PALO ALTO

SAFETY ACTION PLAN - DRAFT

DECEMBER 2024

CITY OF PALO ALTO

FEHR & PEERS

DEDICATION

The City of Palo Alto would like to dedicate this Safety Action Plan to the members of our community – grandparents, parents, children, partners, and colleagues – who have lost their lives or sustained life-altering injuries on the City's roadways. We also express our sincere appreciation to all of those dedicated to improving roadway safety in Palo Alto and reducing these events to zero.

Palo Alto's Commitment to Vision Zero and the Safe System Approach

Reaching zero deaths and fatalities is our commitment – a commitment to providing a transportation system that allows all road users to arrive at their destination comfortably and safely as they travel within and through Palo Alto. We believe that humans are vulnerable and make mistakes. And we believe that an effective, proactive, holistic, and redundant system can prevent fatal and severe injury outcomes associated with those mistakes.

The City of Palo Alto has an important role to play in improving transportation safety in the City. With our Vison Zero commitment we have integrated the Safe System Approach into this Safety Action Plan and intend to update many of our existing programs, policies, and on-going plans to align with this Approach. Our efforts will also include coordination with Caltrans, the County, and adjacent agencies to ensure essential, multi-jurisdictional projects are identified, planned, and Safe System-consistent. Finally, for those components of the Safe System Approach that are outside the City's direct purview, we commit to advocating and collaborating with our Vision Zero peers to bring additional, proven safety tools to Palo Alto.

SAFETY COMMITMENT RESOLUTION

Resolution for the Council of the City of Palo Alto Approving the 2024 Safe Streets and Roads for All (SS4A) Safety Action Plan and Committing to Vision Zero

RECITALS

1. The Federal Infrastructure Investment and Jobs Act (IIJA) was signed into law in November 2021. The law authorized $1.2 trillion for transportation and infrastructure spending through FY 2026. This included the Safe Streets and Roads for All (SS4A) grant program.
2. The National Roadway Safety Strategy (NRSS) was signed into law in January 2022. Through the NRSS, the United States Department of Transportation committed to a national vision of zero roadway fatalities and identified priority action aligned with the five Safe System elements.
3. Caltrans' Strategic Highway Safety Plan (SHSP) was last updated in January 2023. In 2020, State transportation leaders recognized that a change, known as "The Pivot," was necessary to combat the rise in fatalities and serious injuries on California's roadways through the implementation of the Safe System Approach.
4. On June 19, 2023, City Council approved and authorized the City Manager to execute a grant agreement with the Federal Highway Administration (FHWA) to develop the Palo Alto Safe Streets and Roads for All (SS4A)-funded Safety Action Plan.
5. In August 2023, the City of Palo Alto contracted with Fehr & Peers to complete the SS4A Safety Action Plan. The project included two community outreach events, an online survey and interactive map, and project status updates to City Council, Planning and Transportation Commission (PTC), Palo Alto Bicycle Advisory Committee (PABAC), and City/School Transportation Safety Committee (CSTSC).
6. To comply with the SS4A program requirements, the Palo Alto SS4A Safety Action Plan must include a public commitment to the eventual goal of zero roadway fatalities and serious injuries from a high ranking official and/or elected body in the jurisdiction, including a timeline or target for achieving that goal.
7. The City of Palo Alto's SS4A Safety Action Plan states that traffic fatalities and serious injuries on the City's roadways will be reduced to zero by the year **2035/2040.**
8. The City of Palo Alto's SS4A Safety Action Plan is aligned with the Safe System Approach and calls for changes to citywide policies, programs, and practices to clarify our multi-modal safety priority. We acknowledge that these changes will result in tradeoff decisions that proactively provide the opportunity to reduce severe injuries and fatalities and may result in parking loss or increased vehicle delay at times.

The Council of The City of Palo Alto RESOLVES as follows

SECTION 1. The Council hereby approves the Safe Streets and Roads for All (SS4A) Safety Action Plan and the goal of eliminating transportation fatalities and serious injuries in the City of Palo Alto by **2035/2040.**

Introduced and passed:

ACKNOWLEDGEMENTS

2023-2024 City Council

Greer Stone Mayor
Ed Lauing Vice Mayor
Greg Tanaka Council Member
Julie Lythcott-Haims Council Member
Lydia Kou Council Member
Patrick Burt Council Member
Vicki Veenker Council Member

2024-2025 City Council

Update names when 2024-2025 Council is elected

Planning & Transportation Commission

Bryna Chang Chair
Keith Reckdahl Vice Chair
Allen Akin Commissioner
Bart Hechtman Commissioner
Carolyn Templeton Commissioner
Doria Summa Commissioner
George Lu Commissioner

City/School Transportation Safety Committee

Pedestrian and Bicycle Advisory Committee

City of Palo Alto Team

Philip Kamhi Chief Transportation Official
Sylvia Star-Lack Transportation Planning Manager
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Charlie Coles Senior Transportation Planner
Katie Heuser Senior Transportation Planner
Rose Mesterhazy Senior Transportation Planner
Ana Lopez Associate Planner

Fehr & Peers

Meghan Mitman
Ashlee Takushi
Alexandra Lee-Gardner
Sean Reseigh
Steve Davis
Terence Zhao

GLOSSARY

AB Assembly Bill

BPTP Bicycle and Pedestrian Transportation Plan

CIP Capital Improvement Program

Caltrans California Department of Transportation

CSAP Comprehensive Safety Action Plan

CSTSC City/School Transportation Safety Committee

DIB Design Information Bulletin

DP Director's Policy

DUI Driving Under the Influence

EPC Equity Priority Community

FHWA Federal Highway Administration

HIN High-Injury Network

IIJA Infrastructure Investment and Jobs Act

ITE Institute of Transportation Engineers

KSI Killed or Seriously Injured

LTS Level of Traffic Stress

MPH Miles per Hour

MTC Metropolitan Transportation Commission

NRSS National Roadway Safety Strategy

PABAC Pedestrian and Bicycle Advisory Committee

PCF Primary Crash Factor

PDO Property Damage Only

PTC Planning and Transportation Commission

SB Senate Bill

SRTS Safe Routes to School

SS4A Safe Streets and Roads for All

US DOT United States Department of Transportation

VTA Santa Clara Valley Transportation Authority

EXECUTIVE SUMMARY

VISION ZERO GOALS

1

Prioritize reactive, grant-funded projects for the High-Injury Network (HIN) and equity priority areas.

2

Reduce the likelihood of crashes citywide for vulnerable users through proactive and infused safety efforts.

3

Remove barriers to use proven safety tools, and discontinue efforts that perpetuate safety risk.

THIS SAFETY ACTION PLAN HAS BEEN DEVELOPED TO ALIGN WITH THE NATIONAL AND STATEWIDE PIVOT TO THE *SAFE SYSTEM APPROACH TO ACHIEVING VISION ZERO.*

SAFETY FOCUS AREAS

Through crash data analysis, community input, stakeholder feedback, and systemic risk analysis, this Plan identifies several focus areas for enhancing safety in Palo Alto:

Pedestrians on Major Downtown Streets

Children Riding Bicycles

90° Angle Conflicts with Bicyclists of All Ages

Walk & Roll Bike Routes Crossing Higher Stress Streets

Driving Under the Influence

Pedestrians on Arterials at Night

Residential Arterials

EXECUTIVE SUMMARY

HIGH-INJURY NETWORK (HIN)

The High-Injury Network map displays corridors with a disproportionate share of crashes. This Plan identifies and prioritizes projects that address issues and opportunities on these corridors as a way to reactively address safety concerns in Palo Alto.

KEY POLICY AND PROGRAM CHANGES

This Plan also lays out a proactive steps the City will take to create a culture and climate of systemic safety by addressing the key risk factors and barriers to safety that currently exist in Palo Alto. These include:

1

The City of Palo Alto will commit to reducing traffic fatalities and serious injuries to zero on the City's roadways by 2035/2040

2

The City will commit to making design, maintenance, and operations decisions that prioritize safety, and will build off of the outreach completed throughout this Plan

3

The City will seek opportunities to update land use zoning to promote density and infill development, paired with a commitment to provide enhanced facilities and implement traffic calming improvements

4

A citywide, proactive Speed Management Program following the FHWA Safe System Speed Management Framework will guide location-specific interventions in all focus areas

5

Transportation connections to Equity Priority Communities and underserved populations will be prioritized along Walk and Roll Routes and key transit corridors

6

The City will look for opportunities to institutionalize safety into all aspects of policies, planning, programming, design, implementation, and maintenance, with a focus on those efforts that improve safety at the population scale through change to travel patterns, land use conditions, socioeconomic considerations, and built environment provisions

7

Through an audit of the City's transportation budget, funding sources and project selection/priorities will be reevaluated to shift toward more proactive and strategic opportunities, enabling Palo Alto to address safety risk factors more efficiently

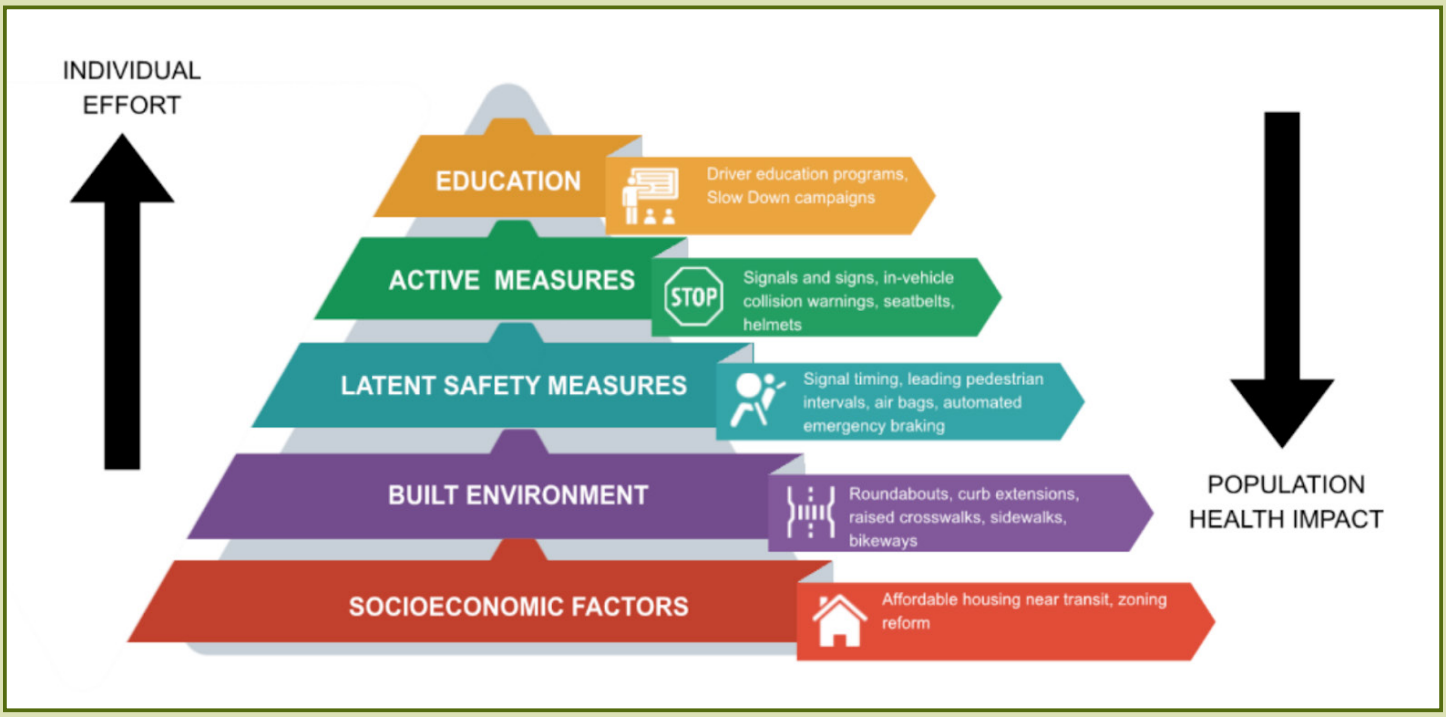
8

The City will collaborate with partners and peers to make meaningful progress on cross-jurisdictional and cross-sector efforts

EXECUTIVE SUMMARY

SAFETY AS A PUBLIC HEALTH CONCERN

The Safe Systems Pyramid builds on established public health practice to illustrate how interventions that have the largest reach and require the least personal effort will be the most impactful. This Plan references the Pyramid as the guiding framework to advance safety in Palo Alto efficiently and holistically. It is a structure for prioritizing the roadway design and operations tools that will have the most impact for safety while also collaborating outside the safety silo with other agency and community stakeholders to engage in upstream and more wide-ranging root cause topics.



Safe System Pyramid *Source: Ederer, et. al., Vision Zero Network*

IMPLEMENTATION PHASING & SEQUENCING

Within the next five years, safety will be institutionalized throughout the City through updates to existing policies, programs, and projects. This will set a framework for staff to shift their focus to be more proactive and systemic, and tradeoff decisions in project prioritization and design will reflect a commitment to reducing safety risk factors in our transportation system.

These next step considerations are color coded, based on the color of the tiers in the Safe System Pyramid:

▲ Socioeconomic Factors

▲ Built Environment

▲ Latent Safety Measures

▲ Active Measures

▲ Education

These items are considered near-term priorities that can address locations with risk factors around exposure (where, when, and why people are at risk, with a focus on equity and schools), likelihood (high conflict zones), and severity (locations with high speed and heavy vehicles).

City staff will:

- Create a **citywide speed management plan** consistent with the Safe System Approach and implement a rollout of the key speed management strategies recommended from the plan ▲
- Create a **community engagement strategy** that communicates the City's **commitment to Vision Zero where safety is the top priority** in design ▲
- Update the City's **Safe Routes to School framework** to **prioritize safety considerations over all other trade-off decisions** for projects on designated Walk and Roll Routes ▲
- Reassess the City's CIP funding allocation and apply for funding to **support mode shift by implementing enhancements along Safe Routes to School Walk and Roll Routes** ▲
- Update the Transportation Impact Assessment Guidelines to **ensure that risk reduction for vulnerable users is a primary consideration in development review** and safety efforts can be funded by impact fees ▲
- Collaborate with neighboring cities, the County, VTA, other transit providers, and Caltrans to **improve first-last mile connections to key routes and improve transit infrastructure** along major transit routes ▲
- **Update Public Works Standard Drawings and Specifications** to align with Safe System principles, including being consistent with NCHRP 1036 and Caltrans DIB 94 ▲
- Collaborate with Santa Clara County Public Health Department and the City of San Jose to partner in **acquisition of trauma center data sharing** ▲
- Develop **user safety guidance for e-bikes and e-scooters** that travel in the City ▲
- Build a **culture of safety with decision makers and City staff** by having standing committee meetings to discuss the progress on policy/programs and infrastructure implementation ▲
- Coordinate **media training for accurate roadway safety reporting** ▲

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A CALL TO ACTION

CHAPTER 1

From 2018-2022

1,132*

Injury crashes occurred on roadways in Palo Alto.

The City of Palo Alto's Safe Streets and Roads for All Safety Action Plan was created to fundamentally shift the way the City of Palo Alto addresses safety risks and concerns, by reflecting on systemic changes needed to institutionalize safety, and implementing a "safety-first" lens to intentionally and proactively reduce, and ultimately prevent, transportation-related fatalities and serious injuries by **2035/2040.**

"We need a national change in mentality. It is time for a transformation in how people think about road safety. Together, we can act to change the culture and expectations. We are so accustomed to hazards on our roads that we sometimes behave as if the risks of today's roadways are inevitable. But they're not. People should leave the house and know they're going to get to their destination safely. Once we believe that, and believe in our ability to collectively make progress, once we demand better, we will see more positive changes cascading across governments and industry."

