 5 that has existing Class II bikeway); allows shared bus and bike in dedicated lane</td><td>
</td></tr>
<tr><td>Purple Alternative
• Maintain two auto lanes in each direction; add Class IV bike lane; add one direction transit lane; only selected for Segments 5, 6, and 7.</td><td>
</td></tr>
</table>

Appendix A includes the selected cross-sections and detailed design prototypes for all seven study segments and highlights the study segments that were included in the microsimulation. The alternatives naming scheme described in Table 3 is consistently applied in the appendix graphics. After developing the cross-sections and prototypes, the feasibility of each transit lane configuration was assessed at the corridor level along with trade-offs. These considerations are summarized in **Table 4.**

Table 4: Design Considerations for Transit Lane

	 **Center-running Transit Lane**	 **Side-running Transit Lane**
Transit Lane Configuration	• Designates two center lanes of the roadway for buses only, typically marked with red/terra cotta color paint • Commonly used for high-ridership BRT service • Station is built on raised platforms between the transit lanes as nearside stop	• Designates the right lanes of the roadway for buses only, typically marked with red/terra cotta color paint • Commonly used for high-ridership BRT service
Feasibility	• Curb-to-curb roadway width of 80' or greater can accommodate: protected/buffered bike lanes, parking on one side, and 14' center island double-sided boarding platform • Roadway width of approximately 76' can accommodate two of those features • Roadway width of approximately 70' can accommodate one of those features	• Feasible in all segments where considered (not considered in narrowest section in San Pablo) • Curb-to-curb roadway widths less than 80' require full parking loss • Requires signal timing/transit signal priority to optimize transit reliability
Benefits	• Eliminates conflicts with drop-offs, deliveries, parking maneuvers, and right-turning movements, providing greatest benefit to transit travel time • Easier to provide effective signal timing/transit signal priority to optimize transit reliability • Opportunity with auto/parking managed lane in El Cerrito to keep peak period capacity in one direction • No modifications or reduction in pedestrian realm needed at stations to accommodate bikes • Provides the highest quality transit experience and greatest benefit to transit travel time and reliability • Opportunity for shared bus/bike lanes to provide continuous bike facility	• Reduces queue delay for buses at traffic signals, improving transit travel time and reliability • Eliminates bicycle and transit conflicts with parking maneuvers • Opportunity to implement in the near-term with striping modifications • Opportunity for shared bus/bike lanes to provide continuous bike facility
Drawbacks	• Left-turns prohibited for one or both movements from San Pablo Ave at stations due to lack of space • Some station configurations may limit use of bus lanes to BRT route only • Eliminates unsignalized left-turn movements, requiring additional traffic signals and/or modifications to community access • Additional complexity for bus routes turning on/off San Pablo Avenue or with different stop spacing • Limited opportunities for phased implementation • Higher cost implication and the longest construction time due to the impact to existing median	• Loss of on-street parking on one or both sides • Limited benefit from transit lane relative to other alternatives due to conflict with right-turning vehicles, parking maneuvers, and other bus lane encroachment • Protected bike lanes not for all ages and abilities due to frequent conflicts at intersections and driveways • Lanes are prone to encroachment by loading or pick-up/drop-off

Alternatives for Microsimulation Modeling

See **Figure 7** for the geometries of the alternatives modeled in the traffic simulation analysis discussed later in this technical summary. These end-to-end alternatives were selected based on direction provided by the stakeholder agencies and generally represent a continuous center-running BRT and a continuous side-running BRT configuration. The microsimulation modeling provides a general comparative understanding of the performance of these alternatives.

Figure 7: Selected Alternatives for Microsimulation Modeling

Segment		Side-running Alternative	Center-running Alternative
1. El Cerrito	Fairmount Ave to Eureka Ave (81')	Modified Red Alternative	Blue Alternative
2. El Cerrito	Schmidt Ln to Potrero Ave (83')	Modified Red Alternative	Blue Alternative
3. El Cerrito/ Richmond	Wall Ave to I-80 (80')	Modified Red Alternative	Blue Alternative
4. Richmond	Solano Ave to Rheem Ave (76')	Modified Red Alternative	Blue Alternative
5. San Pablo	Vale Rd to Road 20 (70')	Green Alternative	Blue Alternative
6. San Pablo	Lovegrove St to Rumrill Blvd (83')	Green Alternative	Blue Alternative
7. San Pablo/ Richmond	Lake St to Rivers St (86')	Red Alternative	Blue Alternative

LEGEND

- Shared Bus and Bike Lane
- Side-running Bus Lane
- Center-running Bus Lane
- Auto Lane
- Class II Bike Lane
- Class II Buffered Bike Lane
- Class IV Bike Lane
- Shared Use Path
- Parking on one side of the street
- Parking on both sides of the street
- No parking on either side of the street

Focus Area Discussion

The BRT is anticipated to deviate off of San Pablo Avenue in three locations - El Cerrito Plaza BART Station, El Cerrito del Norte BART Station, and Contra Costa College. To assess multi-modal connections between San Pablo Avenue and these major regional destinations and hubs, a more detailed focus area analysis was performed. This analysis developed specific recommendations for bus stop locations, routing, and priority treatments for multi-modal access between San Pablo Avenue and the activity hub. **Table 5** describes the proposed configuration with each of the two transit lane configurations being considered for this project and **Appendix B** includes conceptual layouts of the focus area locations.

Table 5: Focus Area Locations

El Cerrito Plaza BART Station	
Side-running Scenario:	Buses would exit San Pablo Avenue via Central Avenue and Fairmount Avenue to provide direct connections to BART and other bus services at the station. The southbound BRT would maneuver from a side-running transit lane into an existing left-turn storage lane and have a protected signal phase turning onto Central Avenue. The analysis proposed installation of a two-way Class IV cycle track along Central Avenue to connect with a new facility along San Pablo Avenue. The installation of bike lanes on Central Avenue would result in on-street parking loss in one direction. A two-stage bicycle turn box is proposed to be installed to facilitate southbound to eastbound bicycle movements. With buses deviating off the corridor to access the BART station, instead of transit lanes on San Pablo Avenue, additional space may be available for a wider pedestrian zone and protected bike lanes between Central Avenue and Fairmount Avenue.
Center-running Scenario:	Buses in both directions would exit San Pablo Avenue at Central Avenue to provide direct connections to BART and other bus services at the station. Given the additional complexity of providing an exclusive phase for bus maneuvers into/out of a center-running transit lane, it is desired to have those movements consolidated to a single intersection. A two-way Class IV cycle track is proposed along Central Avenue to connect with the new bike facility along San Pablo Avenue. The installation of bike lanes on Central Avenue would result in on-street parking loss in one direction.

Note: Focus area improvements were developed consistent with the best information available at the time of development in 2021. BART has subsequently advanced TOD planning efforts for the El Cerrito Plaza BART Station and proposed BRT configuration may need to be adjusted based on the ultimate TOD and station improvements.

El Cerrito del Norte BART Station	
Side-running Scenario:	Buses would route as they do today from San Pablo Avenue to the BART station via Cutting Boulevard and Hill Street. The del Norte Complete Streets Project includes modifying Cutting Boulevard to make it two-way for autos with one-way Class IV bike facilities on both sides of the street. The Complete Streets Project also includes providing Class II or Class IV bicycle lanes on San Pablo Avenue via parking removal and lane geometry modifications. These bicycle lanes can be preserved with the BRT project. The addition of left-turn lanes from San Pablo Avenue to Cutting Boulevard will accommodate southbound transit movement into BART station.
Center-running Scenario:	Buses in both directions would access the BART station via Cutting Boulevard. Traffic signal modifications are required at the intersection to facilitate movements to/from the center-running bus lanes. Similar to side-running, the concept would accommodate other improvements included in the del Norte Complete Streets Project, such as converting Cutting Boulevard to two-way with protected bike facilities and adding bike facilities to San Pablo Avenue.

Contra Costa College	
Side-running Scenario:	A northbound side-running bus would travel east from San Pablo Avenue via El Portal and proceed north along Mission Bell Drive to reach the Contra Costa College Transit Center. The southbound bus would egress via Campus Drive, proceed west via College Lane and rejoin San Pablo Avenue. A traffic signal is required at El Portal and Mission Bell Drive to facilitate the eastbound to northbound bus left-turn movement. Given tight signal spacing, the new signal would need to be closely coordinated with the signal at San Pablo Avenue. A roundabout is proposed at Mission Bell Drive and College Lane to improve vehicle and transit operations and enhance safety for pedestrian and bicyclists.
Center-running Scenario:	With a center-running bus scenario, buses are proposed to access/egress the Contra Costa College Transit Center via College Lane. Improvements to the College Lane intersection with San Pablo Avenue would be needed. Similar to the side-running configuration, a roundabout at Mission Bell Drive and College Lane is proposed. On San Pablo Avenue, BRT stops are proposed at Lovegrove Avenue and Rumrill Boulevard. Removal of left-turn movements at unsignalized intersections would preclude left-turns at Stone Street.

Right-turn and Managed Lane Analysis

Managed Lane Considerations

The proposed center-running alternatives present a managed lane option to maintain existing parking while adding capacity in one direction for auto traffic during needed peak hours. This design is feasible only within the City of El Cerrito where additional curb-to-curb space is available. **Table 6** shows the traffic volume during the peak hour along two study segments in El Cerrito in order to determine the viability and preferred direction of a managed lane. Southbound AM peak and northbound PM peak experience high traffic and can both benefit from an additional travel lane. However, there is only room for an additional lane in one direction. Several operational challenges for a managed lane should be considered. It works best in locations with lower parking and loading demand during peak commute periods. It also requires enforcement to ensure the travel lane is clear of parked cars when designated for moving vehicles. Since the travel lane would be used by autos and not buses, enforcement via cameras on buses is not feasible. It would require active enforcement by police along with towing services.

Table 6: Total Vehicles per Hour During Peak Periods

Segment	Southbound AM (vph)	Northbound AM (vph)	Southbound PM (vph)	Northbound PM (vph)
Segment 1 - Fairmount Ave to Eureka Ave	1,004	311	628	872
Segment 2 - Schmidt Ln to Potrero Ave	825	397	506	837

Traffic Volumes Source: San Pablo Avenue Corridor Project – 2017 Existing Conditions Analysis

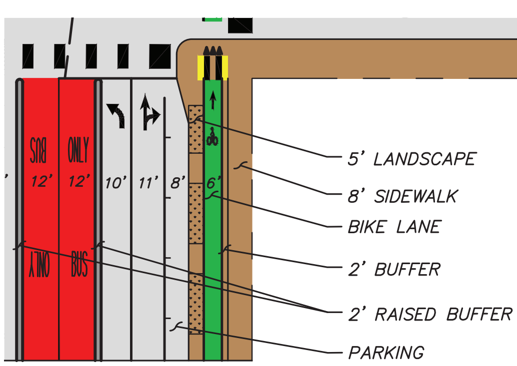
Exclusive Right-turn Lane Analysis

San Pablo Avenue generally has a consistent curb-to-curb width, even at intersections. This results in the lack of additional space for right-turn lanes at most locations. Therefore, sharing facilities between a combination of buses, cars, and bicycles is required. The configuration of shared lanes differs between center-running and side-running bus alternatives.

For center-running bus scenarios, shared-lane options would either be between bicycles and right-turn autos or through traffic and right-turn autos. While requiring the bicyclists to share space with autos is not desirable from a safety and comfort perspective, due to the geometry of the corridor, trade-offs in congestion can be significant. The study analyzed the average delay of through traffic at five major intersections during both peak hours with both the scenarios where right-turn movements would be made from the through auto lane or where right-turn movements would be in a lane shared with bikes, as shown in Figure 8. Results shown in **Table 7** indicate that providing a shared bicycle/right-turn lane is critical at larger intersections to limit impacts to congestion.

Figure 8: Center-running Right-turn Scenarios

Shared Through-Right Lane



Exclusive Right-turn Lane

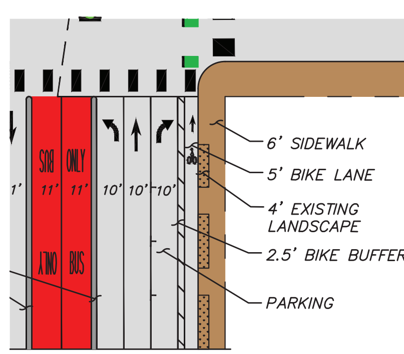


Table 7: Average Delay for Through Traffic (Center-running Bus Scenario)

Intersection (City)	Central Ave (El Cerrito)		Hill Street (El Cerrito)		Solano Ave (Richmond)		San Pablo Dam (San Pablo)		Road 20 (San Pablo)	
Movement	Shared Through-Right Lane (sec)	Exclusive Right-Turn Lane (sec)	Shared Through-Right Lane (sec)	Exclusive Right-Turn Lane (sec)	Shared Through-Right Lane (sec)	Exclusive Right-Turn Lane (sec)	Shared Through-Right Lane (sec)	Exclusive Right-Turn Lane (sec)	Shared Through-Right Lane (sec)	Exclusive Right-Turn Lane (sec)
Northbound PM Peak Hour	208.7	150.8	472.1	410.5	35.0	19.4	N/A[1]	N/A[1]	176.8	137.9
Southbound AM Peak Hour	338.7	232.2	223.4	106.4	136.1	106.8	22.1	21.6	637.7	112.4

Traffic Volumes Source: San Pablo Avenue Corridor Project – 2017 Existing Conditions Analysis

Notes: Delays shown are average delays for through traffic, reported in seconds

Existing volumes, does not assume any vehicle diversion to parallel or alternate routes

[1] *San Pablo Dam widens in the Northbound Direction with a free right-turn lane today; thus, a right-turn lane is anticipated to be preserved*

A side-running transit lane configuration has a similar constraint on the overall roadway width, requiring right-turn vehicles either to share the lane with the bus or to share space with cyclists at intersections, as shown in **Figure 9**. While requiring the bicyclists to share space with autos is not desirable from a safety and comfort perspective, due to the geometry of the corridor, trade-offs in congestion and transit travel times can be significant. A shared bus and right-turn lane is shown to introduce additional delays to transit travel times at some locations, as shown in **Table 8**. Therefore, a shared bicycle and right-turn lane is necessary at certain key locations to limit impacts to bus operation.

Figure 9: Side-running Right-turn Scenarios

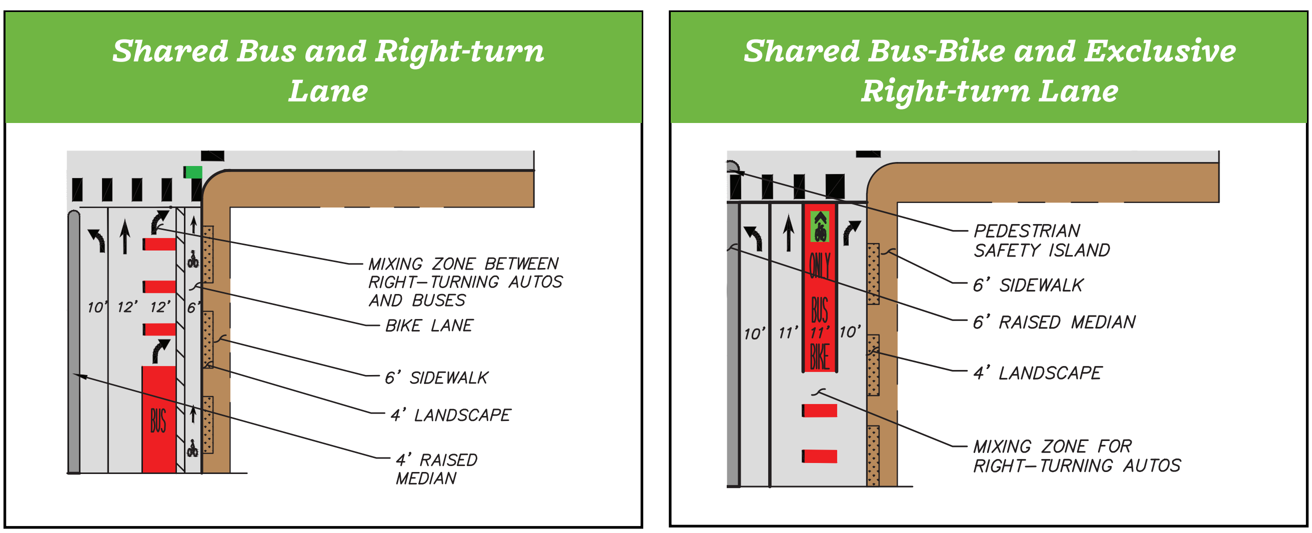


Table 8: Average Additional Delay Associated with Shared Bus and Right-turn Movement (Side-running Bus Scenario)

	Transit Delay from Shared Transit/Right-turn Lane				
	Central Ave (sec)	Hill Street (sec)	Solano Ave (sec)	San Pablo Dam (sec)	Road 20 (sec)
Northbound PM Peak Hour	23.8	1.7	2.7	N/A[1]	0.3
Southbound AM Peak Hour	81.9	461.1	112.6	0.0	136.4

Traffic Volume Source: San Pablo Avenue Corridor Project – 2017 Existing Conditions Analysis

Notes: Delays shown are average delays for through traffic, reported in seconds

Existing volumes, does not assume any vehicle diversion to parallel or alternate routes

[1] San Pablo Dam widens in the Northbound Direction with a free right-turn lane today; thus, a right-turn lane is anticipated to be preserved

Parking and Bike Lane Opportunities

Limitations in right-of-way along San Pablo Avenue determine the combination of facilities that can be implemented along the corridor. Where space is limited, jurisdictions will need to evaluate the trade-offs between prioritizing parking or bike facilities. In some locations, a parking lane and Class IV cycle track can both be provided. In other locations, a bike lane can be provided if parking is removed, or parking can be provided instead of a dedicated bike facility. In the locations that include parking instead of a bike facility, providing bicycle facilities on parallel roadways or trails, where such facilities exist, can serve to provide a north-south connection for cyclists.

Appendix C provides maps of the corridor that indicate the range of parking and bike lane treatments available for both center-running and side-running alternatives, prioritizing either parking or bike lanes.

Transit Line Network Modifications

Bus Stop Spacing and Access

AC Transit has established a service standard of a 1,300-1,900 foot (approximately 1/3 mile) stop spacing for a BRT service (Board Policy No. 501). Maintaining an overlay of local service with more frequent stops (as is the case with the 72 and 72R today) may introduce complexities both for corridor configuration (how to avoid bus bunching and lane blockages) and user uncertainty (should they try to board a local bus or a BRT). Rapid stops are currently spaced approximately every 1/2 mile, while local stops are spaced generally 1/8 to 1/6 mile apart. Making stops too frequent slows the bus down, impacting all of the through riders. Making stops too infrequent introduces challenges in accessing transit, particularly for disabled or elderly riders. Therefore, an analysis was performed to assess optimal BRT stop spacing, stop placement, and the effect on existing Line 72 series riders.

Stops were placed generally consistent with the 1/3 mile spacing target, but fit to the roadway network, transit network, and key land use attractions in the surrounding area. Stop placement does vary slightly for center-running and side-running based on the placement of driveways and signals. For a side-running BRT configuration, BRT stops would also be utilized by other local routes operating on the corridor. For a center-running BRT configuration, BRT stops would be located in the middle of the street and an additional set of local stops would be located curbside in any segments where local bus service would remain.

Each existing bus stop was evaluated based on the number of passenger boarding and alightings, the routes served by the stop, and proximity to community facilities (such as schools, senior centers, and human service locations). Based on the evaluation, bus stops were proposed for as remaining in place and experiencing no location change (amenities would be upgraded), relocating the bus stop less than 100 feet from its current location with additional amenities, removing the bus stop, or providing a new bus stop.

Based on the methodology applied, the potential overall changes in the number of stops is shown in **Table 9**.

Table 9: Hybrid Stop Spacing Summary

Segment	Existing	Center-Running	Side-Running
Number of Rapid/BRT Stops	11 NB/11 SB	19 NB/19 SB	19 NB/19 SB
Number of Stops with Local Service	35 NB/35 SB	20 NB/18 SB	23 NB/24 SB
Average Rapid/BRT Spacing	3,100’	1,900’	1,800’
Average Local Stop Spacing	1,000’	N/A*	N/A*

**Local stops would only be placed in segments with existing local bus service (Lines 7, 74, 76, and school routes)*

While the number of stops would be greatly reduced, the increase in additional walking distance for existing passengers would be small. As shown in **Table 10**, the weighted average additional distance that riders would need to walk to a BRT stop ranges from 95 feet to 160 feet relative to their current walk distance. Additionally, over 60% of existing riders would not experience a change in their stop location and 1% to 10% would have more service at the stop they are currently using.

Table 10: Station Access Impacts Summary

	Center-Running	Side-Running
Percentage of Passengers with No Change to Stop	65%	62%
Percentage of Passengers More Service at Existing Local Stop	1%	10%
Percentage of Passengers with Relocated Stop (moved <100’)	<1%	1%
Percentage of Passengers whose Existing Stop is Removed	33%	27%
Average Additional Walk Distance to Hybrid BRT Stop (weighted by ridership)	160’	95’

Future phases of the project will refine the stop placements based on community input, design evaluation, and further analysis.

Route 72M Trip Patterns

While Line 72 and 72R operate on San Pablo Avenue all the way from Downtown Oakland to Contra Costa College, route 72M currently operates from downtown Oakland only to Macdonald Avenue in Richmond, where it turns to head towards Point Richmond. Combining Lines 72R and 72 into a single BRT service allows for a more frequent, legible, and consistent service with more effective stop configurations. However, options are available for the future configuration of the 72M. The service can be truncated where it connects to San Pablo Avenue at El Cerrito del Norte station, essentially becoming a shuttle from Point Richmond to the BART Station and San Pablo BRT. This would allow reallocation of the Line 72M service on San Pablo Avenue to the BRT, allowing for a more frequent and consistent headway for transit service on San Pablo Avenue, benefiting transit riders all along San Pablo Avenue down to its southern terminus. However, it would then introduce a transfer for many Line 72M riders. Alternatively, Line 72M could extend to El Cerrito Plaza Station or even into Alameda County, thereby reducing transfers, but also diminishing the frequency and reliability of service on San Pablo Avenue.

To asses the optimal configuration of Line 72, the project team analyzed ridership and on-board survey data to better understand trip patterns on the service. An analysis of 2017/2018 on-board survey data provided information related to Line 72M passenger origins and destinations. The survey responses showed that of the passengers who began their trip in Richmond, 32% were staying within Richmond, followed by 24% going to Berkeley and 20% going to Oakland. For the trips that were ending within Richmond, 29% were starting within Richmond, followed by 18% starting in Oakland. The top two stations for transfers from the 72M to BART are the Richmond and El Cerrito del Norte BART stations. An analysis of bus-to-bus transfer connections for Line 72M found that there are substantially more connections available at El Cerrito del Norte BART station than at El Cerrito Plaza BART station. Finally, an analysis of Line 72M passenger load, as shown in **Figure 10** and **Figure 11**, indicates that the low point for load on the central part of the route is just past the El Cerrito del Norte BART station.

Thus, the data is generally mixed in terms of determining a logical southern terminus for Line 72M. Supporting truncation at El Cerrito del Norte are load data, transfer opportunities, and opportunities for optimizing San Pablo Avenue service. However, the on-board survey data indicates that a number of Richmond riders would need to transfer to reach their destination if the route isn't extended further south. Discussion with AC Transit over the course of the project concluded that the route should be truncated at one of the two El Cerrito BART stations, with further analysis and rider engagement needed to make a final determination.

