Chapter 4.

Improvements Toolbox

The toolbox of improvements presented in this chapter is the menu of solutions that were considered for application to address the transportation needs of the neighborhood.

Each strategy has unique benefits and is appropriate for use under certain conditions but not others. Treatments were applied to each street based on its particular characteristics and location.

For crosswalks, the City's *Pedestrian Crossing Guidelines* and *Pedestrian Crossing Guidelines Treatment Applications Guide* (April 2021) were used to inform application decisions.

The strategies in this toolbox each support one or more objectives of the plan:

- Speed reduction and traffic calming
- Safety and comfort for people who are walking
- Safety and comfort for people who are bicycling
- Crosswalk convenience and comfort
- Transit access

Table 1 shows how each strategy supports these objectives.

Lane reductions were considered as a strategy but not included in the toolbox. On some streets that have four lanes — two in each direction — but low volumes of traffic, reducing the number of lanes to one in each direction can be used to slow speeding drivers. Although some members of the public who provided comments during the two workshops held in March supported use of this strategy, many more did not, and thus it was removed from consideration.

Speed safety cameras, which record speeding drivers as evidence for citations, were also considered for the plan. However, such cameras are currently prohibited in California, and no changes to the law are pending. If the law changes in the future, these cameras could be implemented in areas where speeding is a particular issue, such as near schools or other areas with the strongest speeding concerns where speed feedback signs are proposed.

Table 1

Improvement Strategies and Plan Objectives Supported

Strategy	Objectives				
	Speed Reduction	Walking Safety	Bicycling Safety	Crosswalk Improvement	Transit Access
Advanced yield/stop markings		●		●	
Bike conflict zone marking			●		
Buffered bike lane	●		●		
Close sidewalk gap		●			
Co-locate bus stops and marked crosswalks		●		●	●
Countdown pedestrian signal head		●		●	
Curb extension	●	●		●	
Curb ramp		●		●	
Extend bike lane to intersection			●		
Extended signal clearance time			●	●	
Hardened centerline/lane line	●	●		●	
High-visibility crosswalk		●		●	
Improved bus stop					●
In-street crosswalk signs	●	●		●	
Leading pedestrian interval		●		●	
Narrow lanes	●				
New all-way stop control	●	●		●	
New traffic signal	●	●		●	
Pedestrian hybrid beacon		●		●	
Pedestrian refuge island	●	●		●	
Pedestrian signal		●		●	
Raised crosswalk	●	●		●	
Rectangular rapid flashing beacon		●		●	
Roundabout	●	●	●	●	
Separated bikeway	●		●		
Speed feedback sign	●				
Speed lump	●				

Source: Fehr & Peers, 2021

Improvement Strategies A-Co

Advanced Yield/Stop Markings

Crosswalk improvement, Pedestrian Safety

A stop bar placed ahead of the crosswalk at stop signs and signals reduces instances of vehicles encroaching on the crosswalk. Similarly, advanced yield markings placed 20 to 50 feet in advance of crosswalks increase visibility of people who are walking. Beneficial at multi-lane crosswalks to reduce the likelihood of a multiple-threat crash.

Close Sidewalk Gap

Pedestrian Safety

Continuous sidewalks for people who are walking provide a separated facility for people to walk along the street and can help minimize crashes with people who are walking in the street.

Bike Conflict Zone Marking

Bicyclist Safety

Green pavement within a bike lane to increase visibility of people who are bicycling and to reinforce bike priority. Green pavement is used as a spot treatment in conflict areas such as driveways.

Co-locate Bus Stops and Marked Crosswalks

Crosswalk Improvement, Pedestrian Safety, Transit Access

Placement of bus stops and crosswalks in close proximity to allow people riding the bus to cross the street more conveniently and more safely.

Buffered Bike Lane

Bicyclist Safety, Speed

Dedicated street space for people who are bicycling with designated lane markings, pavement legends, and signage. Includes pavement markings between the bike lane and vehicle lane to provide additional space between bikes and vehicles and/or between the bike lane and parking to denote door zone of parked vehicles. Creates a street-narrowing effect that reduces vehicle speeds.

Countdown Pedestrian Signal Head

Crosswalk Improvement, Pedestrian Safety

Display of "countdown" of seconds remaining on the pedestrian signal. Countdown indications improve safety for all street users, and are required for all newly installed traffic signals where pedestrian signals are installed.

Improvement Strategies Cu-H

Curb Extension

Crosswalk Improvement, Pedestrian Safety, Speed

Curb extensions or bulbouts are raised devices, usually constructed from concrete, landscaping, or paint and plastic materials, that narrow the street to reduce speeds of turning vehicles, improve sight lines, and shorten crosswalk lengths.