PETE BUTTIGIEG
US TRANSPORTATION SECRETARY
JANUARY 2022

*Transportation Injury Mapping System (TIMS), 2018-2022. Excludes property damage only (PDO) crashes and grade separated Caltrans facilities.

LATEST FEDERAL AND STATE POLICIES

In recent years, leaders at the Federal, State, and regional levels have taken bold and consistent steps to acknowledge the persistent and unacceptable level of severe injuries and fatalities on our roadways, commit to eliminating these occurrences, and follow international best practice and public health fundamentals to form a new safety paradigm in the United States. This has specifically involved embracing the Vision Zero goal of safe mobility for all and adopting the Safe System Approach as the way to get there. The United States Department of Transportation (US DOT) incorporated the Safe System Approach as part of its National Roadway Safety Strategy (NRSS), adopted in January 2022. Federal transportation officials have since unveiled several policies and programs geared towards the application and implementation of the Safe System Approach at the State and local levels.

The Safe System Approach is a significant evolution in how roadway safety is conceptualized. The Approach includes the key elements and core principles as shown in **Figure 1**, and acknowledges that mistakes are inevitable while also asserting that severe injuries and fatalities are avoidable on our roadways. This is a shift in thinking on how to improve roadway safety; instead of a primary focus on shifting behavior through education campaigns or enforcement, it encourages roads, vehicles, and policies that are intentionally designed to prioritize safety. It involves building layers of redundancy that function as safety nets for users – even if someone makes a mistake on the roadway, the system as a whole minimizes the likelihood of serious injury or death through measures such as decreased speeds, advanced vehicle safety technologies, separation among roadway users in time and space, and better post-crash care in the case of injuries. Some crashes will still happen, but under the Safe System Approach, they won't be nearly as devastating.

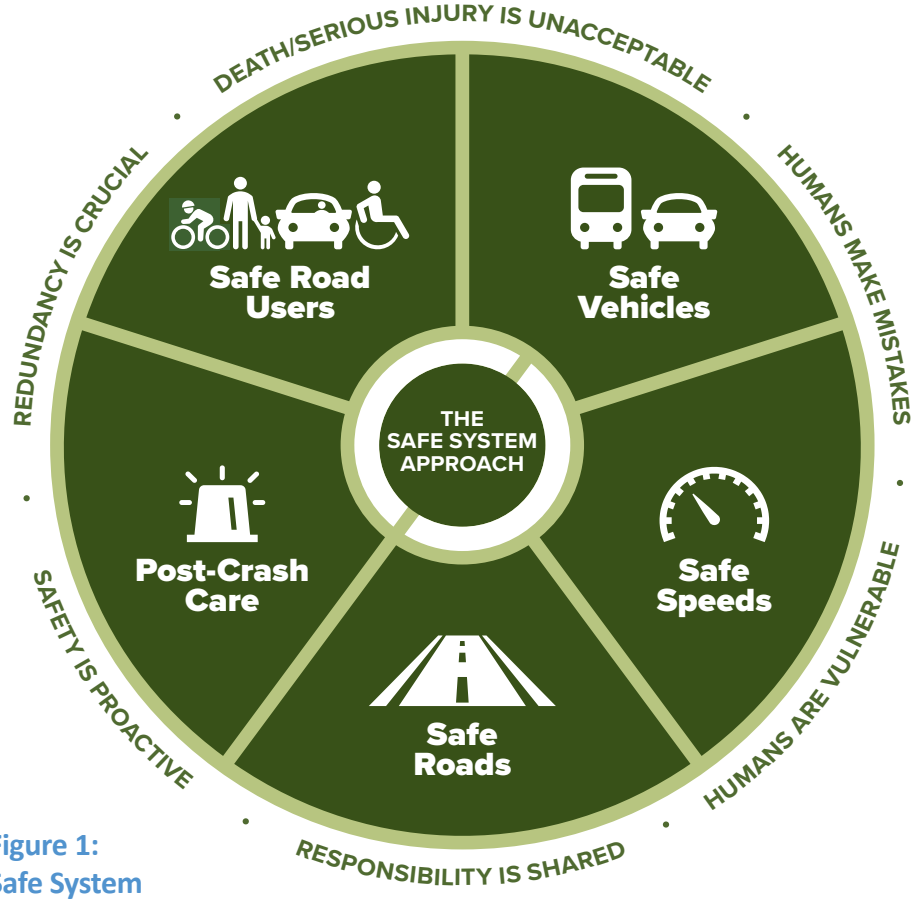


Figure 1: Safe System Approach
Source: FHWA

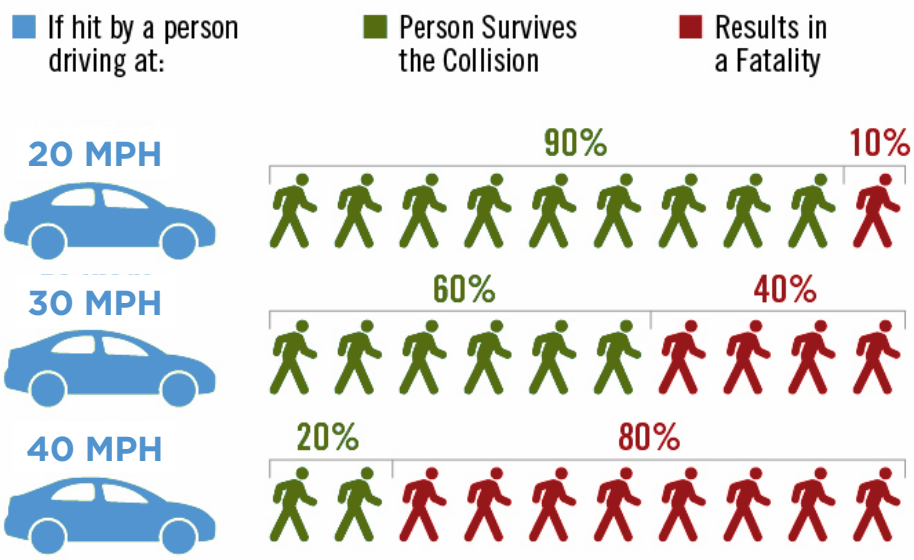


Figure 2: The Exponential Role of Speed in Kinetic Energy (and Associated Injury Risk)
Source: US Department of Transportation

This **Safety Action Plan (Plan)** has been developed to create a project and policy action list, along with the process to implement and hold the safety stakeholders in Palo Alto accountable for institutional alignment with the Safe System Approach. This chapter summarizes the primary reference documents and policy considerations that influenced the direction, decisions, and priorities in this Plan.

We acknowledge these foundational perspectives for the Plan:

Human bodies are vulnerable to injury in a crash because of kinetic energy, the energy of movement associated with speed, mass, and angle of impact. When this energy is strong enough and not mitigated, the energy transfers to fragile bodies with severe consequences. In a Safe System these factors are proactively identified and addressed through a coordinated and redundant, systems-based approach.

The most impactful way to address kinetic energy risk is by acknowledging and systematically addressing socioeconomic and land use factors that create the systemic risk, followed by understanding and enhancing built environment factors, and then considering passive and active safety tools. This Plan presents a holistic assessment of the needs and opportunities for enhancing safety, consistent with this framing and priority order.

Conventionally, safety plans have been organized by reactive Es of safety: education, enforcement, engineering, and emergency services, and did not focus on proactive risk reduction in the system. This Plan shifts away from the silos of those Es and focuses instead on cross-cutting "new Es": energy, exposure, and equity. This Plan addresses kinetic energy risk through an assessment of exposure, likelihood, and severity that is inherently proactive and systemic.

This Plan aspires to make safety the default choice: the easy choice for people as they move about and the easy choice for roadway planning and design decisions. This Plan identifies the opportunities to streamline decision making to prioritize safety and improve internal alignment in programs, practices, and policies consistent with the Safe System Approach.

Table 1 below highlights key takeaways from guidance and principle documents that will be discussed throughout the Plan. Detailed summaries of these reference documents are included in Appendix A.

TABLE 1: FEDERAL AND STATE SAFETY GUIDANCE AND LAWS

Resource	Key Elements
Safe Streets and Roads for All	• Highlights the initiative to prevent roadway deaths and serious injuries by meeting a nine-point criteria set forth by FHWA. • Includes a five-year, $5 billion funding allocation for Planning & Demonstration and/or Implementation grant
FHWA Safe System Roadway Design Hierarchy	• Presents a hierarchy that includes four tiers: remove severe conflicts, reduce vehicle speeds, manage conflicts in time, increase attentiveness and awareness • Prioritizes improvements and countermeasures that make physical changes to the roadway system to accommodate human mistakes
FHWA Safe System Approach for Speed Management	Introduces a five-stage framework to identify, prioritize, and implement arterial and residential speed management, a primary tool of the Safe System Approach
FHWA Primer of Safe System Approach for Pedestrian and Bicyclists	• Details considerations surrounding pedestrians and bicyclists under each of the Safe System elements • Includes a benchmark for agencies to review the policies, programs, and practices for Safe System consistency
FHWA Informational Guide: Improving Intersections for Pedestrians and Bicyclists	Identifies the foundation and examples of intersection design to facilitate a safe, accessible, convenient, and comfortable design for all ages and abilities
FHWA Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations	Provides guidance on the appropriate pedestrian crossing improvements at uncontrolled crossing locations through the Safe Transportation for Every Pedestrian (STEP) program
FHWA Safe System-Based Framework and Analytical Methodology for Assessing Intersections	Quantifies kinetic energy transfer, number of conflict points, and complexity of moments for alternative intersection design through the Safe System method for Intersections (SSI)
FHWA Improving Pedestrian Safety on Urban Arterials: Learning from Australasia	Emphasizes the movement and place framework and the role of target speed limit setting and speed management. Guidance is also given on the selection of safety countermeasures to match the land use context of the roadway.
The Safe Systems Pyramid	• Explores a public health lens for the Safe System pivot, and delivers a clear hierarchy of interventions • Illustrates how interventions that have the largest reach and require the least individual effort will be the most impactful for improving system-wide safety

TABLE 1: FEDERAL AND STATE SAFETY GUIDANCE AND LAWS (CONT.)	
Resource	**Key Elements**
NCHRP 1036: Roadway Cross-Section Reallocation Guide	• Provides guidance for assessing the tradeoffs involved in the allocation of limited width of a roadway through community engagement • Provides guidance on minimum floors for safety standards • Provides guidance on the use of level of service and future year traffic forecasts to align with the Safe System Approach
A Safe System Guide for Transportation: Sharing this Approach to Lead your Community to Action	Includes resources for advocates, practitioners, and stakeholders to communicate the contents, importance, and benefits of the Safe System Approach at the community, agency staff, and elected official level to build capacity and institutionalize these practices into day-to-day operations
ITE Safe System in Impact Assessment Brief	• Explains how, historically, Traffic Impact Analyses have typically focused on vehicle throughput and delay • Prioritizing vulnerable road users integrates safety considerations and helps to promote land uses conducive to safer conditions for all users
ITE Big Data Briefs	Showcases big data and innovative technologies opportunities that can be leveraged to bolster safety analyses; however, the briefs provide guidance on using these sources with caution/caveats
Caltrans Director's Policy 36	Highlights Caltrans' commitment to eliminating fatal and serious injury crashes by 2050 through the Safe System Approach
Caltrans Director's Policy 37	Highlights Caltrans' commitment to creating complete streets that supports active transportation, transit, and rail to meet the States climate and environmental goals
Caltrans Design Information Bulletin 94	Integrates the Safe System Approach and Safe System Hierarchy into design implementation guidance for complete streets projects on the State Highway System, setting safety "floors" for treatment selection
State Laws	
AB 43	Provides flexibility to local jurisdictions to set and be able to enforce context-sensitive speed limits
AB 413	Requires daylighting intersections up to 20 feet of the approach side of a marked or unmarked crosswalk to ensure better sight distance between motorists and vulnerable road users
AB 645	Provides guidance for implementation of speed safety camera pilot programs, allowing automated enforcement through cameras
SB 743	• Introduces a policy change in the State's environmental review process for transportation, quantifying the amount of driving measures by vehicle miles traveled, an important safety exposure consideration • Removes level of service as an environmental impact criteria

BENCHMARKING PROGRAMS, PRACTICES, AND POLICIES THAT INFLUENCE SAFETY IN PALO ALTO

The City of Palo Alto has numerous policies, plans, guidelines, and standards that positively influence roadway safety. For example, the City has prioritized safety through an established and well-funded Safe Routes to School program and is preparing an updated Bicycle and Pedestrian Transportation Plan (BPTP). The BPTP Update aims to close the gaps in citywide walking and bicycling networks and support a shift in modes of transportation to walking and bicycling on safer and less stressful facilities. This Spring, the City effectively collaborated with Caltrans to take meaningful steps to enhance safety on El Camino Real, a road that has long posed safety and accessibility challenges for pedestrians and bicyclists traveling along and across it.

In some areas, Palo Alto aligns with Safe System best practices, while in others, there remains work to do to fully institutionalize the Safe System principles and elements. Moving the needle on safety will not come from reactive infrastructure projects alone and will need to identify and address key barriers. Safety must be prioritized in all of the City's programs and operations to reach the City's safety goals.

The benchmarking assessment identified the most important shifts as being:

- Replacing level of service with level of safety assessments in design decisions, right of way reallocation tradeoffs, and impact assessments
- Collaborating with partners and peers to make meaningful progress on cross-jurisdictional and cross-sector efforts
- Deploying a proactive speed management program and systemic implementation of default safety tools
- VMT reduction as a safety strategy and insuring transit-oriented plans also have first/last mile safety components

The full benchmarking assessment is detailed in Appendix B.


Stanford

ENGAGING THE COMMUNITY

CHAPTER 2

Engagement was a key part of this Plan to understand the community's lived experiences, existing needs, and future visions and to complement crash data with a more complete story of safety concerns and opportunities. The engagement process was done in two stages: Fall 2023 and Spring 2024

The first stage of outreach took place in Fall 2023 and included community events, an online survey, and council and committee presentations. The community event was a collaborative effort with the ongoing Bicycle and Pedestrian Transportation Plan (BPTP) Update. The goal of the Fall engagement series was to gather input from the community on safety concerns and travel challenges in Palo Alto for workers, residents, and students, with a focus on bicycle and pedestrian issues. The input from the first phase of outreach was used to support the analysis and identify areas and specific issues of focus for the Plan.

The second phase of outreach occurred in Spring 2024 and involved community events and council and committee presentations to update key stakeholders on the feedback received from the first phase of engagement. It also helped bolster and refine the safety focus areas and high-injury network (HIN).

Throughout the Plan's process, the project team collaborated with the BPTP Update team to share feedback collected through various engagement events. Feedback received through the City's Office of Transportation communication channels were collected, reviewed, and processed to refine and expand the project and policy list.

COMMUNITY EVENTS

To best reach the community and better access populations often underserved in engagement- such as single parents, those who work multiple jobs, shift workers, and lower income residents- outreach focused on existing events to meet people where they were.

The project team attended the City's Bike Palo Alto event in October 2023 at Fairmeadow Elementary School. The event, hosted annually by the City, supports biking in Palo Alto by sharing bicycle resources and offering bike tune up services. The engagement focused on asking community members about their experiences biking in Palo Alto. Attendees were also encouraged to fill out the online survey described in the **Online Survey & Interactive Map Section.**

The following is a list of key themes and feedback we heard at the Bike Palo Alto event:

- There is general enthusiasm for bike lanes
- There are concerns about speeding motorists
- There are concerns for areas where small bike boulevards intersect with major thoroughfares and intersection controls are not present
- There is a need for enhanced intersection treatments
- There is a need for more bike lanes along school routes
- There is a need for additional connections to trails, grocery stores, and through downtown

Figure 3: Pop-Up at Bike Palo

As part of the second phase of outreach, the project team attended the City's May Fete event in Spring 2024. The event was held at Heritage Park, where participants were asked to share how they commute to school or work and identify locations they frequent on their way by placing stickers on a map of the City with the HIN. This information was used to support the HIN development and the prioritization of projects.

