



OFFICE OF TRANSPORTATION

250 Hamilton Ave, 5th Floor
Palo Alto, CA 94301

CITY OF
**PALO
ALTO**

(650) 329-2520
Transportation@CityofPaloAlto.org

Memo

Date: June 4, 2024

To: Caltrans El Camino Real Council Ad Hoc Committee

From: Philip Kamhi (City of Palo Alto Office of Transportation) & Lauren Ledbetter (VTA Bicycle and Pedestrian Program Manager)

Subject: Joint City of Palo Alto and Santa Clara Valley Transportation Authority (VTA) Review and Comments on Bike and Bus Conflict Areas Proposed on State Route (82)/El Camino Real

DocuSigned by:
Philip Kamhi
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DocuSigned by:
Lauren Ledbetter
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On May 16, 2024, the *Caltrans El Camino Real Council Ad Hoc Committee* requested a meeting between VTA, Caltrans, and City staff to discuss bus stop treatments to add to the current bikeway proposal that accommodates bus stops within the new bike lanes.¹ Under this configuration, cyclists approaching a bus at a stop are expected to either wait behind the bus, safely merge into the vehicle lane to pass the bus on the left, or merge onto the sidewalk and pass the bus on the right.

A follow up meeting with Caltrans staff, VTA staff, City staff, and Fehr & Peers was held virtually on May 23, 2024, to discuss the proposed bike facilities at bus stops and identify other opportunities to improve bike and bus interactions on El Camino Real.

Caltrans staff presented a range of various bus stop design treatments that were generally consistent with the designs featured in VTA’s [Bus Stop & Passenger Facility Design Criteria and Standards](#) (December 2020), [Caltrans’ Design Information Bulletin-94 Complete Streets Contextual Design Guidance](#) (DIB-94) (January 16, 2024), and Caltrans’ [Design Information Bulletin-89-02](#) (DIB-89-02) (February 7, 2022).

DIB-94 includes strategies to reduce conflicts between buses and cyclists (see DIB-94, Section 7.3) and states that “[i]n general, preference should first be given to a design that provides separate spaces for bicyclists to move within their travel way, for buses to stop, and for pedestrians to wait and board bus vehicles. The next-preferred design option would provide a lower degree of separation, integrating pedestrians and bicyclists through the boarding area. The third preference would be to provide a space shared by bicyclists and buses.”

There was consensus that right-of-way constraints severely limit the bus stop treatments that can be implemented within the Caltrans project. Even so, there was agreement that the City and VTA would

¹The proposed draft bikeway plans, dated May 20, 2024, include one improved bus stop near the north-east corner of the El Camino Real and Park Boulevard/Serra Street intersection which does not require the bus stop and bike lane to share space. This stop retains a dedicated bike lane and a separated pull-out area for buses.

further investigate the high frequency bus stops for any treatments that do not require additional right-of-way. To support this work, VTA shared bus stop utilization and ridership (boardings and alightings) data revealing the highest frequency stops to be those at California Avenue, Embarcadero/Galvez, and Charleston/Arastradero.

The following sections provide examples of the range of design treatments referenced in the design standard documents above and discussed in the meeting.

Bus Stop Designs Featuring Separated Spaces

Bus boarding island platforms (i.e., side-boarding islands or floating islands) (see **Figure 1**) represent an example design featuring separated spaces for bikes and buses. However, given the limitations in scope and right-of-way along El Camino Real, it was concluded that bus boarding island platforms would need to be considered in a future project separate from the current Caltrans project.

Figure 1: Example of Bus Boarding Island in San Francisco

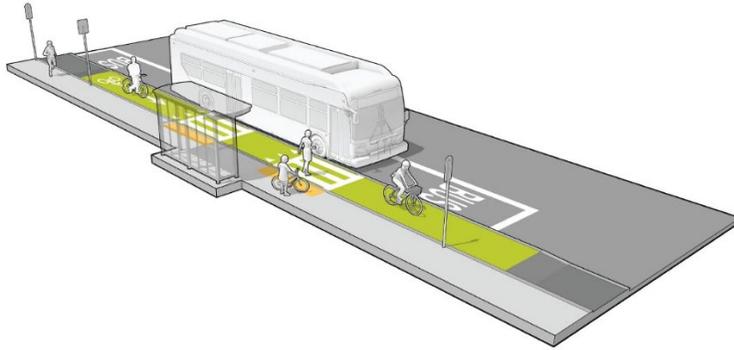


Source: Caltrans DIB-94

Bus Stop Designs Featuring Integrated Bicycle/Pedestrian Spaces

An integrated bike/pedestrian zone at bus stops (see **Figure 2**) is an example design featuring integrated bicycle/pedestrian spaces, however, given the limitations in scope and right-of-way along El Camino Real, it was concluded that these designs would need to be considered in a future project separate from Caltrans SHOPP project. Additionally, VTA design guidelines prohibit integrated bicycle/pedestrian zones at bus stops. The agency cannot commit to a permanent installation but would be willing to participate in a temporary pilot to understand how an integrated stop could be designed to prevent conflicts between transit customers and bicyclists. A pilot would need to be completed outside of the current Caltrans repaving project to allow for the lead time associated with pre-launch planning, outreach, engineering, funding identification, materials procurement, construction, and staff resource identification.

