

## Appendix A: Complete Streets Improvements Toolkit

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## Introduction

There are a variety of different transportation infrastructure options and features that might be implemented in the San Lorenzo Valley (SLV). The “toolkit” presented below describes several different categories of transportation improvements, to provide readers with a general understanding of potential infrastructure options. While most infrastructure modifications are not feasible in all locations in the SLV or would require an exception to state standards (design exceptions), this toolkit provides a sampling of some potential modifications on Highway 9 and county roads.

For each infrastructure option, current regulations, policies, and guidance at the state (Caltrans) or federal (Federal Highway Administration) level are included. References are made to Caltrans regulating documents, such as the Highway Design Manual (HDM) and the California Manual of Uniform Traffic Control Devices (CAMUTCD), as well as federal level guidance from the Federal Highway Administration (FHWA). Other Caltrans resources to be considered during project implementation include: Caltrans Project Development Procedure Manual, Caltrans Division of Design, and Caltrans *Toward an Active California State Bicycle and Pedestrian Plan*.

Caltrans notes that “A ‘one-size-fits-all’ design philosophy is not Departmental policy: “[...]Caltrans] guidance allows for flexibility in applying design standards and approving design exceptions that take the context of the project location into consideration; which enables the designer to tailor the design, as appropriate, for the specific circumstances while maintaining safety.” (*Caltrans Highway Design Manual, Chapter 80*)

## 1. Automobile Infrastructure

### 1.1) Parking

Within urban and suburban areas and in rural communities located the corridor, on-street parking should be considered, as appropriate to accommodate existing land uses. Where adequate off-street parking facilities are not available, the roadway design should consider on-street parking, so that the proposed highway improvement will be compatible with the land use. On-street parking as well as off-street parking needs to comply with accessibility requirements DIB82. (*Caltrans Highway Design Manual, Index 402.3*)

#### A) Parallel Parking

Marking of parking space boundaries encourages more orderly and efficient use of parking spaces where parking turnover is substantial. Parking space markings tend to prevent

encroachment into fire hydrant zones, bus stops, loading zones, approaches to intersections, curb ramps, and clearance spaces for islands and other zones where parking is restricted...The desirable dimensions of parking meter stalls are 8 feet by 24 feet with a minimum length of 20 feet. See Figure 3B-21(CA) - [No Parking Zone of 20 feet minimum adjacent to intersections]. (California MUTCD Section 3B.19)

### B) Back-in Angled Parking

Angled parking, either forward (nose-in) or reverse (back-in), may provide more spaces than parallel parking, but requires more space within the right of way than parallel parking. Back-in angled parking offers drivers better visibility of bicyclists and other traffic when they are exiting a parking space. Angled parking is most feasible when there is adequate space to allow vehicles to enter or exit the space without interfering with a bicycle lane, or the traveled way of the main street. (Caltrans Main Street, California Design Guide)

The following sentence was **REMOVED** from latest CAMUTCD: Department of Transportation does not approve ordinances establishing angled parking on State highways. Diagonal parking stalls are not permitted on State highways. (California MUTCD Section 3B.19)

Figure A1: Back-in Angled Parking, Highway 395 in Bridgeport, CA



Credit: Caltrans

**Interpretation:** Reference to prohibiting angled parking on state highways was removed in the 2018 updates to the CAMUTCD. Caltrans prefers back-in angled parking for the bicycle and auto safety reasons stated above, and back-in angled parking has recently been installed in downtown commercial areas on Highway 395 in Bridgeport and on Highway 16 in Esparto. Back-in angled parking requires drivers to execute the first move of parallel parking only. However, as back-in angled parking is currently a more rarely used parking design option, drivers may still feel uncomfortable performing the maneuver, particularly at night. As of publication of this document, no nose-in angled parking has been approved by Caltrans on any state highway.

### C) Formalizing Unpaved Parking

Caltrans does not have established guidance for formalizing unpaved parking areas. However, the federal US Forest Service, which oversees nearly 200 million acres of federal park land, has published *Designing Parking Areas on Unpaved Surfaces*, which can be found at: <https://www.fs.fed.us/eng/pubs/html/02231314/02231314.html>. Project 1 in this plan seeks to formalize existing shoulder parking along Henry Cowell State Park, so this federal document could provide useful guidance. Options may include use of brightly painted timbers or railroad ties driven into the soil with rebar in lieu of typical concrete parking bumpers/curbs. Timbers would need to be placed on park land, not within Caltrans right-of-way.

## **D) Establishing No Parking Areas**

On-street parking generally decreases through traffic capacity, impedes traffic flow, and increases crash potential. Where the primary service of the arterial is the movement of vehicles, it may be desirable to prohibit on-street parking on State highways in urban and suburban expressways and rural arterial sections. (*Caltrans Highway Design Manual, Index 402.3*)

The Caltrans District Director is authorized to issue orders prohibiting or restricting the parking of vehicles on State highways. The District Director is also authorized to approve ordinances or resolutions of local authorities prohibiting or restricting parking on State highways...Major factors that may be considered for No Stopping Anytime include: Narrow roadway width, Restricted visibility at intersections for pedestrian and vehicular traffic, Narrow shoulder width, Conversion of a parking lane to a through lane or right-turn lane. (*California MUTCD Section 2B.46*)

At all intersections, one stall length on each side measured from the crosswalk or end of curb return should have parking prohibited...At signalized intersections parking should be prohibited for a minimum of 30 feet on the near side and one stall length (20') on the far side. (*California MUTCD Section 3B.19*)

*Interpretation:* Prohibition of stopping or parking may be required to achieve multimodal goals of many of the Highway 9/SLV Complete Streets Corridor Plan projects, particularly projects 1, 8, and any project including vehicle right turn lanes, bike lanes, multiuse paths, or sidepaths. However, maximizing parking availability in commercial areas could support economic vitality objectives in this study. This plan recommends that essential parking in the village cores be relocated, not removed.

### **1.2) Turnouts**

On a two-lane highway where passing is limited, the California Vehicle Code requires slow-moving vehicles followed by five or more vehicles to turn off at designated turnouts or wherever sufficient area for a safe turnout exists. Designated turnouts may be constructed in hilly or mountainous terrain or on winding roads in other areas...(b) Length. Designated turnouts should be from 200 feet to 500 feet long including a short taper (usually 50 feet) at each end...(c) Width. Paved widths of at least 15 feet in fill sections and 12 feet in cut sections are recommended...On the outside of curves along steep fill slopes or drop-offs, greater width or the installation of guardrail should be considered. (d) Location. Turnouts should be located where there is stopping sight distance for approaching drivers to see vehicles leaving and re-entering the through lanes. (*Caltrans Highway Design Manual Index 204.5 (4)*)

### **1.3) Two-Way Left-Turn Lane (TWLTL)**

A Two-Way Left-Turn Lane (TWLTL) consists of a striped lane in the median of an arterial and is devised to address the special capacity and safety problems associated with high-density strip development. It can be used on 2-lane highways as well as multilane highways...The minimum width for a TWLTL shall be 12 feet. The preferred width is 14 feet. (*Caltrans Highway Design Manual Index 405.2 (4)*)



A two-way left-turn lane is a lane reserved in the center of a highway for exclusive use of left or U-turning vehicles. Refer to CVC 21460.5. It is normally used where there are many points of access. (*California MUTCD Section 3B.03*)

*Interpretation:* A TWLTL could be utilized to improve traffic flow in village core areas with high levels of traffic turning into or merging from roadside parking or driveways. Synchro analysis would be needed to determine the minimum amount of TWLTL that would need to be devoted to a left turn only pocket at intersections.

Figure A2: Two-Way Left-Turn Lane (TWLTL)



Credit: Caltrans

#### 1.4) Turn and Merge Pockets

The lane width for both single and double left-turn lanes on State highways shall be 12 feet... Storage length: At a minimum, space for 2 vehicles should be provided at 25 feet per vehicle... Right turn: In urban, city or town centers (rural main streets) with posted speeds less than 40 miles per hour in severely constrained situations, if truck or bus use is low, consideration may be given to reducing the right-turn lane width to 10 feet... Approach tapers are usually unnecessary since main line traffic need not be shifted laterally to provide space for the turn lane ...The conditions and principles of left-turn lane deceleration apply to right-turn deceleration...Right-turn

storage length is determined in the same manner as left-turn storage length. (*California Highway Design Manual 405.2*)

*Interpretation:* Left turn infrastructure length at speed limit 35 mph (design speed 40 mph) is 370 feet, however design exceptions may have been made in the past on Highway 9, as the left turn pocket onto San Lorenzo Way is approximately 326 feet.