The following is a list of key themes and feedback we heard at the May Fete:

- Parents shared the need to use side streets to avoid high-use corridors, and concern for children riding their bike alone. There were also concerns shared for vehicles traveling at high speeds around key routes to school
- Parents shared a desire for a crossing at East Meadow Drive and Bryant Street to connect to Charleston Road
- Adults shared that they work in Palo Alto and live in adjacent cities, but choose driving over biking for convenience and safety

Figure 4: Pop-Up at May Fete, April 2024

ONLINE SURVEY & INTERACTIVE WEBMAP

The purpose of the online survey was to understand general attitudes about trade-off decisions for roadways and to understand community preferences if space was available for amenities such as parklets, community seating areas, or angled parking. The survey asked questions about the community's support for a goal of zero fatalities and serious injuries; perceived safety at key destinations and areas with high pedestrian and/or bicycle traffic; and whether they were willing to make trade off decisions to support safety. The survey results helped inform Chapter 6, how the City will approach safety-related projects and trade-off decisions moving forward.

The survey received over 760 responses. Key takeaways from the survey included:

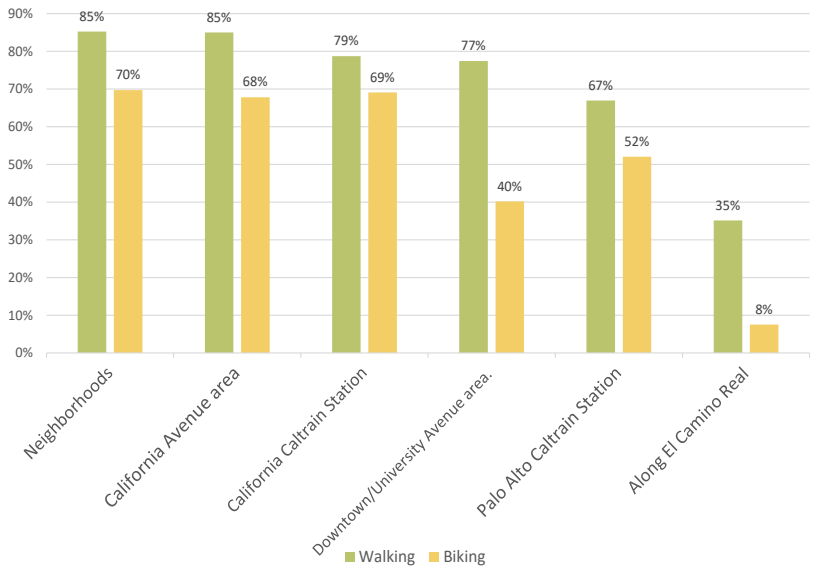
- Sixty-seven percent (67%) of respondents strongly agreed to prioritize safety over on-street parking
- Ninety-two percent (92%) agree or strongly agree that pedestrian and bicycle safety should be prioritized over on-street parking
- Eighty-five percent (85%) of respondents strongly support eliminating traffic fatalities and serious injuries in Palo Alto
- Ninety-nine percent (99%) of respondents are willing to change their driving behavior to reduce fatalities or serious injuries
- Eighty-six percent (86%) of respondents believe that reducing the number of lanes or parking should be prioritized to enhance safety for pedestrians and bicyclists

Survey respondents were also asked to share their general sense of safety at key locations in Palo Alto, as shown in **Figure 5**. Participants generally felt safe walking and biking within their neighborhoods and many major commercial corridors, including California Avenue and Downtown/ University Avenue. Participants also generally felt safe walking and biking near California Avenue Caltrain Station and Palo Alto Caltrain Station. The majority of participants felt that there was an opportunity to enhance safety for pedestrian and bicyclists along El Camino Real; only 35% of respondents felt safe walking and 8% of respondents said they felt safe biking along El Camino Real.

The full list of survey responses is included in Appendix C.

In addition to the attitudinal survey, an interactive webmap was prepared by the BPTP Update project team. The webmap, developed by Kittelson and Associates, was hosted online during the same period as the survey (September to December 2023). Some of the top priorities listed by residents were improving the bicycle infrastructure, implementing safety enhancements along school routes and in the Downtown area, and safety education.

Figure 5: I Feel Safe at...



INTERNAL STAKEHOLDER WORKING GROUP

An internal stakeholder working group meeting was held with City staff across multiple departments in November 2023. The group was established in collaboration with the BPTP Update project and consisted of staff from the Office of Transportation, Park and Recreation, Community Services, Fire, Safe Routes to School, Utilities and Engineering, Police, and Public Works Engineering. The meeting introduced City staff to the Safe System Approach and the overall project. The working session aimed to understand opportunities to institutionalize safety within all City processes, which aligned with the benchmarking exercise mentioned on page 18. Members of this group were part of committee meetings, and were engaged throughout the Plan's process to gather feedback.

COUNCIL & COMMITTEE OUTREACH

For each phase of outreach, the project team met with the Pedestrian and Bicycle Advisory Committee (PABAC), the City/ Schools Transportation Safety Committee (CSTSC), the Planning and Transportation Commission (PTC), and City Council. In Fall 2023, the project and the Safe System Approach was introduced. The committees and commissions were also asked to share feedback on the Plan's vision statement.

In Spring 2024, the project team provided an update on community engagement and a summary of the crash analysis. This information was presented at PABAC, CSTSC, and PTC. A staff report, along with feedback shared from the committees and commissions, was shared with City Council.
In early 2025, the project team shared the draft plan with PABAC, CSTSC, PTC, and City Council. The Plan was also posted for public review and comment.

The Final Plan was shared with all committees and City Council in Spring 2025, and final adoption occurred on **April XX, 2025.**

CRASH DATA & AREAS OF EMPHASIS

CHAPTER 3

This chapter summarizes the results of a broad crash analysis for the City of Palo Alto. This analysis incorporated crashes resulting in injuries and fatalities from 2018 to 2022 available through the Transportation Injury Mapping System (TIMS). TIMS was created by the Safe Transportation Research and Education Center (SafeTREC) and reports crashes using data from the Statewide Integrated Traffic Records System (SWITRS).

The data analysis encompasses a breakdown of fatal and injury crashes by severity, mode, type, and primary crash factors. Using the data and other contextual factors, seven safety focus areas were identified.

CRASH ANALYSIS & HIGH-INJURY NETWORK DEVELOPMENT

Crash Data Source

Crash data for the five most recent years of data available, January 1, 2018 through December 31, 2022, was collected using TIMS.". TIMS provides geocoded access to California crash data using the SWITRS data from injury and fatal crashes. SWITRS is collected and maintained by the California Highway Patrol (CHP) and contains crashes that were reported to CHP from local and governmental agencies. The California Local Roadway Safety Manual recommends using TIMS data for crash analysis, and the Safe System Approach focuses on specifically analyzing and eliminating crashes where involved parties are killed or seriously injured.

In general, crash databases have been found to have certain reporting biases, including:

- Crashes involving people walking, on bicycles, or on motorcycles are less likely to be reported than crashes with people driving
- Property-damage-only crashes are less likely to be reported compared to more severe crashes
- Younger victims are less likely to report crashes
- Alcohol-involved crashes may be under-reported
- Race, income, immigration status, and English proficiency may also impact reporting, but there is limited research on these factors

The crash data was spatially referenced and mapped in GIS. Each crash was assigned to the nearest intersection within 250 feet of a major street or 75 feet of a minor street, or nearest roadway segment if no intersection was within range.

KILLED OR SEVERELY INJURED CRASH (KSI)

A crash is classified as a KSI if a person is killed or seriously injured in the traffic event. These crashes can result in catastrophic impacts on the individual and the families of those involved. Severe injuries can cause permanent disability, lost productivity and wages, and ongoing healthcare costs, while fatalities can cause huge emotional distress and financial hardships to families.

Severe injuries can include:

- Broken bones
- Dislocated or distorted limbs
- Severe lacerations
- Unconsciousness at or when taken from the crash scene

Key Considerations of Crash Data-based Analyses

It is important to note that crash data is inherently limited in two ways:

1. The variables provided on the report form are focused on those that help assign "fault" for the purpose of insurance payouts or criminal proceedings. As such, they are skewed to both behavioral factors and factors associated with the moment of crash and the preceding/subsequent brief periods of time.
2. Contextual elements associated with the crash, including roadway design (those elements both present and not present in the design) and socioeconomic and land use characteristics (the who, where, when, where, and why elements of transportation, many of which are determined hours, years, or decades before the crash) are typically not apparent in crash reports

Thus, while the insights from this analysis are key inputs to

understanding the safety issues and opportunities in Palo Alto, they are not sufficient for understanding or addressing the full scope of safety considerations and interventions.

Summary

In the past five years (2018-2022), 1,132 injury crashes[2] were reported in the City of Palo Alto as shown in **Figure 6**. This captures pre- and post COVID-19 conditions and reflects existing roadway conditions, including any recent street improvements from the past five years.

Overall, reported crashes in the City have decreased since 2018, with the lowest number of crashes in 2022 (87 crashes). There were 47 total killed or serious injury (KSI) crashes in the 5-year study period. In 2020, due to the COVID-19 pandemic and fewer people using roads, total crashes dropped to 164 crashes. This was significantly lower than the previous year (317 crashes in 2019) but higher than 2022 crashes. However, there were 13 KSIs in 2020, which made up 8% of all 2020 crashes. This pattern of lower crashes but a higher proportion of KSIs in 2020 is consistent with nation-wide trends of lower vehicle traffic volumes and higher vehicle speeds.

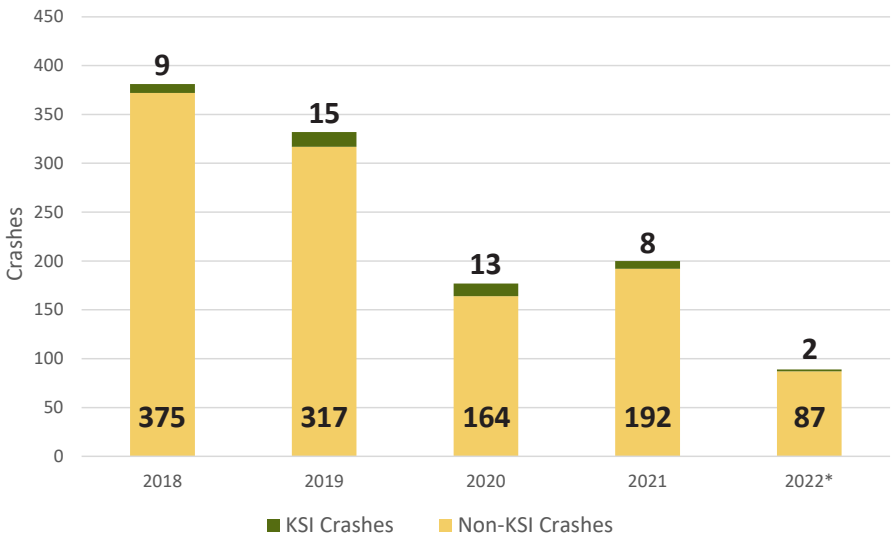


Figure 6: Palo Alto Injury Crashes from 2018 to 2022
Notes: 2022 data is still preliminary and is subject to change.
Source: TIMS, 2018-2022; Fehr & Peers, 2024

[2] Transportation Injury Mapping System (TIMS), 2018-2022. Excludes property damage only (PDO) crashes and grade-separated Caltrans facilities.

Injury Crash Trends

Of the reported 1,132 injury crashes that occurred in the City between 2018 and 2022, 361 crashes involved a pedestrian or bicyclist, as shown in **Figure 7**. Pedestrians and bicyclists make up 32% of all crashes but are overrepresented in 51% of KSI crashes (24 out of 47 crashes). This highlights the vulnerability of pedestrians and bicyclists among road users.

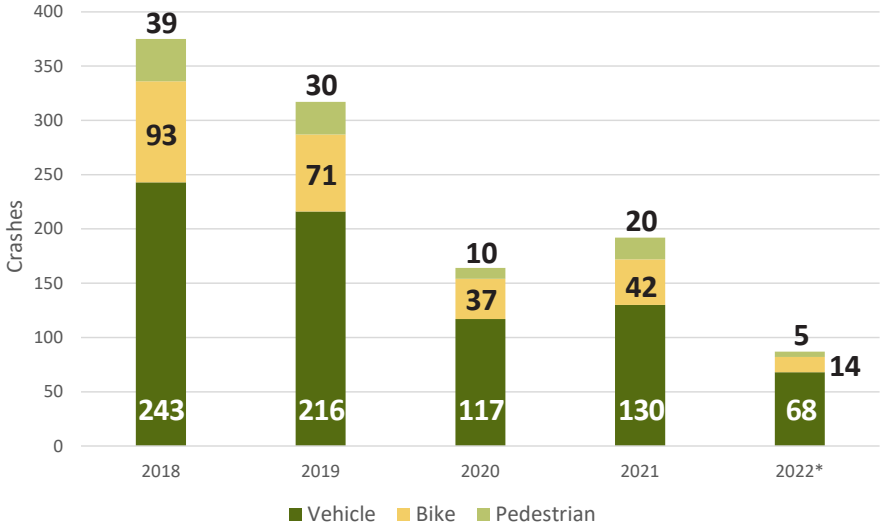


Figure 7: Modal Breakdown of Palo Alto Injury Crashes from 2018 to 2022

Notes: 2022 data is still preliminary and is subject to change.

Source: TIMS, 2018-2022; Fehr & Peers, 2024

Injury Crashes by Type

Crash types describe how a crash is reported by law enforcement based upon the parties who were involved and generally describe the way contact was made between the involved parties, as shown in Figure 8.

- **HEAD-ON CRASHES** are between two vehicles where the primary point of contact was the front of both vehicles
- **SIDESWIPE CRASHES** are between two vehicles, where the primary point of contact was the side of the vehicles
- **REAR-END CRASHES** are between two vehicles traveling in the same direction where the front of one vehicle contacts the rear of another
- **BROADSIDE CRASHES** are between two vehicles on conflicting paths where the front of one vehicle contacts the side of another
- **HIT OBJECT CRASHES** are between a vehicle and non-vehicular object in or near the roadway
- **OVERTURNED CRASHES** are any type of crash that result in at least one vehicle rotating 90 degrees or more side-to-side or end-to-end (also known as a "rollover")
- **VEHICLE-PEDESTRIAN CRASHES** are any crash involving both a motor vehicle and a pedestrian
- **UNKNOWN/OTHER CRASHES** describe any reported crashes that were not consistent with one of the primary crash types above, or where crash type was not coded into the crash database

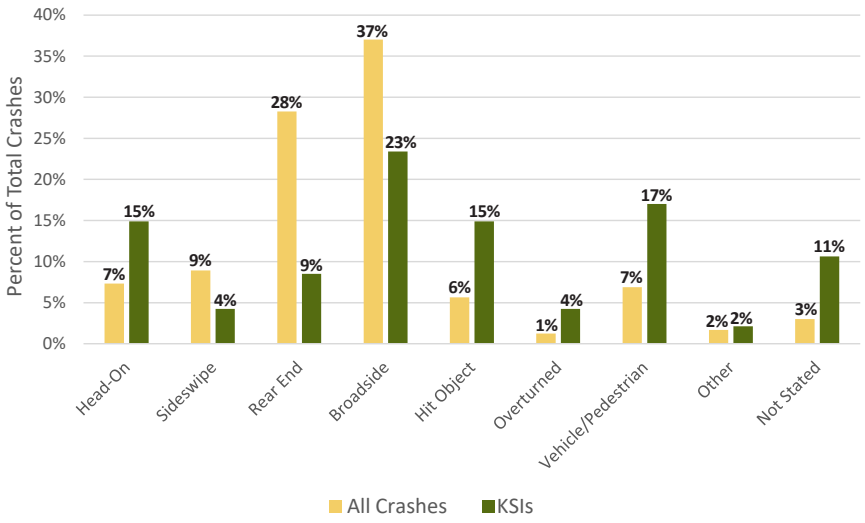


Figure 8: Share of Crashes by Crash Type of Palo Alto Injury Crashes from 2018 to 2022

Notes: 2022 data is still preliminary and is subject to change.