Figure 10: 72M Northbound Daily Passenger Load

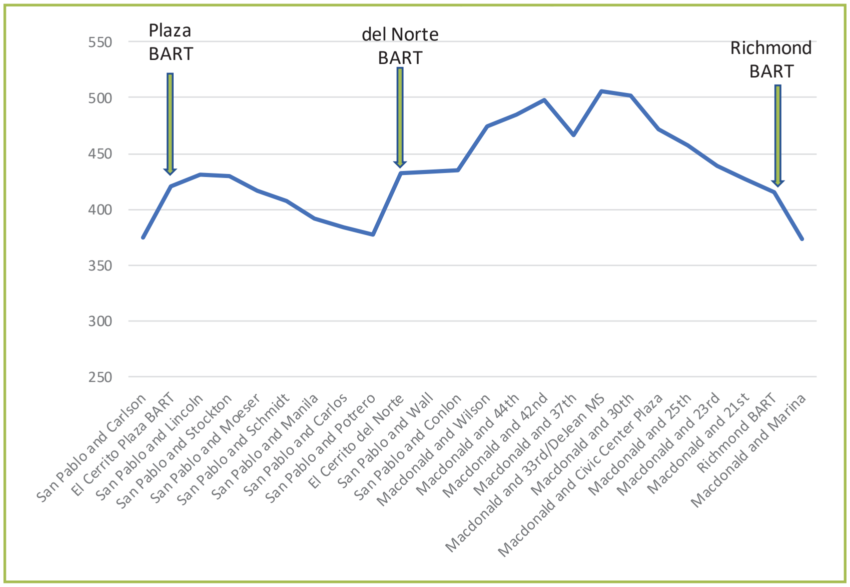
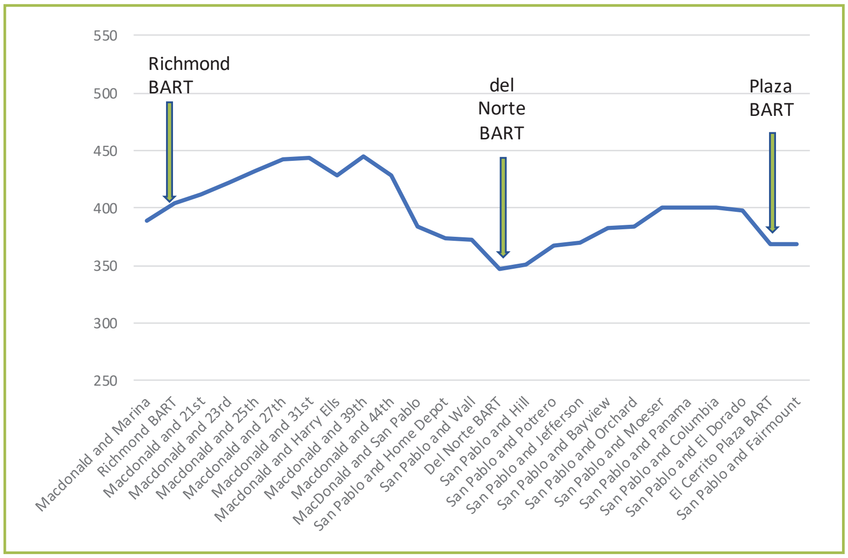


Figure 11: 72M Southbound Daily Passenger Load



Simulation Analysis

At the outset of this phase of technical work, some of the key questions to be answered by this study included:

- How much traffic would divert off of San Pablo Avenue if a mixed-flow travel lane in each direction were converted to bus only?
- How much faster would the bus travel if it had a dedicated lane?
- What amount of auto congestion would result if a lane in each direction was converted to bus-only?
- What difference in performance is there between side-running and center-running BRT?

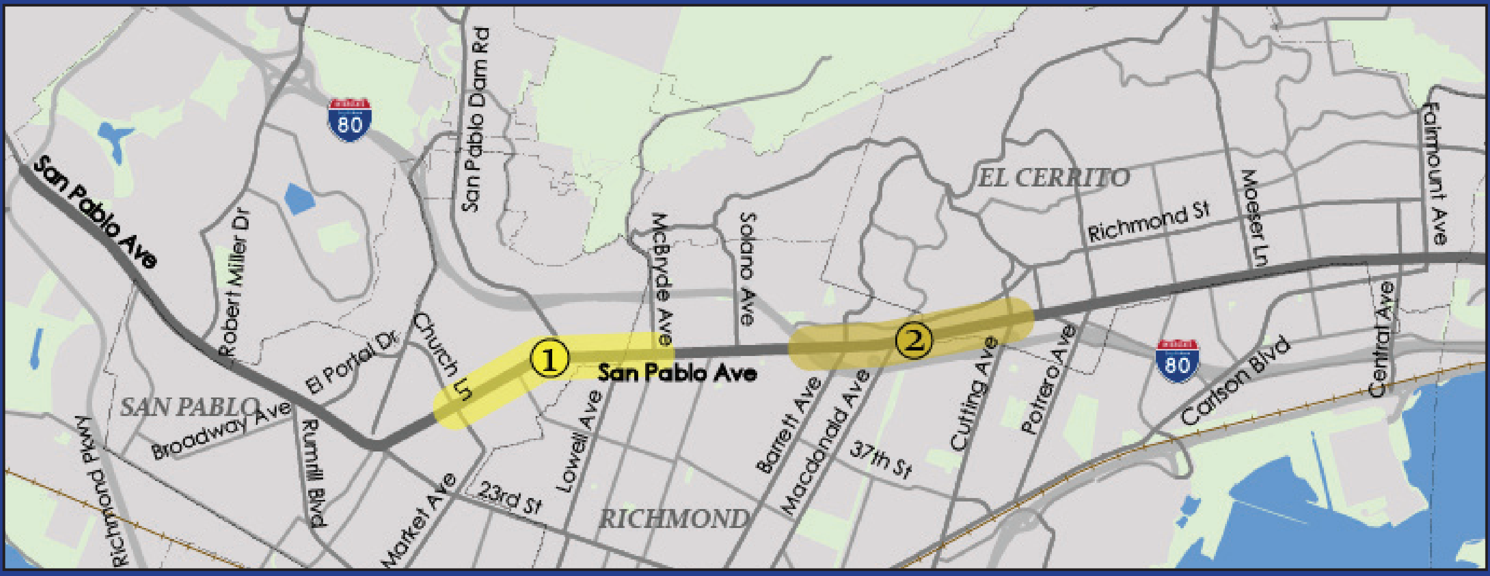
In order to effectively answer these questions, the project team created a microsimulation model using the VISSIM modeling platform. The VISSIM model was calibrated to existing (pre-pandemic) conditions based on FHWA and Caltrans calibration standards. A future year (2035) model was created to forecast future conditions. Then both center-running and side-running BRT alternatives were modeled to determine their effect on transit and auto performance.

Budget was not available to model the entire approximately 7 mile segment within the study area. Instead, the traffic simulation modeling was completed for two 1-mile segments along San Pablo Avenue, (1) Church Lane to McBryde Avenue and (2) Eastbound I-80 ramps to Cutting Boulevard, as shown in **Figure 12**. These segments were selected because they both were deemed representative of typical conditions on the corridor and reflected the differing volumes and geometries in different geographic areas of the study area. Modeling segment (1) was selected to include higher bus ridership and the slowest speed segment in the cities of San Pablo and Richmond. Segment 1 included seven signalized intersections and three center-running or side-running stations. Modeling segment (2) was selected because it includes several freeway and BART station access streets within the cities of Richmond and El Cerrito. Segment 2 included seven signalized intersections (including Ohlone Greenway) and two BRT center-running or side-running stations.

The model was utilized to calculate the following metrics:

- Transit travel time and variability
- Auto travel time
- Intersection delay and LOS
- Network-wide metrics on delay and vehicles served

Figure 12: VISSIM Modeling Segments



Existing PM (4-6 PM) Peak Period Model → **Future Year (2035) No Build Models** → **Diversion Estimation** → **Future Year (2035) Build Models**

Existing Conditions = 2017

Calibrate model to 2017 conditions (volumes and travel times, transit schedules, infrastructure)

Future Year (2035) forecasts assume 15-20% growth over existing (2017) traffic volumes

Add roadway projects and signal operations changes built/planned between 2017 and 2035. No transit network changes are assumed.

Adjust traffic volumes to account for diversion associated with reduced auto capacity and prioritized transit on San Pablo Avenue. Diversion consists of a combination of mode shift to the faster bus service, selection of a different route other than San Pablo Avenue, and travel at a different time of day with less congestion.

Iterate through diversion scenarios based on congestion and queuing levels to determine how much traffic the corridor can serve.

Incorporate the two build alternatives (center-running and side-running) based on design alternatives selected by stakeholder agencies.

Model Overview - Diversion Analysis Process

1. Identify the key travel markets (regional and local trips)
2. Identify potential alternative routes and how traffic would connect to these routes (shown in **Figure 13**)
3. Compare travel time on potential diversion routes to assess desirability
4. Estimate changes to traffic volumes for various modeled auto routes
5. Reflect constrained capacity on local (non-highway) alternative routes

Figure 13: Diversion and Auto Parallel Networks

Estimated Reduction in Peak Hour Auto Volume on San Pablo Avenue

Based on the diversion assessment, the percentages in **Table 11** reflect the forecast equilibrium diversion amounts with each alternative. The percentages provided indicate the magnitude of baseline traffic on San Pablo Avenue that would divert to alternative routes, switch to another mode, or shift their trip to outside of the peak hour.

Table 11: Change in Peak Hour Auto Volume by Segment as a Result of Vehicle Diversion

	Direction	Side-running	Center-running
Segment 1 *Church to McBryde*	NB	-28%	-33%
	SB	-16%	-16%
Segment 2 *1-80 Ramps to Cutting*	NB	-29%	-34%
	SB	-19%	-19%

Bus and Auto Travel Time and Reliability Results

The analysis concluded that bus travel time variability decreases by over 50%-80% with both center and side-running options. Reduced variability translates into improved transit reliability, which is often identified as the most critical need for existing and prospective transit riders. When high-quality BRT options are implemented, there is typically a 30%-35% increase in ridership. **Figure 14** shows the change in bus travel time for both the side-running and center-running alternatives. **Figure 15** shows the corresponding changes to auto vehicle travel times.

Figure 14: Bus Travel Time Comparison

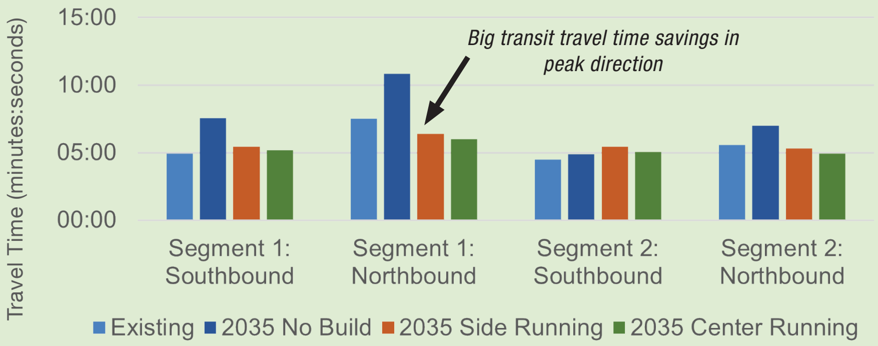
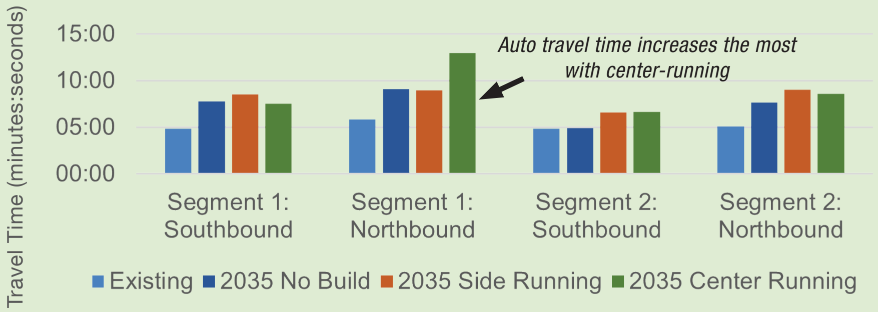


Figure 15: Auto Vehicle Travel Time Comparison



Options for Next Steps

Next Steps

During presentations to elected bodies and the WCCTAC Technical Advisory Committee, stakeholder agencies have indicated initial interest in moving components of the projects forward.

An initial, near-term, phase of work could include the design and construction of pedestrian and bicycle safety improvements at locations with a history of collisions or existing safety hazards.

The safety improvements could include a mix of improvements that would make it easier to cross the street for cyclists, pedestrians, and transit users, remove safety hazards at bus stops, enhance bus stop waiting areas, and improve transit reliability. Pedestrian and bicycle treatments could include upgrading unprotected crossings with a Pedestrian Hybrid Beacon (PHB) or Rectangular Rapid-Flashing Beacon (RRFB), adding additional crosswalks at signalized intersections, and provide enhanced bike crossings at existing bike connections. Modifications to vehicle movements at intersections could include removing pork chops/free-right turn lanes and adding in side-street bulbouts in order to reduce traffic speeds and provide safer pedestrian crossings. In addition to enhancing safety for transit access, improvements could also benefit transit reliability. Examples include: adding bus bulbs to enlarge existing Rapid stops and allow in-lane stopping, consolidating bus stops that are close together, and relocating near-side bus stops to the far-side of the intersection to improve pedestrian visibility and reduce signal delay for buses. In some areas of the corridor, many of these improvements have already been identified as part of previous planning efforts, such as the San Pablo Bicycle/Pedestrian Corridors Project and El Cerrito San Pablo Specific Plan, but currently remain unfunded.

Appendix D includes the map of an initial set of potential near-term safety improvements. Further analysis and design development is needed to confirm the specific locations and countermeasures to be included in such a program, as well as the estimated cost and funding strategy for the implementation. A circulation analysis of the proposed changes would be needed to assess and minimize the effect of traffic calming and pedestrian priority improvements on bus progression. Coordination with local agencies, including the transit operator, would also be needed to discuss the specific nature and design configuration of the improvements.

In addition to the safety improvements, a near-term project could include a side-running bus lane demonstration project, similar to what is currently being advanced on San Pablo Avenue in Alameda County. The demonstration project would allow for the evaluation of transportation patterns and safety, as well as an opportunity to collect community feedback on the project in order to inform future improvements to the corridor.

A side-running bus lane demonstration project, including design plus environmental and construction, is estimated to cost between $20 - $25 Million per mile. Next steps on this effort would include conceptual design effort to identify specific locations and treatments for the side-running improvements. As part of this effort, survey on the corridor would be needed to confirm corridor dimensions and identify physical barriers. The microsimulation models could be expanded to evaluate the proposed improvements within the determined project limits. Cost estimates would be developed to allow the project team to pursue funding. Service planning would also be performed to maximize utility of the bus lane. This could include analyzing bus stop spacing, service frequency, bus route patterns, and service to the El Cerrito Plaza BART station.

Portions of the corridor (south of Cutting Boulevard) are on the state highway network and coordination of any improvements with Caltrans would be required. Discussions with Caltrans would determine the appropriate review and approval process.

If desired by decision-makers, further consideration of a center-running BRT project can be advanced as well. A logical next step would be further concept engineering development to understand implications on community access, analyze traffic/circulation, develop cost estimates, and assess funding viability.

Any of the next step options would require substantial community engagement to determine community priorities, obtain input on trade-offs, and build consensus around a set of desired solutions. An equity analysis is also encouraged to assess the implications of proposed improvements on equity in the corridor.

Following conceptual design and community engagement efforts, a California Environmental Quality Act (CEQA) process will be needed. It is likely that the project will qualify for one or more exemptions, as it is aligned with statewide sustainability goals, streamlining the CEQA process.

Local agency support is critical to advance any near-term or long-term project phases. A key component of the project's viability is partnership with the jurisdictions involved, including policy-maker input, coordination on engagement activities, and the inter-relationship with land use policies and approvals. Strong local agency support will be an essential component in securing project funding. As part of the next project phase, it is recommended for each involved jurisdiction to adopt a resolution supporting the project definition that is being advanced.

Funding Opportunities

Construction cost estimates have not been developed as part of Phase 2 of this plan. However during Phase 1 of the plan, preliminary construction costs estimates were completed for a ~3 mile section in Alameda County from Oakland to Emeryville. These cost estimates ranged between $177 Million for a side-running bus lanes with bike lane to $209 Million for center-running bus lanes with bike lanes. Costs included a wide variety of related and ancillary improvements, including protected bike lanes, lighting improvements, roadway reconstruction, utility relocation, and landscaping/aesthetic treatments. See *San Pablo Avenue Corridor Project Phase 1 Concept Summary Report* for more detail on this cost estimate. Alameda County is currently advancing a lower-cost near-term project with side-running bus lanes that do not include the full magnitude of roadway reconstruction.

Improvements proposed for consideration in this project phase are oriented around improving safety, enhancing mobility choices, and achieving sustainability goals, aligning them well with local, state, and federal grant programs, including those listed below. Note that a variety of funding sources will likely be required to implement the improvements. A variety of local and state funding sources can be leveraged as local matches for federal funding.

CONTRA COSTA transportation authority

Contra Costa Transportation Authority - In 2004, Contra Costa voters approved the Measure J Expenditure Plan, a half cent transportation sales tax through 2034. Future renewals of this sales tax could present new opportunities for transportation project funding.

METROPOLITAN TRANSPORTATION COMMISSION

Metropolitan Transportation Commission (MTC) Regional Measure 3 (RM3) - RM3 was approved by Bay Area voters in 2018 to fund $4.45 Billion in transportation projects by increasing the bridge toll on bridges in the Bay Area. Two projects included in RM3 are associated with improvements on San Pablo Avenue: The Interstate 80 Transit Improvements Project, which specifically included funding for the San Pablo Avenue Multimodal Corridor, was allocated $25 Million and the AC Transit Rapid Bus Corridor Improvements Project, which will fund AC Transit bus corridor projects, was allocated $100 Million. RM3 is currently under litigation and, while funds are currently being collected and deposited into an escrow account, no funds will be made available until or if a successful legal outcome is reached. Named RM3 projects, such as the San Pablo Avenue Multimodal Corridor, are eligible to receive MTC Commission approval under the Letter of No Prejudice (LONP) process to move forward with a specific scope of work using non-RM3 funds and be reimbursed with RM3 funds if and when RM3 litigation is resolved.

California Transportation Commission

California Transportation Commission (CTC) - Road Repair and Accountability Act of 2017 (SB1) - The SB1 program has had three cycles of funding, 2018, 2020, and most recently 2022. The 2022 Program will cover funding for fiscal years 2023-24 and 2024-25. Funding from both programs from SB1, Solutions for Congested Corridors Program and Local Partnership Program (LPP), are available for the construction phase of projects.

- ***Solutions for Congested Corridors Program (SCCP)*** *- The SCCP is a statewide program which aims to reduce congestion throughout the state. The program has $250 Million available annually for eligible projects and awarded funding to seven projects in the 2020 Program. To be eligible for program funding, projects must be identified in a currently adopted regional transportation plan and an existing comprehensive corridor plan. Projects funded through this program do not require a funding match.*

– ***Local Partnership Program (LPP)*** *– Competitive and Formulaic - The LPP provides funding ($200 Million annually) to cities, counties, agencies, etc, in which voters have approved fees or taxes dedicated solely to transportation improvements. There are two components to the Local Partnership Programs, competitive and formulaic. The program distributes 60 percent of its funding through the formulaic program and 40 percent via the statewide competitive program. 21 projects were funded through the 2020 Competitive Program (a total of $216 Million over three years) and 177 through the 2020 Formulaic Program (a total of $324 Million over three years). Projects funded through LPP require at least a one-to-one match of private, local, federal, or state funds.*

California State Transportation Agency (CalSTA) Transit and Intercity Rail Capital Program (TIRCP) - Created by SB 862 and modified by SB 9, TIRCP uses the Greenhouse Gas Reduction Fund (GGRF) to award grants to capital improvement projects that will transform California's transit services and reduce greenhouse gas emissions. Through the past five cycles (10 years), the program has awarded $6.6 Billion in funding to nearly 100 projects. The most recent cycle, Cycle 5, awarded $796.1 Million towards 23 projects.

US DOT Rebuilding American Infrastructure with Sustainability and Equity (RAISE) Grant - USDOT RAISE grants are available for road, rail, transit and port projects that promise to achieve national objectives. Project applicants are evaluated on statutory criteria such as safety, mobility, community connectivity, and environmental sustainability. The RAISE grant is an annual grant that is available for planning or capital (construction or right of way acquisition) phases of project development. Through this grant, an up to 80 percent federal funding match is available. Capital RAISE grants have a minimum federal funding amount of $5 Million and maximum of $25 Million. Planning grants have no minimum. The most recent cycle, 2022, awarded $2.2 Billion towards 166 projects.

FTA - Capital Investment Grant (CIG) - The CIG program is a FTA discretionary grant program which funds transit capital investments. CIG program grants are available for the construction phase of projects, but federal transit law requires transit agencies seeking CIG funding complete a series of steps over several years, including FTA project rating at various points in the process to evaluate project justification and local financial commitment. For both of the CIG grant programs, New Starts and Small Starts, projects applying for funding must have completed the project development phase of the project, which includes the environmental review process, review and selection of a locally preferred alternative (LPA), and adoption of LPA into the fiscally constrained long range transportation plan. The first step of the process is to request Entry into Project Development, which requires only a request letter to the FTA. That process typically occurs once the project has developed a realistic funding plan for implementation and has a schedule and plan for project advancement. For the 2022 fiscal year funding, FTA requested $1.117 Billion for 13 existing New Starts projects, $158 Million for two proposed New Starts projects, and $303 Million for six proposed Small Starts projects.

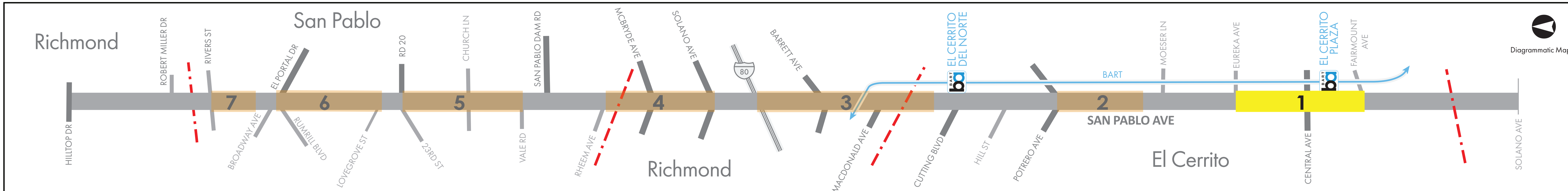
– ***Small Starts*** *- Small Start grants are available annually for projects with total project costs less than $400 Million. Projects are eligible for up to an 80 percent federal match, up to $150 Million. Projects are typically most competitive with a requested federal share of 50 percent or less. This grant is available for the construction phase of projects and requires the completion of project development prior to receiving grant. The Small Starts category typically funds BRT projects similar to the San Pablo Avenue project. It was utilized for the recently completed AC Transit TEMPO project.*

– ***New Starts*** *- New Start grants are available annually for projects with total project costs greater than $400 Million or where the total New Starts funding sought is $150 Million or more. These projects are eligible for up to a 60 percent federal match. This grant is available for the construction phase of projects and requires the completion of project development and engineering prior to receiving grant. While BRT projects may be funded by New Starts, this category often includes heavy rail projects.*

Other, smaller funding sources are often assembled to provide additional local matches or fund project planning and design phases of the project prior to solicitation of the larger programs noted above. These may include regional Bay Area Air Quality Management District grant programs, federal Congestion Mitigation and Air Quality Improvement Program, regionally-selected One Bay Area Grant (OBAG), and other state programs such as the Active Transportation Program and Caltrans Sustainable Communities Transportation Program.