Figure A3: Turn and Merge Pockets



Credit: SCCRTC

#### 1.5) Displaced Left Turn

Various effective geometric alternatives to traditional designs that can reduce crashes and their severity, improve operations, reduce congestion and delay typically by reducing or altering the number of conflict points; these alternatives include geometric design features such as intersections with displaced left-turns. (*California Highway Design Manual 401.5*)

The displaced left turn (DLT) intersection is also known as a continuous flow intersection (CFI) and a crossover displaced left-turn intersection... This attribute consequently allows left-turn movements to proceed simultaneously with the through movements and eliminates the left-turn phase for this approach. The number of traffic signal phases and conflict points (locations where user paths cross) are reduced at a DLT intersection, which can result in improvements in traffic operations and safety performance. (*FHWA Displaced Left Turn Intersection Informational Guide (2014)*)

### 1.6) New Stop Signs

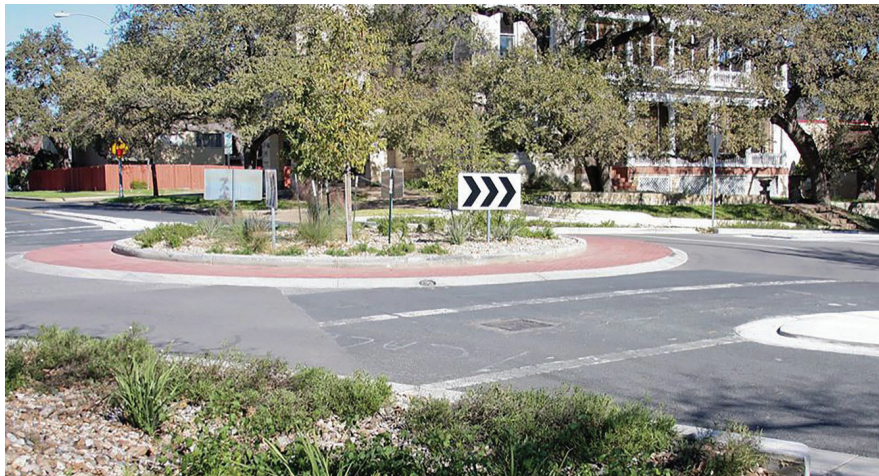
An engineering study of traffic conditions, pedestrian characteristics, and physical characteristics of the location shall be performed to determine whether installation of a traffic control signal is justified at a particular location. Traffic signal warrants: Eight-Hour Vehicular Volume, Four-Hour Vehicular Volume, Peak Hour, Pedestrian Volume, School Crossing, Coordinated Signal System, Crash Experience, Roadway Network, Intersection Near a Grade Crossing. The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal... The Peak Hour signal warrant is intended for use at a location where traffic conditions are such that for a minimum of 1 hour of an average day, the minor-street traffic suffers undue delay when entering or crossing the major street. (*California MUTCD Section 4C.01-4C.09*)

*Interpretation:* Caltrans requires an intersection control evaluation (ICE) for installation of new stop signs. This Complete Streets Corridor Plan proposes analyzing the installation of one new additional stop sign for southbound Highway 9 at Bear Creek Road (Project 27). The proposed stop sign would serve the dual purpose of slowing highway traffic as it enters Boulder Creek from the north and reducing delay for autos turning from Bear Creek Road onto Highway 9, especially during peak commute times. The new stop control at this location would likely need to pursue the “Peak Hour” traffic signal warrant option.

### 1.7) Roundabouts

A roundabout is a form of circular intersection in which traffic travels counterclockwise around a central island and entering traffic must yield to the circulating traffic... Benefits of roundabouts are: A) Fewer conflict points typically result in fewer collisions with less severity. B) Roundabouts are designed to reduce the vehicular speeds at intersections. Lower speeds

Figure A4: Roundabout



Credit: NACTO

lessen the vehicular collision severity. C) Roundabouts allow continuous free flow of vehicles and bicycles when no conflicts exist... Roundabout intersections on the State highway system must be developed and evaluated in accordance with National Cooperative Highway Research Program (NCHRP)



Report 672 entitled “Roundabouts: An Informational Guide, 2nd ed.” (NCHRP Guide 2) dated October 2010 and Traffic Operations Policy Directive (TOPD) Number 13-02. (*Caltrans Highway Design Manual Index 405.10*)

*Note:* Truck and bus turning radii should be considered in the design of any roundabouts.

## 2. Auto Safety

### 2.1) Improving Sight Lines

At unsignalized intersections a substantially clear line of sight should be maintained between the driver of a vehicle, bicyclist or pedestrian waiting at the crossroad and the driver of an approaching vehicle. Line of sight for all users should be included in right of way, in order to preserve sight lines...In some cases the cost to obtain 7-1/2 seconds of corner sight distances may be excessive. High costs may be attributable to right of way acquisition, building removal, extensive excavation, or immitigable environmental impacts. In such cases a lesser value of corner sight distance, as described under [table 201.1], may be used...At unsignalized public road intersections corner sight distance values given in Table 405.1A should be provided... Private Road Intersections and Rural Driveways - the minimum corner sight distance shall be equal to the stopping sight distance as given in Table 201.1, measured as previously described. (*Caltrans Highway Design Manual Index 405.1*)

*Interpretation:* At the typical Highway 9 speed limit of 35 mph (40 mph design speed) corner sight distance for unsignalized public intersections should be 440 feet, and for private roads and rural driveways should be 300 feet. Where cost to provide the full 440 feet for public intersections is infeasible, a minimum of 300 feet of sight distance must be provided.

### 2.2) Radar Speed Feedback Signs

A Vehicle Speed Feedback sign that displays to approaching drivers the speed at which they are traveling may be installed in conjunction with a Speed Limit (R2-1) sign. If a Vehicle Speed Feedback sign displaying approach speeds is installed, the legend shall be YOUR SPEED XX. The numerals displaying the speed shall be white, yellow, yellow-green or amber color on black background. When activated, lights shall be steady-burn conforming to the provisions of CVC Sections 21466 and 21466.5. (*California MUTCD Section 2B.13*)

A radar speed sign may be considered in conjunction with other guidance where a speed transition zone exists (high to low speed limits). A radar speed sign may be considered when the observed mean speeds at a site exceed the posted speed limit by 5 mph or more. A radar speed sign may be considered when ADT exceeds 500 vehicles. A radar speed sign may be considered at sites exhibiting a correctable speed-related accident history within a recent time period. A radar speed sign may

Figure A5: Radar Speed Feedback Signs



Credit: FHWA

be used at sites with a pedestrian-related accident history.

*(FHWA Office of Safety Speed Management Reference Materials – Guidance for Radar Speed Sign Deployments)*

*Interpretation:* Caltrans District 5 has provided with the following additional guidance regarding guidelines for placement of radar speed feedback signs:

*Caltrans Process:*

*The engineering guidance for use of speed feedback signs is found in the California Manual on Uniform Traffic Control Devices. The permitting application requirements would be:*

- 1. Engineering study and support for the speed feedback signs. The study would, at a minimum, need to justify the use and location of the signs by way of evaluation of 3 years traffic collision data and possibly speed samples from a traffic engineer. Caltrans Traffic Operations will need to concur with the study and recommendations prior to application for permit. This engineering study is an evaluation that will need to provide purpose, need, and justification for installation/location; as it is an engineering study, a Registered Civil Engineer will need to seal, sign, date, and provide the expiration date of the license in accordance with State law.*
- 2. Resolution of support by County Board of Supervisors (BOS) for installation and maintenance in perpetuity for said signs after Caltrans Traffic Operations Branch Chief has concurred with the engineering study.*
- 3. CHP may need to be in written support of the sign as well, see what Cal MUTCD says.*
- 4. Complete application including as appropriate: California Environmental Quality Act (CEQA) Notice of Determination (NOD), completed/signed encroachment permit application, complete/final Resolution by BOS for installation and maintenance of speed feedback signs, six sets of 100% complete engineering plans.*
- 5. The permit will be issued within 30 days of receipt if it is complete. The application will be rejected if incomplete.*

In some communities, radar feedback signs can become less effective over time as drivers “get used to” their presence.