Source: TIMS, 2018-2022; Fehr & Peers, 2024

Crashes associated with higher kinetic energy risk are overrepresented by KSI crashes. Of the angle-type crashes, broadside crashes and head-on crashes have two of the highest percentages of KSI crashes. The angle at which these crashes occur leads to higher fatalities and serious injuries. This is particularly true in crashes between pedestrians and vehicles; due to the mass of vehicles and the kinetic energy transferred when vehicles are traveling at a higher speed, pedestrians are more likely to be killed or seriously injured in crashes (see **Figure 2**).

Primary Injury Crash Factors

Primary crash factors (PCFs) are cited by the responding officer and based on their judgment of what contributed to the crashes. PCFs do not include contextual information related to the design of the location that could have been a primary or secondary contributor to the crash.

- **UNSAFE SPEED** refers to a crash where a party is identified to be traveling at a speed exceeding that deemed reasonable or prudent for conditions in violation of CVC 22350
- **VEHICLE RIGHT OF WAY** refers to a driver infringing upon the right-of-way of another party in violation of CVC 21800-21809
- **IMPROPER TURNING** identifies a crash where a party made a left or right turn in violation of CVC 22100-22113
- **TRAFFIC SIGNALS AND SIGNS** describes a party disobeying a traffic control device, such as a traffic signal or roadside sign, in violation of CVC 38280-38302
- **DRIVING UNDER INFLUENCE** identifies a crash where a driver is found to have been operating a vehicle or bicycling while impaired by a substance – typically alcohol – in violation of CVC 23152

The most common PCFs reported in Palo Alto for all crashes, as shown in **Figure 9**, are unsafe speed, improper turning, and vehicle right of way violation. Comparatively, the most common PCFs for KSIs in Palo Alto are improper turning, DUIs, and pedestrian-related crashes.

HIGH-INJURY NETWORK

The high-injury network (HIN), as shown in **Figure 10**, was developed to show street segments with a high number of crashes, including KSI crashes and crashes involving vulnerable users (bicyclists, pedestrians, youth, and seniors) in the City; 63% of all crashes occur on only 4% of City streets as represented by the HIN. This network illustrates crash trends geographically throughout the City and provides a framework for where to prioritize reactive-based improvements, which are frequently grant funded.

Many streets on the HIN overlap with major streets, including Caltrans and County owned streets. El Camino Real, which is owned and operated by Caltrans, has the highest proportion of crashes (14%).

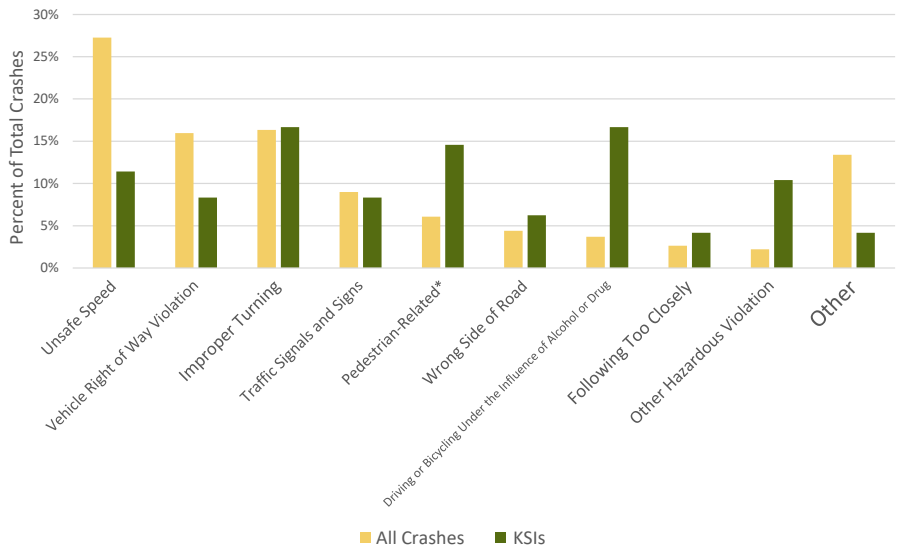


Figure 9:
Share of Crashes by Primary Crash Factors of Palo Alto Injury Crashes

Notes:
1. 2022 data is still preliminary and is subject to change.
2. The "Pedestrian-Related" category shown here combines two PCF categories: Pedestrian Violation and Pedestrian Right of Way Violation. The former indicates that the pedestrian violated a rule of the road, such as crossing outside of a crosswalk, where the latter indicates the driver of a vehicle violated the pedestrian's right of way. The Pedestrian Violation category may be overrepresented due to a lack of clear information related to crash circumstances, and the increased likelihood that the pedestrian party may be unable to provide their side of the incident at the time of the crash. For this reason, we have elected to not show the distinction in these tallies, and instead show all pedestrian-related crashes in one single category.

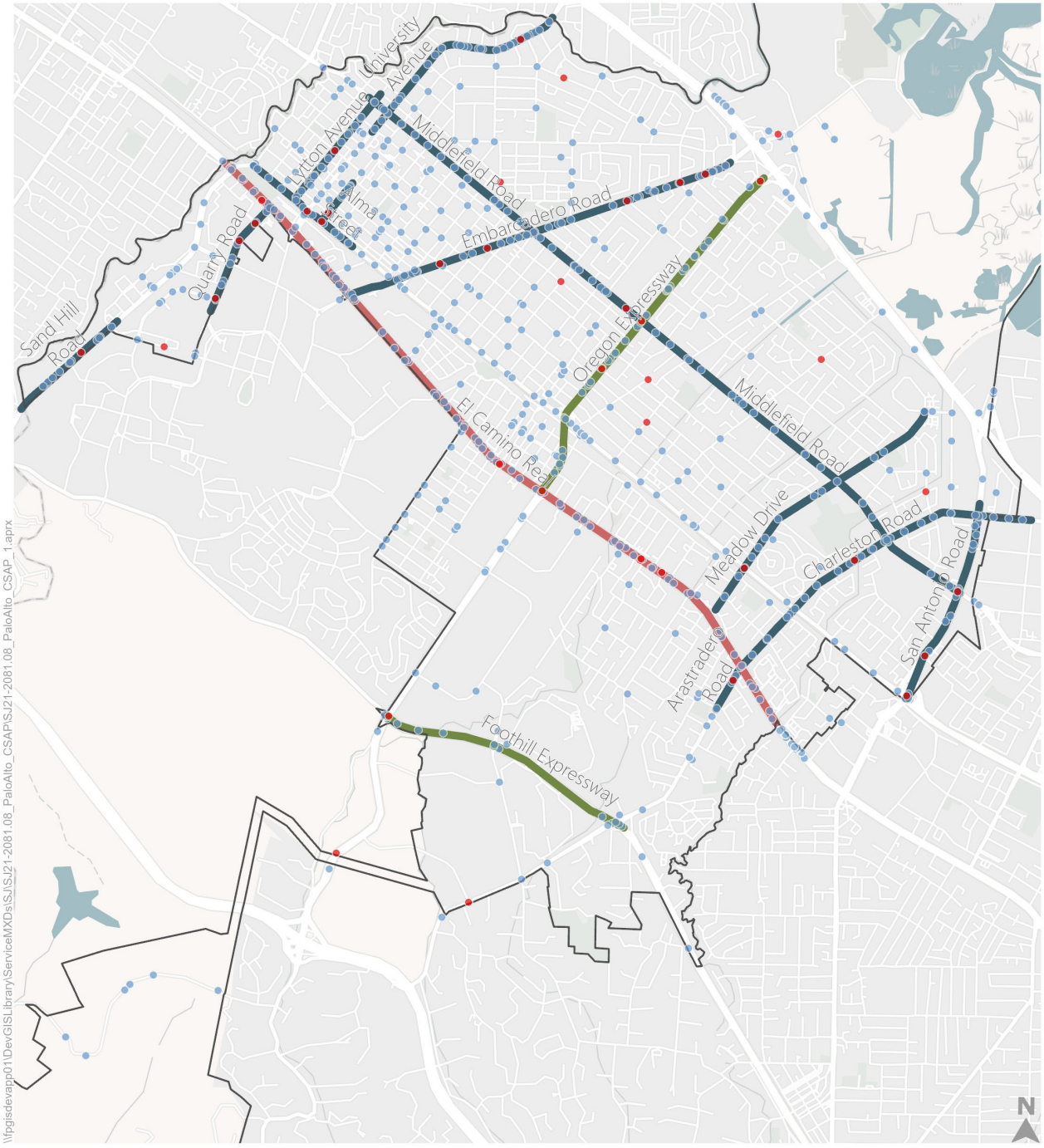
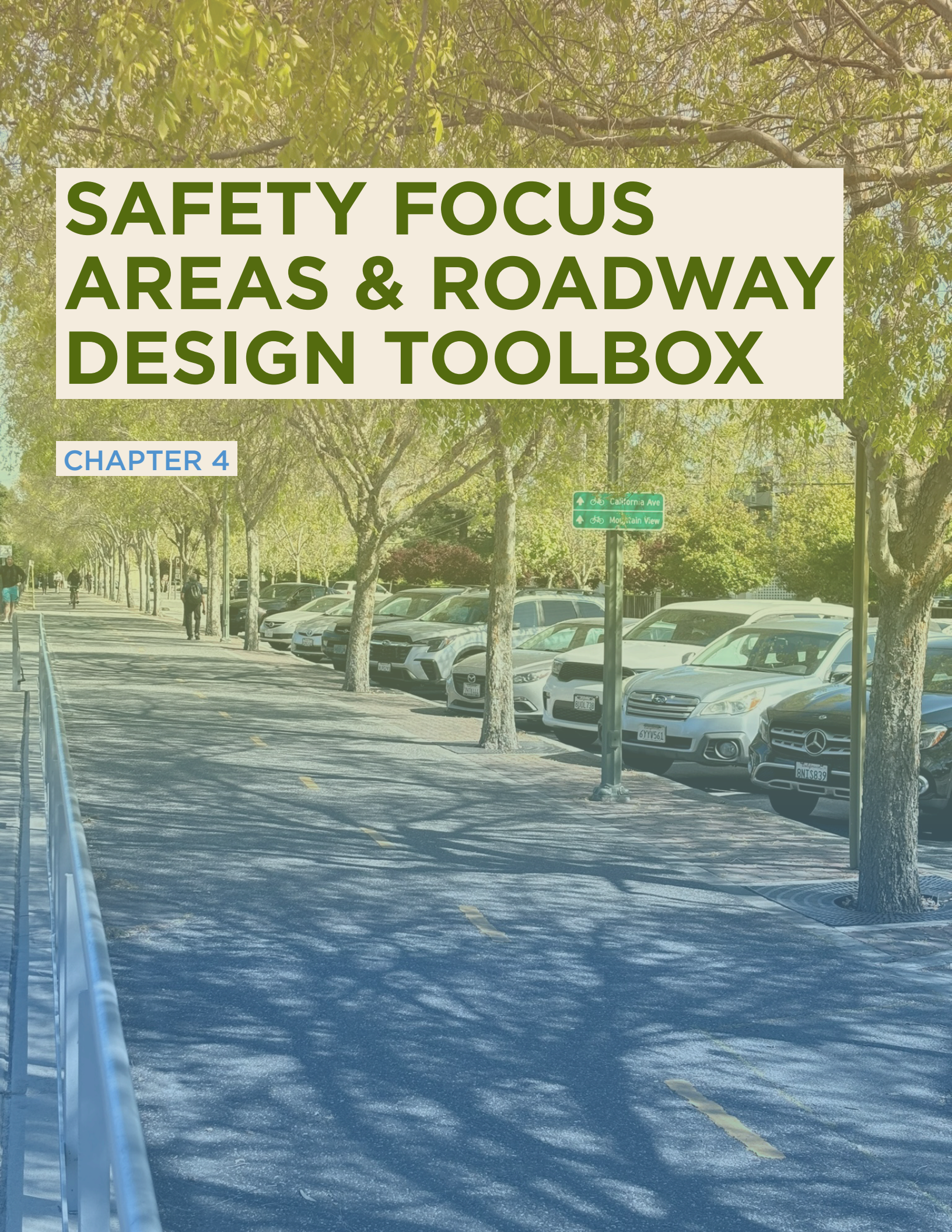


Figure 10: High-Injury Network

KSI Crash
Non-KSI Crash
Caltrans-Owned
City-Owned
County-Owned

SAFETY FOCUS AREAS & ROADWAY DESIGN TOOLBOX

CHAPTER 4



This chapter presents safety focus areas identified through a systemic analysis, as well as key roadway design countermeasures applicable to address these focus areas. The countermeasures align with the Safe System Design Hierarchy, which focuses on eliminating conflicts, reducing speed, separating users in space and time, and increasing awareness.

THE CITY WILL CREATE A CITYWIDE, PROACTIVE SPEED MANAGEMENT PROGRAM FOLLOWING THE FHWA SAFE SYSTEM SPEED MANAGEMENT FRAMEWORK. THIS WILL BE A CRITICAL OVERLAY TO LOCATION-SPECIFIC INTERVENTIONS IN ALL OF THE FOCUS AREAS. THIS PROGRAM IS THEREFORE RECOMMENDED AS THE FIRST IMPLEMENTATION STEP FOLLOWING THE ADOPTION OF THE PLAN.

SYSTEMIC ANALYSIS

Systemic analysis is a proactive approach that extrapolates crash history to the system by identifying other locations that are contextually similar to those with a history of crashes involving severe and fatal injuries. It looks at crash history on an aggregate basis to identify roadway characteristics of concern, in addition to looking at high crash locations. By merging adjacent road and intersection features with crash data, relationships can be uncovered between contextual factors and the likelihood of frequent and severe crashes.