Figure 2: Diagram of an Integrated Bicycle/Pedestrian Zone at a Bus Stop (MassDOT Separated Bike Lane Guide)



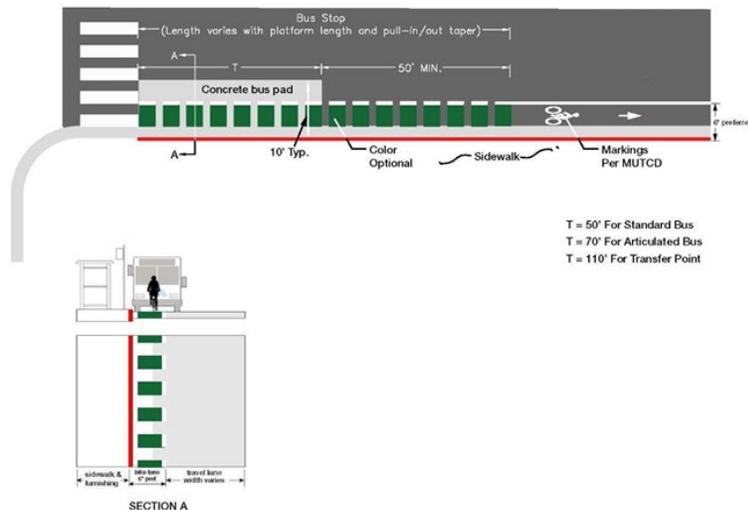
Source: Caltrans DIB-94

Bus Stop Designs Featuring Shared Bike/Bus Spaces

The following bikeway designs featuring shared bike and bus spaces were also discussed:

- Dashed standard bike lane shared with bus pull out area (current proposal for most stops - see **Figure 3**)
- Dashed standard bike lane with separated bus pull out area (current proposal for 1 stop)
- Dashed buffered bike lane with separated bus pull out area

Figure 3: Bus Stop in Standard Bike Lane with No Parking



Source: VTA Bus Stop & Passenger Facility Design Criteria and Standards (December 2020)

Additional Strategies Considered

Below are several other design strategies and programs that were considered in addition to the above bus stop designs:

- Class I bikeway and signage (as needed) directing bicyclists to ride on sidewalk around bus stop. This was not recommended after staff analysis documented in the next section.

- On-street markings to clarify conflict areas and right-of-way for bicyclists and buses. This is recommended based on the discussion in the next section.
- Relocate bus stops to locations with additional right-of-way that would allow for separated bike/bus design treatments. VTA recently rebalanced bus stops on ECR, so this would not be ideal.
- Educational materials and techniques for transit operators and bicycle educators to encourage safer interactions between buses and bicyclists. This is recommended below.

Assessment of Bus Stops along El Camino Real

Sidewalk Use

Palo Alto staff performed a qualitative assessment of the six high frequency bus stops to determine the feasibility of potential treatments to improve bike and bus interactions. One question to resolve was whether existing sidewalks could be used for both bicycle and pedestrian traffic when buses are stopped in the bike lane at bus stops. When buses block the bike lane, the sidewalk could potentially provide a safer alternative for cyclists than passing a bus on the left in the adjacent travel lane. Potential conflicts with pedestrians could occur depending on sidewalk width, but these conflicts may be less severe than potential bus/bike or car/bike conflicts if cyclists or drivers make a mistake.

To safely support bus loading as well as bicycle and pedestrian traffic, adjacent sidewalks would need to accommodate a bus landing of 5 feet wide by 8 feet deep plus a 10' sidewalk clearance, for a total width of 18 feet. The results of this bus stop analysis are in **Table 1**, which includes the following:

- the average number of buses per day that use that stop
- average number of boardings/alightings per day
- presence of a concrete bus pad at the stop
- estimate of the sidewalk width adjacent to the stop

Table 1: Highest Frequency Bus Stops for Routes 22/522 – Riders, Bus Pads, Sidewalk Width