### **2.3) Speed Limit Sign with Flashing Beacon**

A Speed Limit Sign Beacon shall be used only to supplement a Speed Limit sign. A Speed Limit Sign Beacon shall consist of one or more signal sections of a standard traffic control signal face, with a flashing CIRCULAR YELLOW signal indication in each signal section... When a Speed Limit Sign Flashing Beacon is installed at the request of a local agency or installed by the local agency under an encroachment permit the costs of installing and maintaining the

*Figure A6: Speed Limit Sign with Flashing Beacon*



*Credit: FHWA*

beacon should be at 100% local agency expense. (*California MUTCD Section 4L.04*)

*Interpretation:* In some communities, continually activated flashing beacons, which are currently the only type defined or allowed by the California MUTCD, can become less effective over time as drivers “get used to” their presence. In the future, if the MUTCD includes beacons that are only activated when speeding is detected, prioritize use of these technologies.

## 2.4) Daytime Headlight Section

Some States require road users to turn on their vehicle headlights under certain weather conditions, as a safety improvement measure on roadways experiencing high crash rates, or in special situations such as when driving through a tunnel. If a particular section of roadway has been designated as a safety improvement zone within which headlight use is required, a TURN ON HEADLIGHTS NEXT XX MILES (R16-7) sign or a BEGIN DAYTIME HEADLIGHT SECTION (R16-10) sign should be installed at the upstream end of the section, and an END DAYTIME HEADLIGHT SECTION (R16-11) sign should be installed at the downstream end of the section. (*California MUTCD Section 2B.64*)

*Interpretation:* Creating a daytime headlight section Daylight Headlight (S30(CA)) Series) signs may be used after a traffic investigation and consultation with the local CHP office and/or law enforcement as a traffic safety improvement measure in high accident locations on two lane highways where there is a potential for head-on collisions.

## 2.5) Narrowed lanes

For conventional State highways with posted speeds less than or equal to 40 miles per hour and AADTT (truck volume) less than 250 per lane that are in urban, city or town centers (rural main streets), the minimum lane width shall be 11 feet. The preferred lane width [otherwise] is 12 feet. (*Caltrans Highway Design Manual Index 301.1*)

*Interpretation:* 2016 AADTT volumes in the SLV project area range from 300 – 500 per lane. This means narrowed, 11-foot lanes would require a Caltrans design exception. Bus, truck and oversized vehicle use should be evaluated when narrowing lanes below 12 feet.

## 2.6) Rumble Strips

Shoulder and Centerline Rumble strips are an effective proactive safety measure in reducing run-off-road or cross centerline collisions. Rumble strips can be used adjacent to the outside lane and along the centerline of undivided highways, or adjacent to both inside and outside lanes of divided highways. Consideration should also be given to adding a centerline buffer zone with rumble

Figure A7: Rumble Strips



Credit: WisDOT



strips on highway segments where collision data exhibits a high number of cross centerline collisions. (*Caltrans Design Bulletin 79*)

Where rumble strips are placed in the shoulder, the shoulder shall be a minimum of 4 feet width to the right of the grooved rumble strip when a vertical element, such as curb or guardrails present or a minimum of 3 feet width when a vertical element is not present. Shoulder rumble strip must not be placed in the Class II bike lane. Also see Standard Plans for rumble strip details. From 2015 Shoulder Rumble Strip Standard Plan:

*Shoulder width: 4 feet*

*Placement: 6-inch offset outside the white line*

*Frequency: No gap pattern is specified*

*Depth: 5/16" (0.3125 inches)*

*Width: 5 inches*

*Length: 12 inches (Caltrans Highway Design Manual Index 302.1)*

If rumble strips are desired on bicycle network routes optimize the dimension, design, and placement of rumble strips to be more tolerable to bicyclists. 12-inch spacing center-to-center, 6–8 inches long, perpendicular to roadway, 6-inch-wide, measured parallel to roadway, 3/8 (0.375") inch deep. Place rumble strips to overlap with the roadway edge line, also known as edge line rumble strips or rumble stripes. Provide a bicycle gap pattern to allow access into and out of the shoulder area by bicyclists. The gap pattern consists of a 12 ft (3.3 m) clear gap followed by rumbles, typical 40–60 ft (12.1–18.2 m). 8 in wide white line with rumble strip is an edge marking option. (*FHWA Rural and Multimodal Networks, Paved Shoulder*)

These are the rumble strip best practices recommendations that provide the minimum standards to safely accommodate bicyclists:

- Shoulder width: No rumble strips or stripes installed on shoulders less than four feet wide.
- Placement: Adjacent to or on the white line, *providing a minimum of four feet of usable shoulder to the right of the rumble strip.*
- Frequency: 10-foot gaps allow cyclists to navigate away from the shoulder if needed.
- Depth: 0.375 inches
- Width: 5 inches
- Length: 6 inches
- Center line rumble strips: Ensure a minimum four-foot shoulder width when installing center line rumble strips. AASHTO recommends six-foot minimum shoulder width when both center line and shoulder rumble strips are present.

(*Adventure Cycling Association – Rumble Strips Best Practices*)

*Interpretation:* While the FHWA Rural and Multimodal Networks guidelines closely align with the recommendations from cycling organizations, the Caltrans design standards are quite different, particularly in terms of the lack of placement of frequent gaps to allow bicyclists to exit the shoulder/bike lane to avoid hazards. If rumble strips are utilized in the SLV, either to help prevent auto run-off-road crashes or to help prevent autos from drifting into paved right-of-way space intended for cyclists or pedestrians, the FHWA Rural and Multimodal Network guidelines should be followed.

## **2.7) Guardrails**

Guardrail, installed to reduce the severity of run-off-road collisions, is the most common traffic safety system found on California State Highways. Guardrail may redirect an errant vehicle and dissipate energy from the collision in some, but not for all cases depending on the sequence of events during the collision. Although guardrail is itself a fixed object, it may reduce collision severity in situations where it is determined that striking the guardrail is less severe than striking fixed objects or slopes behind the guardrail. (*Caltrans Traffic Safety Systems Guidance, 2017*)

## **2.8) Improved Drainage**

Roadway drainage involves the collection, conveyance, removal, and disposal of surface water runoff from the traveled way, shoulders, sidewalks, and adjoining areas defined in Index 62.1(7) as comprising the roadway... The design of roadway drainage systems often involves consideration of the problems associated with inadequate drainage of the adjacent or surrounding area. Cooperative drainage improvement projects with the responsible local agency may offer the best overall solution. (*Caltrans Highway Design Manual Index 831.1*)

## **2.9) Enforcement**

Traffic laws in San Lorenzo Valley are enforced by the California Highway Patrol (CHP). Extra enforcement increases the number of CHP officers patrolling an area, and this high CHP visibility serves to encourage safer driving and deter traffic violations. Current CHP patrol levels are relatively low in the San Lorenzo Valley, due to lack of funding. Increases in enforcement could be funded by applying for grants through the California Office of Traffic Safety or the National Highway Traffic Safety Administration.

## **2.10) Reduce speed limits**

Reducing speed limits can potentially reduce collisions and the severity of collisions. Driving at higher speeds can increase stopping distances, result in greater potential for loss of vehicle control, increase the degree of crash severity, reduce the effectiveness of occupant protection equipment, and increase fuel consumption and cost. Most speed regulations are based on the Basic Speed Law: “No person shall drive a vehicle at a speed greater than is reasonable or prudent and in no event at a speed which endangers the safety of persons or property” (California Vehicle Code 22350). All speed limits other than maximum speed limits are called *prima facie* limits, which are considered by law to be safe and prudent under normal conditions. Certain *prima facie* limits are established by California law and include the 25 MPH speed limit in school zones when children are present. Speed limits are normally set at the first five-mile per hour increment nearest the 85th percentile speed, defined as that speed at or below which 85 percent of the traffic is moving. Any further reduction of the speed limit must be documented by and clearly justified by an Engineering and Traffic Survey. Caltrans typically conducts surveys and adjusts the speed limits every seven to ten years based on this methodology, most recently in 2017. In 2018, the California legislature passed AB 2363 to establish a Zero Traffic Fatalities Task Force which will consider alternatives to the 85<sup>th</sup> percentile methodology to determine speed limits in California. The Task Force’s recommendations are expected to be available in 2020 and could allow Caltrans to modify the speed limits through SLV.