SAFETY FOCUS AREAS

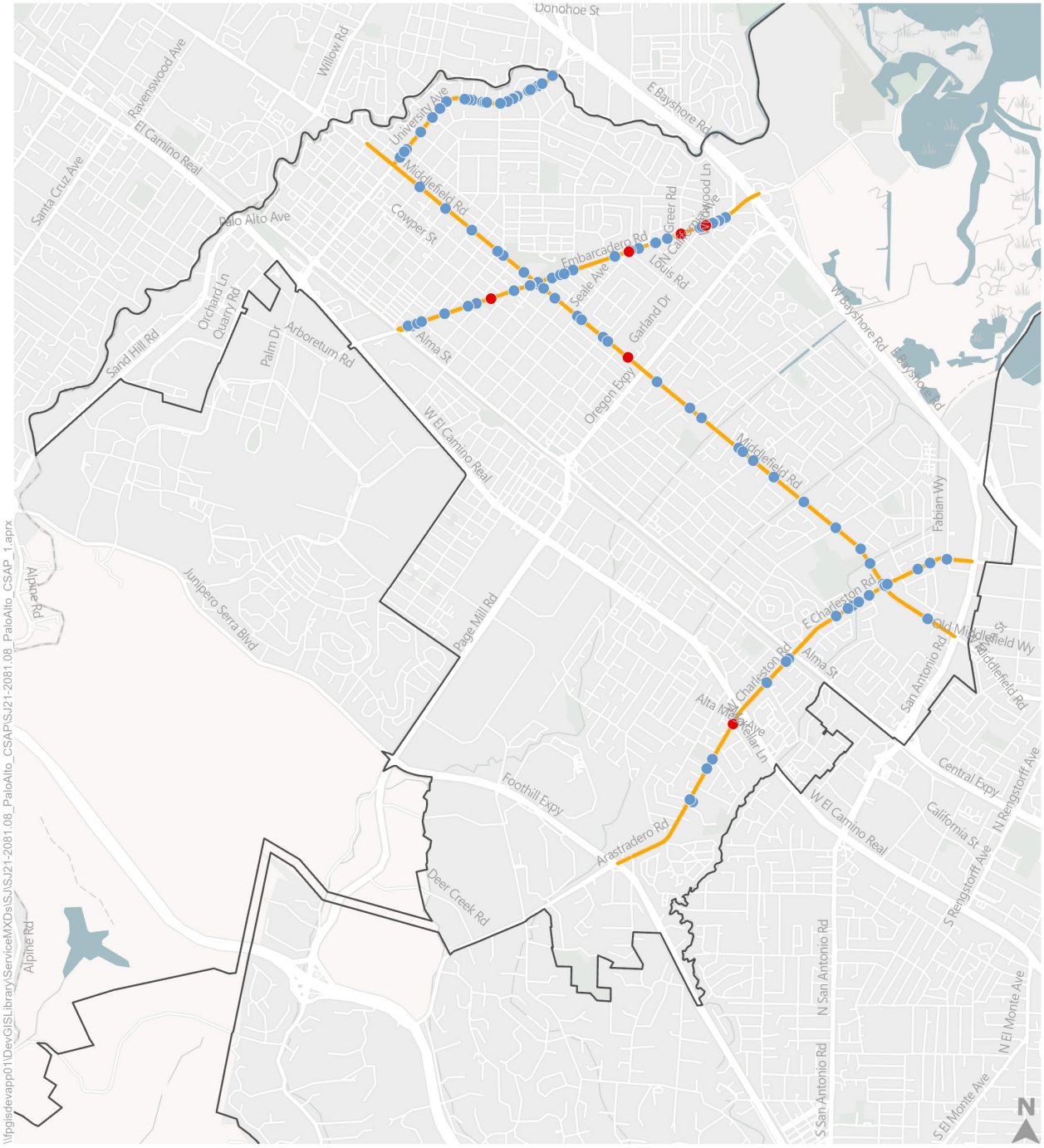
The systemic analysis combined crash history with contextual data on roadway characteristics, as well as input from local stakeholders, to produce seven safety focus areas that highlight the most common and severe crash patterns in Palo Alto. Full details on the contextual factors identified for each Safety Focus Area, crash statistics, and potential roadway design countermeasures can be found in **Appendix D**.

EQUITY CONSIDERATIONS

Data analysis also included identifying Equity Priority Communities.[1] Although no areas within the City have this official designation, many of the City's roadways are used by neighboring underrepresented communities, and these roads are identified as priority locations to ensure accessibility and enhanced safety for all those who travel through Palo Alto.