Cross Street Direction	Avg. # of 22/522 Stops/Day			Oct 2023	Bus Pad	Sidewalk
	Weekday	Saturday	Sunday	Boardings	Y/N	Width @ Stop
EL CAMINO + CALIFORNIA						
EAST (to SJ)	59	48.4	45.4	186.21	Y	10' + planter strip
WEST (to PA Transit Center)	56.9	49.8	43.6	56.73	Y	<10'
EL CAMINO + EMBARCADERO						
WEST (to PA Transit Center)	42.19	30.2	26	10.26	N	<10'
EL CAMINO + ARASTRADERO						
EAST (to SJ)	40.81	24.6	26.4	69.97	N	10' + planter strip
EL CAMINO + CHARLESTON						
WEST (to PA Transit Center)	38.29	29.6	29.8	33.25	N	<10'
EL CAMINO + GALVEZ						
EAST (to SJ)	33.81	25	23.8	97.62	N	<10'

Staff found that none of the sidewalks adjacent to the high frequency bus stops meet standards for bus loading and Class 1 bike facilities. Only two of the high frequency bus stops have greater than 10 feet clearances that could accommodate both cyclists and pedestrians. However, when space for wheelchair landing area is taken into account, these stops do not meet the threshold widths needed for safe mixed bicycle and pedestrian use under Caltrans and VTA standards. Moreover, the sidewalk widths leading up to the bus stop areas are generally not wide enough to support mixed bicycle and pedestrian traffic.

On-Street Markings

Bus/bike interaction designs should make bicyclists and bus operators feel more comfortable about sharing the road with one another, mostly by knowing where to expect each other. See Figures 4 and 5 below for suggested green paint markings, “Bike Bus Only” labels, and “Bike Yield” markings that may have following benefits:

- Make it clear to bus operators and cyclists who has the right-of-way when conflicts occur (i.e., yield markings in bike lane indicates priority for buses and delineates space for cyclists to stop and wait for buses to load/unload passengers)
- Encourage cyclists to wait behind buses, keeping them out of the travel lane and off the sidewalks
- Reinforce that this space is for bicyclists and uses only, which could deter private vehicle loading/unloading activity that may occur

Staff Recommendations

Following the meeting with Caltrans, City staff and VTA staff reviewed the range of bus stop treatments discussed above and noted that the following strategies could be available within the current Caltrans project to enhance the safety of the shared bus stop/bike lane areas:

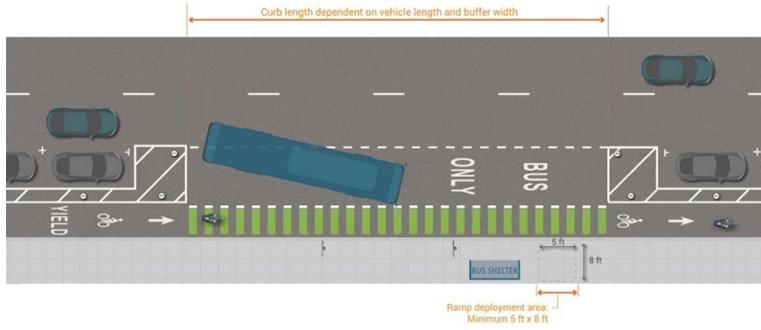
- Incorporate on-street green markings at bus stopping areas with “Bike Bus Only” labels (see **Figure 4** for example)
- Include “Bike Yield” markings in bike lanes (see **Figure 5** for example)
- Implement an educational campaign on how to safely use the shared bike lane/bus stop area
- If possible, relocate bus stops to locations with additional right-of-way that would allow for desired bike/bus design treatments

Figure 4: Example of Bus Stop at Class IV Separated Bikeway in Hayward



Source: Caltrans DIB-94

Figure 5: Diagram of Bus Stop Mixing from the FHWA Separated Bike Lane Planning and Design Guide



Source: Caltrans DIB-94

Next Steps

Based on the discussion above, City staff and VTA staff suggest the following as key next steps:

- Prior to finalizing striping plans, City and VTA staff to coordinate with Caltrans on incorporating clear, consistent, and gap-free roadway markings and signage (as needed) into bikeway design, considering the potential bus stop treatments and strategies discussed above
- Prior to finalizing striping plans, City staff and VTA staff to assess the feasibility of relocating bus stops to locations with additional right-of-way that would allow for desired bike/bus design treatments
- Prior to repaving completion, City staff and VTA staff to coordinate with Caltrans, Silicon Valley Bicycle Coalition (SVBC), and other relevant stakeholders to develop educational materials and techniques for transit operators and bicycle educators to encourage safer interactions between buses and bicyclists
- In the coming months once resources and staff are identified, City staff and VTA staff to coordinate with Caltrans on a bus boarding island pilot on El Camino Real in Palo Alto outside of the current Caltrans project

Attachments

Attachment 1: VTA Boardings for Palo Alto Bus Stops along El Camino Real (October 2023)

Attachment 2: VTA Daily Number of Stops at Palo Alto Bus Stops along El Camino Real