### 3. Pedestrian Facilities

#### 3.1) Sidewalks

The minimum width of a sidewalk should be 8 feet between a curb and a building when in urban and rural main street place types. For all other locations the minimum width of sidewalk should be 6 feet when contiguous to a curb or 5 feet when separated by a planting strip. The roadway cross section usually provides areas for pedestrians. If the safety or capacity of the highway will be improved, the State may

contribute towards the cost of building a pedestrian facility with a local agency project or fund it entirely with a State highway project. (*Caltrans Highway Design Manual Index 105.2*)

Minimum clear width is 48 inches exclusive of curb width. Exception – The clear width may be reduced to 32 inches minimum for a length of 24 inches maximum provided that reduced width segments are separated by segments that are 48 inches long minimum and 48 inches wide minimum. (*Permanent Pedestrian Facilities ADA Compliance Handbook 2018 - Path of Travel*)

*Interpretation:* Sidewalks narrower than 6 feet will likely require a Caltrans design exception, with a minimum of 4 feet, or 2 feet 8 inches where a utility pole or other fixed object conflicts. Typical sidewalk widths on Santa Cruz County maintained roads are 3 feet.

#### 3.2) Trails, Pathways, and Pedestrian Lanes (see also #6. Multiuse Path)

Trails are generally, unpaved multipurpose facilities suitable for recreational use by hikers, pedestrians, equestrians, and off-road bicyclists. Trails as defined here do not meet Class I bikeways standards and should not be signed as bicycle paths. Where equestrians are expected, a separate equestrian trail should be provided. See DIB 82 for trail requirements for ADA. (*Caltrans Highway Design Manual Index 1003.4*)

*Interpretation:* DIB 82 adopts the *Federal Guide on Outdoor Developed Areas* from the US Access Board. The guide states: surface must be firm and stable, but does not need to be slip resistant. 3' minimum width, 5' preferred, if less than 5' needs passing spaces every 200 feet. Maximum grade of 10%, maximum cross slope of 5%.

While sidewalks are typically made of concrete, less expensive walkways may be constructed of asphalt, crushed stone, or other materials if they are properly maintained and accessible (firm, stable, and slip-resistant). In more rural areas, in particular, a “side path” made of one of these materials may be suitable. In areas where a separated walkway is not feasible, a wide paved shoulder on a roadway can provide a place for pedestrians to safely walk. Both the FHWA and the Institute of Transportation Engineers (ITE) recommend a minimum width of five feet for a sidewalk or walkway, which allows two people to pass comfortably or to walk side-by-side. The

Figure A8: Sidewalk



Credit: SCCRTC

preferred width for paved shoulders is at least 6 feet. Wider sidewalks should be installed near schools, at transit stops, in downtown areas, or anywhere high concentrations of pedestrians exist. Sidewalks should be continuous along both sides of a street and sidewalks should be fully accessible to all pedestrians, including those in wheelchairs. A buffer zone of four to six feet is desirable to separate pedestrians from the street. The buffer zone will vary according to the street type. In downtown or commercial districts, a street furniture zone is usually appropriate. Parked cars or bicycle lanes can provide an acceptable buffer zone. In more suburban or rural areas, a landscape strip is generally most suitable. Careful planning of sidewalks and walkways is important in a neighborhood or area in order to provide adequate safety and mobility. For example, there should be a flat sidewalk provided in areas where driveways slope to the roadway. *(Pedestrian and Bicycle Information Center, Sidewalks and Walkways)*

A **pedestrian lane** is an interim or temporary pedestrian facility that may be appropriate on local and collector roads with low to moderate speeds and volumes (under 20 mph and under 2000 vehicles per day). A pedestrian lane is a designated space on the roadway for exclusive use of pedestrians. The lane may be on one or both sides of the roadway and can fill gaps between important destinations in a community. They may include a 0-4 ft optional buffer marked by paint. 5' width is the minimum, with 8' width is preferred. The pedestrian lane could be separated from adjacent travel lanes with some form of longitudinal marking, such as double white lines, flexible delineators, and PED ONLY markings and pedestrian stencils. *(FHWA, www.ruraldesignguide.com)*

Figure A8b: Pedestrian Lane



Source: FHWA Rural Design Guide  
ITRE Bike and Ped Flickr (CCBY2.0)

### 3.3) Shade trees

Large tree setback requirements on conventional highways for speed limits less than or equal to 35 mph: with no curb = 30 feet, with curb = 18 inches, see Table 902.3. Large trees are defined as plants which at maturity, or within 10 years, have trunks 4 inches or greater in diameter, measured 4 feet above the ground, Coast Redwood (*Sequoia sempervirens*) is specifically defined as a large tree. Small trees are those with smaller trunks or plants usually considered shrubs, but trained in tree form which would not develop 4-inch diameter trunks within 10 years. Examples of small trees are Crape Myrtle (*Lagerstroemia Indica*), and Bottle Brush trained as a standard (*Callistemon sp.*). Locate plants so that pruning will not be required. Maintain a minimum vertical clearance of 8 feet from the sidewalk to the lower foliage of overhanging branches for pedestrian passage. Do not plant trees under overhead utilities or structures.

*(Caltrans Highway Design Manual Index 902.2 – 902.4)*

**Interpretation:** Shade trees to compliment pedestrian facilities within the right-of-way are allowed within certain species, trunk width, and vertical clearance restrictions. Guidance regarding existing large trees within 30 feet of the edge of the traveled way is unclear.



### 3.4) Safety or Pedestrian Lighting

[When] safety lighting is to be installed or modified at the intersection of a State highway and a local road, local agency participation in the installation or modification costs shall be sought...When it is necessary to widen or reconstruct a State highway, the reconstruction and relocation of traffic control devices and safety lighting systems, shall be at 100% State expense...Encroachment permits shall be required for a local agency or a private party to install or modify traffic signals and roadway lighting on a State highway. (*California MUTCD Sections 4B.106, 4B.112*)

On conventional highways, including expressways, State financing of highway safety lighting shall be limited to that at intersections with traffic signals or flashing beacons or at those locations which meet the conditions listed below. The existence of an intersection is not, in itself, a justification for lighting...Safety lighting may be provided at existing intersections on expressways and conventional highways...where combinations of sight distance, or horizontal or vertical curvature of the roadway, channelization or other factors constitute a confusing or unsatisfactory condition that may be improved with lighting. The project report covering such lighting should include an explanation of the factors constituting the confusing or unsatisfactory condition.

(*Caltrans Traffic Manual Section 9-08*)

*Interpretation:* Standard lighting on conventional highways is 30 feet tall, with the mast arms holding the fixture out from the pole a minimum of 6 feet (*Traffic Manual Section 9-11 Lighting Standards*). Lighting within the right-of-way that does not meet these standards typically requires financing and installation by the local agency. Due to the rural character of the San Lorenzo Valley, the input from the community favors alternative lighting options. Specifically, pedestrian-scaled (i.e. considerably shorter) lighting fixtures in a more old-fashioned style, such as the double acorn lamppost shown in **Figure A9**, and already installed within the Caltrans right-of-way in Boulder Creek. See description of Corridor Priority D in Section 2.4 of the Highway 9/SLV Complete Streets Corridor Plan for additional information on directing light downward to avoid light pollution and other goals of the pedestrian safety lighting project.