Extend Signal Clearance Time

Crosswalk Improvement, Bicyclist Safety

Extending yellow and all-red time allows people who are driving and bicycling to more safely cross through a signalized intersection before conflicting traffic movements are permitted to enter the intersection.

Curb Ramp

Crosswalk Improvement, Pedestrian Safety

Curb ramps provide access to those using wheelchairs and also ease access for people using other assistive devices or wheeled devices such as strollers. New ramps must also incorporate tactile warning devices detectable to visually impaired people.

Hardened Centerline/Lane Line

Crosswalk Improvement, Bicycling Safety, Speed

Centerline hardening encourages people who are driving to make left turns at slower speeds. Lane line hardening also make lanes feel smaller and encourages drivers to stay in their lane and proceed more slowly. Typically, plastic delineators and/or curbing are placed along the line striping to provide a vertical separation between lanes.

Extend Bike Lane to Intersection

Bicyclist Safety

In locations where a bike lane is dropped due to the addition of a right-turn pocket, the intersection approach may be restriped to allow for people who are bicycling to move to the left side of right-turning vehicles prior to reaching the intersection.

High-Visibility Crosswalk

Crosswalk Improvement, Pedestrian Safety

A crosswalk designed to be more visible to approaching people who are driving, striped with ladder markings using high-visibility material such as thermoplastic tape instead of paint.

Improvement Strategies I-N

Improved Bus Stop

Transit Access

Adding benches and shelters improves the comfort of people who are waiting for a bus.

Narrow Lanes

Speed

A reduction in lane width, to 11 feet, produces a traffic calming effect by encouraging people who are driving to travel at slower speeds, lowering the risk of crashing with people walking and bicycling and other people who are driving.

In-Street Crosswalk Signs

Crosswalk Improvement, Pedestrian Safety, Speed

Yield-to-pedestrians signs alert people who are driving about the presence of people crossing the street. These signs can be placed on the centerline in the street with advanced yield markings.

New All-Way Stop Control

Crosswalk Improvement, Pedestrian Safety, Speed

Requires all vehicles to stop before crossing the intersection. Removes the need for people walking, bicycling, and driving on a side-street stop-controlled intersection to cross free-flowing lanes of traffic, which reduces the risk of collision. Can have a traffic calming effect on long straightaways.

Leading Pedestrian Interval

Crosswalk Improvement, Pedestrian Safety

Traffic signals timed to allow people walking across the intersection a short head start to minimize conflicts with turning vehicles and improve visibility of people walking across the street.

New Traffic Signal

Crosswalk Improvement, Pedestrian Safety, Speed

New traffic signals help organize travel of all modes at an intersection, limiting interactions between people walking, bicycling, and driving in conflicting movements. New signals can have a traffic calming effect on long, high-speed straightaways.

Improvement Strategies P-R

Pedestrian Hybrid Beacon

Crosswalk Improvement, Pedestrian Safety

Pedestrian hybrid beacons (PHBs) are button-activated lights used at unsignalized intersections or mid-block crosswalks to notify oncoming drivers to stop with a series of red and yellow lights. Unlike a traffic signal, the PHB rests in dark until activated by a person walking across the street.

Raised Crosswalk

Crosswalk Improvement, Pedestrian Safety, Speed

A raised crosswalk is typically elevated 3-6 inches above the street or at sidewalk level and ensures that people who are driving traverse the crosswalk slowly. Similar to speed lumps and other vertical speed control elements, it reinforces slow speeds and encourages motorists to yield to people walking at the crosswalk.

Pedestrian Refuge Island

Crosswalk Improvement, Pedestrian Safety, Speed

Pedestrian refuge islands provide a protected area for people walking across the street at the center of the street. They reduce the exposure time for people walking across the intersection and simplify crossing the street by allowing people walking across the street to focus on one direction of traffic at a time.

Rectangular Rapid Flashing Beacon

Crosswalk Improvement, Pedestrian Safety

A rectangular rapid flashing beacon (RRFB) is a flashing light activated by a person crossing the street with additional signage to alert motorists of the crosswalk. Improves safety by increasing the visibility of marked crosswalks and provides motorists a cue to slow down and yield to people walking across the street.

Pedestrian Signal

Crosswalk Improvement, Pedestrian Safety

Pedestrian signals are button-activated traffic signals used at mid-block crosswalks to notify oncoming motorists to stop. These signals operate similarly to traffic signals at intersections.

Roundabout

Bicyclist Safety, Crosswalk Improvement, Pedestrian Safety, Speed

Circular intersection with a raised central island and yield control, which direct flow in a continuous circular direction around the intersection. Can reduce the number of conflict points compared to an uncontrolled intersection and decrease vehicle speeds due to intersection geometry.