Appendix A

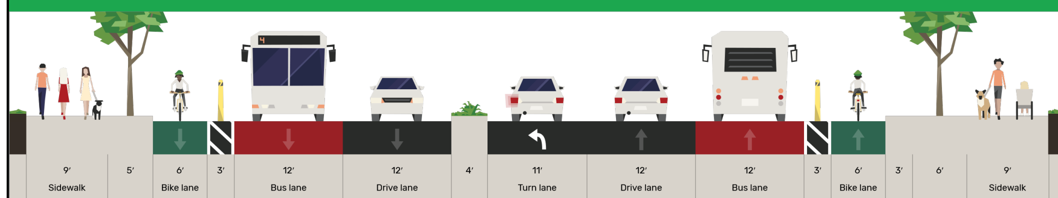
Cross-section Alternatives and Design Prototypes

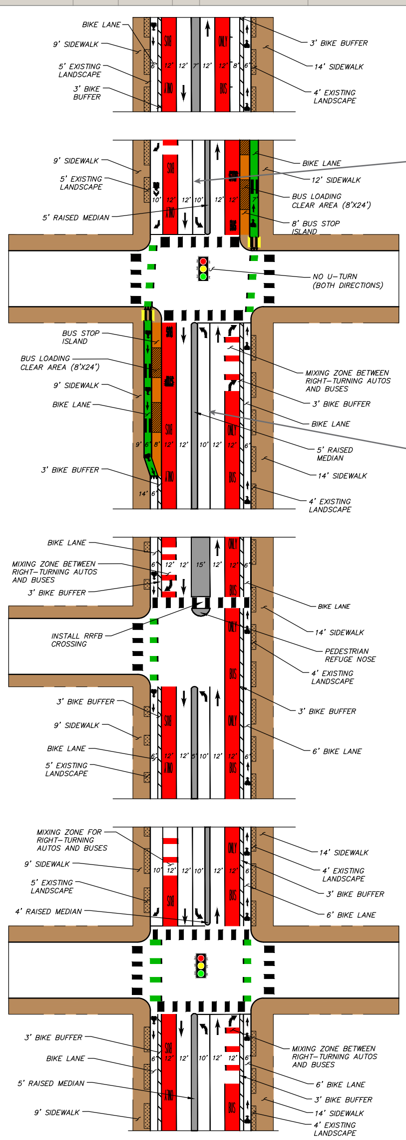


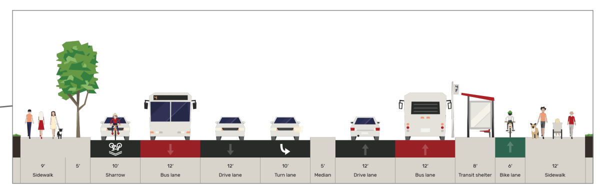
SEGMENT 1 - SAN PABLO AVE BETWEEN FAIRMOUNT AVE AND EUREKA AVE

= ALTERNATIVE SELECTED FOR MICROSIMULATION MODELING

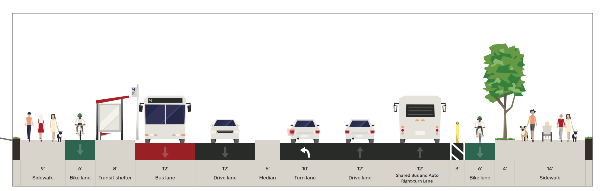
GREEN ALTERNATIVE



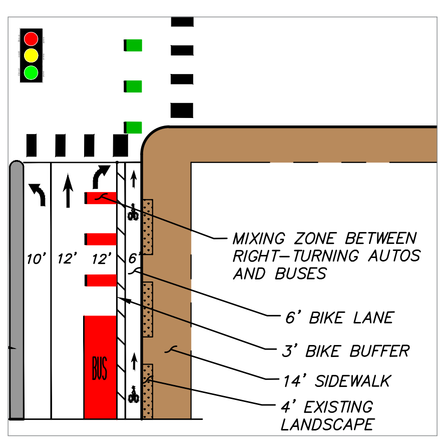




Farside Bus Stop Island Configuration
Shared Bike and Auto Right-Turn Lane

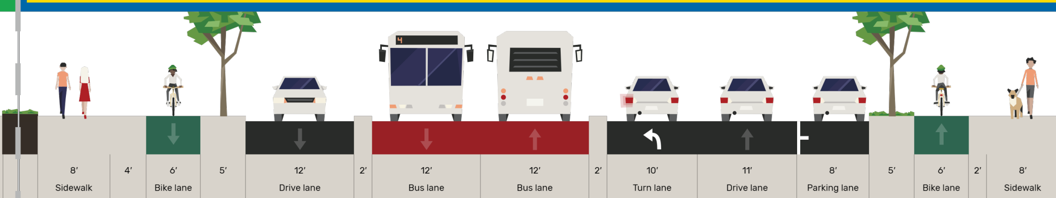


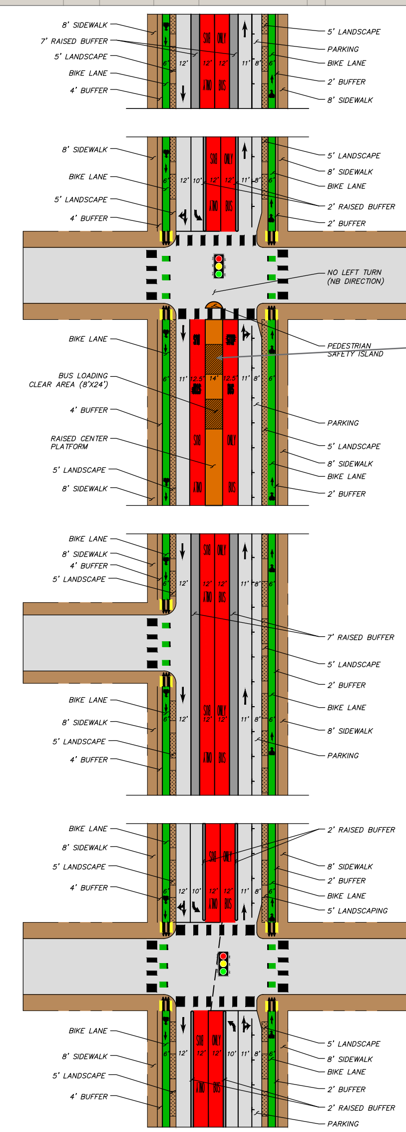
Farside Bus Stop Island Configuration
Shared Bus and Auto Right-Turn Lane

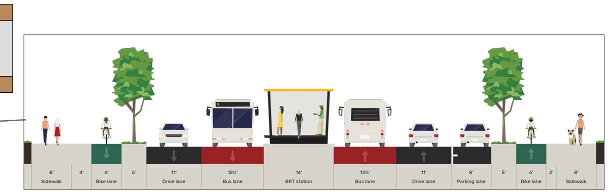


Shared Bus and Auto Right-Turn
with Protected Bike Lane

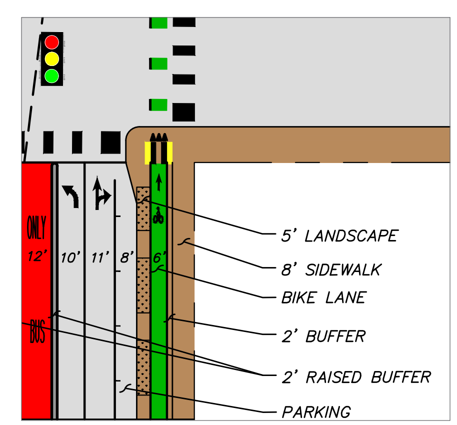
BLUE ALTERNATIVE





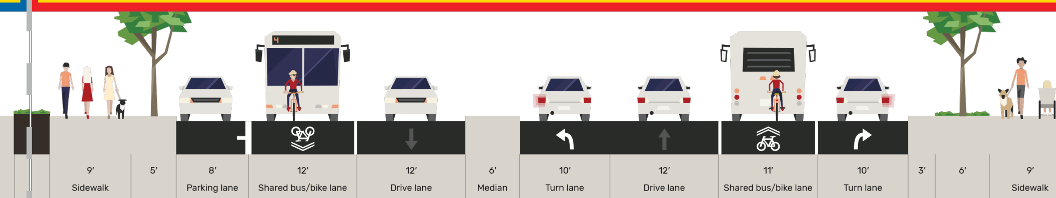


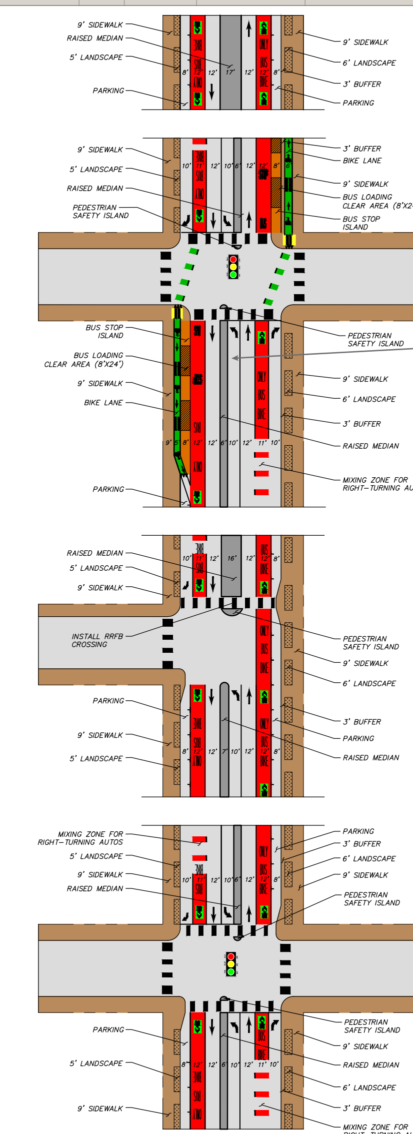
Dual Boarding Center Island Configuration
Protected Bike Lane and Parking

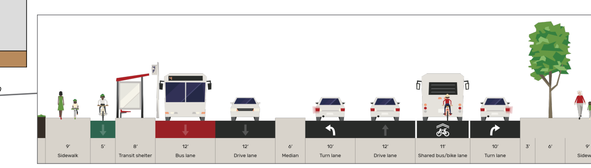


Shared Through-Right with Parking and Protected Bike Lane

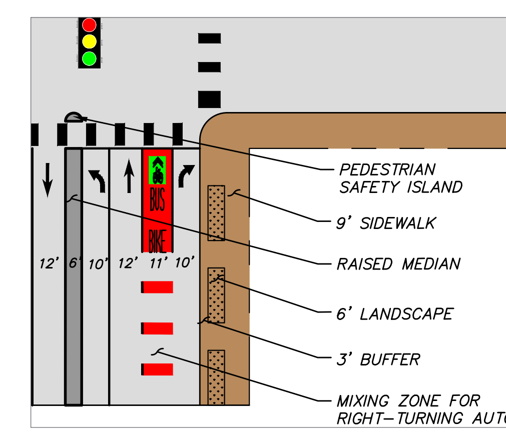
RED ALTERNATIVE



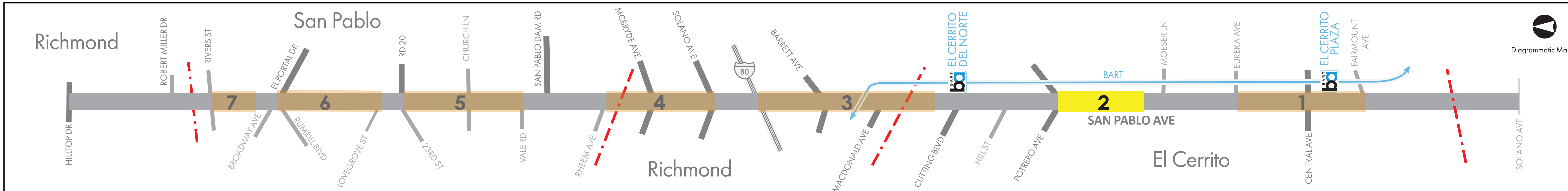




Farside Bus Stop Island Configuration
Shared Bus and Bike Lane with Protected Right-Turn Lane



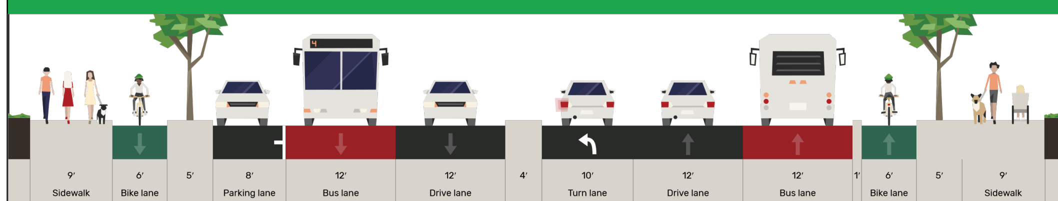
Shared Bus and Bike Lane
with Protected Right-Turn Lane

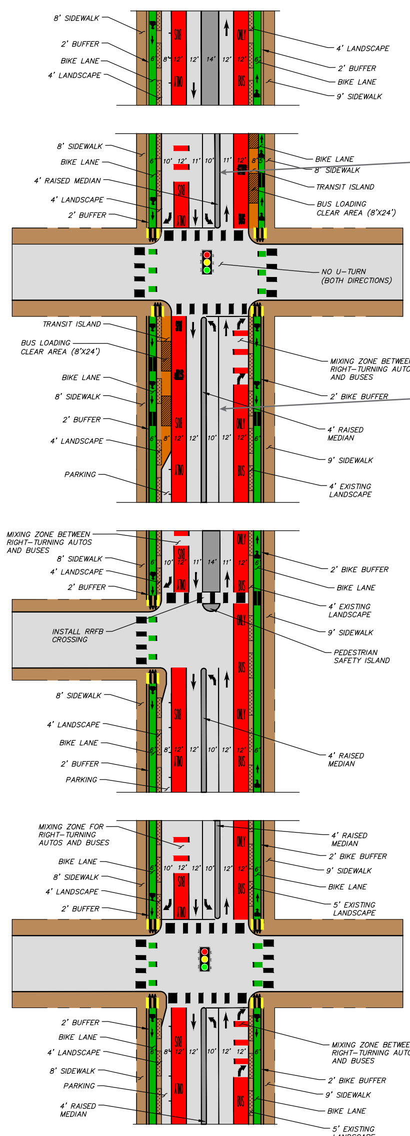


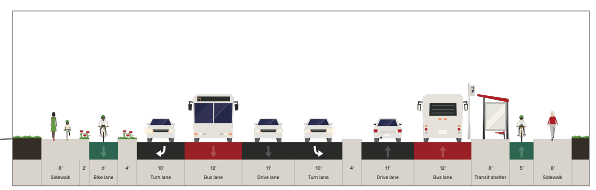
SEGMENT 2 - SAN PABLO AVE BETWEEN SCHMIDT LN AND POTRERO AVE

= ALTERNATIVE SELECTED FOR MICROSIMULATION MODELING

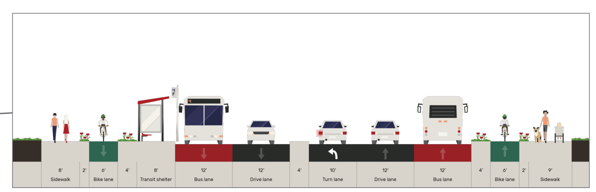
GREEN ALTERNATIVE



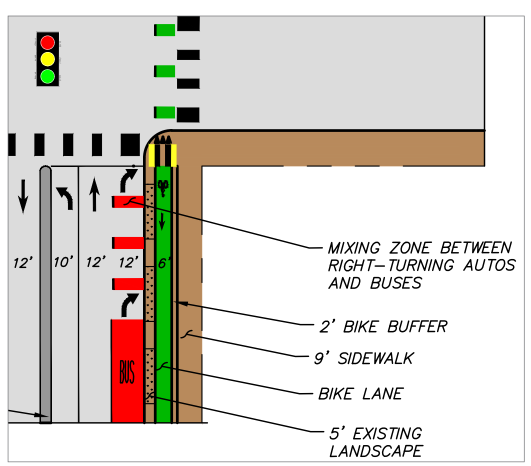




Farside Bus Stop Island Configuration
Protected Bike Lane and Protected Right-Turn Lane

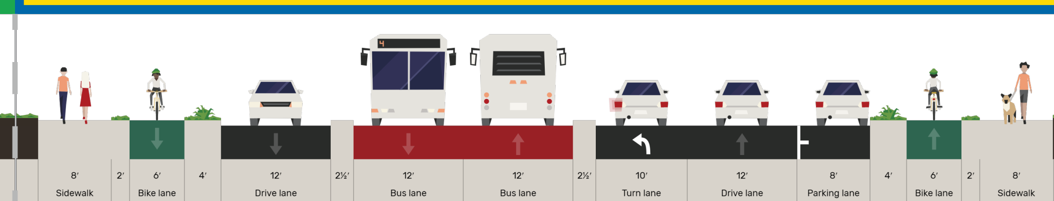


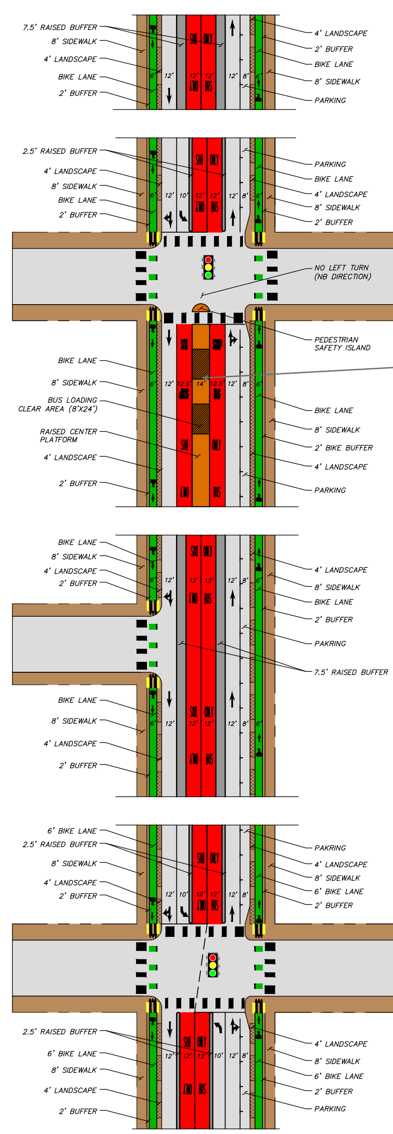
Farside Bus Stop Island Configuration
Shared Bus and Auto Right-Turn Lane

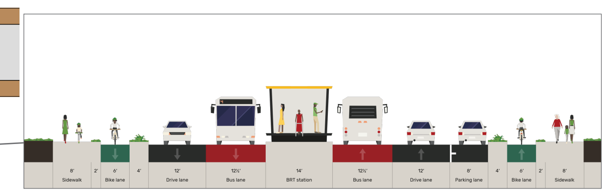


Shared Bus and Auto Right-Turn
with Protected Bike Lane

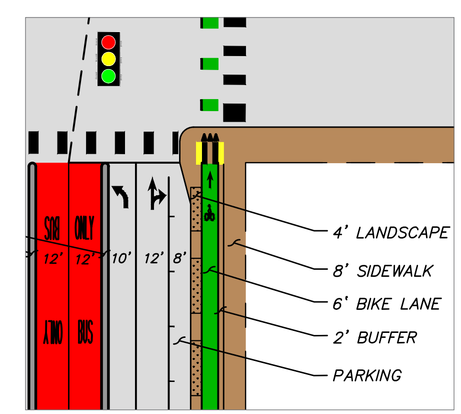
BLUE ALTERNATIVE





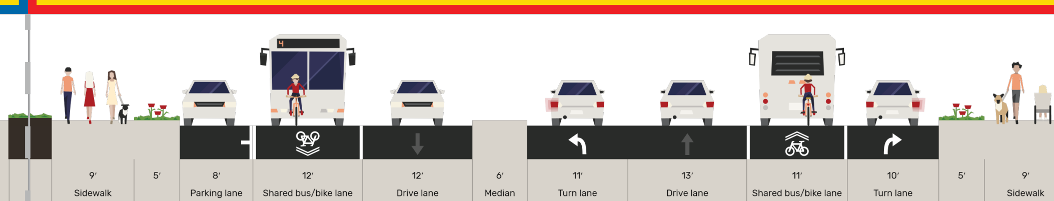


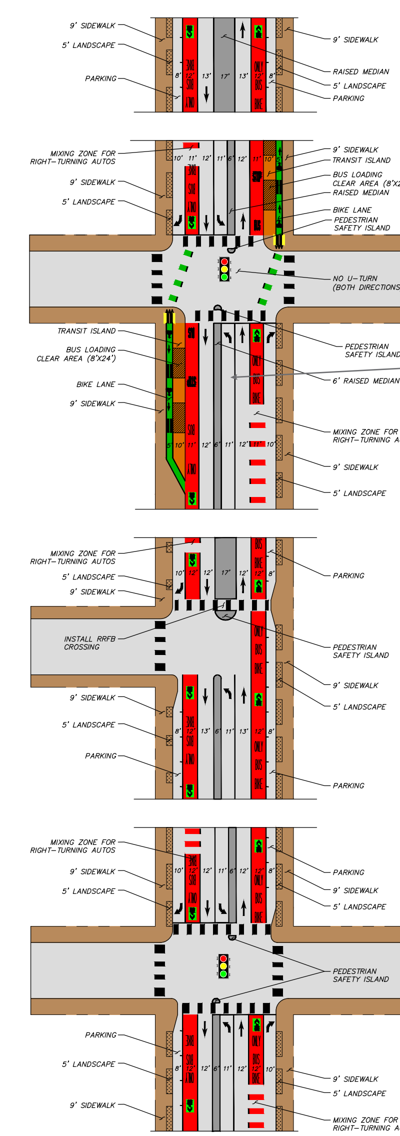
Dual Boarding Center Island Configuration
Protected Bike Lane and Parking

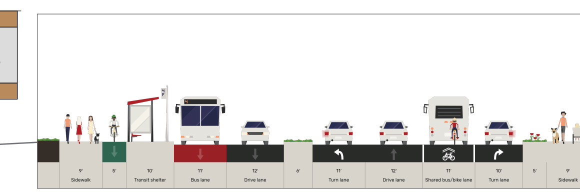


Shared Through-Right with Parking and Protected Bike Lane

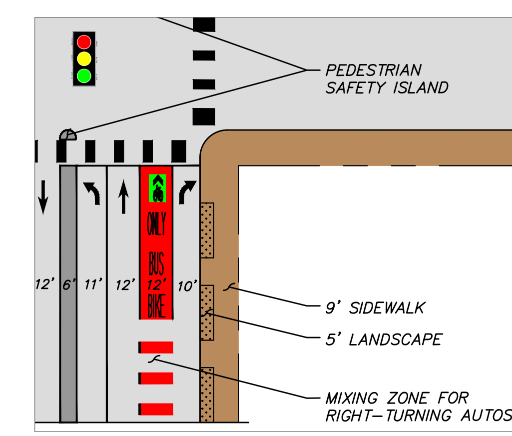
RED ALTERNATIVE



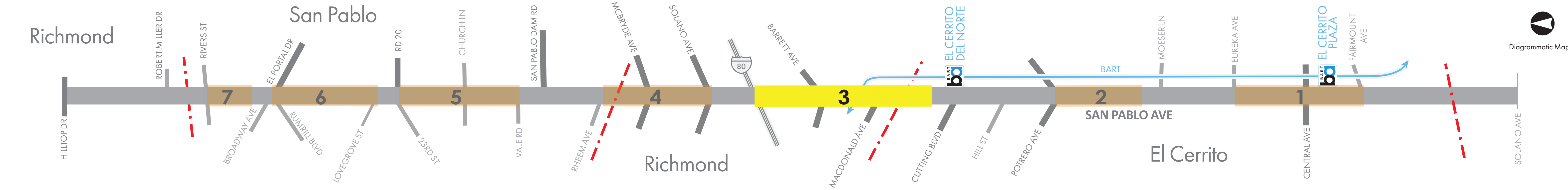




Farside Bus Stop Island Configuration
Shared Bus and Bike Lane with Protected Right-Turn Lane



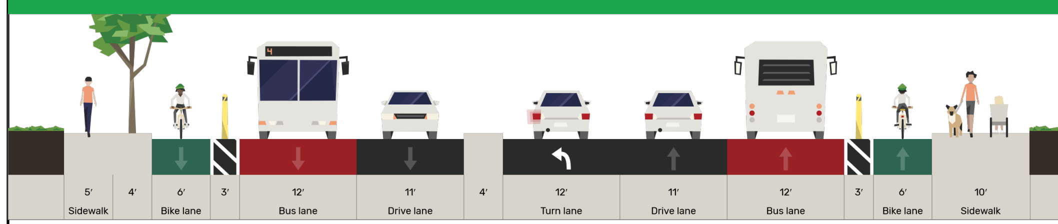
Shared Bus and Bike Lane
with Protected Right-Turn Lane