Figure A9: Sample Pedestrian Lighting



Credit: Dark Sky Parking Lot Light, Sign Bracket Store  
Forms+Surfaces, Cordia Pedestrian Lighting

## 4. Crossing Facilities

### 4.1) New Crosswalk

Crosswalk markings provide guidance for pedestrians who are crossing roadways by defining and delineating paths on approaches to and within signalized intersections, and on approaches to other intersections where traffic stops. In conjunction with signs and other measures, crosswalk markings help to alert road users of a designated pedestrian crossing point across roadways at locations that are not controlled by traffic control signals or STOP or YIELD signs. At non-intersection locations, crosswalk markings legally establish the crosswalk...Crosswalk lines should not be used indiscriminately. An engineering study should be performed before a marked



crosswalk is installed at a location away from a traffic control signal or an approach controlled by a STOP or YIELD sign. The engineering study should consider the number of lanes, the presence of a median, the distance from adjacent signalized intersections, the pedestrian volumes and delays, the average daily traffic (ADT), the posted or statutory speed limit or 85th-percentile speed, the geometry of the location, the possible consolidation of multiple crossing points, the availability of street lighting, and other appropriate factors.

*(California MUTCD Section 3B.18)*

The most thorough and rigorous study of pedestrian crossing facilities, conducted by Zegeer et al., performed a comparison of pedestrian collision risk at marked and unmarked uncontrolled crossing locations. They found that marked crosswalks at unsignalized locations on multilane roads with high traffic volumes (above 12,000 vehicles per day) results in an elevated collision risk compared with unmarked crosswalks, which could be associated with a false sense of security at the locations. Crosswalk markings serve primarily to guide pedestrians in the proper paths. Pedestrian crosswalk markings should not be used indiscriminately. Unwarranted crosswalks can be detrimental to pedestrian safety by providing a false sense of security.

*(Caltrans State Bicycle and Pedestrian Plan Technical Report, Safety Trends 2017)*

Crosswalk markings serve primarily to guide pedestrians in the proper paths. Pedestrian crosswalk markings should not be used indiscriminately. Unwarranted crosswalks can be detrimental to pedestrian safety by providing a false sense of security.

*(Chapter M, Caltrans Maintenance Manual 2014)*

The use of "ladder", "zebra" or other enhanced markings at uncontrolled crossings can increase both pedestrian and driver awareness to the increased exposure at the crossing. Incorporating advanced "stop" or "yield" markings provides an extra safety buffer and can be effective in reducing the 'multiple-threat' danger to pedestrians. Nearly one-third of all pedestrian-related crashes occur at or within 50 feet of an intersection. Of these, 30 percent may involve a turning vehicle. There are several types of pedestrian crosswalks, including: continental, ladder, zebra, and standard... The enhanced safety elements, which may include curb extensions, medians and pedestrian crossing islands, beacons, and lighting, combined with pavement markings delineating a portion of the roadway that is designated for pedestrian crossing. Care must be taken to warn drivers of the potential for pedestrians crossing the roadway and enhanced improvements added to the crossing increase the likelihood of pedestrians crossing in a safe manner. *(Caltrans Local Roadway Safety Manual 2018)*

*Interpretation:* New crosswalks are not easy to get approved. Caltrans does not typically support or approve new midblock crosswalks. Frequent crosswalks of traditional design often do not attract the proper amount of attention from drivers, especially at higher speeds. This plan focuses on upgrades to existing crosswalks, as well as installation of new enhanced- pedestrian activated crosswalks at a few key intersections where pedestrian injury rates are high (see projects 4, 5, 12, 14, 18, 27, 28). For auto volumes and pedestrian volumes typical in the SLV, the FHWA *Small Town and Rural Multimodal Networks* recommends enhanced and/or pedestrian activated crossings.

#### **4.2) Crosswalks without connecting sidewalks**

For reconstruction or new construction, a curb ramp or blended transition should serve each pedestrian crossing. *(Caltrans Highway Design Manual Index 105.5)*

In some cases, a curb ramp cannot be constructed because there is no sidewalk at the intersection. However, there may be reason to provide a blended transition, which could be at-grade... *Blended Transition*: A raised pedestrian street crossing, depressed corner, or similar connection between the pedestrian access route at the level of the sidewalk and the level of the pedestrian street crossing that has a grade of 5 percent or less [PROWAG R105.5].  
(Caltrans Design Bulletin 82 – ADA Accessibility for Highway Projects)

*Interpretation*: Caltrans Design Bulletin 82 goes on to describe the slope, landing, cross slope, detectable warning device, and detectable warning surface requirements of at-grade blended transitions. There are many locations throughout the SLV where upgrades are needed to pedestrian crossing facilities that are not directly linked to pedestrian facilities with curbs, such as sidewalks (see projects 3, 5, 12, 13, 18, 27, 28). The Blended Transition option allows for maximizing the safety and accessibility of pedestrian crossings at locations where curb-and-gutter sidewalks are not planned in the foreseeable future or may never be installed. See also the federal FHWA *Small Town and Rural Multimodal Networks* document for depictions of accessible at-grade pedestrian crossing facilities in the “Pedestrian Lane” design example.

#### 4.3) Curb Extensions (“Bulb-Outs”)

Bulbouts provide queuing space and shorten crossing distances, thereby reducing pedestrian conflict time with mainline traffic. By placing the pedestrian entry point closer to traffic, bulbouts improve visibility between motorists, bicyclists, and pedestrians. They are most appropriate for urban conventional highways and Rural Main Streets with posted speeds 35 miles per hour or less. Curb extensions are not to extend into Class II Bikeways (Bike Lanes). The corner curb radii should be the minimum needed to accommodate the design vehicle, see Topic 404.

When used, bulbouts should be placed at all corners of an intersection. When used at mid-block crossing locations, bulbouts should be used on both sides of the street.

(Caltrans Highway Design Manual Index 303.4)

*Interpretation*: In order to increase visibility of pedestrians waiting to cross the road, bulb-out type treatment options could be desirable in the many locations throughout the San Lorenzo Valley. In order to increase safe pedestrian space and slow traffic by shortening crossing distances, bulb-outs could be designed in an at-grade manner similar to pedestrian refuge islands (see 4.4 below), except installation would occur in the shoulder of the travel lane instead of within a median. Truck and bus turning radius will need to be vetted thoroughly.

Figure A10: Curb Extension/ “bulb-out” shown on lower left



Credit: FHWA

#### 4.4) Pedestrian Refuge Island

Raised islands or medians of sufficient width that are placed in the center area of a street or highway can serve as a place of refuge for pedestrians who are attempting to cross at a midblock or intersection location. Center islands or medians allow pedestrians to find an adequate gap in one direction of traffic at a time, as the pedestrians are able to stop, if necessary, in the center island or median area and wait for an adequate gap in the other direction of traffic before crossing the second half of the street or highway. The minimum widths for accessible refuge islands and for design and placement of detectable warning surfaces are provided in the “Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG)” (*California MUTCD Section 3I.06*)

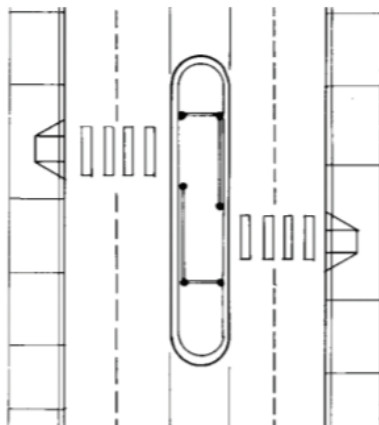
Figure A11: Pedestrian Refuge Island



Credit: Santa Clara County Parks

Traffic islands used as pedestrian refuge are to be large enough to provide a minimum of 6 feet in the direction of pedestrian travel, without exception. All traffic islands placed in the path of a pedestrian crossing must be accessible, refer to DIB 82, see figure 405.4 of HDM. (*California Highway Design Manual Index 405.4*)

Figure A11B:  
Pedestrian Corral Style Crosswalk



Credit: SANDAG

Pedestrian “corrals” (see **Figure A11B**) can be located in islands to improve safety by forcing the pedestrian to look into the direction of oncoming traffic. Refuges can take on several different forms. Center Median Islands where possible, center medians should provide a waiting area for pedestrians waiting to cross the second half of the street. Right-turn Channel Islands where traffic is allowed a free right-turn at intersections, islands should be provided for pedestrians waiting to cross. However, right-turn channels should be discouraged as these devices typically allow cars to merely yield as they turn. Drivers thus need not take their time to thoroughly watch for pedestrians while making the turn. Side Access Lane medians where side access lanes (boulevards) are constructed, a waiting area should be provided on the median. (*SANDAG Planning and Designing for Pedestrians*)

**Note:** Caltrans does not usually support planting of trees in medians due to sight distance and fixed object concerns.