Improvement Strategies S-Sp

Separated Bikeway

Bicyclist Safety, Speed

Designated bike lanes, separated from vehicle traffic by a physical barrier, usually bollards, landscaping, or parked cars. These facilities can increase safety by decreasing opportunities for crashing with overtaking drivers and reducing the risk of dooring.

Speed Feedback Sign

Speed

A speed feedback sign notifies people who are driving of their current speed, with a reminder of the posted speed limit. Improves safety by providing a cue for people who are driving to check their speed and slow down, if necessary.

Speed Lump

Speed

Speed lumps and humps use vertical deflection to raise the entire wheelbase of a vehicle and encourage motorists to travel at slower speeds to avoid discomfort or damage to the undercarriage of the vehicle.

Costs

Unit costs for each of these strategies are shown in Table 2. For focus corridors, more detailed cost estimates are provided in Chapter 6 and Appendix E.

Unit cost estimates were based recent construction bid unit costs. Actual project costs will be determined by surveyed base mapping, geotechnical reports, concept refinement, environmental reviews, right of way availability, project phasing, and bid conditions at the time of advertisement. Project costs should be reviewed prior to any grant application or initiation of a capital improvement project to revalidate and update the assumptions in this study as necessary.

Table 2

Unit Costs of Improvement Strategies

Strategy	Unit	Unit Cost
Advanced yield/stop markings	square feet	$5
Bike conflict zone marking	square feet	$5
Buffered bike lane	linear feet	$2
Close sidewalk gap	linear feet	$130
Co-locate bus stops and marked crosswalks	each	$1,500
Countdown pedestrian signal head	each	$800
Curb extension	square feet	$12
Curb ramp	each	$8,000
Extend bike lane to intersection	linear feet	$1
Extended signal clearance time	each	(Note 1)
Hardened centerline/lane line	each	$825
High-visibility crosswalk	square feet	$1
Improved bus stop	each	$7,500
In-street crosswalk signs	each	$500
Leading pedestrian interval	each	(Note 1)
Narrow lanes	linear feet	$3
New all-way stop control	each	$5,000
New traffic signal	each	$550,000
Pedestrian hybrid beacon	each	$230,100
Pedestrian refuge island	each	$10,000
Pedestrian signal	each	$230,100
Raised crosswalk	each	$10,000
Rectangular rapid flashing beacon	each	$122,230
Roundabout	each	$1,200,000
Separated bikeway	linear feet	$20
Speed feedback sign	each	$16,275
Speed lump	each	$2,500

Note: [1]Cost is labor to program signal controllers.
Source: City of Sacramento, Mark Thomas, and Fehr & Peers, 2022

Community Programs

In addition to the toolbox of improvements, other community-wide projects and programs can help meet the transportation needs and desires of neighborhood residents and support the successful implementation of the strategies in the toolbox.

Enforcement

Targeted enforcement can help reduce red light, stop sign, and speeding violations. However, the City of Sacramento Police Department currently has only a small motor unit available for traffic enforcement throughout the entire city. Therefore, while some targeted enforcement may be possible, a consistent police presence for traffic enforcement is not viable today with staffing limitations.

Shared Use Path Etiquette

Education programs encourage good behavior by all users and support infrastructure improvements. These programs can include topics such as appropriate speeds for bicycling and managing dogs. Programs can include outreach through signs, local media, and volunteer interactions. As the neighborhood network of shared use paths is expanded and becomes more popular, an etiquette program can support harmony among all users.

Walk and Bike to School

Walk and bike to school events, often included as part of Safe Routes to Schools programs, are a great way to encourage students and their parents to walk and bike to neighborhood schools. Group events demonstrate walking and bicycling, and these behaviors can carry over after the events.

Bike Repair Programs

Hands-on programs to teach students and the community how to repair bikes are another way to encourage people to bike. These lessons also teach mechanical skills useful in other aspects of daily life. Learners may repair their own bikes or fix other bikes for donation to others who might not be able to afford their own.

Wayfinding

Wayfinding signage can be used on facilities for people who are walking and bicycling to direct users to connecting facilities and key destinations. Good wayfinding signs can also encourage people who are walking and bicycling to visit local businesses. These signs provide the most value at path junctions and at intersections of key bicycling and walking routes. For example, wayfinding to guide people to the Sacramento River Parkway and to lower stress walking and bicycling connections over and under I-5 would benefit those traversing this barrier. Development of a system of wayfinding signs in accordance with the City's Wayfinding Signage Process is recommended for the neighborhood.

Programs that encourage more safe and more courteous walking and bicycling can help increase walking and bicycling in the neighborhood and reduce conflicts among different users on shared use paths.

Atlanta BeltLine "Southern Charm" campaign

Sign from Bol Park in Palo Alto

Matsuyama Elementary School Walk to School Day