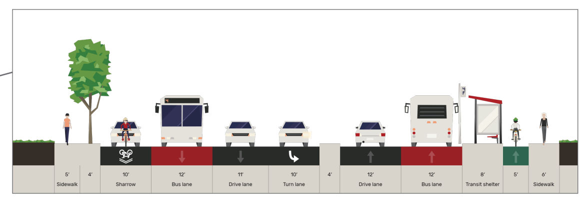


SEGMENT 3 - SAN PABLO AVE BETWEEN WALL AVE AND I-80

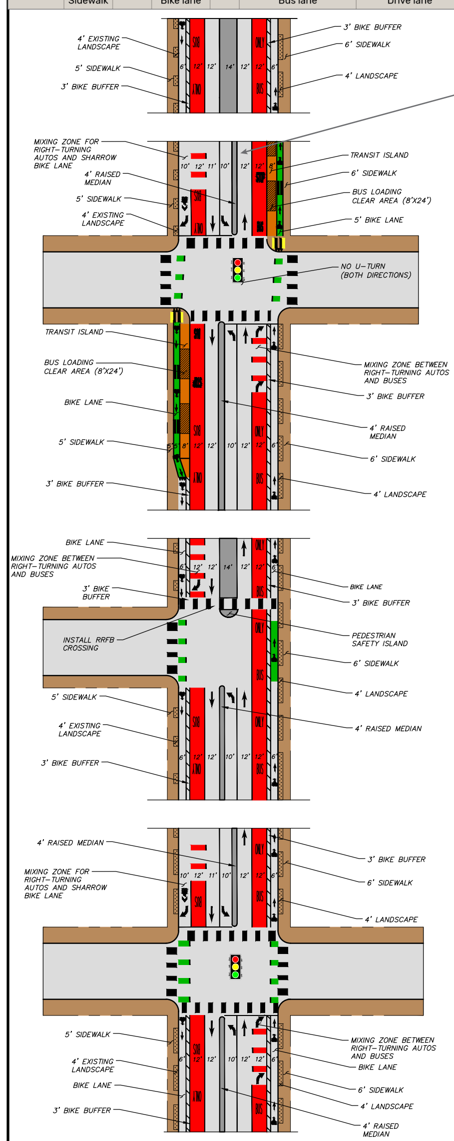
= ALTERNATIVE SELECTED FOR MICROSIMULATION MODELING

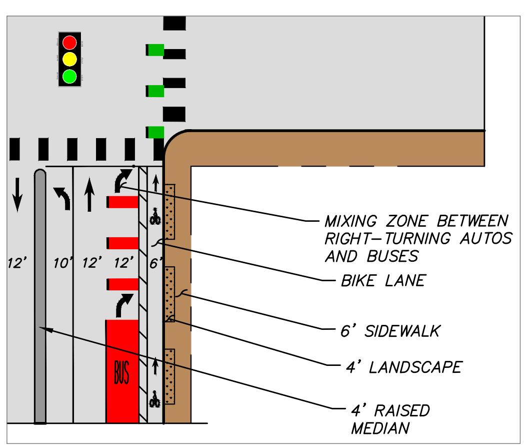
GREEN ALTERNATIVE





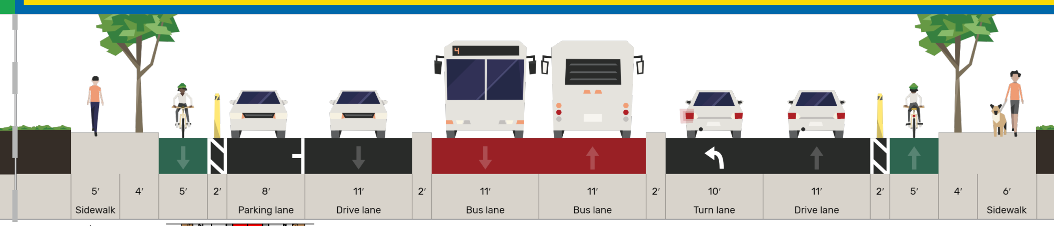
Farside Bus Stop Island Configuration
Shared Bike and Auto Right-Turn Lane

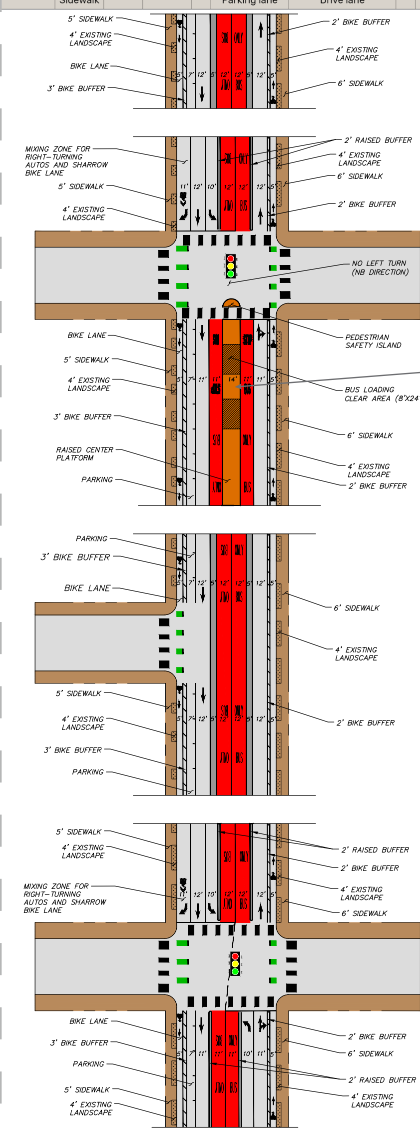


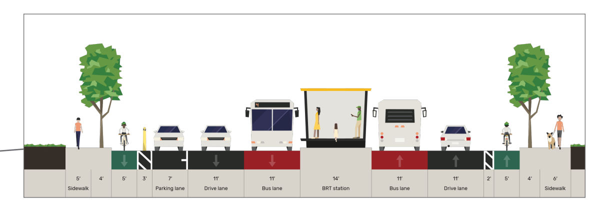


Shared Bus and Auto Right-Turn
with Protected Bike Lane

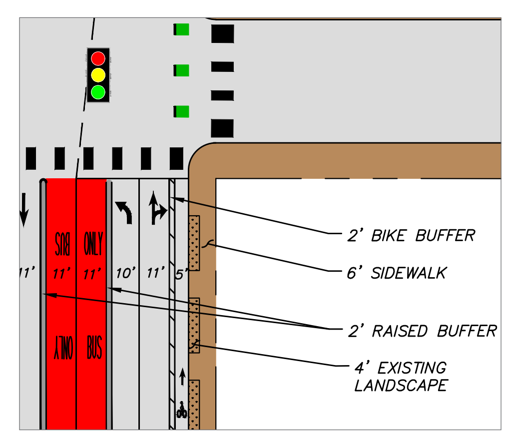
BLUE ALTERNATIVE





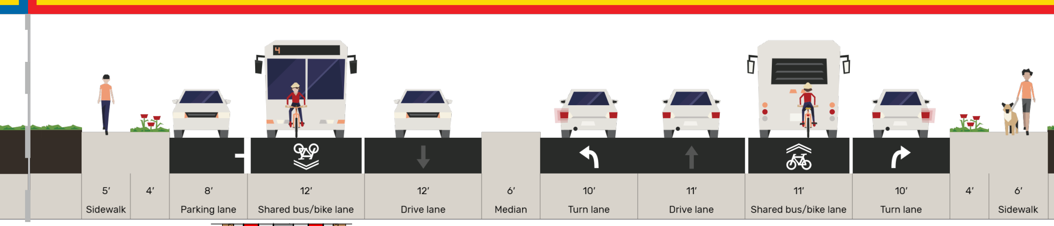


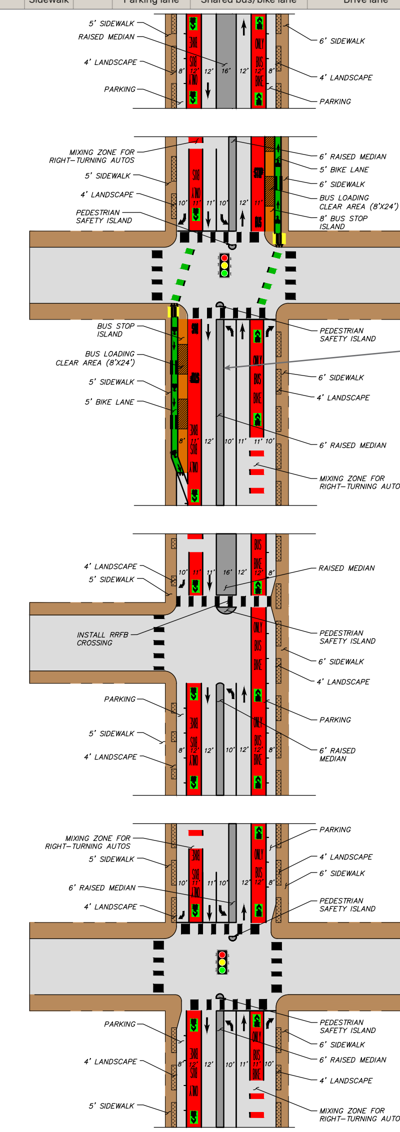
Dual Boarding Center Island Configuration
Protected/Buffered Bike Lane and Parking

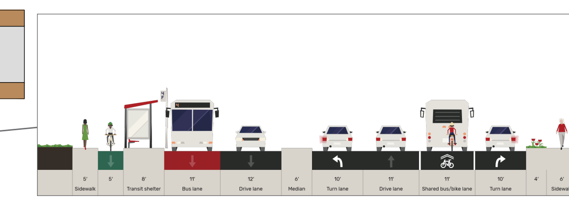


Shared Through-Right and Protected Bike Lane

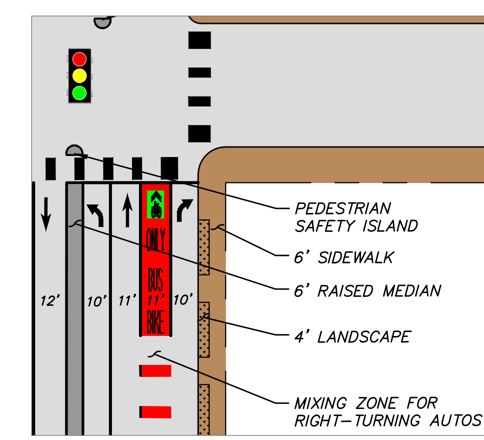
RED ALTERNATIVE



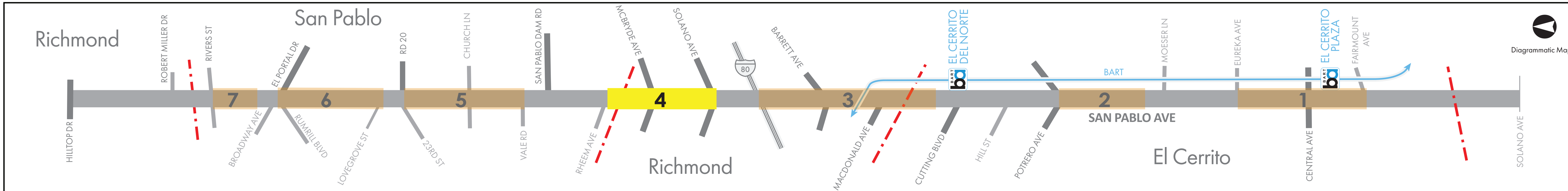




Farside Bus Stop Island Configuration
Shared Bus and Bike Lane with Protected Right-Turn Lane



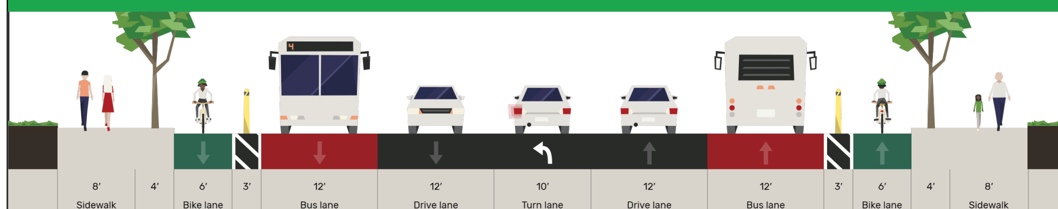
Shared Bus and Bike Lane
with Protected Right-Turn Lane

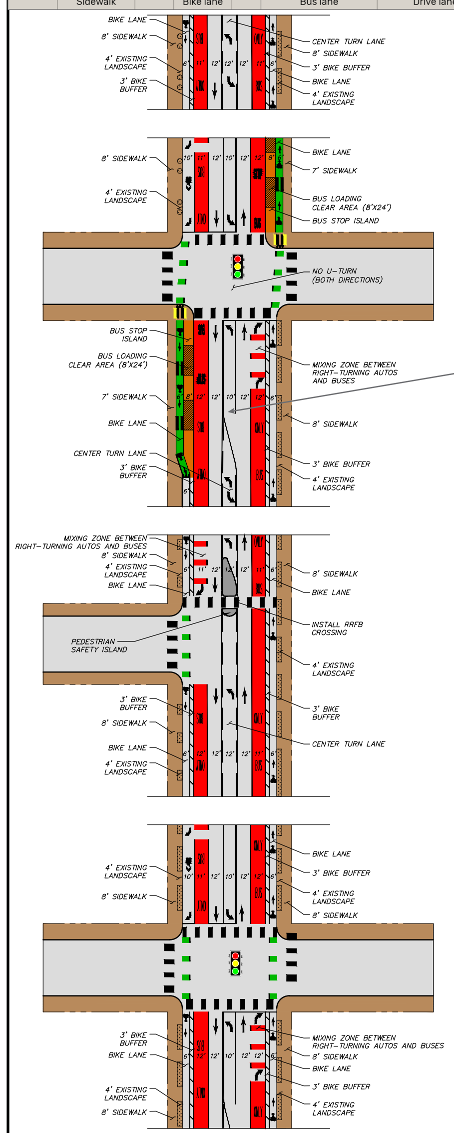


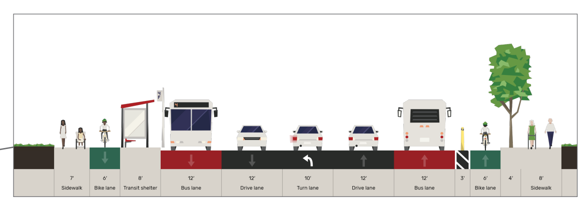
SEGMENT 4 - SAN PABLO AVE BETWEEN SOLANO AVE AND RHEEM AVE

= ALTERNATIVE SELECTED FOR MICROSIMULATION MODELING

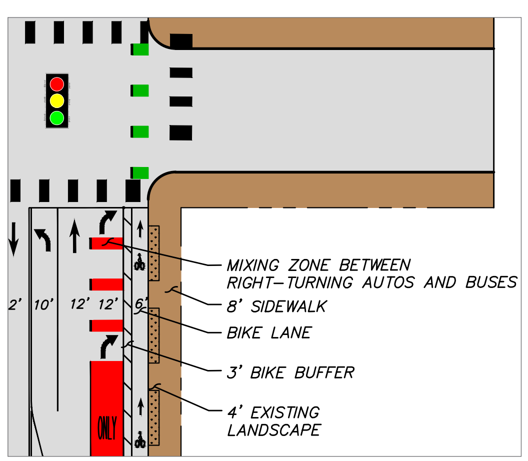
GREEN ALTERNATIVE





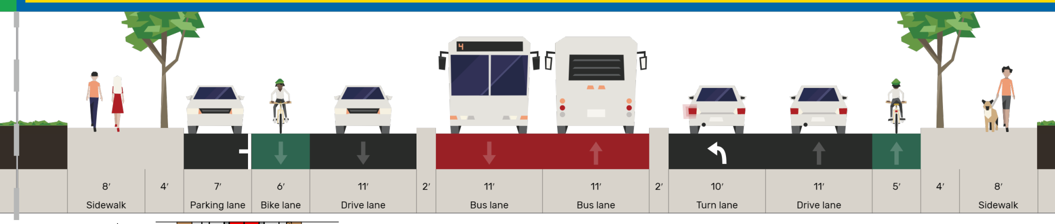


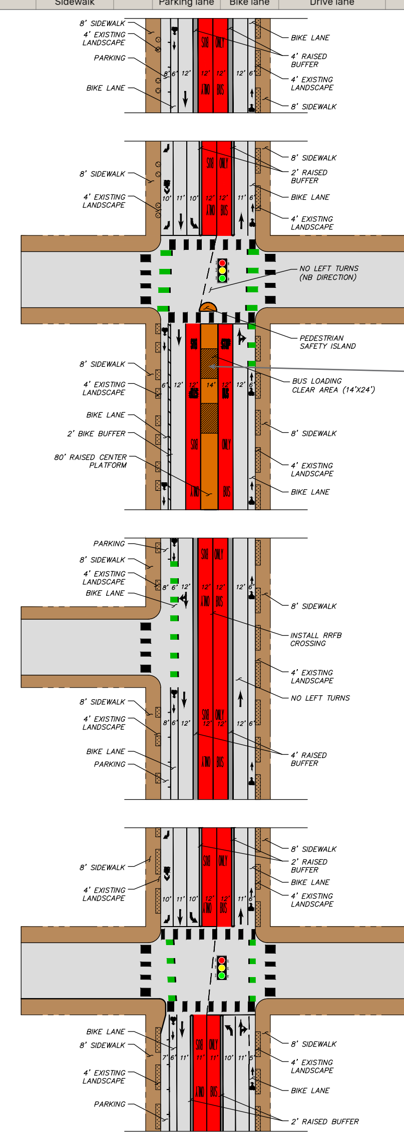
Farside Bus Stop Island Configuration
Shared Bus and Auto Right-Turn Lane

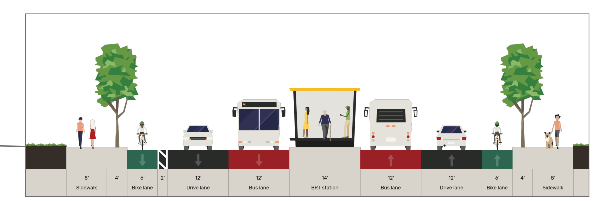


Shared Bus and Auto Right-Turn
with Protected Bike Lane Design

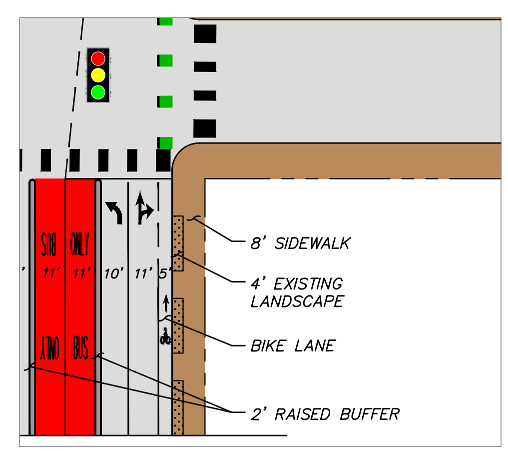
BLUE ALTERNATIVE





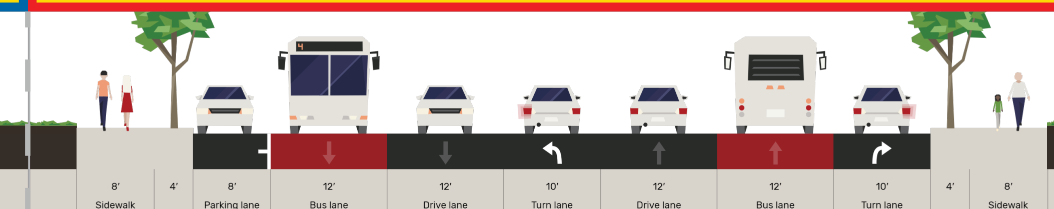


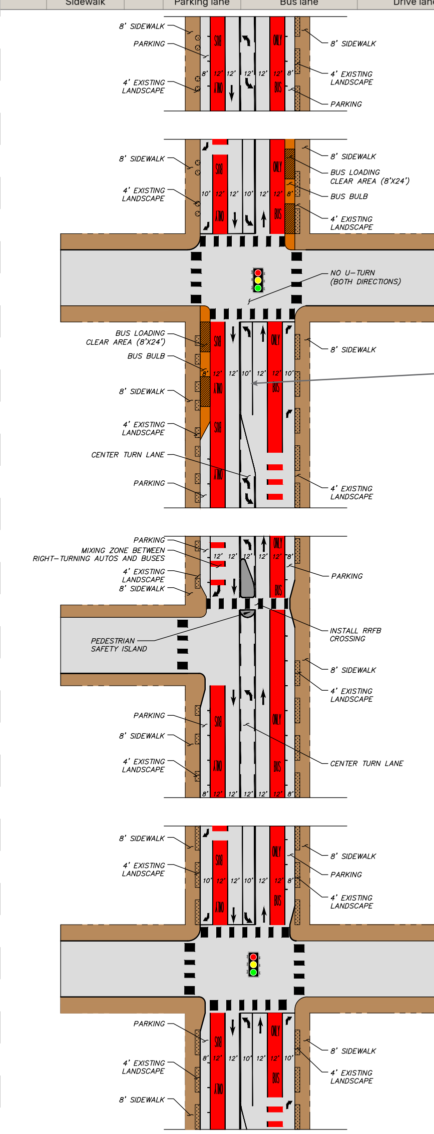
Dual Boarding Center Island Configuration
Buffered/Non-Buffered Bike Lane

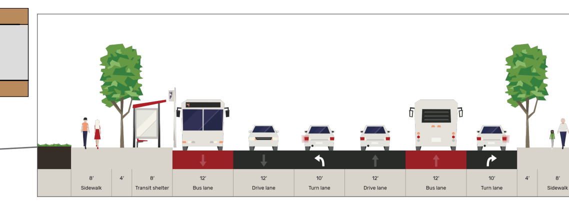


Shared Through-Right with Bike Lane

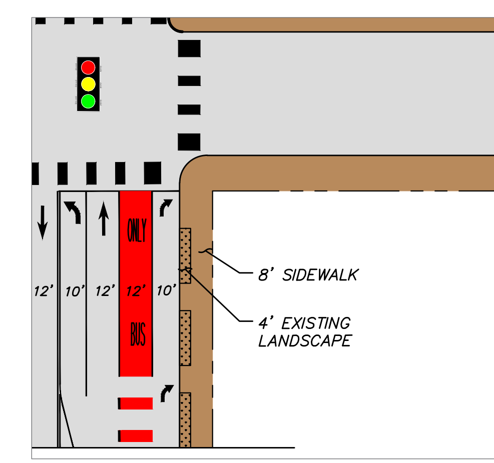
RED ALTERNATIVE



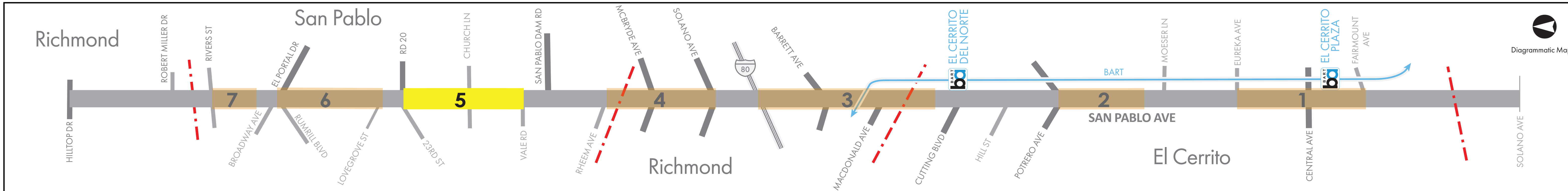




Farside Bus Stop Island Configuration
Dedicated Bus Lane with Protected Right-Turn Lane