[1] https://abag.ca.gov/our-work/equity-priority-communities

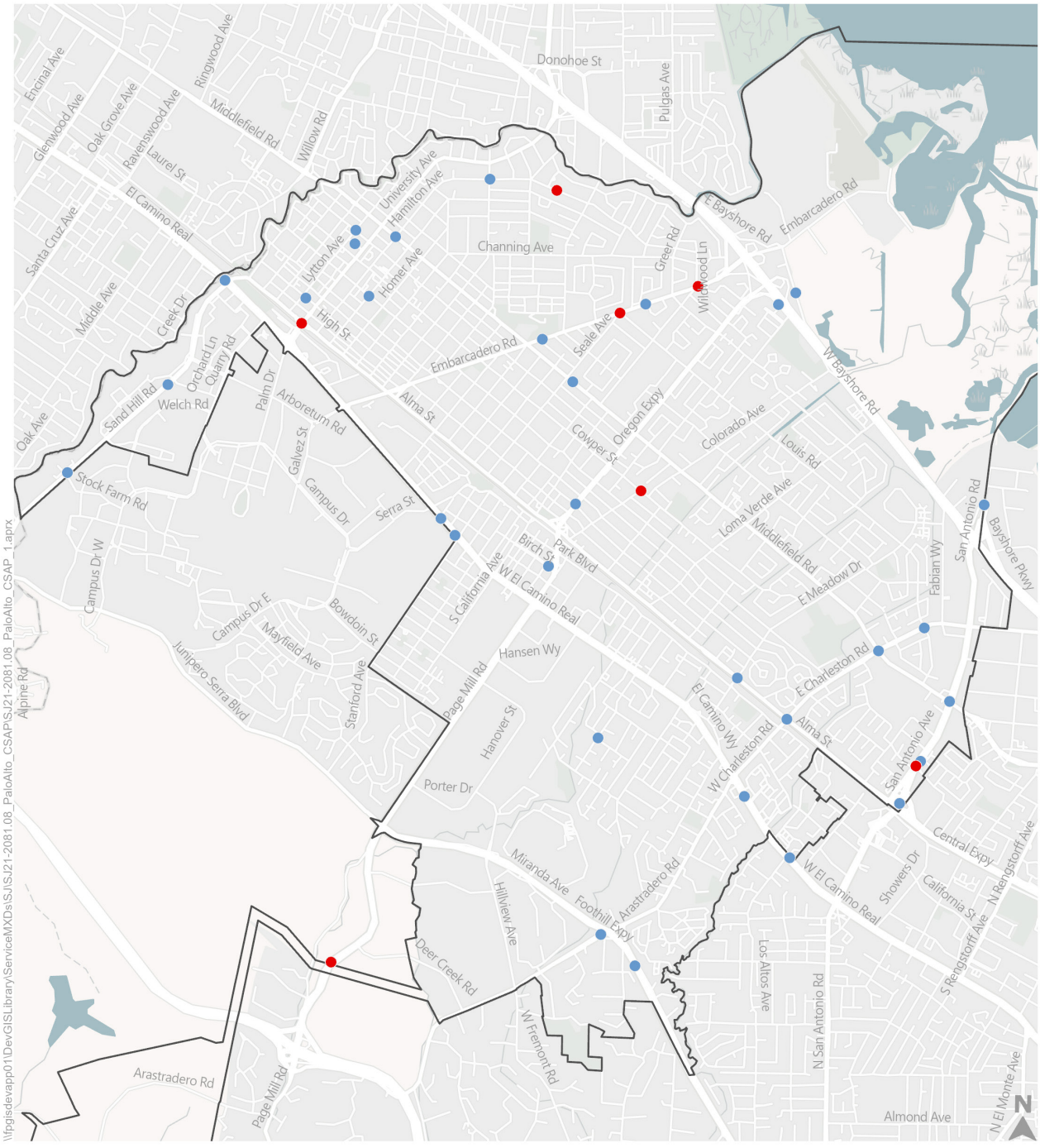
SAFETY FOCUS AREAS



Vehicle-Involved Crashes on Residential Arterials

- KSI Crash
- Non-KSI Crash
- Residential Arterial

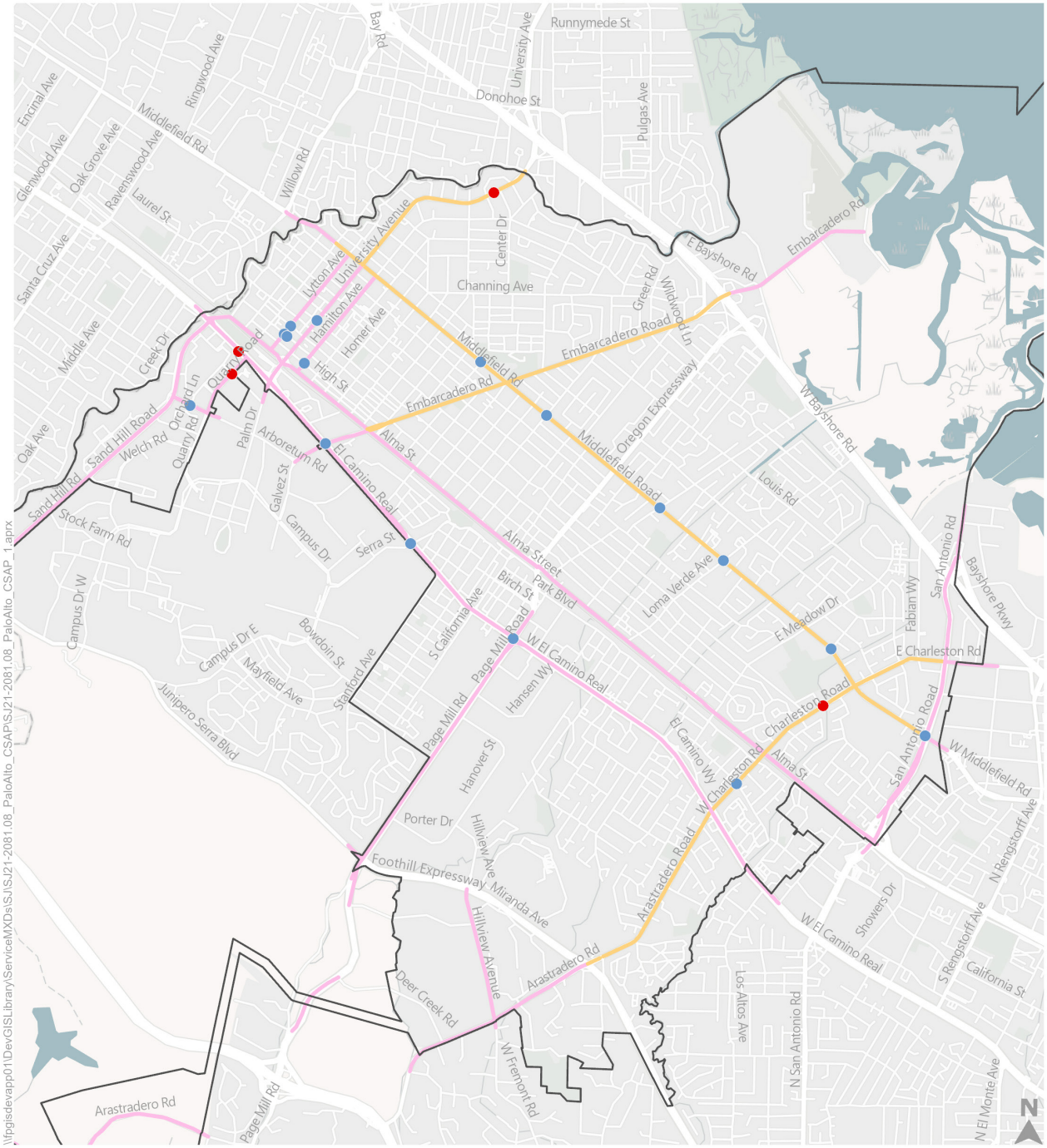
SAFETY FOCUS AREAS



Driving Under the Influence Crashes

- KSI Crash
- Non-KSI Crash

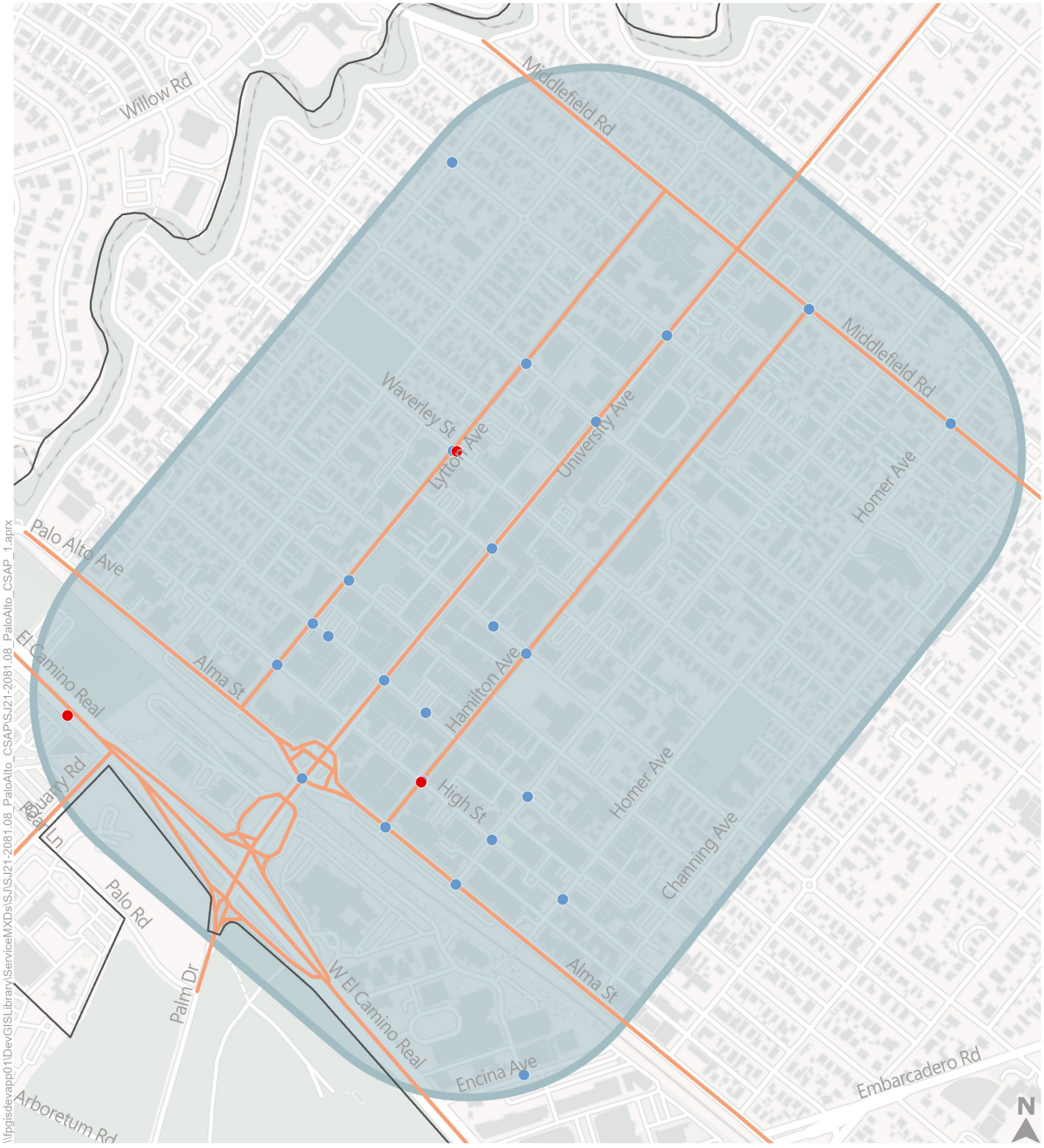
SAFETY FOCUS AREAS



Pedestrians on Arterials at Night

- KSI Crash
- Non-KSI Crash
- Residential Arterial
- Other Arterial

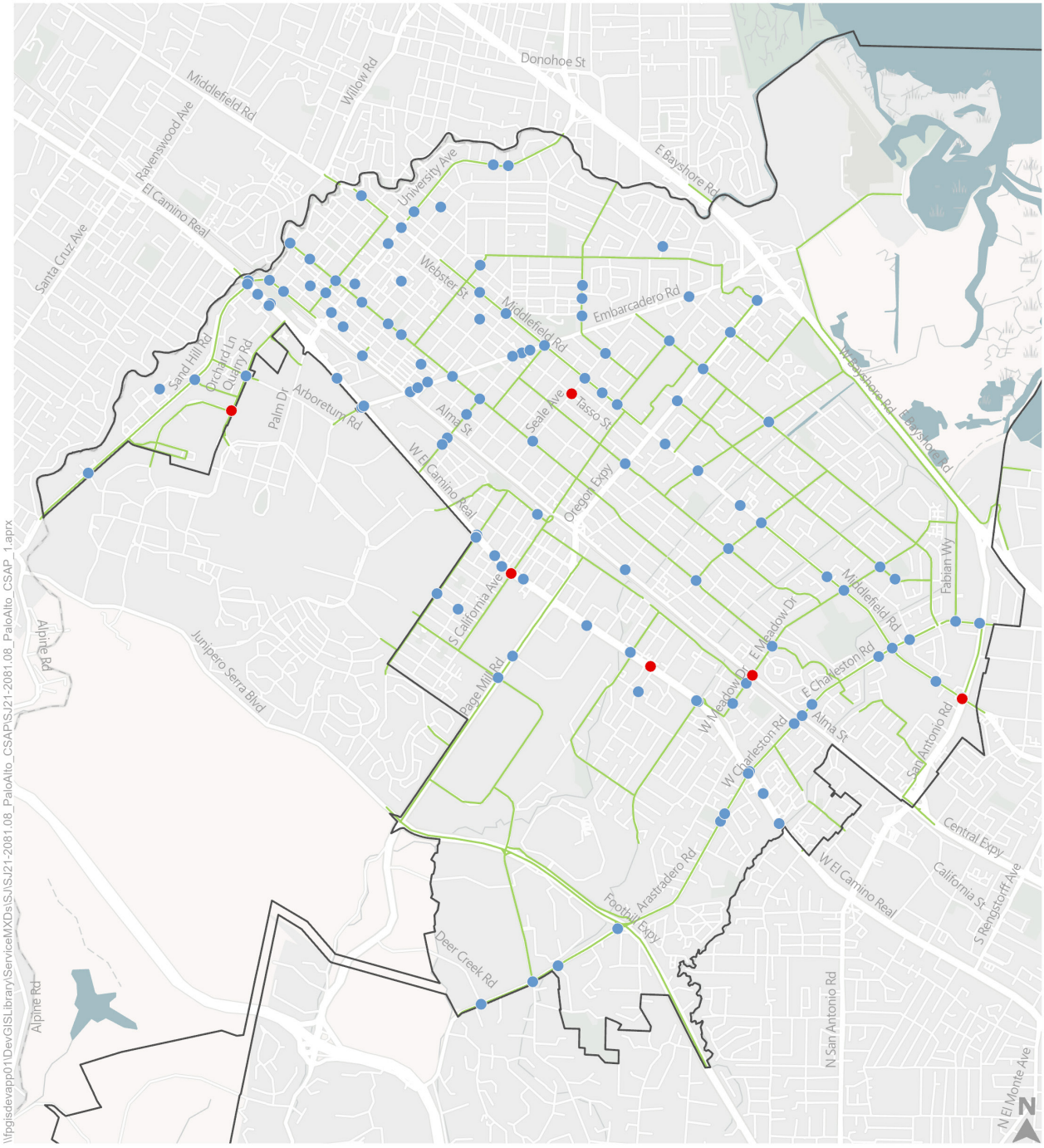
SAFETY FOCUS AREAS



Pedestrians on Major Downtown Streets

- KSI Crash
- Non-KSI Crash
- Major Street
- Downtown Area

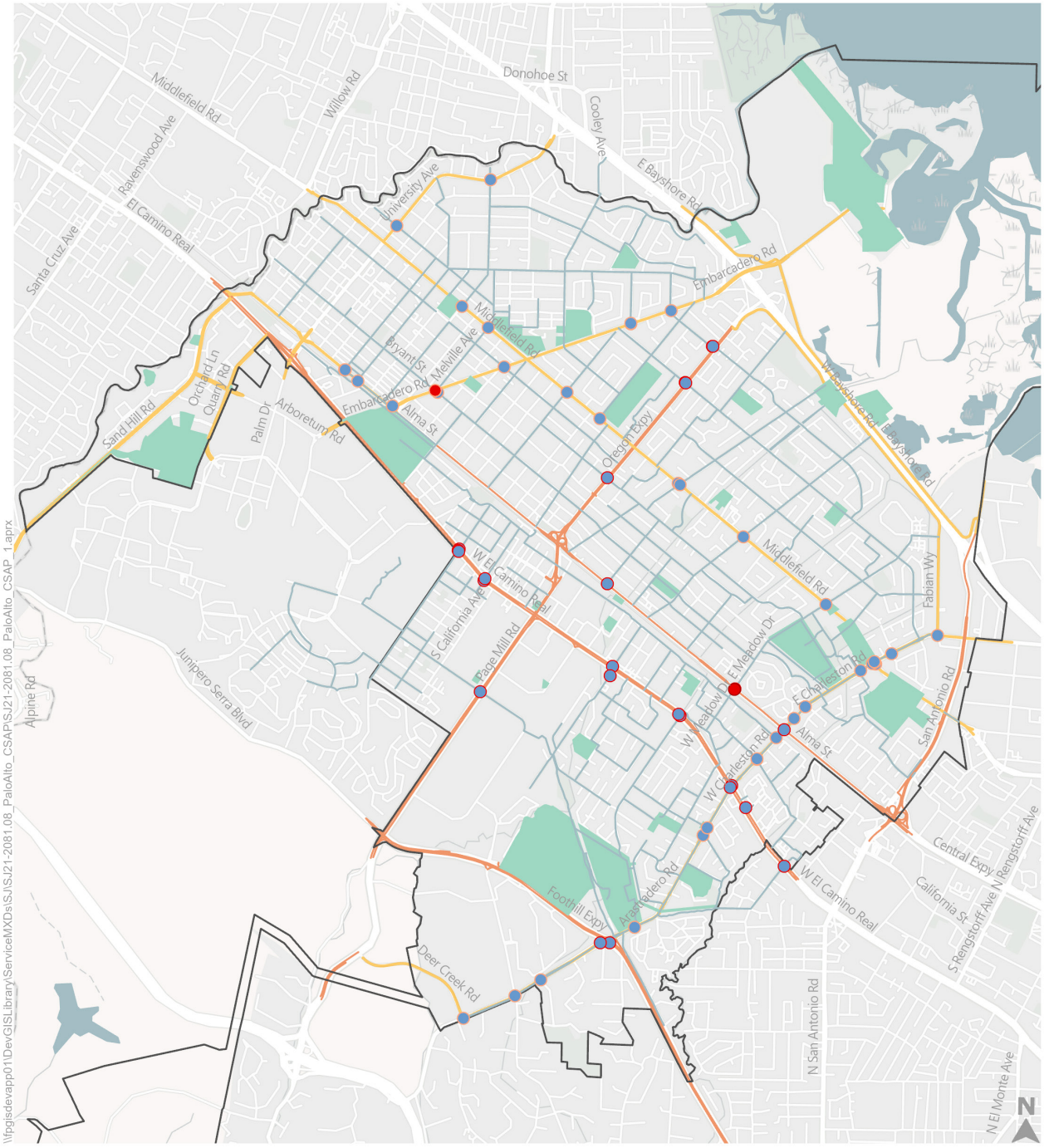
SAFETY FOCUS AREAS



90-Degree Angle Crashes Involving Bicyclists at Intersections

- KSI Crash
- Non-KSI Crash
- Bicycle Facilities

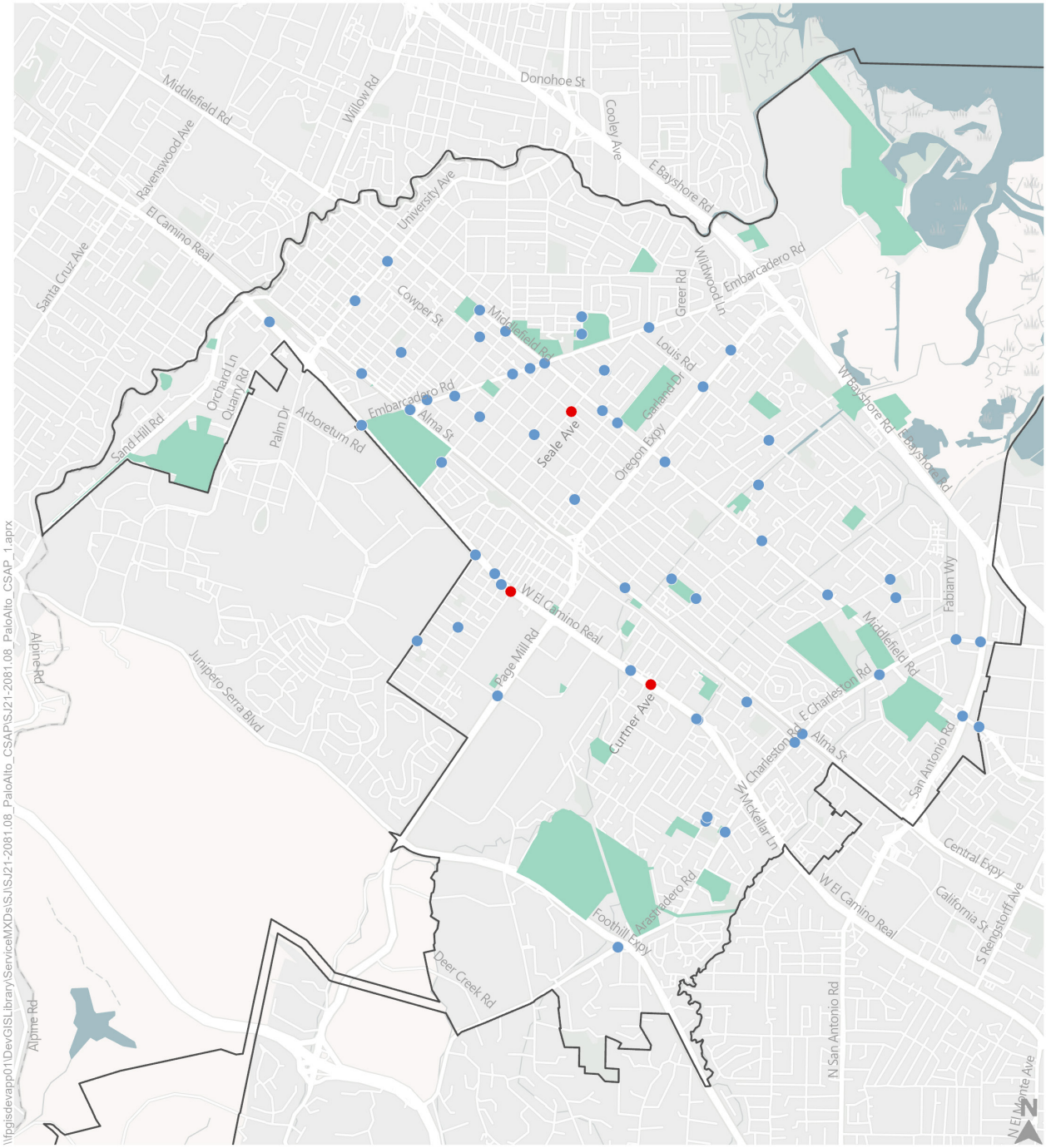
SAFETY FOCUS AREAS



Bicycle Walk and Roll Routes and High Stress Streets

- KSI Crash
- Non-KSI Crash
- Schools
- Bicycle Walk and Roll Routes
- High Stress Streets (LTS 3)
- High Stress Streets (LTS 4)

SAFETY FOCUS AREAS



Youth-Involved Bicycle Crashes

- KSI Crash
- Non-KSI Crash
- Schools

EQUITY CONSIDERATIONS

This Plan is created for everyone who lives in, studies in, works in, and visits Palo Alto. Negative safety outcomes disproportionately affect disadvantaged communities and roadway conditions of concern are frequently located in equity priority areas as a result of historic under-investment or roadway location/sizing decisions. As a result, identifying and prioritizing projects and locations that focus on equity-priority communities and users is a key focus for safety plans.

The Metropolitan Transportation Commission (MTC) measures equity including income, race, English proficiency, age, disability, and car-ownership to develop Equity Priority Communities (EPC), or designated census tracts with a significant concentration of underserved populations. MTC has not identified any EPCs in Palo Alto, so this Plan uses other equity considerations and definitions. **Figure 11** shows the population by census blocks that has a household income below the Federal poverty line. Generally, the number of peoples throughout the City that live below the poverty line is very low. There are some census blocks where between 10%-20% of the population lives below the poverty line. These are located near downtown, the Alma Street/East Meadow Drive/Charleston Road area, near Stanford, and in the southeast corner of the City near Foothill Expressway.

While Palo Alto does not have designated EPC areas, adjacent communities that include parts of Stanford and East Palo Alto are EPC geographies. To best serve those accessing and using City streets, this Plan considers roadways that serve as connections to the City from these EPC geographies. This includes the City's suggested Walk and Roll Routes for students who reside in East Palo Alto and commute to school in Palo Alto, as shown in **Figure 12**.

Transit also often serves as the main mode of transportation for households where members are unable to drive or one member of the family needs to use the car to get to work or school, and others in the household need to use transit. **Figure 13** shows the major transit corridors in Palo Alto, where bus stops and connections to and from key destinations could be prioritized for first/last mile access consideration to center equity concerns.