#### 4.5) Speed Table Crosswalk

Speed Table: Modified speed hump with a flat top that allows the wheelbase of a passenger car to rest on top. Provides a gentler slope than speed humps, but less reduction in speed can be expected...Speed humps are generally not recommended for use on bus routes or emergency vehicle routes; speed tables may be more appropriate.

*(Caltrans Preliminary Investigation: Effective Application of Traffic Calming Techniques)*

The SPEED HUMP (W17-1) sign (see Figure 2C-6) should be used to give warning of a vertical deflection in the roadway that is designed to limit the speed of traffic. If used, the SPEED HUMP sign should be supplemented by an Advisory Speed plaque (see Section 2C.08) .... Speed humps generally provide more gradual vertical deflection than speed bumps. Speed bumps limit the speed of traffic more severely than speed humps. Other forms of speed humps include speed tables and raised intersections. However, these differences in engineering terminology are not well known by the public, so for signing purposes these terms are interchangeable.

*(California MUTCD Section 2C.29)*

*Interpretation:* Caltrans Highway Design Manual does not provide guidance on installation of speed tables. Regulations regarding installation of speed tables on state highways is unknown. Caltrans staff have expressed concerns about the maintenance cost of speed tables.

#### 4.6) Pedestrian activated flashers: Rectangular Rapid Flashing Beacon (RRFB)

Technology can be used to enhance pedestrian crossings where there is no traffic signal. Rectangular Rapid Flashing Beacons (RRFBs) are user-actuated amber LEDs with irregular flash patterns at unsignalized intersections or mid-block crosswalks.

They can be activated by pedestrians manually, or passively by a pedestrian detection system. These improvements are intended to draw attention to, or stop traffic for, crossing pedestrians.

*(Caltrans Yes We Can: Accommodating bicyclists and pedestrians on California's transportation system)*

Figure A12: RRFB flashers on Highway 1 at Pine Street in Mill Valley, Marin County, CA



Credit: Google Streetview

The [RRFB] flashing pattern is irregular, similar to some emergency response vehicles. Research shows that traffic yields at a greater rate with the RRFBs compared to standard flashing beacons. RRFBs can be used on either two-lane or multilane roadways.

*(Caltrans Main Street, California Design Guide Chapter 3)*

RRFB shall not be used for crosswalks across approaches controlled by stop signs or traffic control signals. If sight distance is less than deemed necessary by the engineer, additional RRFB may be installed in advance of the crosswalk with AHEAD plaque. Additional RRFB in advance of the crosswalk shall be supplemental to and not a replacement for the RRFB at the crosswalk itself. (*FHWA Interim Approval IA-21*)

*Interpretation:* RRFBs are an emerging safety technology, and as such their placement and use is controlled by FHWA Interim Approval IA-21, which requires state and local agencies to request and receive permission from the FHWA to install an RRFB. Feasibility analysis is needed for installation of an RRFB; if there are visibility constraints where drivers do not have enough time to see an activated RRFB and react to it coming around a curve, placement of an RRFB may not be appropriate. Feasibility may depend on power source availability. RRFBs have been installed within the Caltrans right-of-way along highways without adjoining sidewalks, as shown in Figure A12.

#### 4.7) Pedestrian Crossing Flashing Warning Beacon

Non-Vehicular Warning W11-2 [Pedestrian Crossing Sign] may be used to alert road users in advance of locations where unexpected entries into the roadway might occur or where shared use of the roadway by pedestrians...might occur....An advance Pedestrian Crossing (W11-2) sign with an AHEAD or a distance supplemental plaque may be used in conjunction with a Yield Here To (Stop Here For) Pedestrians sign on the approach to the same crosswalk. (*California MUTCD Section 2C.50*)

Typical applications of warning beacons include...supplemental emphasis to warning signs. A Warning Beacon shall consist of one or more signal sections of a standard traffic signal face with a flashing CIRCULAR YELLOW signal indication in each signal section. A Warning Beacon shall be used only to supplement an appropriate warning or regulatory sign or marker. Warning Beacons, if used at intersections, shall not face conflicting vehicular approaches. (*California MUTCD Section 4L.03*)

*Interpretation:* Pedestrian Crossing Signs are considered “Warning Signs”. Circular flashing beacons may be used in conjunction with pedestrian crossing warning signs in advance of pedestrian crossings. Pedestrian crossings at uncontrolled intersections that do not have adequate lines of sight to utilize an RRFB (see projects 20, 28) may be considered for a flashing beacon, which will flash continuously whether or not pedestrians are present. Feasibility may depend on power source availability.

#### 4.8) Pedestrian Signal Heads

Pedestrian signal heads provide special types of traffic signal indications exclusively intended for controlling pedestrian traffic...Pedestrian signal heads should be used under any of the following conditions: A. If it is necessary to assist pedestrians in deciding when to begin crossing the roadway in the chosen direction or if engineering judgment determines that pedestrian sig-

Figure A13: Pedestrian Crossing Flashing Warning Beacons



Credit: SCCRTC



nal heads are justified to minimize vehicle pedestrian conflicts; B. If pedestrians are permitted to cross a portion of a street, such as to or from a median of sufficient width for pedestrians to wait, during a particular interval but are not permitted to cross the remainder of the street during any part of the same interval; and/or C. If no vehicular signal indications are visible to pedestrians, or if the vehicular signal indications that are visible to pedestrians starting a crossing provide insufficient guidance for them to decide when to begin crossing the roadway in the chosen direction, such as on one-way streets, at T-intersections, or at multiphase signal operations. (California MUTCD Section 4E.01)

#### 4.9) In-Roadway Warning Lights at Crosswalks

In-roadway lights may be installed at certain marked crosswalks, based on an engineering study or engineering judgment, to provide additional warning to road users. If used, In-Roadway Warning Lights at crosswalks shall be installed only at marked crosswalks with applicable warning signs. They shall not be used at crosswalks controlled by YIELD signs, STOP signs, or traffic control signals... If used, In-Roadway Warning Lights should be installed in the center of each travel lane, at the center line of the roadway, at each edge of the roadway or parking lanes, or at other suitable locations away from the normal tire track paths. (California MUTCD Section 4N.02)

## 5. Bicycle Facilities

[An] important reason for constructing bike lanes is to better accommodate bicyclists through corridors where insufficient room exists for side-by-side sharing of existing streets by motorists and bicyclists. This can be accomplished by reducing the number of lanes, reducing lane width, or prohibiting or reconfiguring parking on given streets in order to delineate bike lanes. (Caltrans Highway Design Manual Index 1002.1 (3))

#### 5.1) Class II Bike Lane

Class II bikeways (bike lanes), for the preferential use of bicycles, may be established within the roadbed and shall be located immediately adjacent to a traffic lane...The minimum Class II bike lane width shall be 4 feet, except where: adjacent to on-street parking, the minimum bike lane

should be 5 feet; posted speeds are greater than 40 miles per hour, the minimum bike lane should be 6 feet; or on highways with concrete curb and gutter, a minimum width of 3 feet measured from the bike lane stripe to the joint between the shoulder pavement and the gutter shall be provided...Class II bikeways may be included as part of the

shoulder width See Topic 302...There are situations where it may be desirable to reduce the width of the lanes in order to add or widen bike lanes or shoulders. In determining the

Figure A14: Class II Bike Lane



Credit: FHWA

appropriateness of narrower traffic lanes, consideration should be given to factors such as motor vehicle speeds, truck volumes, alignment, bike lane width, sight distance, and the presence of on-street parking. When on-street parking is permitted adjacent to a bike lane, or on a shoulder where bicycling is not prohibited, reducing the width of the adjacent traffic lane may allow for wider bike lanes or shoulders, to provide greater clearance between bicyclists and driver-side doors when opened. (*Caltrans Highway Design Manual Index 301.2*)

## 5.2) Green Bike Lane

The FHWA will grant Interim Approval for the optional use of green colored pavement in marked bicycle lanes and in extensions of bicycle lanes through intersections and traffic conflict areas to any jurisdiction that submits a written request to the Office of Transportation Operations... Green colored pavement may be used within a bicycle lane or within an extension of a

bicycle lane to enhance the conspicuity of the bicycle lane or extension... If a pair of dotted lines is used to extend a bicycle lane across an intersection or driveway (see Section 3B.08 of the 2009 MUTCD) or a ramp, green colored pavement may be installed between these lines as a supplement to the lines. (*FHWA Interim Approval IA-14*)

Figure A15: Green Bike Lanes



Credit: SCCRTC

## 5.3) Buffered Bike Lane – Paint

A buffered bike lane may also be established within the roadbed, separated by a marked buffer between the bike lane and the traffic lane or parking lane. See the California MUTCD for further buffered bike lane marking and signing guidance.