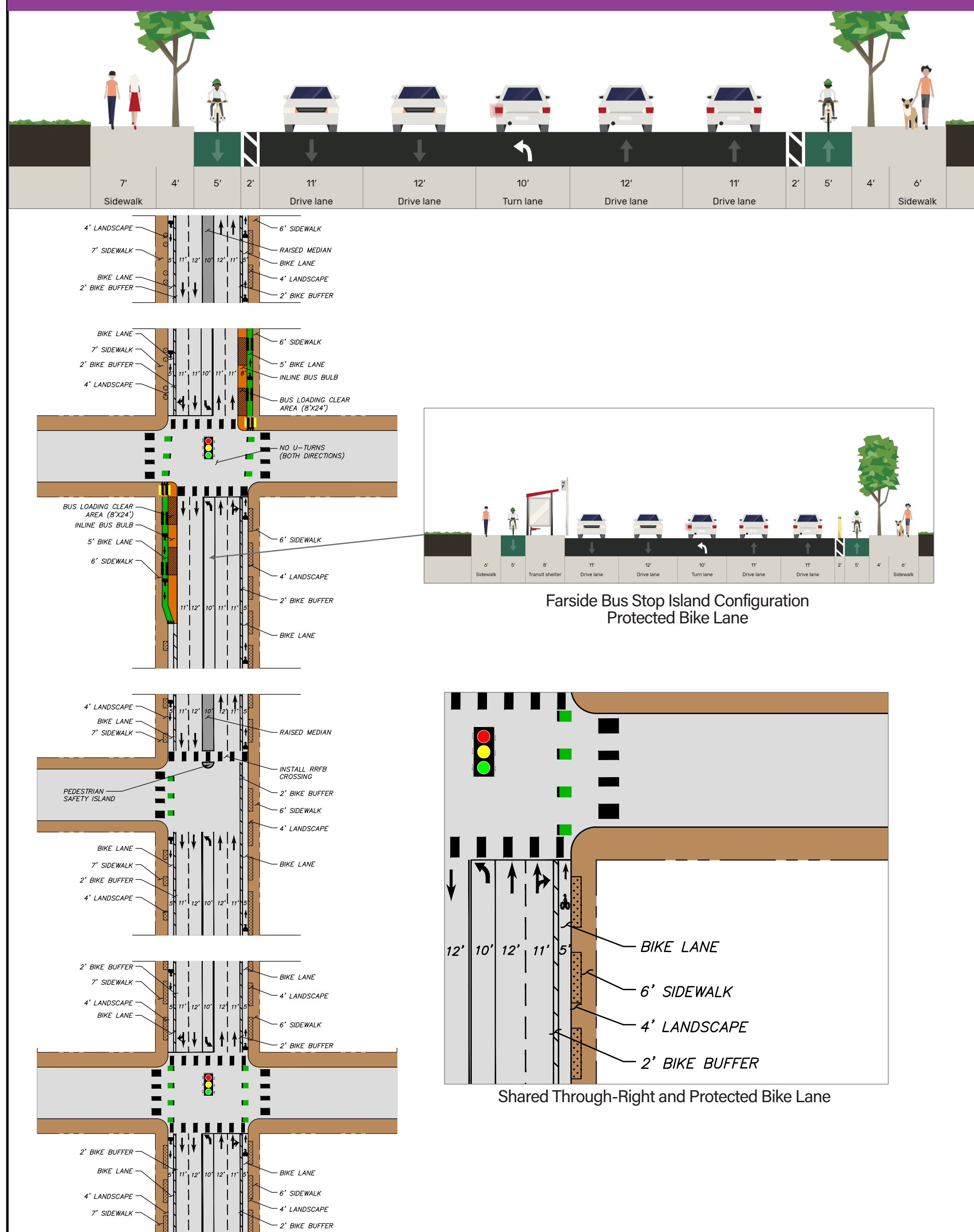
Dedicated Bus Lane with
Right-Turn Lane



SEGMENT 5 - SAN PABLO AVE BETWEEN VALE RD AND ROAD 20

= ALTERNATIVE SELECTED FOR MICROSIMULATION MODELING

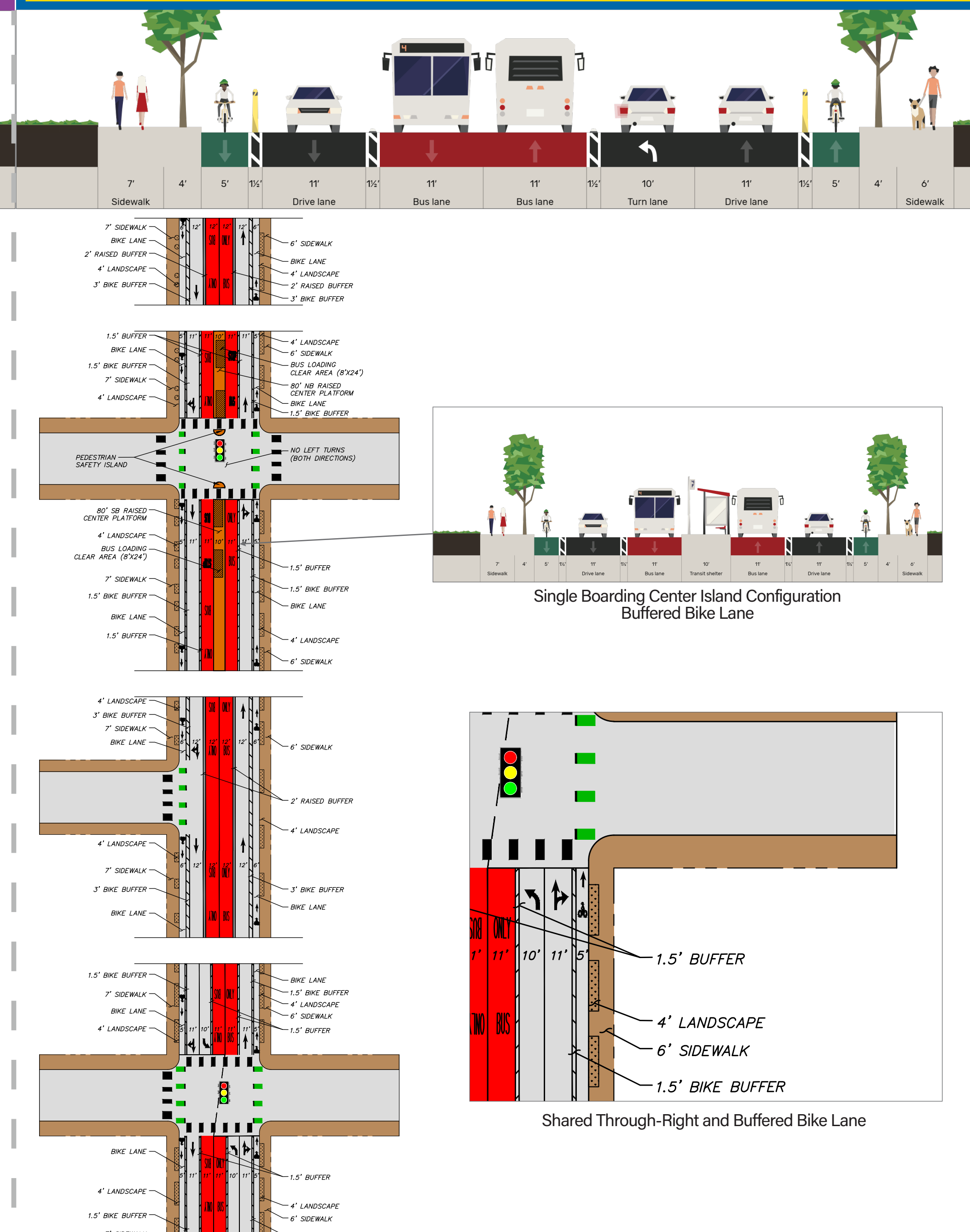
PURPLE ALTERNATIVE



Farside Bus Stop Island Configuration
Protected Bike Lane

Shared Through-Right and Protected Bike Lane

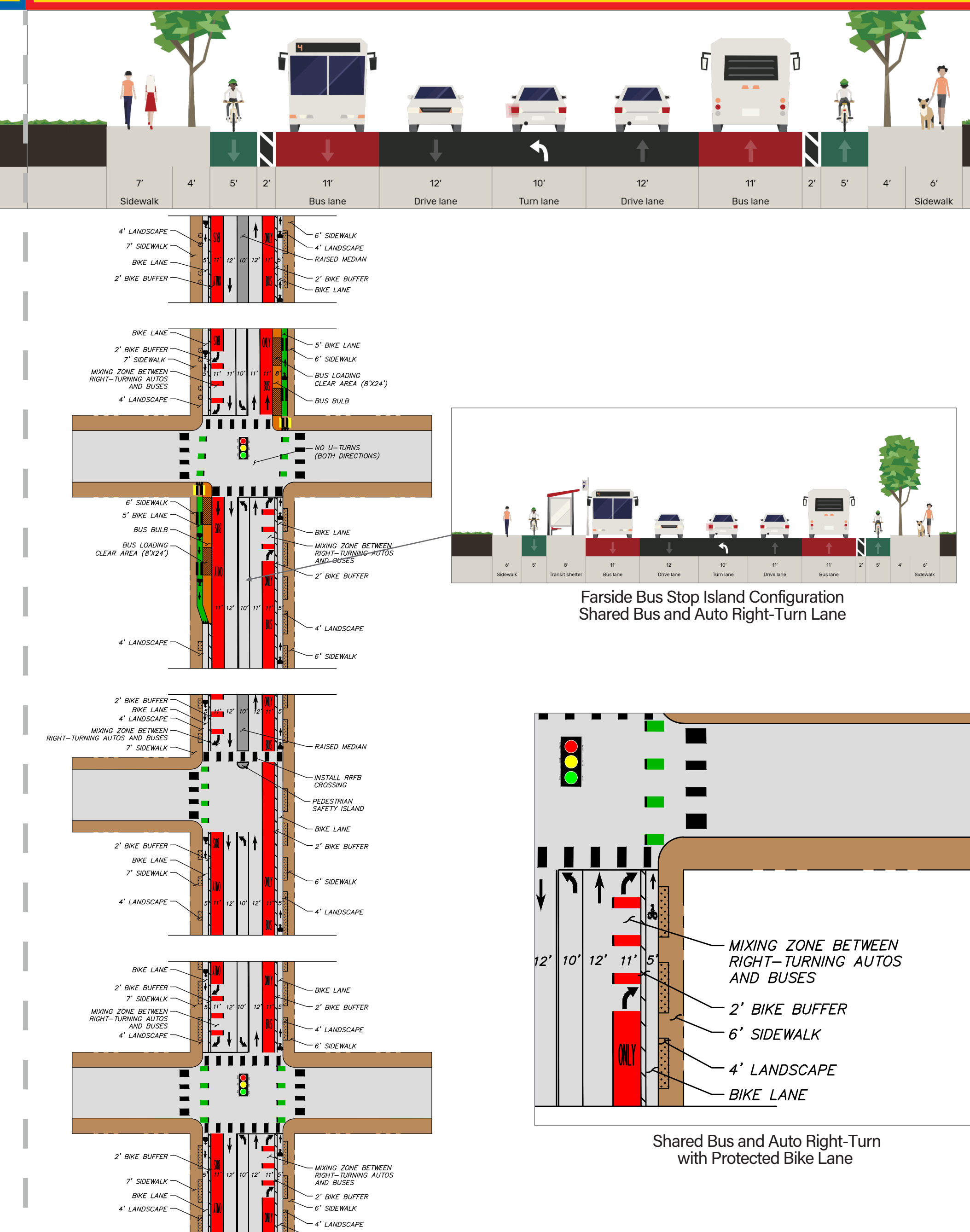
BLUE ALTERNATIVE



Single Boarding Center Island Configuration
Buffered Bike Lane

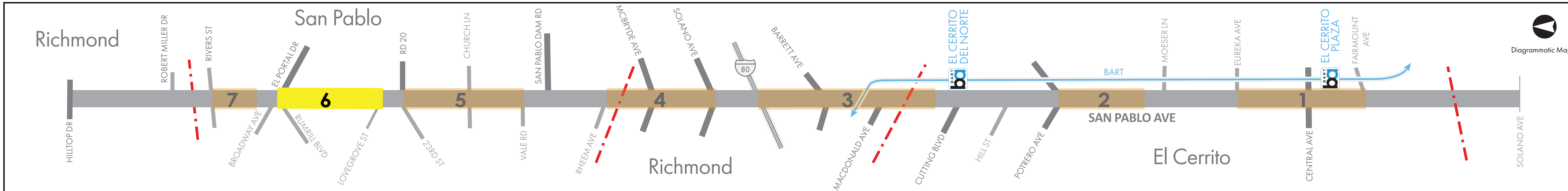
Shared Through-Right and Buffered Bike Lane

RED ALTERNATIVE



Farside Bus Stop Island Configuration
Shared Bus and Auto Right-Turn Lane

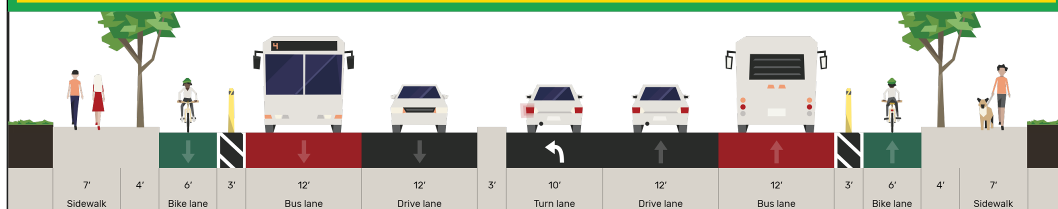
Shared Bus and Auto Right-Turn
with Protected Bike Lane

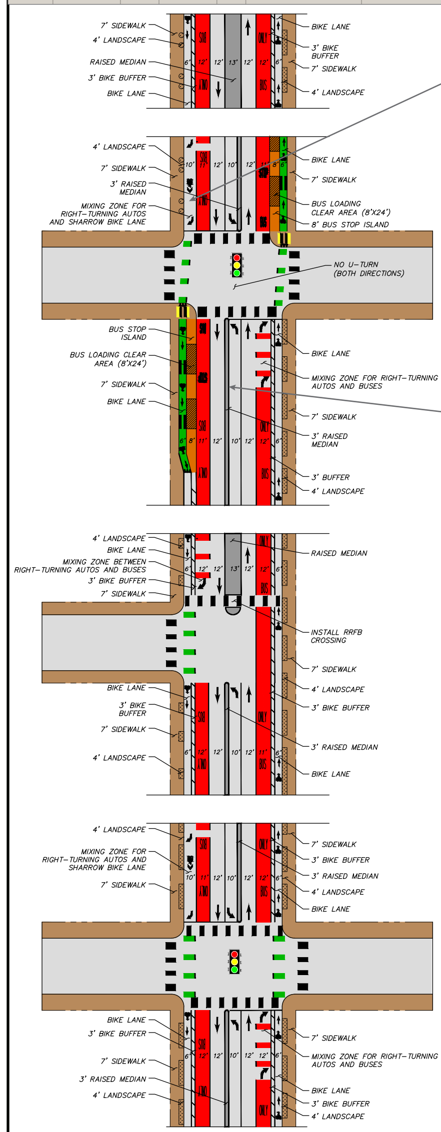


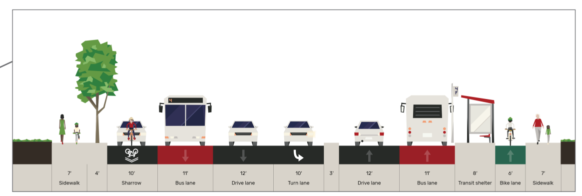
SEGMENT 6 - SAN PABLO AVE BETWEEN LOVEGROVE ST AND RUMRILL BLVD

= ALTERNATIVE SELECTED FOR MICROSIMULATION MODELING

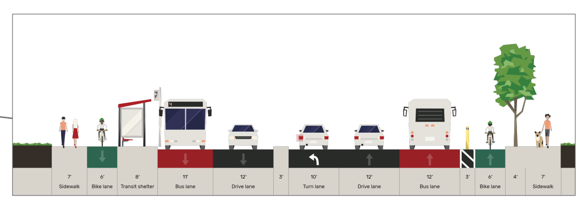
GREEN ALTERNATIVE



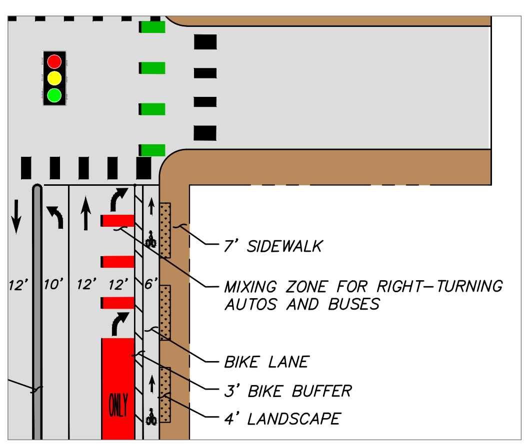




Farside Bus Stop Island Configuration
Bike and Auto Right-Turn Lane

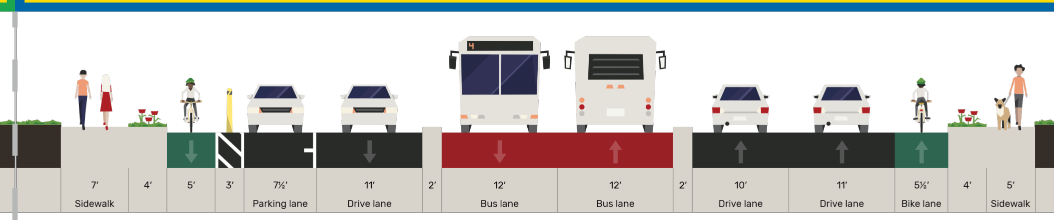


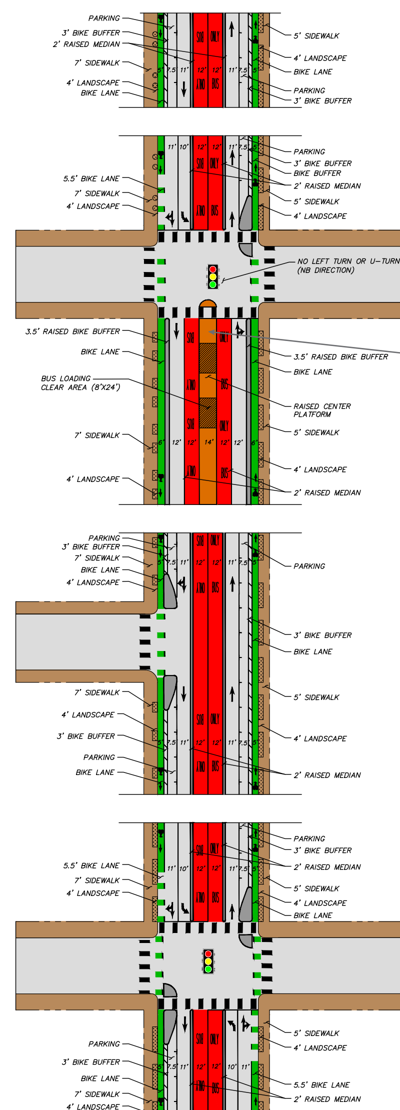
Farside Bus Stop Island Configuration
Shared Bus and Auto Right-Turn Lane

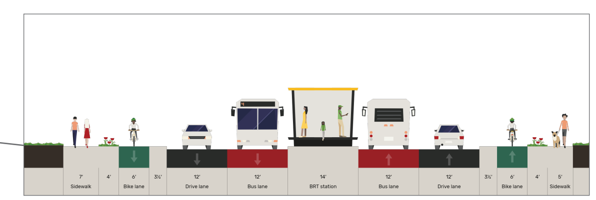


Shared Bus and Auto Right-Turn
with Protected Bike Lane

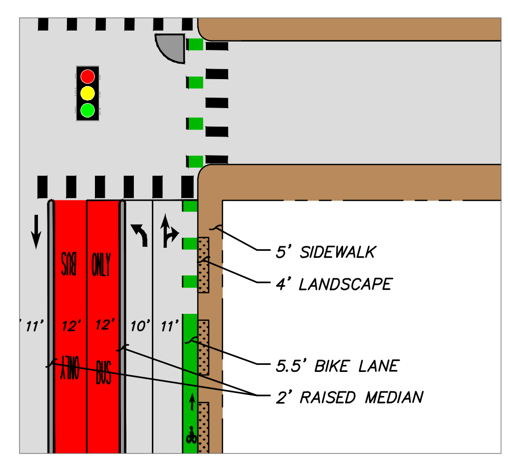
BLUE ALTERNATIVE





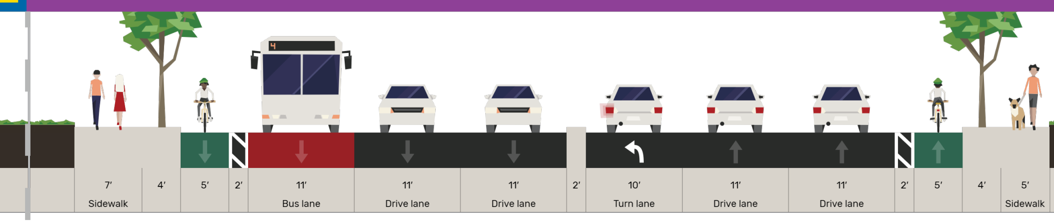


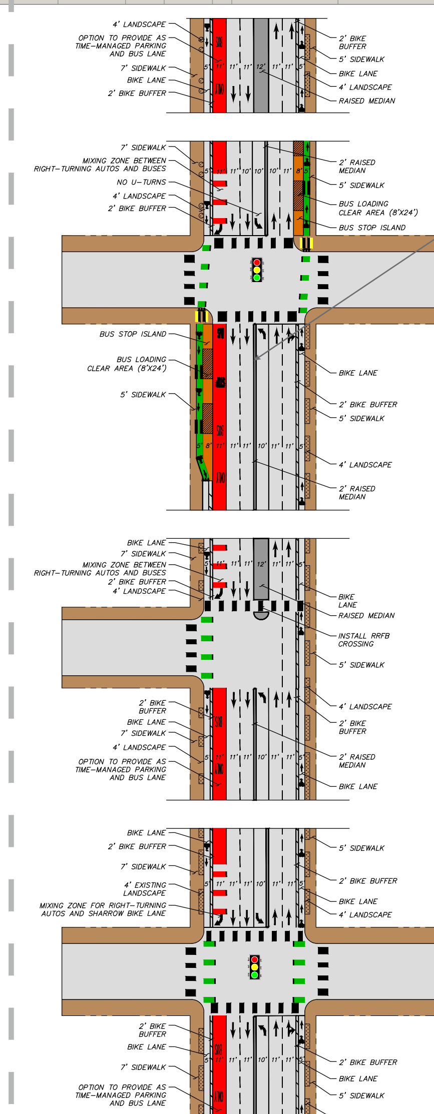
Dual Boarding Island Configuration
Protected Bike Lane

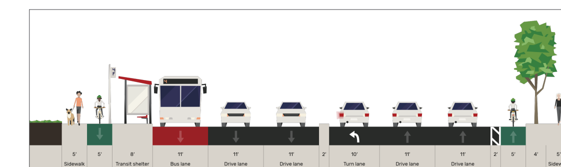


Shared Through-Right with Bike Lane

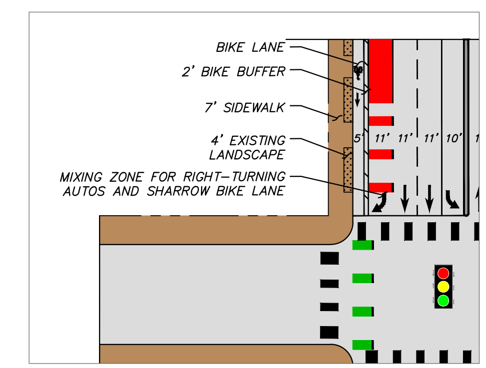
PURPLE ALTERNATIVE



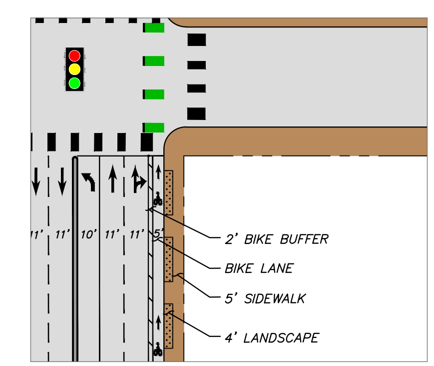




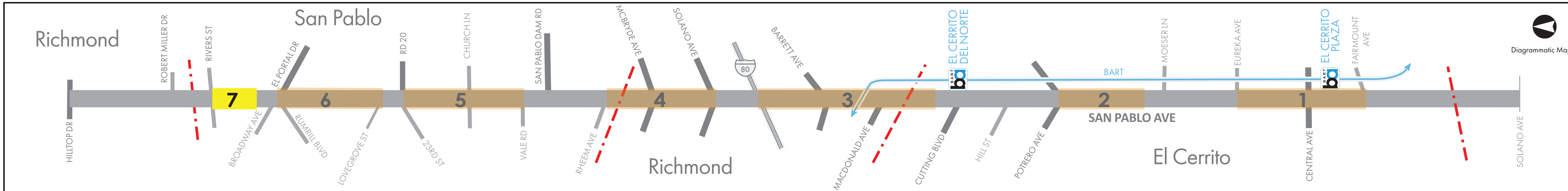
Farside Bus Stop Island Configuration
Protected Bike Lane (No Transit Lane in One Direction)