EQUITY ANALYSIS

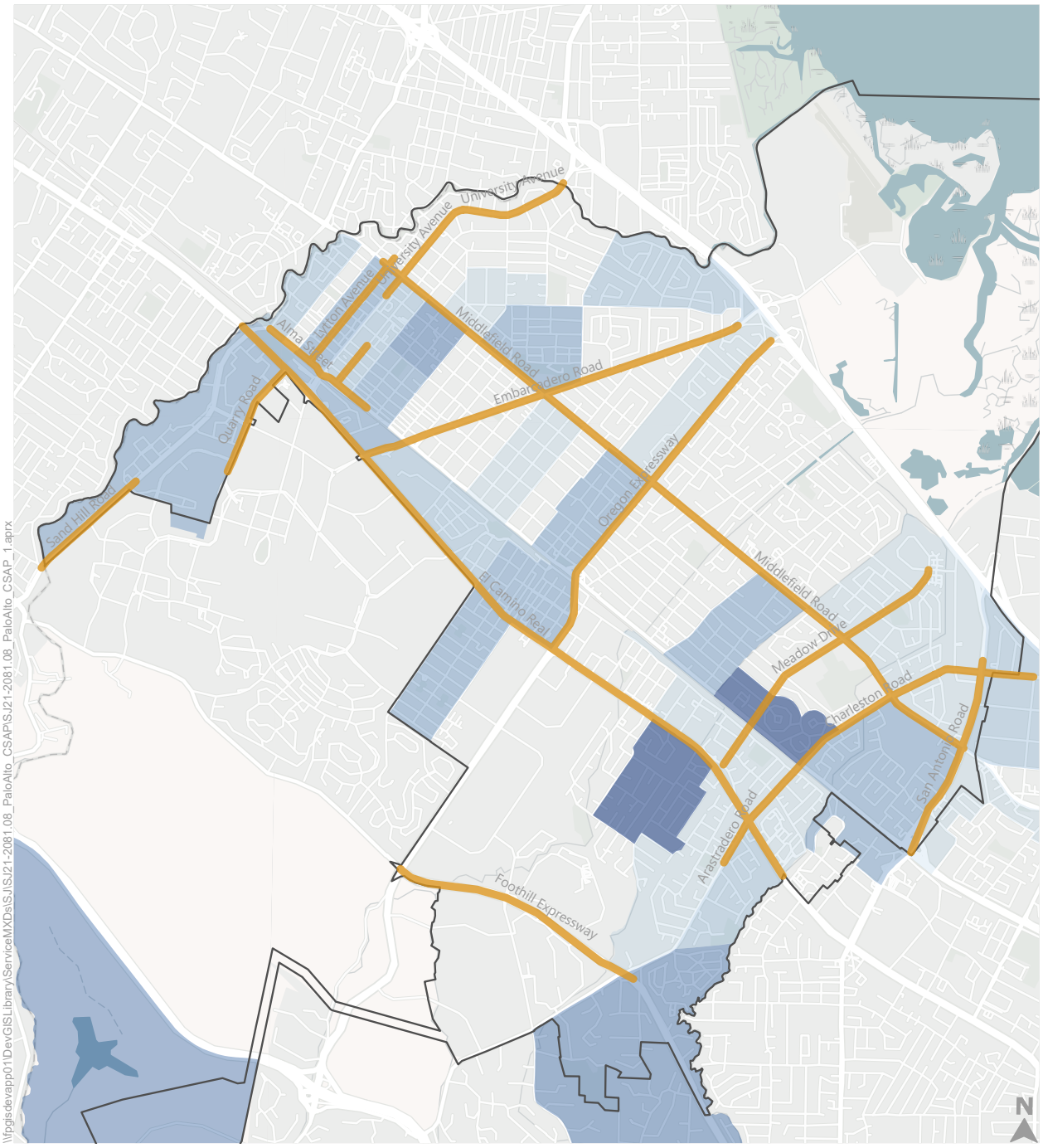


Figure 11: Population Below the Federal Poverty Line in Palo Alto

EQUITY ANALYSIS

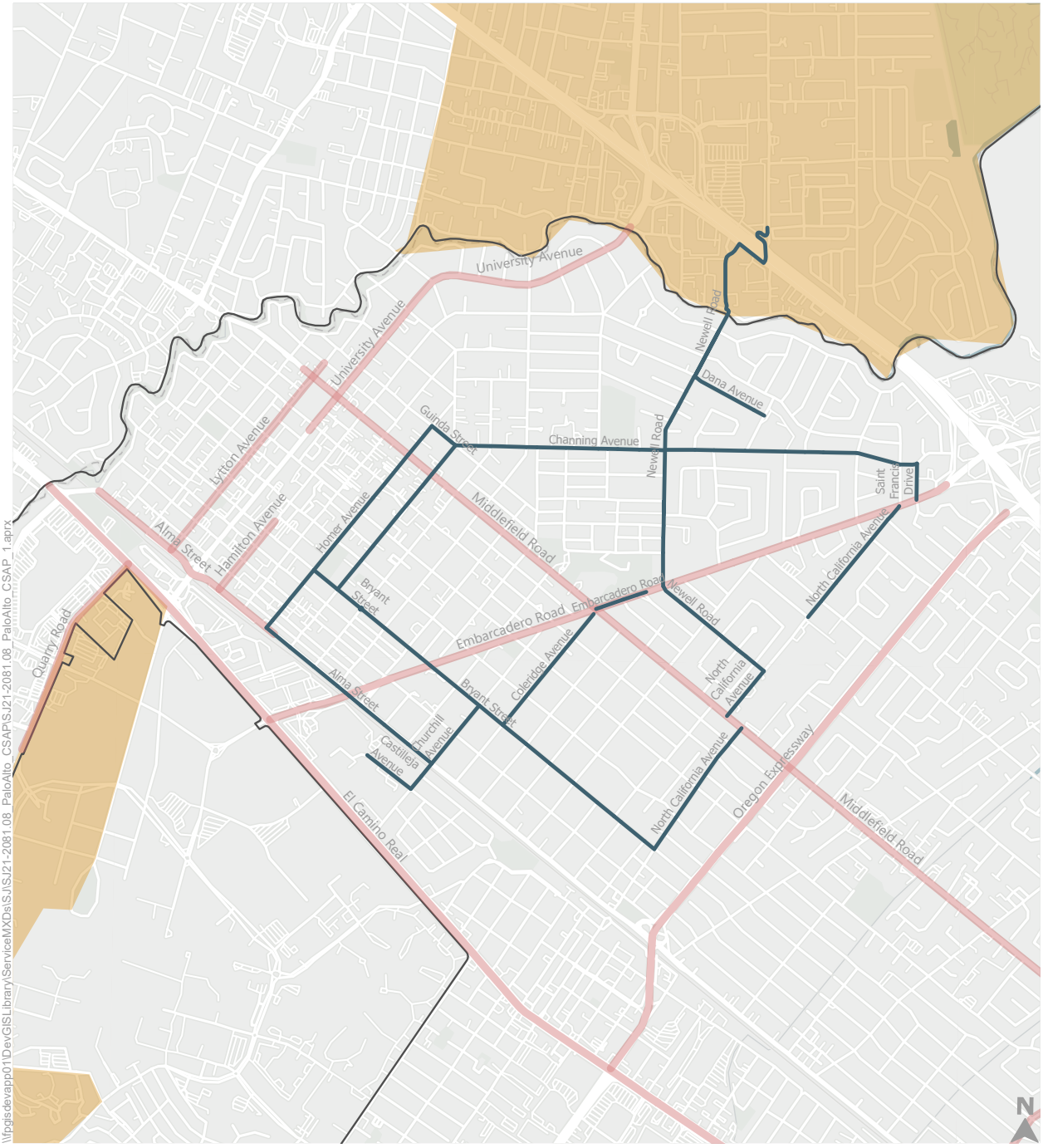


Figure 12:
East Palo Alto Walk and Roll Routes

East Palo Alto Walk and Roll Routes

High-Injury Network

Equity Priority Communities (EPCs)

EQUITY ANALYSIS

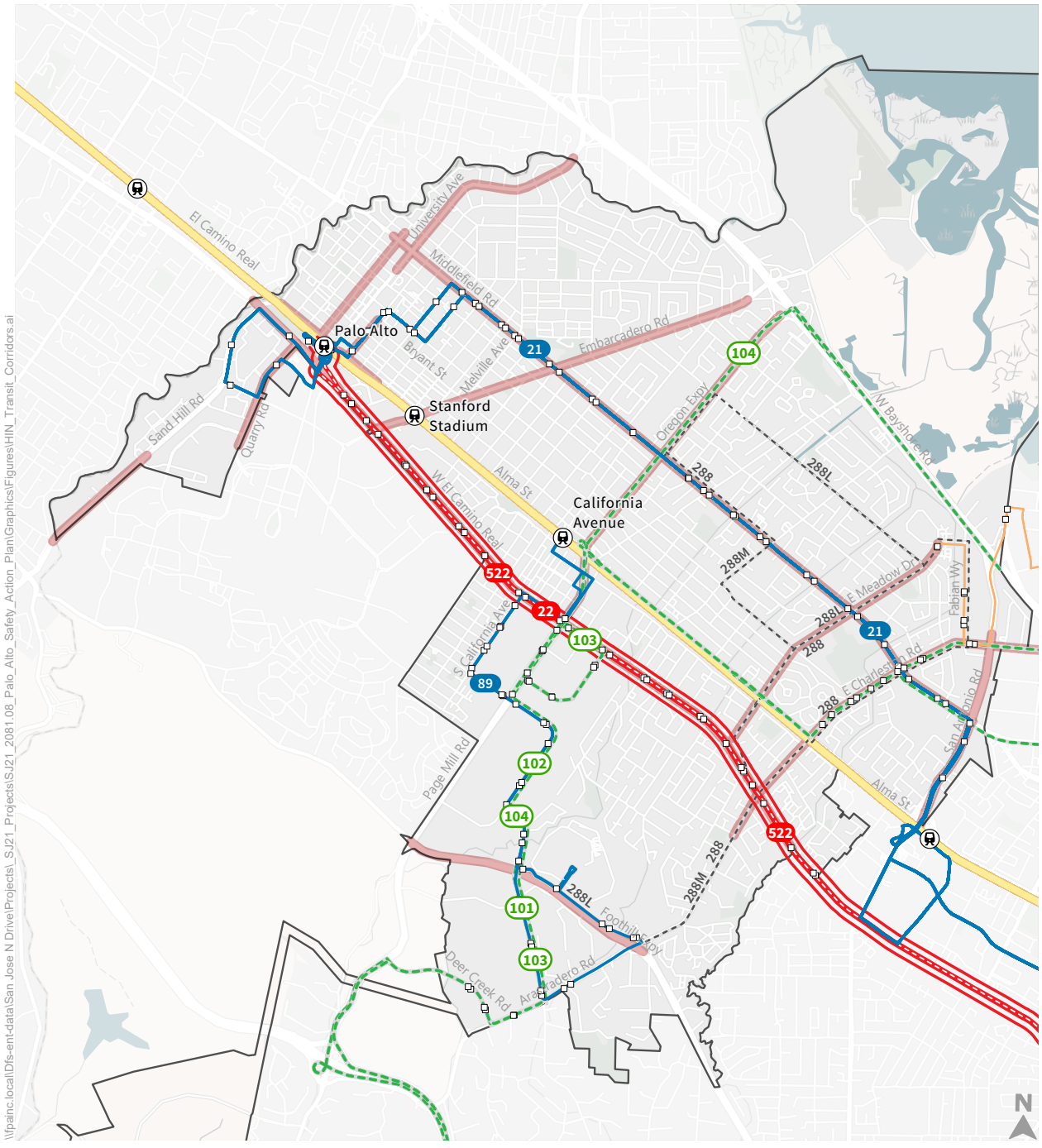


Figure 13: Transit Corridors in Palo Alto

High-Injury Network
Caltrain
Express Bus
School Routes
ACE Orange
Frequent Bus
Local Bus
Rapid Bus

ROADWAY DESIGN COUNTERMEASURES TOOLBOX

For each Safety Focus Area, this toolbox includes a series of countermeasures from FHWA's **Proven Safety Countermeasures** list. Key safety countermeasures are applicable in different roadway contexts across Palo Alto and include an associated Crash Reduction Factor (CRF), where applicable from the California Local Road Safety Manual (LRSM). The tools are organized based on the FHWA Safe System Roadway Design Hierarchy. This toolbox will be used to identify improvements the City can implement systemically for each safety focus area and includes both quick build solutions as well as more detailed improvements. The full toolbox is included in **Appendix E**.

An overarching and fundamental tool to address all of the Safety Focus Areas is a citywide Speed Management Program. While Palo Alto generally establishes low speed limits on many arterials, speed limit changes alone may be insufficient for speed to be contextually appropriate, and speeding remains the number one reported cause of crashes in Palo Alto. A speed management program will identify locations where the City can leverage AB 43 to legally enforce speed limits and to determine roadway design solutions to encourage motorists to drive at the lower speed limits.

The FHWA Safe System Approach for Speed Management provides guidance on how to develop a speed management program. The program will be data-driven and prioritize locations that are likely to have high speed angle crashes as they are more likely to result in KSIs. Roadway treatments to achieve target speeds can include vertical deflections (e.g., speed humps, speed tables, raised intersections), horizontal shifts (e.g., chicanes), roadway narrowing (e.g., roadway space reallocation, lane-width reduction), intersection treatments (e.g., closures, raised intersections, protected intersections, intersection turn calming), and signal timing modifications.

SAFETY AS A PUBLIC HEALTH CONCERN

CHAPTER 5

This Plan draws from emerging "Vision Zero 2.0" best practices to look for institutionalization opportunities and to prioritize efforts that address kinetic energy risk at the population scale. The Safe Systems Pyramid builds on established public health practice to illustrate how interventions that have the largest reach and require the least personal effort will be the most impactful. This Plan references the Pyramid as the guiding framework to advance safety in Palo Alto efficiently and holistically. It is a structure for prioritizing the roadway design and operations tools that will have the most impact for safety while also collaborating outside the safety silo with other agency and community stakeholders to engage in upstream and more wide-ranging root cause topics. This chapter discusses the key insights and opportunities for viewing safety as a public health concern - and opportunity - for Palo Alto.

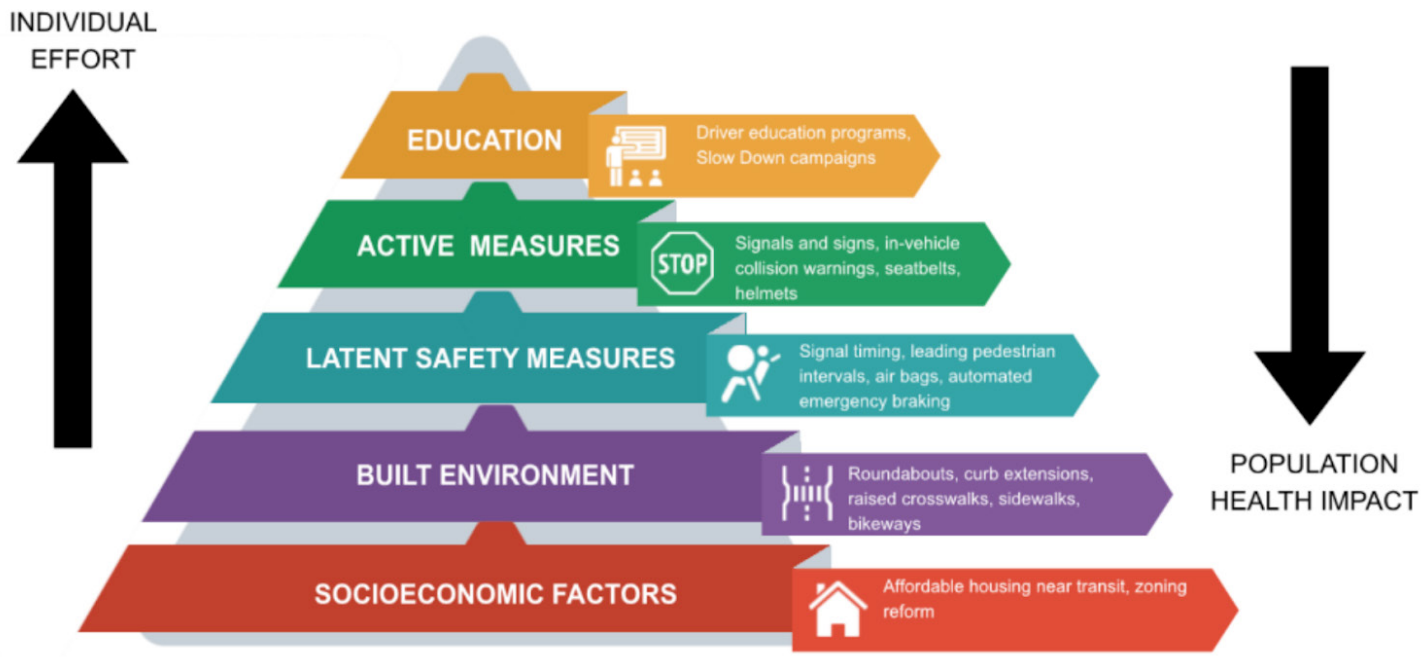


Figure 14: Safe System Pyramid
Source: Ederer, et. al., Vision Zero Network

SOCIOECONOMIC FACTORS

As described in the **Latest Federal and State Policies** Section and **Appendix A**, the base of the pyramid focuses on socio-economic factors, which are those that fundamentally influence why, where, when, and how people travel, and are related to the level of risk exposure experienced in the transportation system.