(*Caltrans Highway Design Manual Index 301.2*)

A buffered bicycle lane is a bicycle lane that is separated from the adjacent general-purpose lane or parking lane by a pattern of standard longitudinal markings. The buffer area might include chevron or diagonal markings. The buffer area width includes the width of the parallel white lines. Markings for buffered bicycle lanes are shown in Figure 9C-104(CA).

(*California MUTCD Section 9C.04*)

Figure A16: Buffered Bike Lane - Paint



Credit: SCCRTC

*Interpretation:* CAMUTCD Figure 9C-104 shows 18-inch minimum buffer width (including width of paint markings), bike lane of 5' minimum if adjacent to parking.



#### 5.4) Buffered Bike Lane – Physical Buffer

A Class IV bikeway (separated bikeway) is a bikeway for the exclusive use of bicycles and includes a separation required between the separated bikeway and the through vehicular traffic. The separation may include, but is not limited to, grade separation, flexible posts, inflexible posts, inflexible barriers, or on-street parking. See DIB 89 for further Class IV guidance. (*Caltrans Highway Design Manual Index 1002.1*)

Vertical elements in the buffer area are critical to separated bikeway design. Forms of vertical separation include, but are not limited to, grade separation, flexible delineator posts, inflexible physical barriers, or on-street parking. See Figure 9C-110 and Caltrans design bulletin 89. (*California MUTCD Section 9C.102*)

*Interpretation:* Caltrans Design Bulletin 89 states that flexible posts should be 10'-20' on center, and that "an inflexible physical barrier should be used in lower speed environments (where the posted speed is 35 miles per hour or less). It further states that an inflexible physical barrier should be placed in a marked buffer of 3 feet wide preferred, with 2 feet minimum width, and that in higher speed environments a concrete barrier should be used."

#### 5.5) Bike Box

The FHWA has been requested to provide traffic control devices to facilitate bicyclists positioned to the right side of general use travel lanes to enter the center of the general use lanes at the approach of a signalized intersection...

Figure A18: Bike Box



Credit: America's Transportation Awards

approach, countdown pedestrian signals shall be provided for the crosswalk across the

Figure A17: Buffered Bike Lanes - Physical Buffer



Credit: SCCRTC, Beach Street in Santa Cruz

Figure A17b: "Wave Delineator" bikeway barriers



Credit: Potomac Ave, Crystal City by Beyond DC – Creative Commons

enter the center of the general use lanes at the approach of a signalized intersection...Positioning bicyclists in the center of the appropriate lane allows them to turn from a location where they are more visible to surrounding traffic...A bicycle box shall be formed by an advance stop line placed at least 10 feet in advance of the intersection stop line. At least one bicycle symbol shall be placed within the bicycle box. Where a bicycle box is provided across multiple lanes of an



approach on which the bicycle box is located to inform bicyclists whether there is adequate time remaining to cross an adjacent lane...Green colored pavement may be used within a bicycle box and the approach lane, where one is provided.

(FHWA Interim Approval IA-18)

## 5.6) Bicycle Safety Signage

The absence of a marked bicycle lane or any of the other traffic control devices...on a particular roadway shall not be construed to mean that bicyclists are not permitted to travel on that roadway. 9B.06: The Bicycles May Use Full Lane (R4-11) sign (see Figure 9B-2) may be used on roadways where no bicycle lanes or adjacent shoulders usable by bicyclists are present and where travel lanes are too narrow for bicyclists and motor vehicles to operate side by side.

9B.102: In situations where there is a need to remind motorists to pass bicyclists with sufficient lateral clearance in compliance with CVC 21760 (Three Feet for Safety Act) the PASS Bicycle 3 FT MIN sign (R117(CA)) may be used. (California MUTCD Section 9A.02)

Figure A19:  
Bicycle Safety Signage



Credit: Caltrans MUTCD

*Interpretation:* Highway 9 in the SLV has many locations with very narrow or non-existent shoulders, and no bike lanes. In areas where bike lanes are not called for in the short term in this corridor plan, consider installing safety signage for cyclists, including signage reminding drivers of the law requiring them to give 3 feet when passing cyclists.

## 6. Multiuse Facilities

### 6.1) Wider Shoulders

Shoulders on conventional highways may need to be widened in urbanized areas, suburban areas with commercial and residential development adjacent to central business districts, and other locations where it is known or anticipated that shoulder usage by pedestrians and bicyclists is common...upgrades and additions to pedestrian facilities must be considered on projects covered by this DIB...Bicyclist safety must be taken into consideration on all 2R [and 3R] projects.

(Caltrans Design Information Bulletin 79)

Figure A20: Wider Shoulders



Credit: FHWA

*Interpretation:* For 2-lane conventional highway new construction, minimum shoulder width is 8 feet for highways with traffic volumes seen on Highway 9 (over 400 vehicles in either direction per day, per *Caltrans Highway Design Manual, Table 307.2*). When a highway is to receive pavement rehabilitation for either a 2R (restoring to original condition) or 3R (requires additional geometric changes to the roadbed to reduce collisions, including bike/ped collisions) project, *Caltrans Design Information Bulletin 79* states that upgrades to bicycle and pedestrian facilities, at minimum establishing appropriate shoulder widths for bike/ped safety, must be considered in the project scope. Specifically, at the traffic volumes typical on Highway 9 in the SLV, with 6,001 to 18,000 Average Daily Traffic volumes (ADT), the minimum width for existing shoulders must be 4 feet. If shoulders are not already 4 feet, they must be widened to 8 feet during rehabilitation. For sections with ADT above 18,000, such as exists between Graham Hill Road and the southern intersection of Highway 9 with Glen Arbor Road, minimum widths for existing shoulders must be 8 feet.

For interpretation of this DIB within the context of the San Lorenzo Valley, see Chapter 2: *Corridor Vision*, Section 2.3A: *Rural Cross Section: Wider Shoulders*, of the Highway 9/SLV Complete Streets Corridor Plan.

## 6.2) Class I Multiuse Path

Class I bikeways (bike paths) are facilities with exclusive right of way, with cross flows by vehicles minimized. Motor vehicles are prohibited from bike paths per the CVC, which can be reinforced by signing. Class I bikeways, unless adjacent to an adequate pedestrian facility, (see Index 1001.3(n)) are for the exclusive use of bicycles and pedestrians, therefore any facility serving pedestrians must meet accessibility requirements, see DIB 82... The minimum paved width of travel way for a two-way bike path shall be 8 feet, 10-foot preferred. The minimum paved width for a one-way bike path shall be 5 feet. It should be assumed that bike paths will be used for two-way travel.

Figure A21: Class I Multiuse Path



Credit: Rails-to-Trails Conservancy

Development of a one-way bike path should be undertaken only in rare situations where there is a need for only one-direction of travel... The minimum separation between the edge of traveled way of a one-way or a two-way bicycle path and the edge of traveled way of a parallel road or street shall be 5 feet plus the standard shoulder widths [4 feet per DIB 79].

(*Caltrans Highway Design Manual Index 1003.1*)



*Interpretation:* Given the Highway Design Manual requirements for Class 1 Multiuse paths, in particular the requirements regarding 9 feet of separation between the edge of the vehicle lane and the multiuse path, a Class I multiuse path reduces the required right of way by 3 feet at most, as compared to the right of way required for sidewalks and bike lanes on either side of the vehicle lanes. However, FHWA Sidepath guidelines (see 6.3 below) allow for narrower separation between the vehicle lanes and the path.