Shared Bus and Auto Right-Turn
with Protected Bike Lane



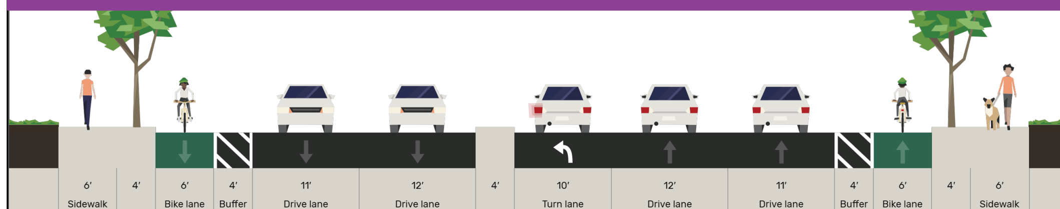
Shared Through-Right and Protected Bike Lane

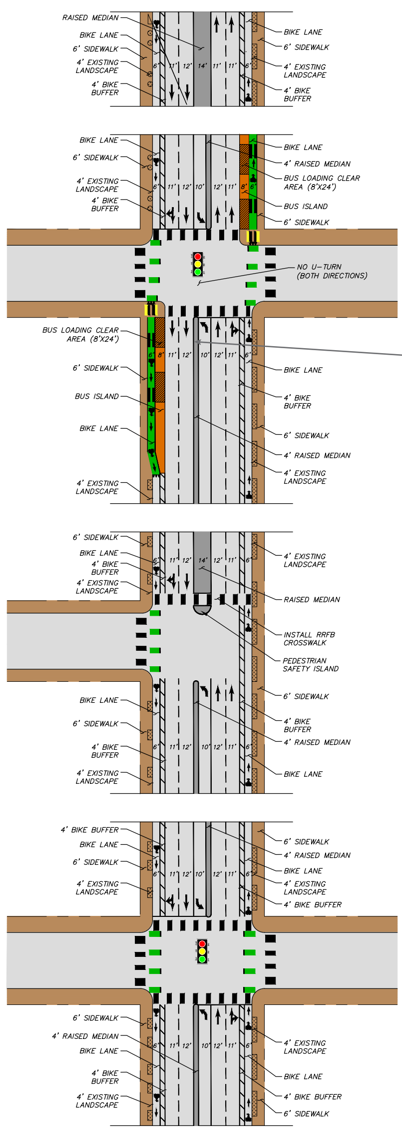


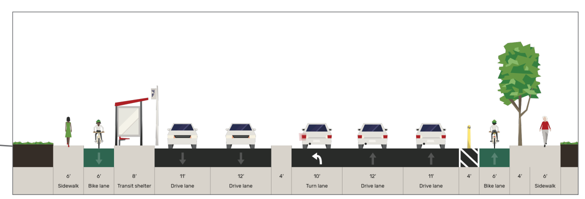
SEGMENT 7 - SAN PABLO AVE BETWEEN LAKE ST AND RIVERS ST

= ALTERNATIVE SELECTED FOR MICROSIMULATION MODELING

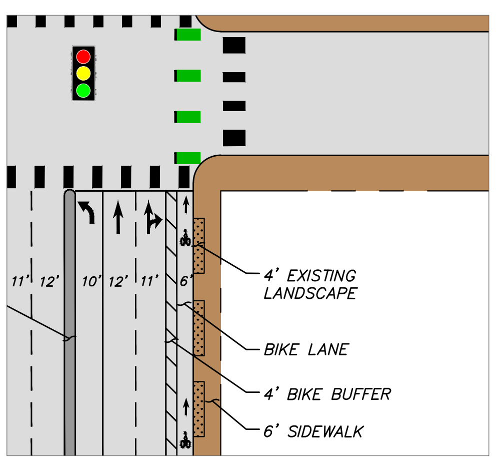
PURPLE ALTERNATIVE





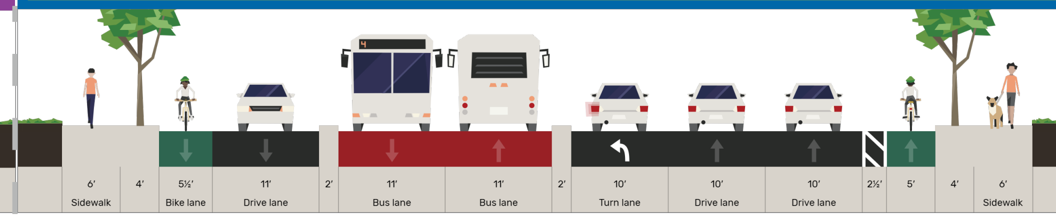


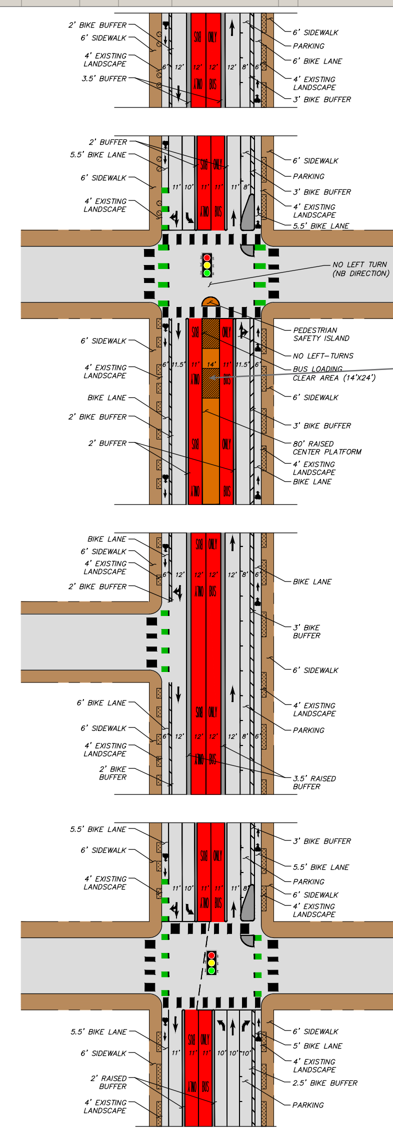
Farside Bus Stop Island Configuration
Shared Through-Right with Protected Bike Lane

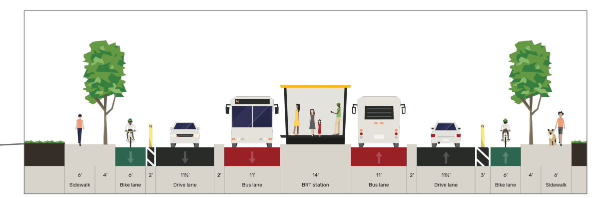


Shared Through-Right with
Protected Bike Lane

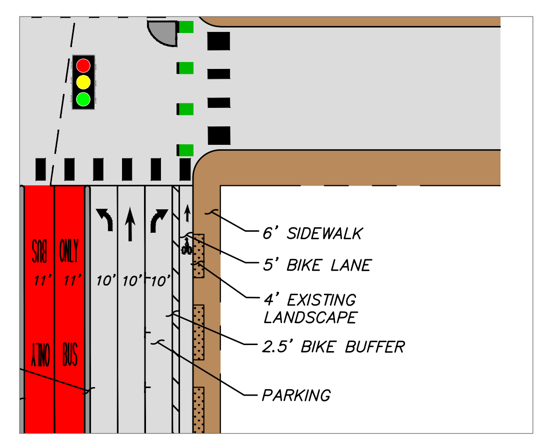
BLUE ALTERNATIVE





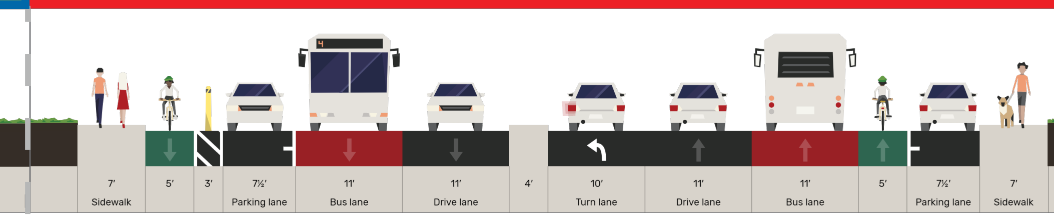


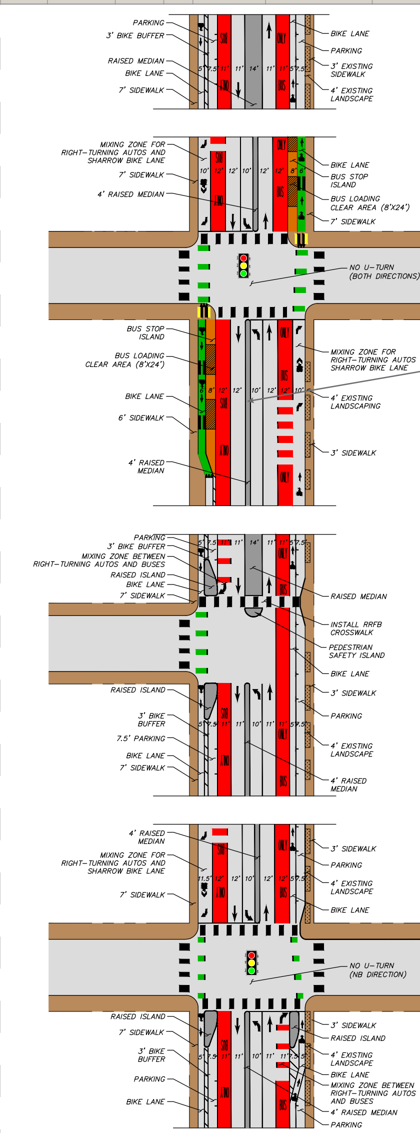
Dual Boarding Island Configuration
Protected Bike Lane

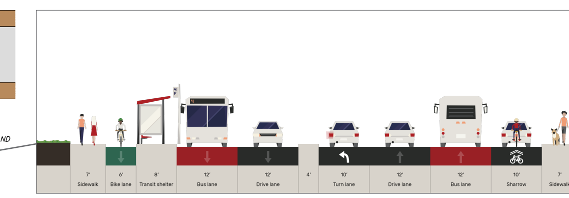


Exclusive Right Turn
with Protected Bike Lane

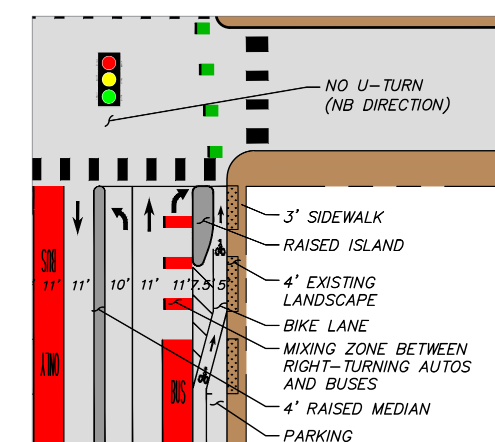
RED ALTERNATIVE







Farside Bus Stop Island Configuration
Shared Bike and Auto Right-Turn Lane

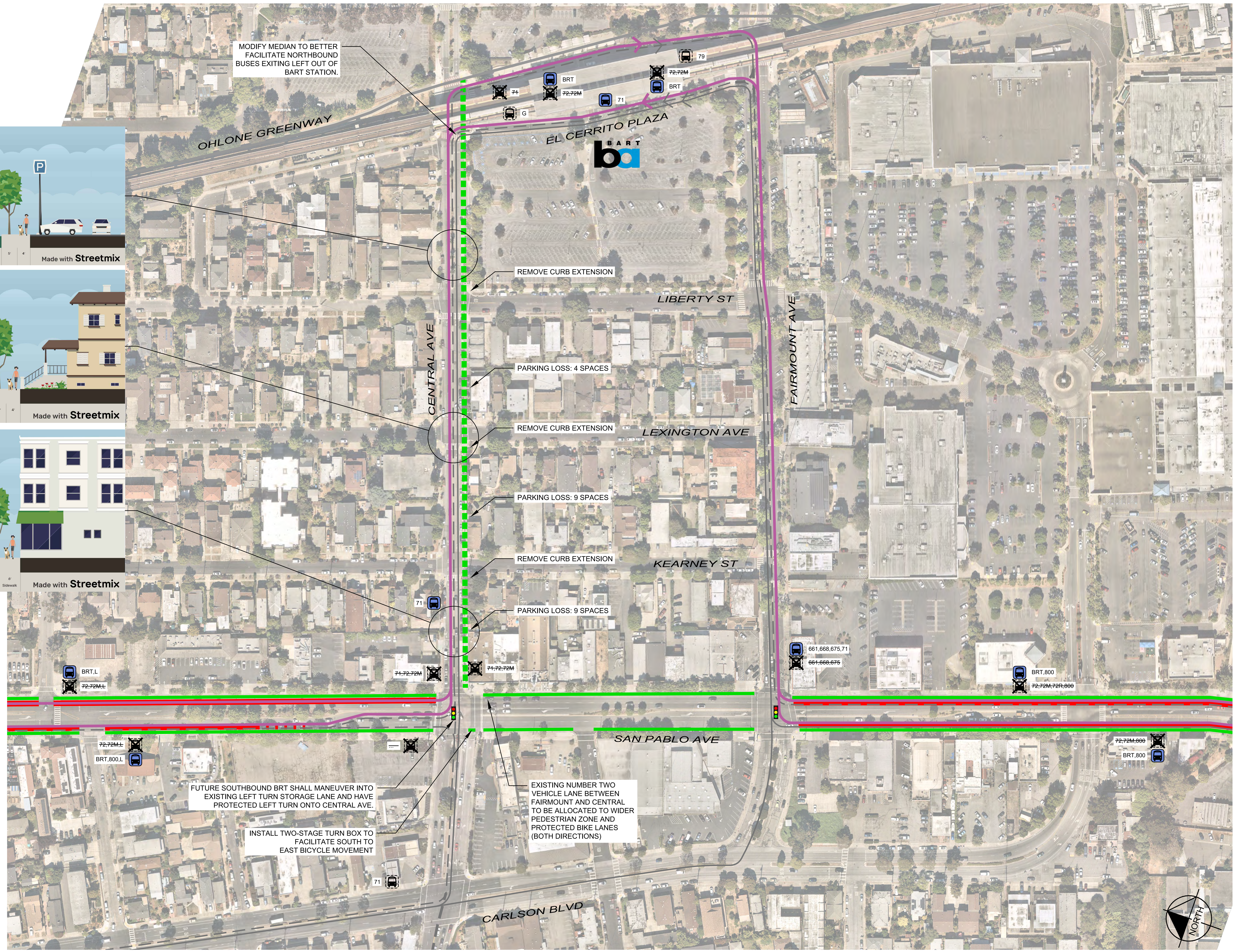


Shared Bus and Auto Right-Turn
with Protected Bike Lane

Appendix B

Focus Area Layouts

CROSS SECTION
LOOKING NORTH



GRAPHIC SCALE IN FEET
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LEGEND

- PROPOSED 2-WAY CYCLE TRACK
- PROPOSED CLASS IV PROTECTED BIKE LANE
- PROPOSED BUS ONLY LANE
- EXISTING BUS STOP
- FUTURE BUS STOP
- EXISTING BUS STOP - REMOVE
- EXISTING BUS ROUTE
- PROPOSED LINE 71 ROUTE
- PROPOSED BRT ROUTE
- SIGNALIZED INTERSECTION

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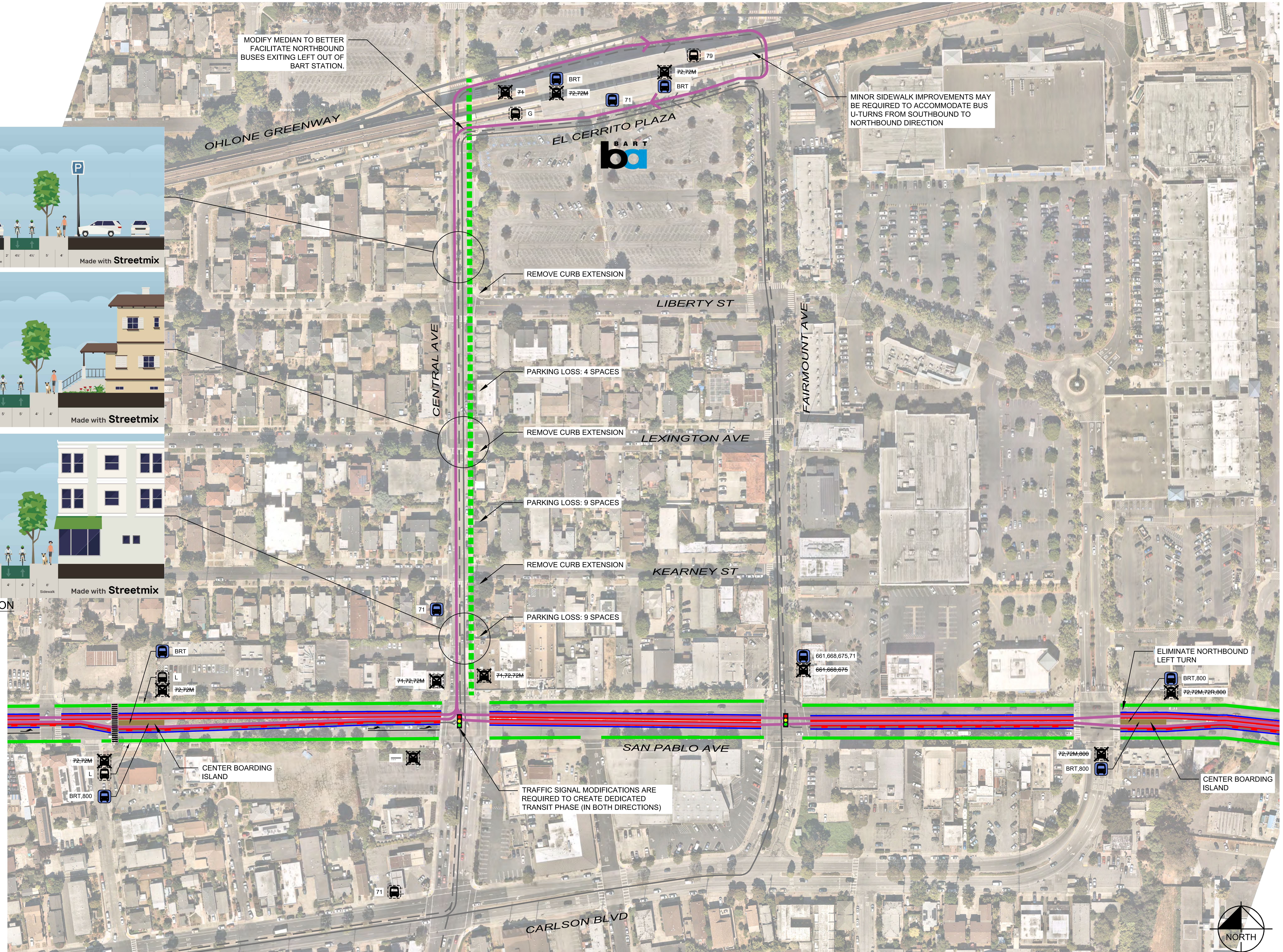
TRANSIT DESIGN CONCEPTS FOR WCCTAC FOCUS AREAS
EL CERRITO PLAZA

AUGUST 2021

SIDE RUNNING ALTERNATIVE

CROSS SECTION
LOOKING NORTH



GRAPHIC SCALE IN FEET
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LEGEND

- PROPOSED 2-WAY CYCLE TRACK
- PROPOSED CLASS IV PROTECTED BIKE LANE
- PROPOSED BUS ONLY LANE
- EXISTING BUS STOP - REMAIN
- FUTURE BUS STOP
- EXISTING BUS STOP - REMOVE
- EXISTING BUS ROUTE
- PROPOSED LINE 71 ROUTE
- PROPOSED BRT ROUTE
- SIGNALIZED INTERSECTION

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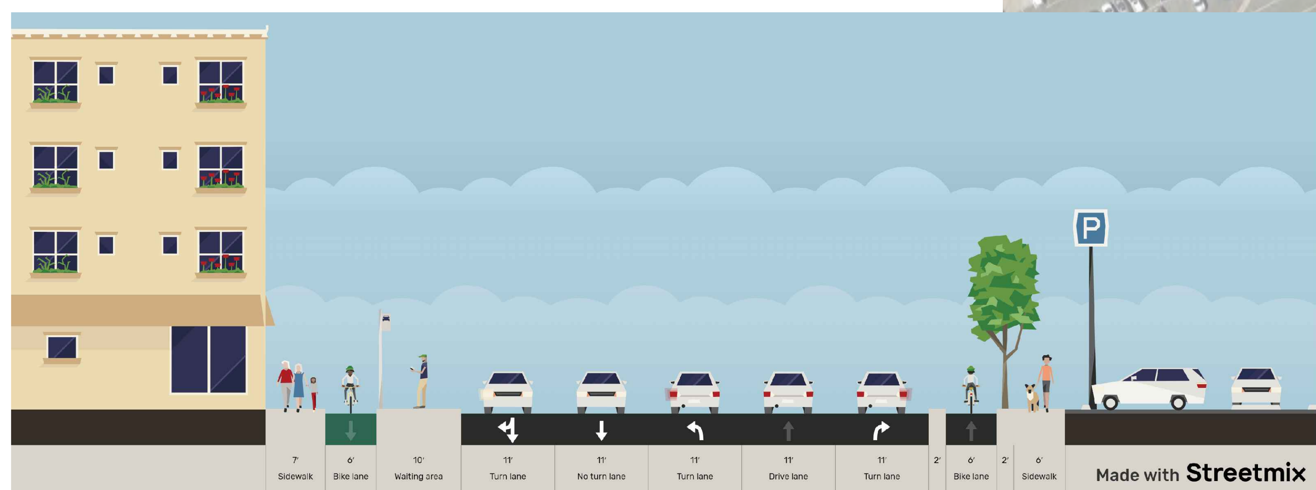
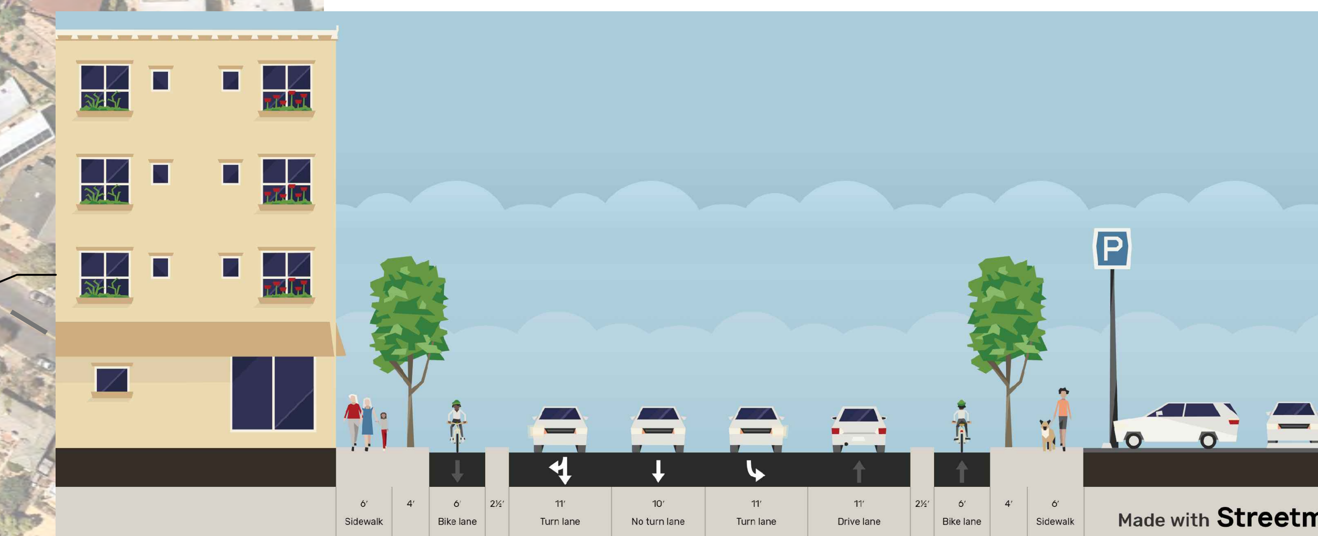
AUGUST 2021