VTA Data: Boardings by Bus Stop on El Camino Real in Palo Alto

stopid	stop_	di	on_name	at_name	oct2023_boardings
60331	E		EL CAMINO REAL	SAM MCDONALD	3.61
60339	E		EL CAMINO REAL	BARRON	21.26
60337	E		EL CAMINO REAL	HANSEN	38.09
60340	E		EL CAMINO REAL	LOS ROBLES	25
60335	E		EL CAMINO REAL	CALIFORNIA	186.21
60330	S		EL CAMINO REAL	GALVEZ	97.62
60341	E		EL CAMINO REAL	VISTA	15.92
60518	N		EL CAMINO REAL	WELLS	0.67
60511	W		EL CAMINO REAL	PAGE MILL	20.36
60514	W		EL CAMINO REAL	PARK	2.36
60508	W		EL CAMINO REAL	CURTNER	21.83
60343	E		EL CAMINO REAL	ARASTRADERO	69.97
60327	S		EL CAMINO REAL	STANFORD SHOP	4.8
60510	W		EL CAMINO REAL	PORTAGE	7.49
60507	W		EL CAMINO REAL	EL CAMINO WAY	21
60516	W		EL CAMINO REAL	SAM MCDONALD	0.12
60515	W		EL CAMINO REAL	CHURCHILL	0.5
60513	W		EL CAMINO REAL	STANFORD	3.81
60504	W		EL CAMINO REAL	CHARLESTON	33.25
60338	E		EL CAMINO REAL	MATADERO	10.57
60509	W		EL CAMINO REAL	MARGARITA	12.58
60342	E		EL CAMINO REAL	MAYBELL	10.72
60503	W		EL CAMINO REAL	Dianhs Court	8.61
60336	E		EL CAMINO REAL	PAGE MILL	40.79
60333	E		EL CAMINO REAL	SERRA	20.84
60505	W		EL CAMINO REAL	EL CAMINO WAY	11.9
60332	E		EL CAMINO REAL	CHURCHILL	7.48
60512	W		EL CAMINO REAL	CALIFORNIA	56.73
60329	S		EL CAMINO REAL	PALM	26.29
60517	N		EL CAMINO REAL	EMBARCADERO	10.26
60334	E		EL CAMINO REAL	OXFORD	9.93

LOCATION	Average # of buses per day		
	Weekday	Saturday	Sunday
Cross Street	Weekday	Saturday	Sunday
EL CAMINO + CALIFORNIA			
EAST	59	48.4	45.4
WEST	56.9	49.8	43.6
EL CAMINO + EMBARCADERO			
WEST	42.19	30.2	26
EL CAMINO + ARASTRADERO			
EAST	40.81	24.6	26.4
EL CAMINO + CHARLESTON			
WEST	38.29	29.6	29.8
EL CAMINO + GALVEZ			
EAST	33.81	25	23.8
EL CAMINO + PAGE MILL			
EAST	17.19	9.2	9
WEST	22.48	12	10
EL CAMINO + EL CAMINO WAY / LOS ROBLES			
WEST	19.48	17.8	17.4
EL CAMINO + CURTNER			
WEST	17.95	19.2	17.2
EL CAMINO + HANSEN			
EAST	17.05	8.4	8.4
EL CAMINO + LOS ROBLES			
EAST	16.19	16	14
EL CAMINO + BARRON			
EAST	16	13	13.2
EL CAMINO + DINAHS CT			
EAST	7	5.4	5.6
WEST	9	9.2	8.2
EL CAMINO + CESANO			
WEST	13.1	10.4	8.8
EL CAMINO + PORTAGE			
WEST	11.62	8.2	5.6
EL CAMINO + MARGARITA			
WEST	11.29	9.4	7.8
EL CAMINO + VISTA			
EAST	10.67	10.4	8.6
EL CAMINO + EL CAMINO WAY / MAYBELL			
WEST	10.48	9	6.4
EL CAMINO + MATADERO			
EAST	10.29	8.2	7
EL CAMINO + MAYBELL			
EAST	10	4.8	5.8
EL CAMINO + WELLS			
WEST	8.86	8.4	6.6
EL CAMINO + OXFORD			
EAST	8.38	8.4	8.4
EL CAMINO + PARK			
WEST	7.86	8.4	5.4
EL CAMINO + STANFORD			
WEST	6.81	8.8	6.6
EL CAMINO + PALM			
EAST	6.81	4.6	3.2
EL CAMINO + SERRA			
EAST	6.19	5.8	6
EL CAMINO + CHURCHILL			
EAST	2.9	2.4	2.6
WEST	3.1	3.4	2.8
EL CAMINO + SAM MCDONALD			
EAST	1.05	1.4	1
WEST	1.38	2	0.2