### 6.3) Sidepath

A sidepath (see **Figure A22**) is a bidirectional shared use path located immediately adjacent and parallel to a roadway. Sidepaths can offer a high-quality experience for users of all ages and abilities as compared to on-roadway facilities in heavy traffic environments, allow for reduced roadway crossing distances, and maintain rural and small town community character...Minimum recommended pathway width is 10 ft. In low-volume situations and constrained conditions, the

absolute minimum sidepath width is 8 ft. Provide a minimum of 2 ft clearance to signposts or vertical elements. Preferred minimum separation width from roadway is 6.5 ft. Minimum separation distance is 5 ft. Separation narrower than 5 ft is not recommended, although may be accommodated with the use of a physical barrier between the sidepath and the roadway. In extremely constrained conditions for short distances, on-roadway rumble strips may be used as a form of separation.

(FHWA *Small Town and Rural Multimodal Networks*, 4-11 Sidepath and *Small Town and Rural Design Guide*)

Figure A22: Side path on Highway 50 in South Lake Tahoe, CA



Credit: FHWA

## 7. Transit and Travel Demand Management

### 7.1) ADA Waiting Pad

A waiting or accessory pad is a paved area at a bus stop provided for bus patrons and can contain either a bench or a bus shelter. Bench and shelter amenities, such as trash receptacles or bike racks, can also be located on the waiting pad... A waiting pad should accommodate a 5-foot (measured parallel to the street) by 8-foot (measured from the back face of the curb) wheelchair landing pad that is free of all street furniture and overhangs.

Figure A23: ADA Waiting Pad



Credit: SCCRTC



(2015 Santa Cruz Metro Bus Stop Guidebook)

## 7.2) Bus Shelter with Bench

Shelters should generally be placed so that they are facing the travel lane to ensure that the bus operator can easily see the waiting passengers and that there is minimal walking distance from the waiting area to the boarding area. Shelters should not be placed within 15 feet of a fire hydrant or an ADA-accessible parking space. If a shelter is installed adjacent to a building or structure, a minimum of a 12-inch gap should be preserved to allow for trash removal and cleaning of the shelter. Finally, the location of utility access points should be considered when installing shelters. No matter how the shelter is placed, all shelters must meet both local jurisdictional accessibility requirements and DOT's ADA Standards.

(2015 Santa Cruz Metro Bus Stop Guidebook)

## 7.3) Accessible Transit Stop Egress

Figure A24: Accessible Transit Stop Egress



Credit: SCCRTC

Pedestrian and ADA Accessibility conditions or considerations – sidewalks must be in good repair with minimal obstacles and appropriate width (>4 ft). If the bus stop is not ADA accessible, major modifications are needed and could potentially require engineering plans, encroachment permits, and major construction...Examine all the paths planned from the alighting point at the bus stop to destinations off the bus stop premises. Determine whether any protrusions exist that might restrict wheelchair movements. If protrusions exist and

they are higher than 27 inches or lower than 80 inches, a person with a vision impairment may not be able to detect an obstacle (such as a phone kiosk) with a cane. A guide dog may not lead the person with the impairment out of the path. Although it may not be the transit agency's responsibility to address accessibility problems along the entire path, an obstacle anywhere along the path may make it inaccessible for some transit users with disabilities. (2015 Santa Cruz Metro Bus Stop Guidebook)

## 7.4) Cruz511 Traveler Information

Cruz511 is a free traveler information service for up-to-the minute traffic, transit, bicycle, and pedestrian information in Santa Cruz County via a mobile-responsive website. It was developed with the mission to provide comprehensive, accurate, reliable, and useful multi-modal travel information to meet the needs of Santa Cruz County travelers. For those without online access, a traveler help desk is available for personalized assistance by email or phone at 831-429-POOL. Cruz511 is a service of the SCCRTC.

Cruz511 services also include:

- Ridematching services to assist commuters and employers in forming carpools or vanpools
- Directions for trips by bike, bus, car, or on foot

- Electric vehicle charging spots
- Shared ride options
- Free online ride matching service
- Park and Ride lot locations
- Countywide bike map
- Report a bike or walking hazard
- Accessible travel options
- Cost of driving calculator
- Transportation resources for employers, schools, and organization  
(SCCRTC, [Cruz511.org](http://Cruz511.org))

## **7.5) School Programs**

### **7.5a) Safe Routes to Schools safety education programs**

Safe Routes to School non-infrastructure programs aim to make it safer for students to walk and bike to school and encourage more walking and biking where safety is not a barrier.

Transportation, public health and planning professionals, school communities, law enforcement officers, community groups and families all have roles to play using education, encouragement, engineering (changes to the physical environment) and enforcement to meet a local community's needs. In Santa Cruz County the County Health Services Agency, Ecology Action, and Bike Santa Cruz County implement programs aimed at teaching students rules of the road and how to safely walk or bike.

### **7.5b) School Pool**

A School Pool is a way of sharing in the duties of getting children to and from school. School Pool options include carpooling, walk pools ("walking school buses"), bike pools ("bike trains") or arranging bus buddies for school buses or public transit. Two or more families agree to share responsibilities by trading days as pool leaders. Many parents have taken up School Pooling as a way to save time, save money and provide a safer way for their children to get to school... Implementation steps include forming a committee, identifying and mapping neighborhoods, identifying neighborhood residents and recruiting neighborhood captains, and promoting the program. (*Safe Routes to Schools School Pool Guide*)

### **7.5c) Walking School Bus and Bicycle Train**

A walking school bus is a group of children walking to school with one or more adults. That may sound simple, and that is part of the appeal. It can be as informal as two families taking turns walking their children to school or as structured as a planned route with meeting points, a timetable and a schedule of trained volunteers. A variation on the walking school bus is a bicycle train where a group of children and adult leaders ride together to school. For more information about these programs, see the National Center for Safe Routes to School website ([www.saferoutesinfo.org](http://www.saferoutesinfo.org)) and [http://guide.saferoutesinfo.org/walking\\_school\\_bus/](http://guide.saferoutesinfo.org/walking_school_bus/) for more information.

### **7.5d) Walk & Bike to School Day**

These events are used to encourage commuters, students and families to celebrate the benefits of walking and biking and to increase local leader commitment and visibility for traffic safety and community quality of life. Each year these events break records for participation. Most event

coordinators report that their events led to changes to policies or the physical environment—the kinds of changes needed to support safe walking and biking every day, not just for special events. (*Safe Routes to Schools Walk and Bike to School Day*)

In Santa Cruz County Bike and Walk to School days, typically celebrated in May and October are organized by Ecology Action, in coordination with schools, local jurisdictions, and multiple stakeholder groups.

### 7.6) Park-and –Ride Lots

Park & Ride lots can help make your commute a breeze by offering a convenient and safe location to transfer from a single passenger vehicle or bicycle to a carpool, vanpool, or transit. Ridesharing or using transit saves you time and money, while reducing traffic congestion and energy consumption. Park & Ride lot locations, including those with bicycle lockers, are available to help serve your commuting needs. (*Cruz511.org*)

*Interpretation:* Existing Park-and-ride lots located closest to the SLV are on Highway 17 at the Pasatiempo exit (on the western frontage road in front of 555 Hwy 17, Back Nine Bar and Grill), and at the Summit Road exit (northbound). Additional park-and-ride lots within the SLV could be implemented, especially in existing parking lots that are not heavily used during weekday work hours, such as church parking lots.

Figure A25: Park and Ride Lots



Credit: SCCRTC/Cruz511

### 7.7) Microtransit

“Microtransit” is a service similar to the rideshare models popularized by Uber and Lyft but reliant on shuttle buses or vans that riders request via smartphone. The shuttles pick riders up wherever they are and drop them off where they want to go. These services are sometimes provided by transit agencies.

### 7.8) Paratransit

Paratransit transportation services typically operate on flexible routes and/or provide demand-responsive service and is most frequently used by elderly and disabled passengers unable to take fixed route transit. Generally, vans, small buses or taxis are used to provide this service. ParaCruz, the Americans with Disabilities Act (ADA)-mandated service operated by Santa Cruz METRO in Santa Cruz County, provides door-to-door service to origin and destination locations within 3/4 mile of a METRO bus routes for eligible riders. Community Bridges Lift Line is another main provider of paratransit service. The RTC publishes a *Guide to Specialized Transportation Services* which lists the range of accessible transportation services available in Santa Cruz County including eligibility requirements, hours/schedule, service charges, service area, and more details.