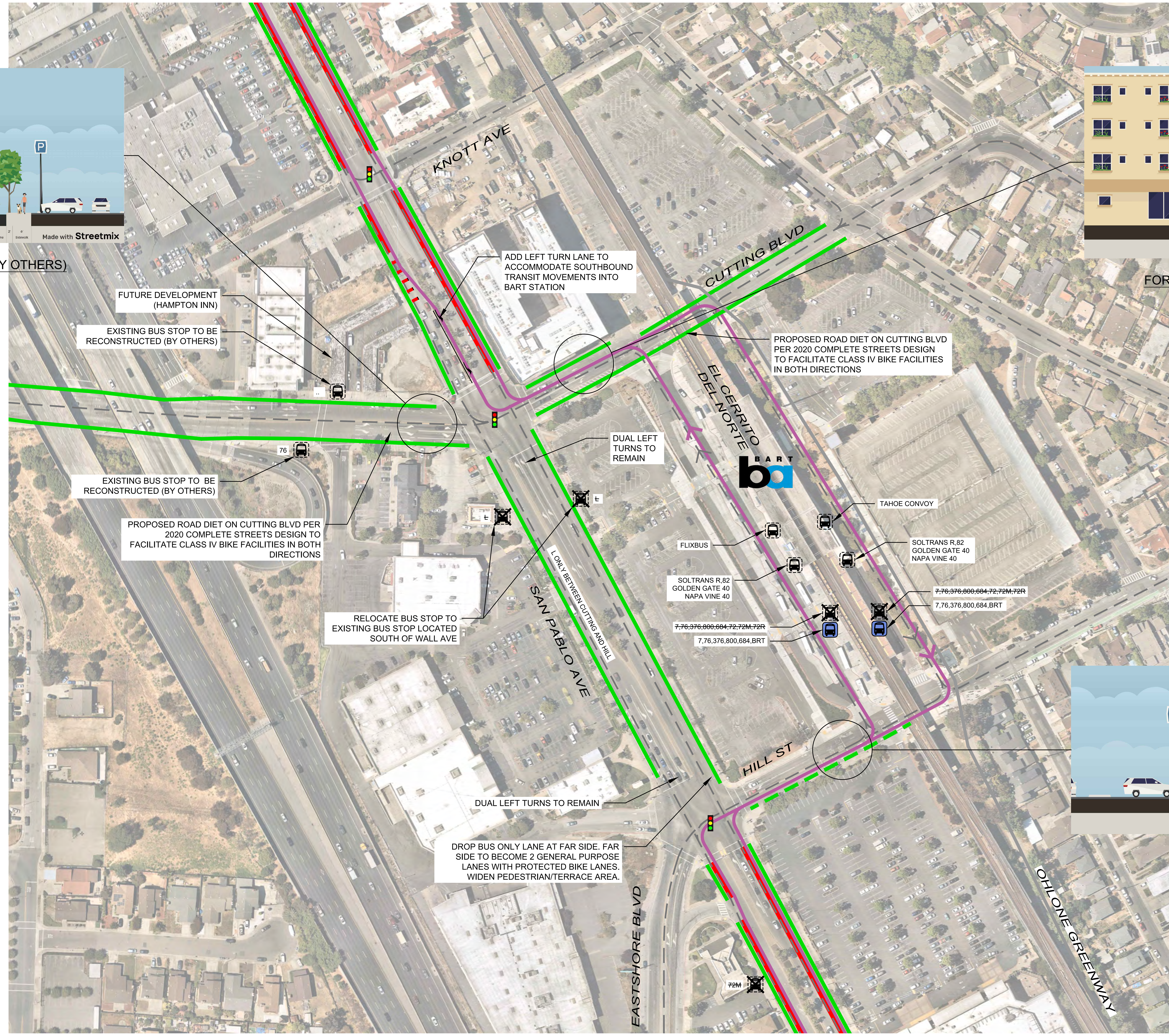
CENTER RUNNING ALTERNATIVE

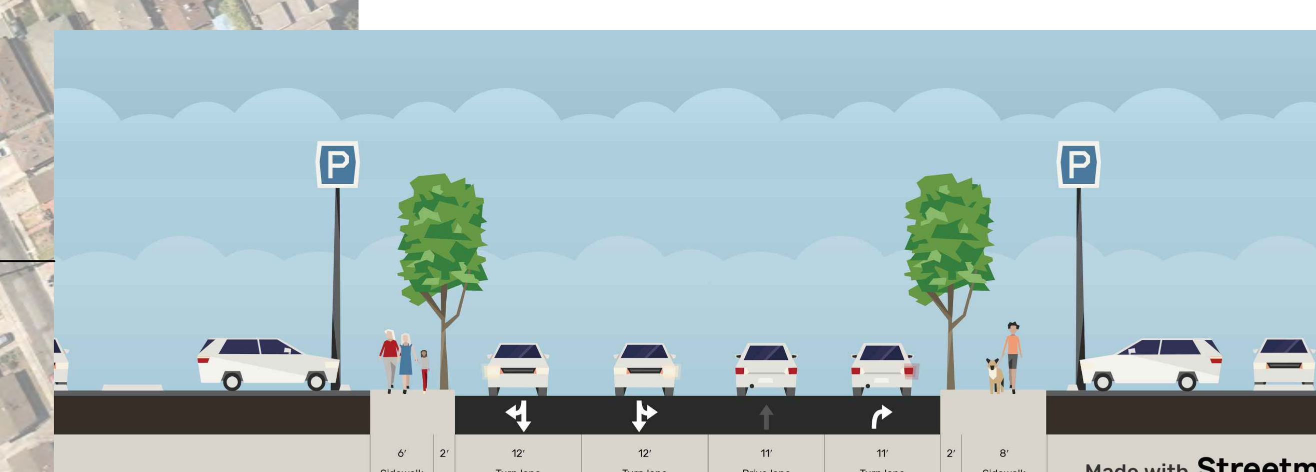


CROSS SECTION
FOR FUTURE COMPLETE STREETS PROJECT (BY OTHERS)
LOOKING EAST



CROSS SECTION
FOR FUTURE COMPLETE STREETS PROJECT (BY OTHERS)
LOOKING EAST





EXISTING CROSS SECTION (TO REMAIN)
LOOKING EAST

LEGEND

- PROPOSED CLASS III BIKE ROUTE
- PROPOSED CLASS IV PROTECTED BIKE LANE
- PROPOSED BUS ONLY LANE
- EXISTING BUS STOP
- FUTURE BUS STOP
- EXISTING BUS STOP - REMOVE
- SIGNALIZED INTERSECTION
- EXISTING BUS LINE
- PROPOSED BRT ROUTE

NORTH

GRAPHIC SCALE IN FEET
0 50 100 200

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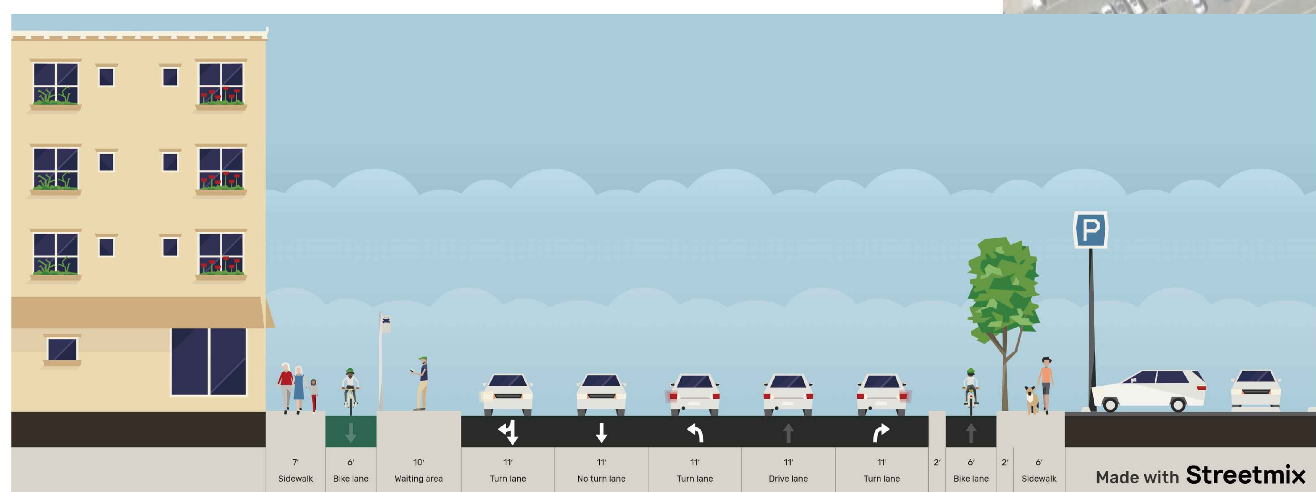
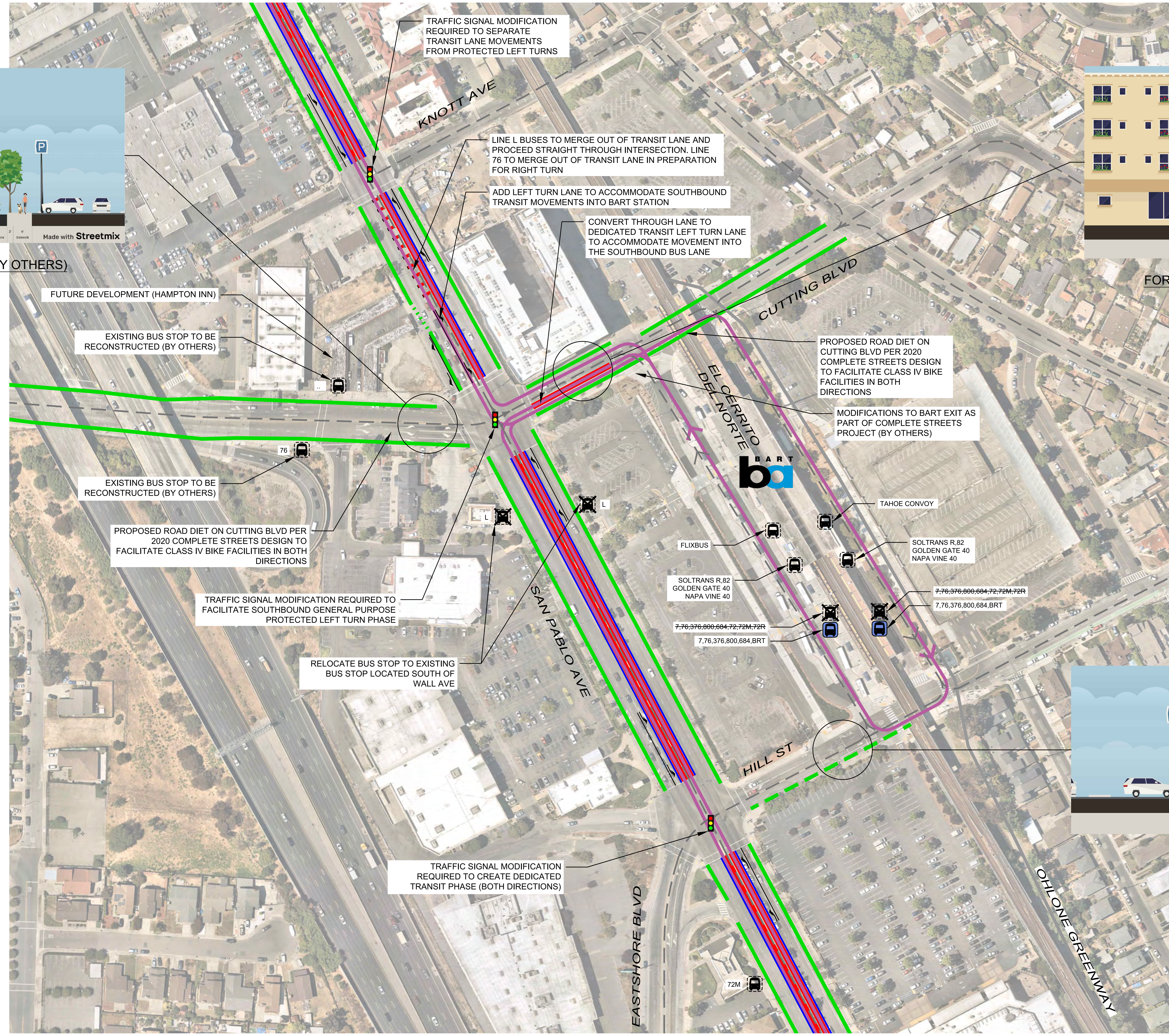
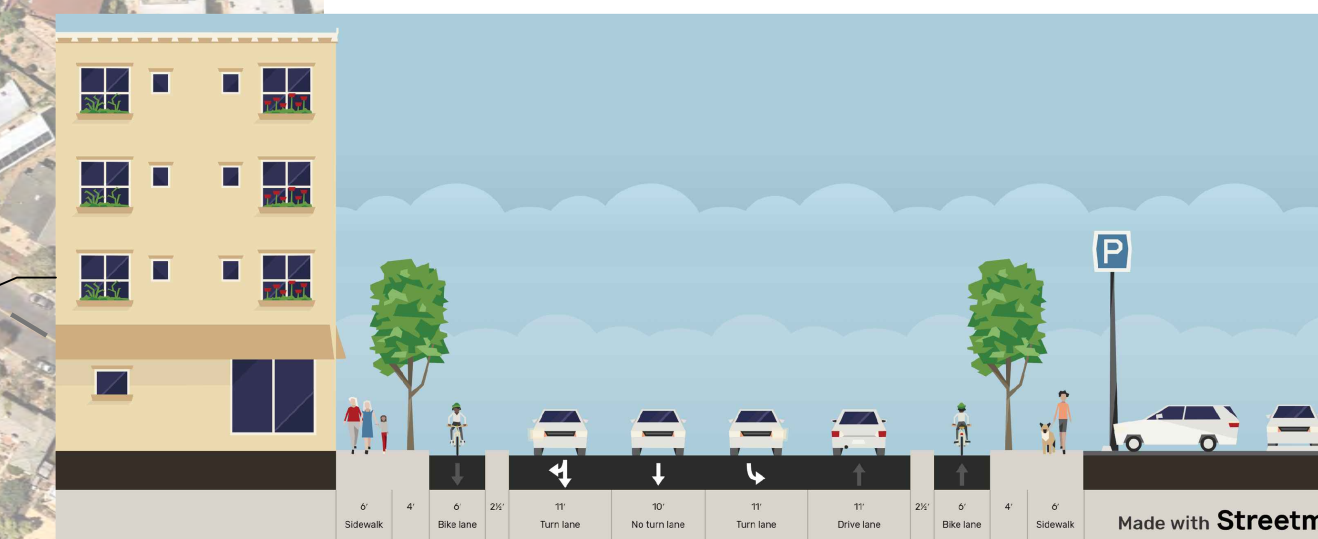
SIDE RUNNING ALTERNATIVE

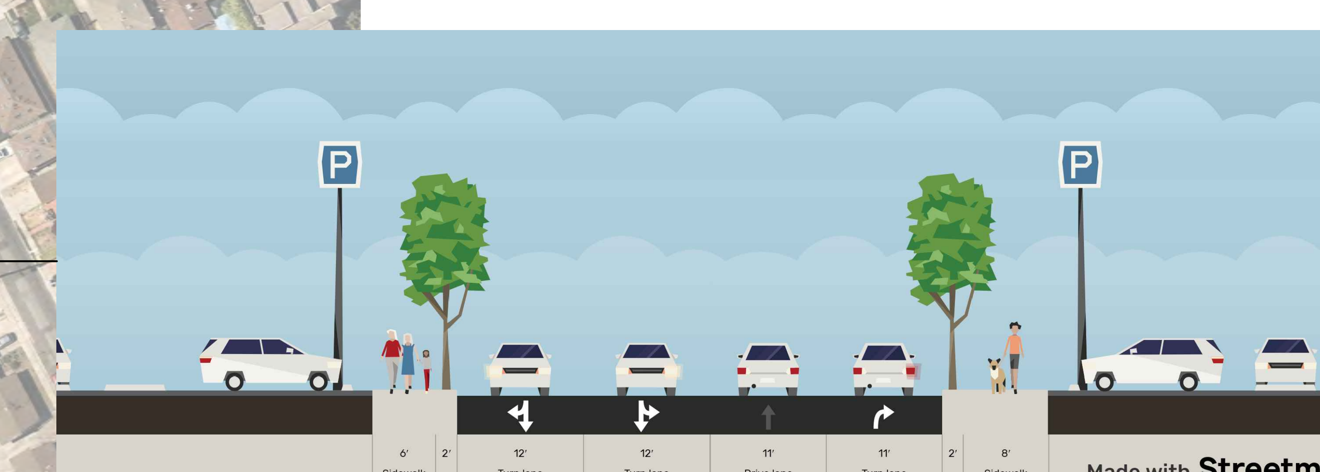


CROSS SECTION
FOR FUTURE COMPLETE STREETS PROJECT (BY OTHERS)
LOOKING EAST





CROSS SECTION
FOR FUTURE COMPLETE STREETS PROJECT (BY OTHERS)
LOOKING EAST



EXISTING CROSS SECTION (TO REMAIN)
LOOKING EAST

LEGEND

- PROPOSED CLASS III BIKE ROUTE
- PROPOSED CLASS IV PROTECTED BIKE LANE
- PROPOSED BUS ONLY LANE
- PROPOSED RAISED CURB
- EXISTING BUS STOP - REMAIN
- FUTURE BUS STOP
- EXISTING BUS STOP - REMOVE
- SIGNALIZED INTERSECTION
- EXISTING BUS LINE
- PROPOSED BRT ROUTE

NORTH

GRAPHIC SCALE IN FEET
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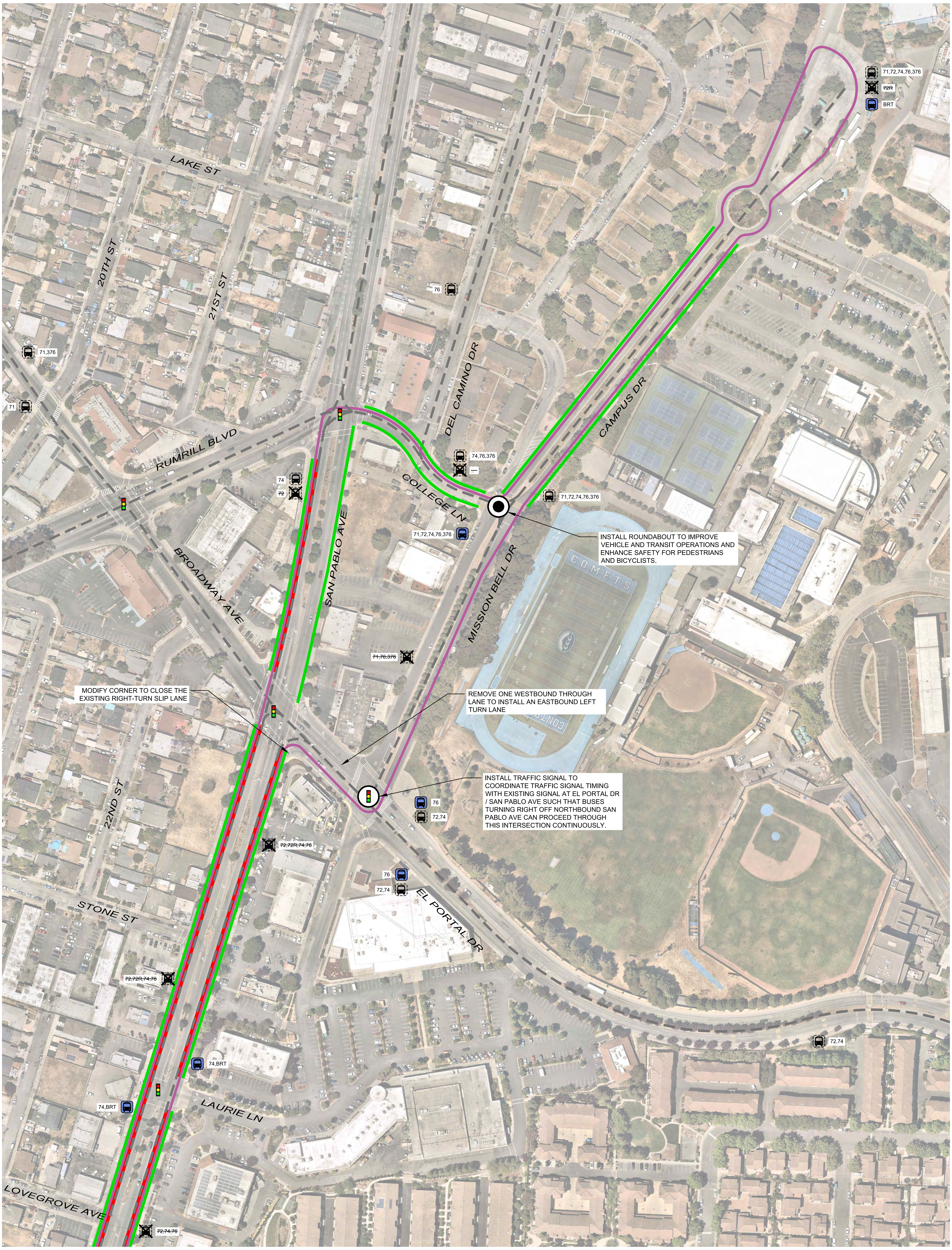
CENTER RUNNING ALTERNATIVE



LEGEND

- PROPOSED CLASS IV PROTECTED BIKE LANE
- PROPOSED BUS ONLY LANE
- EXISTING BUS STOP - REMAIN
- FUTURE BUS STOP
- EXISTING BUS STOP - REMOVE
- EXISTING SIGNALIZED INTERSECTION
- EXISTING BUS ROUTE
- PROPOSED BRT ROUTE
- PROPOSED SIGNALIZED INTERSECTION
- PROPOSED ROUNDABOUT

NORTH

GRAPHIC SCALE IN FEET
0 50 100 200

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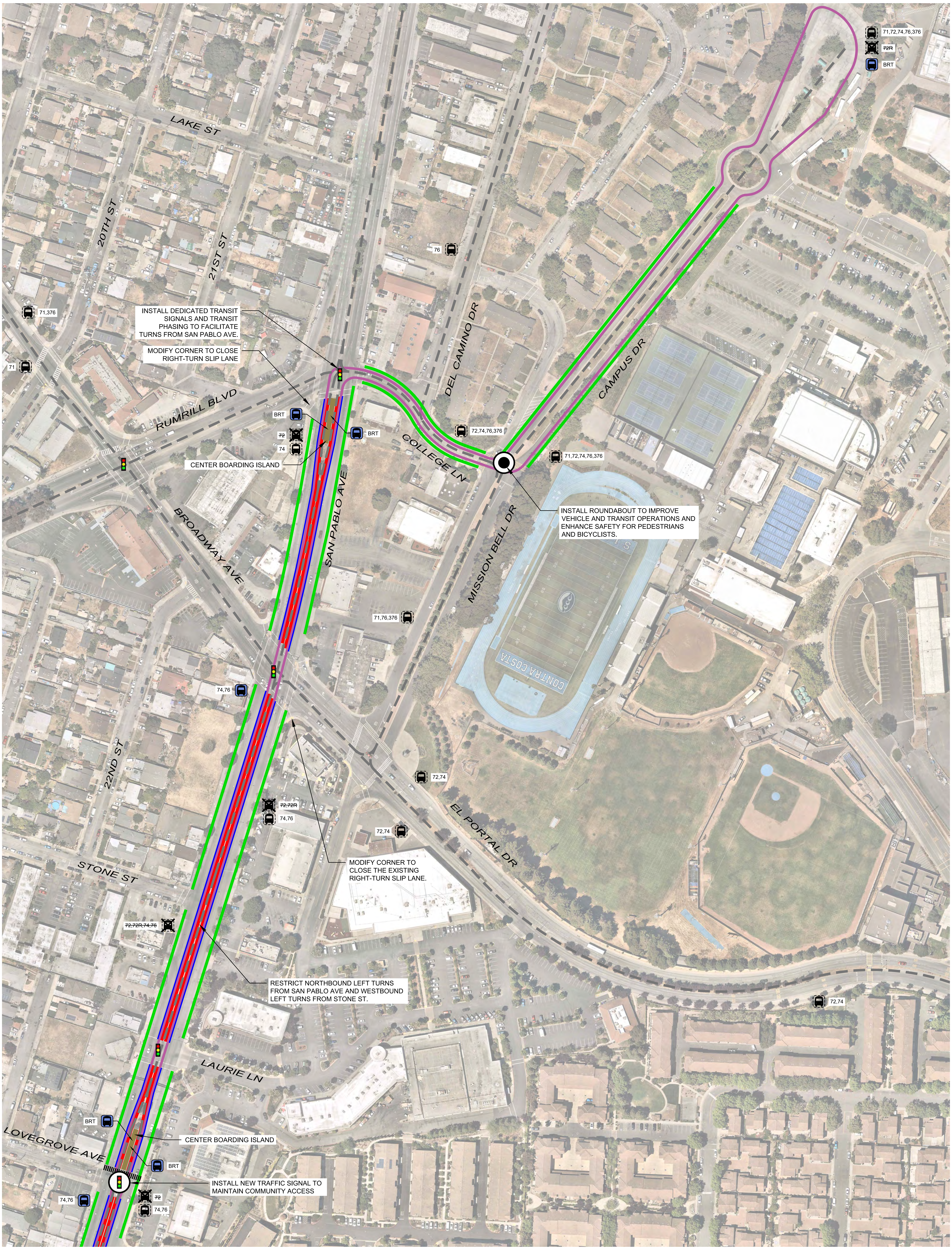
TRANSIT DESIGN CONCEPTS FOR WCCTAC FOCUS AREAS
CONTRA COSTA COLLEGE

AUGUST 2021
SIDE RUNNING ALTERNATIVE



LEGEND

- PROPOSED CLASS IV PROTECTED BIKE LANE
- PROPOSED BUS ONLY LANE
- EXISTING BUS STOP
- FUTURE BUS STOP
- EXISTING BUS STOP - REMOVE
- EXISTING SIGNALIZED INTERSECTION
- EXISTING BUS ROUTE
- PROPOSED BRT ROUTE
- PROPOSED SIGNALIZED INTERSECTION
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NORTH

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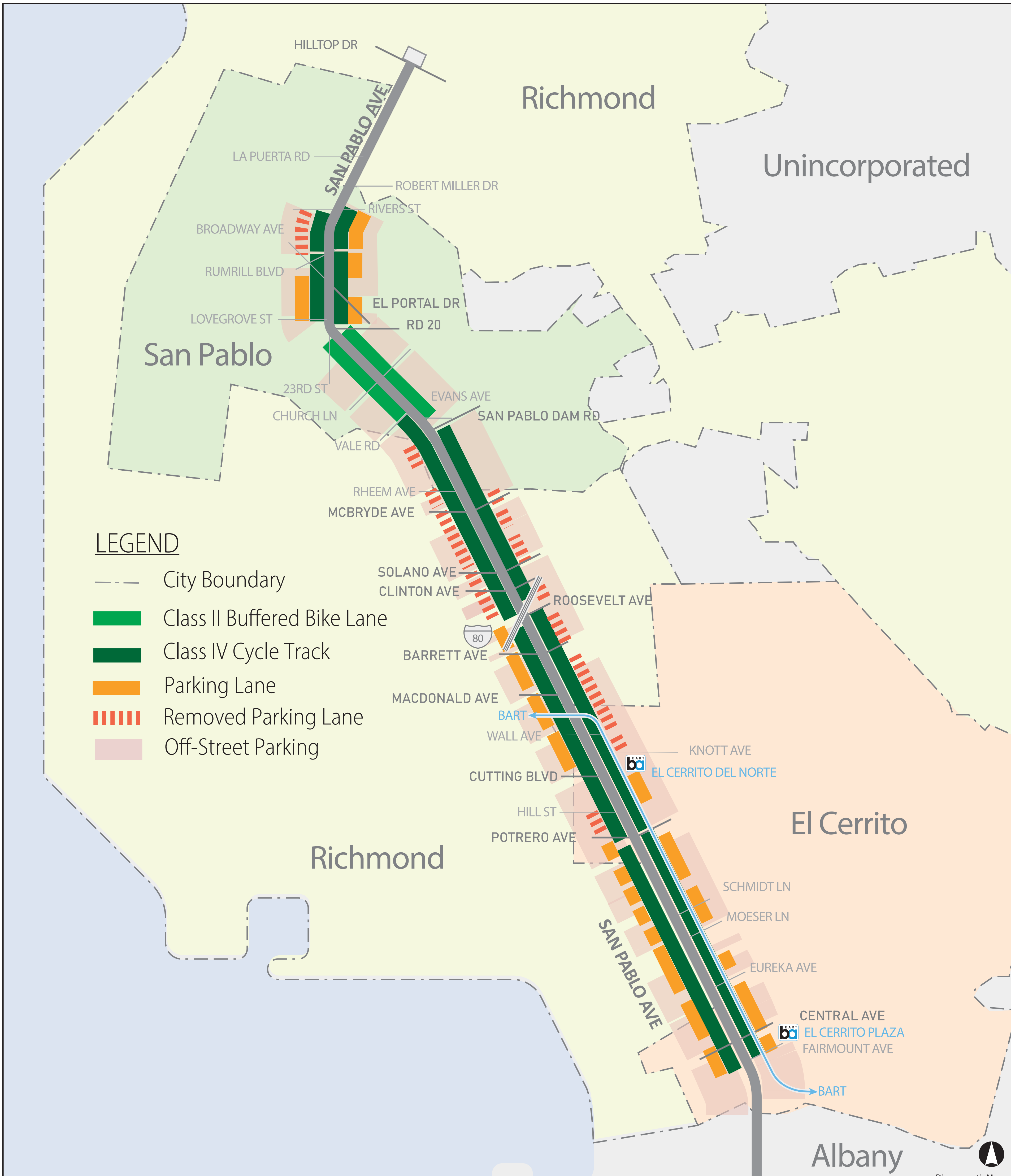
CONTRA COSTA COLLEGE

AUGUST 2021
CENTER RUNNING ALTERNATIVE

Appendix C

Parking and Bike Lane Opportunities



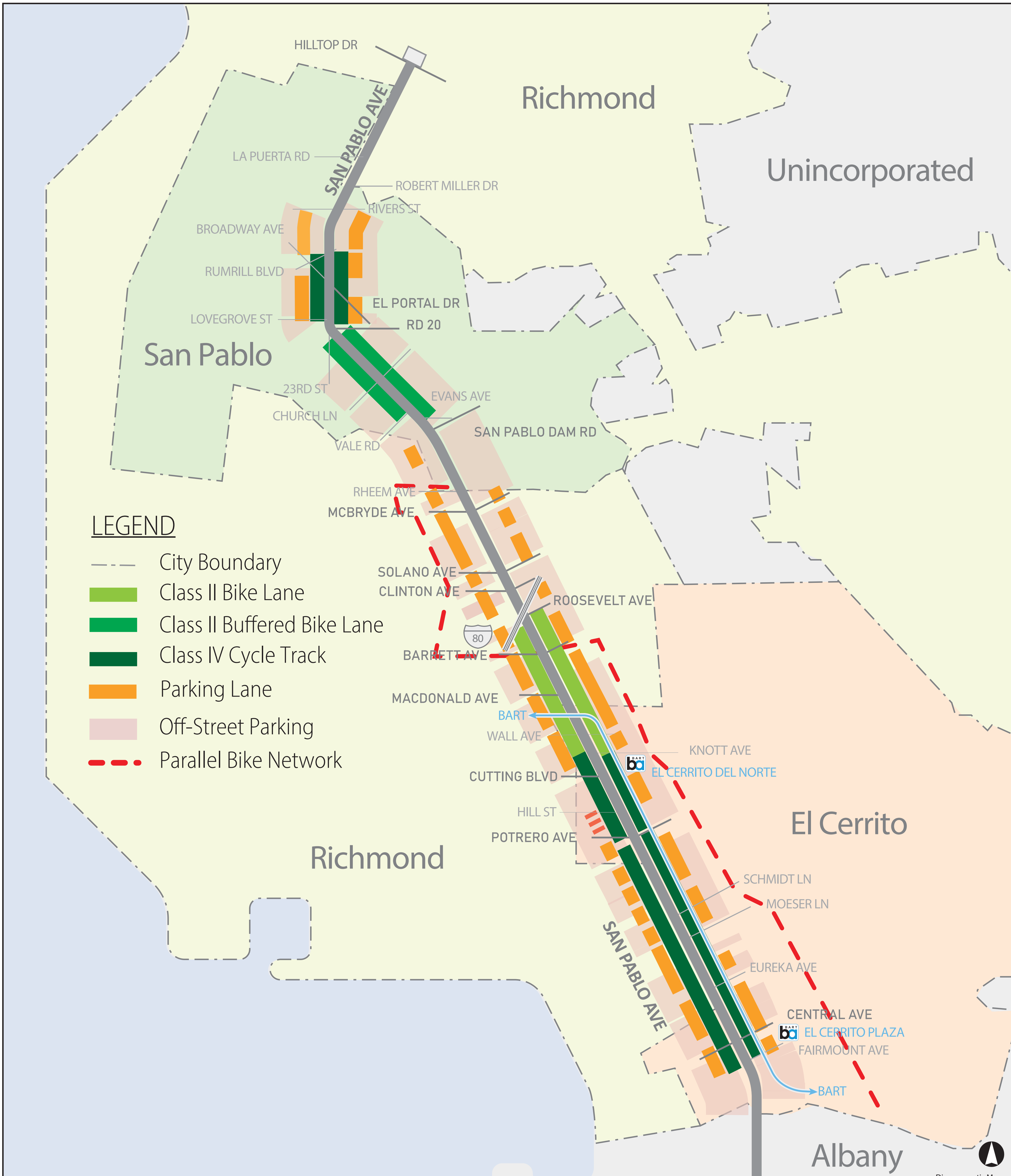
ALAMEDA County Transportation Commission

CONTRA COSTA transportation authority

WCCTAC West Contra Costa Transportation Advisory Committee

San Pablo Avenue Multimodal Corridor Study

Center-Running BRT with Bike Lane Prioritized



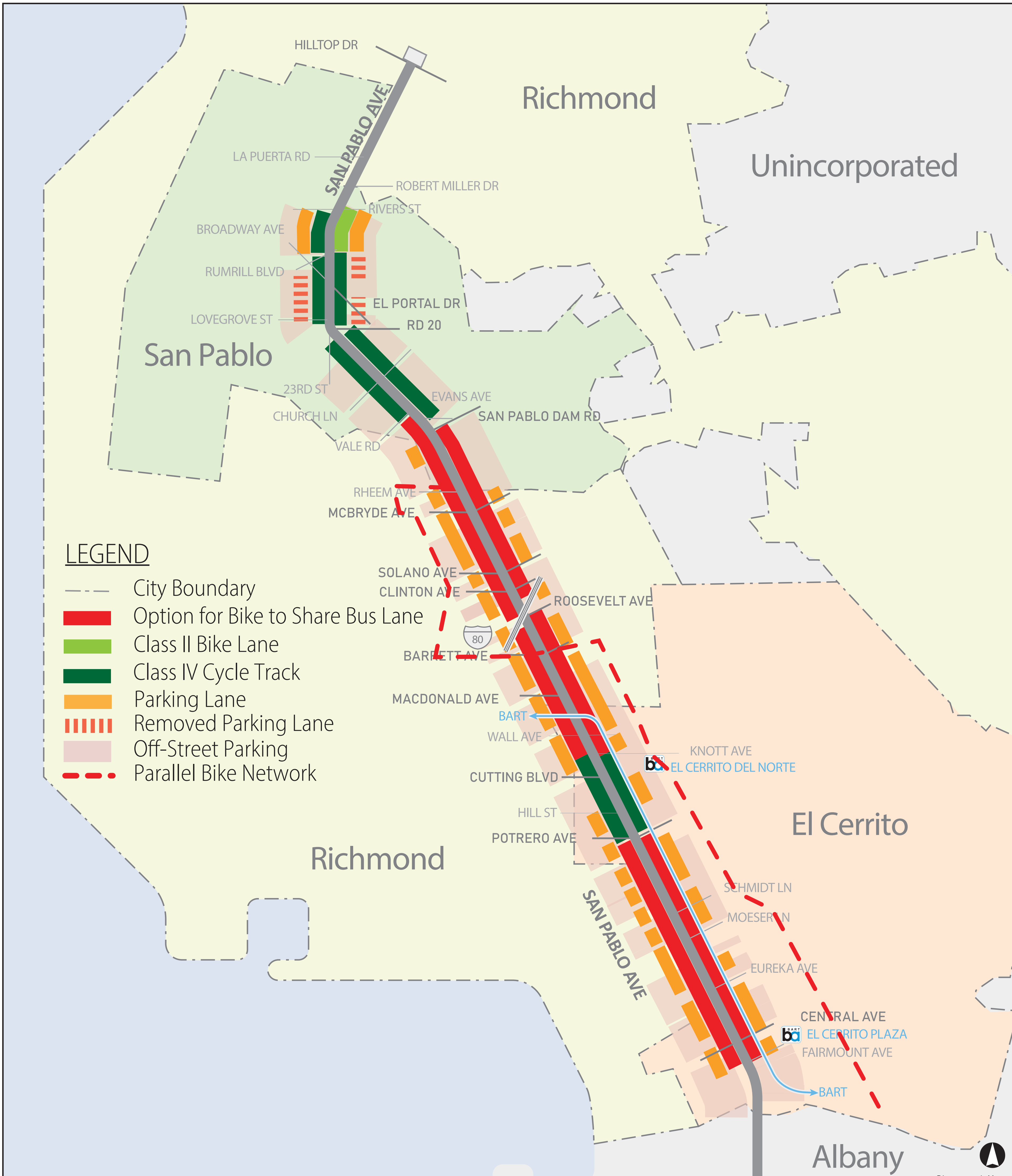
San Pablo Avenue Multimodal Corridor Study

Center-Running BRT with Parking Prioritized

ALAMEDA County Transportation Commission · CONTRA COSTA transportation authority · WCCTAC West Contra Costa Transportation Advisory Committee

San Pablo Avenue Multimodal Corridor Study

Side-Running BRT with Bike Lane Prioritized



ALAMEDA County Transportation Commission

CONTRA COSTA transportation authority

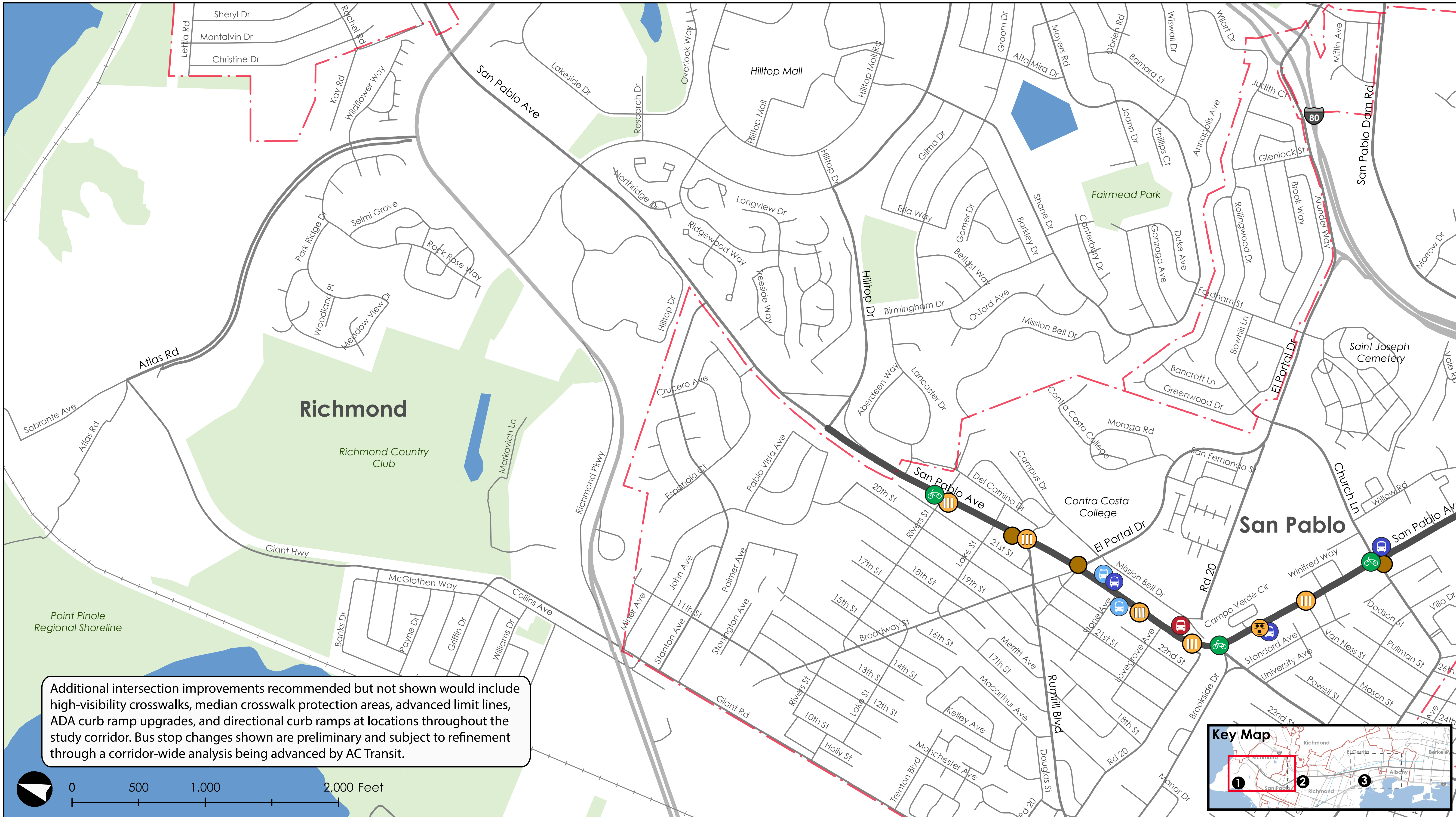
WCCTAC West Contra Costa Transportation Advisory Committee

San Pablo Avenue Multimodal Corridor Study

Side-Running BRT with Parking Prioritized

Appendix D

San Pablo Avenue Safety Improvements



Legend

- BART Above/Below Ground
- Freight Rail and Capitol Corridor Tracks
- Jurisdiction Boundary
- San Pablo Avenue Study Area
- Freeways

Transit Improvements

- Bus Bulb Improvement at Rapid Stop
- Bus Stop Relocation
- Bus Stop Removal

Pedestrian/Bicycle Improvements

- PHB/RRFB at Unsignalized Intersections
- Additional Crosswalks at Signalized Intersections
- Bike Crossings to Existing Facilities

Other Safety Improvements

- Pork Chop/Free-right Removal
- Side-street Bulbout

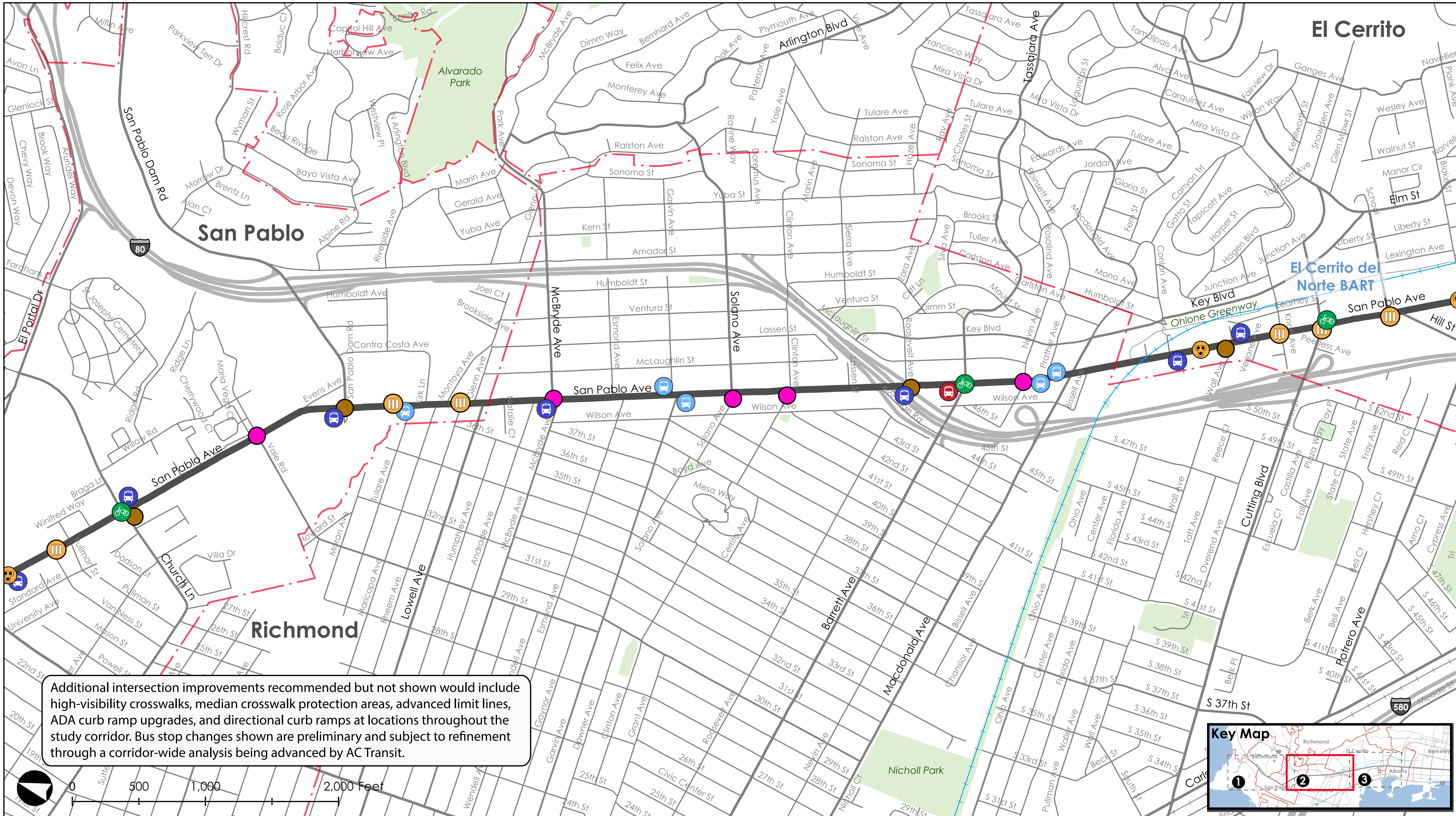
Sheet 1

WCCTAC West Contra Costa Transportation Advisory Committee

San Pablo Avenue Priority Safety Improvements

WCCTAC San Pablo Multimodal Corridor Phase 2 Project

November 2022



Legend

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Sheet 2

WCCTAC West Contra Costa Transportation Advisory Committee

San Pablo Avenue Priority Safety Improvements
WCCTAC San Pablo Multimodal Corridor Phase 2 Project

November 2022

Legend

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Sheet 3

WCCTAC West Contra Costa Transportation Advisory Committee

San Pablo Avenue Priority Safety Improvements
WCCTAC San Pablo Multimodal Corridor Phase 2 Project

November 2022