In this way, many of the City's existing and planned efforts to enhance transit and provide mixed-use, transit oriented, and affordable housing options can be seen as critical Vision Zero strategies. Identifying opportunities to update land use zoning to promote density and infill development must be paired with the commitment to provide continuous sidewalks, protected bicycle facilities, and traffic calming improvements to slow speeds on high-traffic, high-speed roadways. This is also in alignment with the City's Comprehensive Economic Development Strategy to improve accessibility by embracing walking and biking solutions to, from, and within all of the City's commerical districts and addressing parking policies and systems. By recognizing and rectifying these gaps in the roadway network, the City creates opportunities for residents to have closer access to employment, education, and medical-related institutions.

In areas where housing is planned, the City will prioritize implementation of continuous and comfortable pedestrian and bicycle facilities. This may require the re-allocation of space within the existing roadway or removal of parking.

BUILT ENVIRONMENT

The next tier of the Pyramid focuses on the built environment. The City's roadway network has generally been designed for vehicle throughput. Strategies in this tier systemically and proactively create a self-enforcing system where safety is the default choice for design decisions in the City and for those traveling in and through Palo Alto. As described in Safety Focus Areas & Roadway Design Toolbox Section, such interventions can also improve the experience for walking and biking and reduce the number of trips made by car.

The built environment also includes upgrades to the City's Green Stormwater Infrastructure (GSI) and improves the overall comfort of pedestrian and bicycle facilities. GSI can be implemented as part of curb extensions and green pedestrian buffers. This infrastructure can minimize the potential of run-off pooling in bike lanes and sidewalks, reduces the urban heat island effect, and provides education on meeting the City's climate action goals through safety and green measures.

ENHANCING THE BUILT ENVIRONMENT FOR SAFETY IN PALO ALTO

While the toolbox to create this environment has many proven countermeasures and a clear hierarchy, the routine use of the tools can be limited by City policies, procedures, programs, and funding decisions. The City will address the built environment through updating City policies to prioritize safety enhancements, shifting to proactive and opportunistic funding sources, seeking overlapping opportunities to include safety enhancements as part of other projects, and streamlining implementation of safety projects. The City will prioritize the Safe System Approach in all City plans, programs, and policies moving forward. Existing policies will be updated to follow the Safe System Approach. Additionally, all street, land use, and development projects will be reviewed for alignment with Safe System principles. City staff will also collaborate with neighboring cities, the County, and Caltrans to address roadways owned by other agencies that are on the HIN or not aligned with the Safe System Approach.

LATENT SAFETY MEASURES

Latent safety measures encompass countermeasures such as signal timing modifications (for example, leading pedestrian intervals, or LPIs), as well as vehicle features such as lane departure prevention and automated emergency braking.

The City of Palo Alto will explore updating signal timings for LPIs, rest in red, and arterial traffic calming strategies. The City also intends to join with peers in supporting legislation to allow the use of speed safety cameras to allow for more equitable enforcement.
The City of Palo Alto will explore implementing safe vehicles on City streets by managing the City's fleet choices. At a minimum, all new City vehicles will include up to date safety features as required by law. Beyond City fleets, the City will deploy curbside management and Safe Routes to School strategies that reduce conflicts with high mass vehicles (trucks and other heavy vehicles) and vulnerable road users. The City will also explore employing TDM strategies to support alternative modes and minimize the presence of large City vehicles when not necessary.

In regard to post-crash care, the City of Palo Alto will partner with emergency response and local public health departments, as well as Stanford Health Care, to gather comprehensive data annually. Stakeholders will also proactively discuss emergency response, evacuation, and other priorities to seek win-win solutions with day-to-day safety concerns.

ACTIVE MEASURES

Active safety measures encompass countermeasures such as warning signals and signs, as well as in-vehicle devices such as seat belts and potential conflict warnings. These safety measures are effective when used, but rely on individual opt-in (for example, for a driver to react to signage or to a warning) to function.

For the City of Palo Alto, active measures will include additional transportation demand management strategies to reduce drunk driving, by providing alternative options. The City will work with local businesses to offer overnight parking around restaurants, bars, and entertainment venues and/or create programs for additional transit, microtransit, or shuttle service during holidays, festivals, and other large events that include promotional and proactive campaigns, schedules, and rates for fare purchases.

EDUCATION

At the top (lowest priority/ least impactful) of the Safe System Pyramid is education, which generally includes driver education programs and campaigns. The City achieves this through their Safe Routes to School program and bike education events. The City will continue to partner with Stanford Injury Prevention/Ecology Action and other organizations to promote safer bicycling, walking, and driving practices. In addition to these programs and events, Palo Alto will explore developing roadway safety educational campaigns asking drivers to slow down and/ or obey the speed limit. The City will collaborate with traffic safety advocates and collect and publish resources that support crash victims.

Education will also include education for City staff and elected officials. This will include capacity building for staff to become proficient in the Safe System Approach and training for newly elected officials. The City of Palo Alto will share best practices for local media on how to communicate traffic crashes and roadway safety to the public.

REACHING ZERO DEATHS AND SERIOUS INJURIES: A SAFETY ACTION PLAN

CHAPTER 6

A key pillar of the Safe System Approach requires partnerships and collaboration across various jurisdictions, with local organizations, and with the community to be successful. This Plan identifies several strategies, along with the party/parties responsible for leading and supporting the action. A timeline for implementation is provided, as well as performance metrics. These actions will be periodically revisited and evaluated on whether they achieve the vision of this Plan and contribute to the Vision Zero goal of 2035/2040. Actions that are successful may be expanded, while actions that are not successful will be revisited or eliminated and replaced with other strategies. As conditions and strategies evolve, the strategies and supporting elements are expected to evolve as well.

CONSISTENCY WITH SAFE SYSTEM

This Plan builds on the City's existing safety practices to ensure consistency with the Safe System Approach. The Plan establishes a framework for the City to guide transportation related implementation moving forward to be aligned with the Safe System Approach. This includes rethinking how the City prioritizes projects and allocates funding to address safety concerns systematically and proactively. The Plan also includes guidance for developing projects by reviewing them through a safety-first lens. All City transportation projects should be reviewed to ensure they reduce kinetic energy risk, especially for vulnerable users.

GOLDILOCKS STRATEGY

Implement the "Goldilocks Strategy" by selecting demonstration or early adopter projects that can act as catalysts for mode shift and generate broad support for safety initiatives. These projects should be carefully chosen to have limited backlash, meaning they may not necessarily target the areas with the most fatalities. Measuring accessibility "impact" and level of traffic stress reductions will be critical for finding the opportunity projects. (Source: Research Team Workshops, NCHRP 08-171)

UPDATED PROGRAM & POLICY LIST

As a result of the benchmarking exercises described in the **Benchmarking the Current Landscape** section, the Internal Stakeholder Working Group section of this Plan and the Public Health-based Pyramid recommendations, an updated programs and policies list was created. This list includes recommendations to existing City policies to streamline safety projects that are supported by engagement through this Plan or the BPTP Update, including proven safety countermeasures. Where there was a need for additional guidance, new policies and programs were added. These included policy recommendations for maintaining complete streets design guidelines that reflect updated guidance and best practices, upgrading City processes to align with the FHWA Roadway Design Hierarchy, and looking for opportunities to develop guidance around e-bikes and e-scooters.

The list shown in **Appendix G** was reviewed through a Safe System lens.

Some key policies include:

- An upgraded traffic calming program that aligns with the Safe System Approach
- Media resources to inform best practices in reporting out on crashes from a Safe System Approach
- Develop a rapid response program (or team) that will evaluate roadway design and context of crash locations after KSI crashes
- Safe routes to work, shopping, downtown, community services, and parks that follow the principles of the Safe Routes to School program
- CIP auditing to prioritize projects on the HIN and those that address speed and exposure related risks

UPDATED PROJECT LIST

The project list was prepared based on review of the City's existing plans including the Comprehensive Plan, the City's Capital Budget, VTA's Valley Transportation Plan 2040, the Capital Improvement Plan, and the City's 5-Year Repaving Plan. Requests and comments from the community received through the Office of Transportation's email or other City staff were also documented and added next to the relevant project or policy. The project list also identifies if the location is located on a HIN corridor. The goal of the review was to filter for projects that could help achieve the goals of this Plan and identify opportunities for the City to institutionalize Safe System as the projects become further developed.

The projects were reviewed and updated to align with the Safe System Approach and include additional notes and guidance to refer to as projects are designed and implemented. To assist with prioritization, the project list shown in **Appendix H** includes associated **FHWA Roadway Design Hierarchy** tiers based on the projects' expected outcomes.

Key projects along the HIN include:

- Improving pedestrian, bicycle, and transit facilities through the intersection at Quarry Road and El Camino Real
- Implementing a Complete Streets project on El Camino Real that integrates bicycle and transit use on the corridor and upgrades crossing treatments at intersections.
- Institutionalizing additional safety improvements as part of the repaving program
- Implementing sidewalk and traffic calming improvements on Middlefield Road
- Upgrading bicycle facilities on East Meadow Drive

PROJECT PRIORITIES

The FHWA Safe System Roadway Design Hierarchy provides guidance on how to prioritize projects when reviewing development applications and making land use and transportation planning decisions. Projects identified in the project list, as well as any future projects, shall prioritize projects in higher tiers with the goal of first removing severe conflicts.

Project priorities in the City should include those with the greatest potential of reducing kinetic energy risk (exposure, likelihood, and severity), consistent with the FHWA Safe System Project Alignment tool.

Other prioritization considerations include projects on the HIN, projects on the Walk and Roll routes, and projects that improve travel for Equity Priority Communities and underserved populations.

Within each tier, projects in the City are prioritized by location. Projects along the HIN, and those along or intersecting with suggested Walk and Roll routes, should be a higher priority. As described in the Equity Considerations section, project prioritization includes projects in areas with a higher population living under the poverty line, along East Palo Alto Walk and Roll routes, and along transit corridors. While prioritizing projects is important, the Safe System Approach emphasizes redundancy as a key tenant. Therefore, projects that allow for redundancy should not be deprioritized or ignored even if they appear to be repetitive.

SHARED RESPONSIBILITIES

The City must work across departments and with partner agencies to carry out the projects and policies listed in **Appendix G** and **Appendix H** and assume a shared responsibility for the implementation of the Plan. The City will use the standing committees including PABAC, CSTSC, and PTC to discuss progress on policy, programs, and infrastructure implementation. These committees will receive updates from the City to ensure Palo Alto is on track to meet the Vision Zero goal. These committees will also work to continue coordinating the implementation of this Plan with the ongoing BPTP Update. This will require additional education for committee members at the beginning of each new election/appointment cycle so that committee members are well versed in the Safe System Approach.

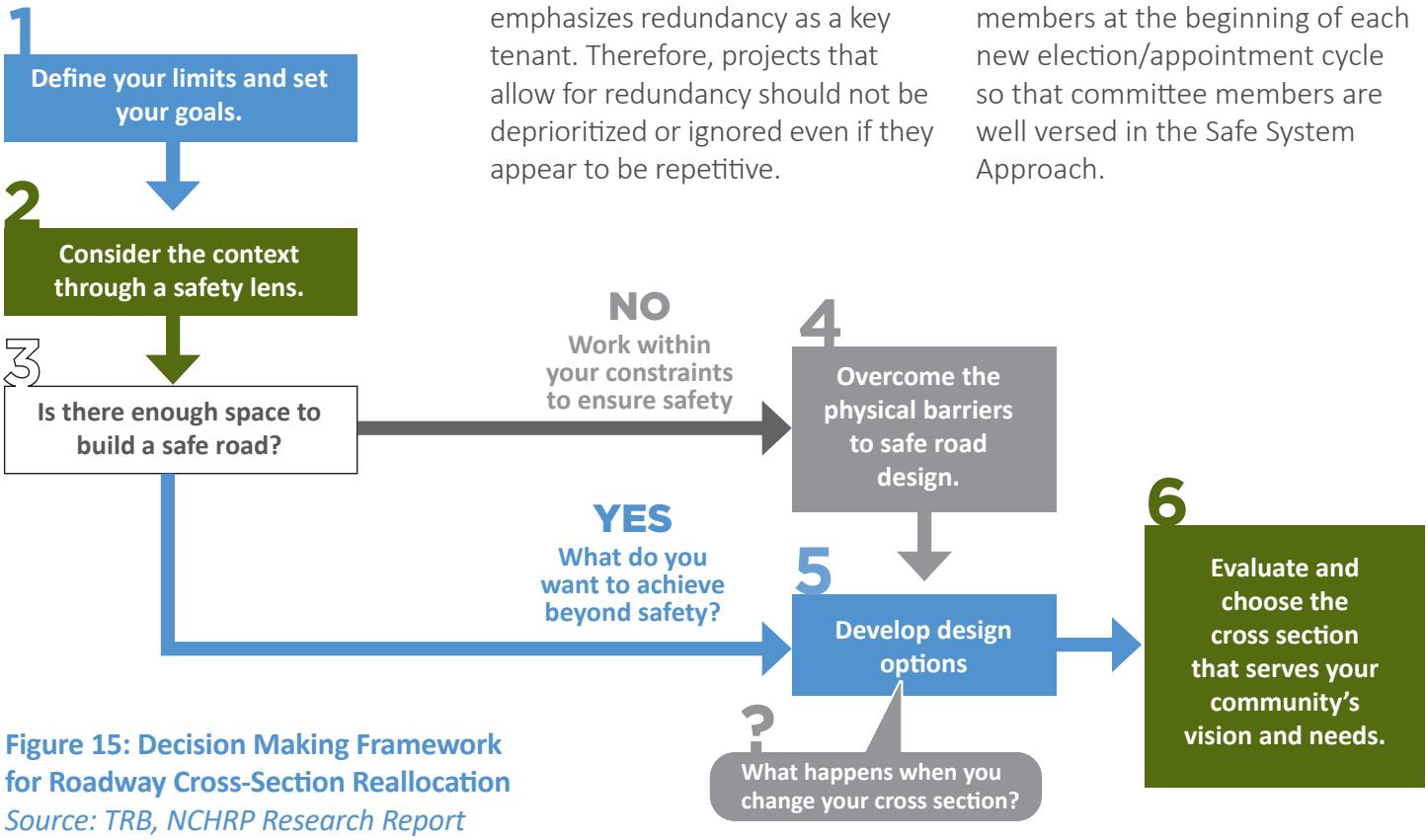


Figure 15: Decision Making Framework for Roadway Cross-Section Reallocation
Source: TRB, NCHRP Research Report 1036: Roadway Cross-Section Reallocation

FUTURE ENGAGEMENT

While gathering public input and collaborating with the community is a critical part of implementing projects, it is important to consider the role of engagement for safety projects. With the City's commitment to Vision Zero, safety default design elements will not be included as part of trade-off discussions through the engagement process. The anticipated process of making design decisions is shown in **Figure 15**.

Future engagement will build off the outreach done as part of the Plan, described in the Engaging the Community chapter to guide implementation and decision making. The outreach conducted as part of this Plan identified safety attitudes and safety concerns. The programs, policies, and projects included in this Plan address issues identified through outreach and align with the attitudes and non-safety trade off decisions the community expressed.

Inform

For projects that require less contextual specific collaboration, outreach will be used to inform the public of the upcoming work and learn about any additional ways to make the project more successful beyond safety improvements. This will apply to "quick build" projects included in the countermeasures toolbox, such as striping changes. This will also include projects that are legally required, such as daylighting (AB 413), or that have legal basis, such as speed limit changes (AB 43). Projects that align with other Plans, such as the BPTP Update, also fall into this category.

Collaborate

For larger capital projects that require more detailed implementation such as protected bike lanes, or plans that require additional neighborhood specific feedback, outreach may need to be more formalized and require collaboration with the community. While additional outreach is important, projects will continue to align with the Safe System Approach. Design decisions will be made with community feedback in mind, but the FHWA Safe System Roadway Design Hierarchy and NCHRP 1036: Roadway Reallocation Guide will be used as a basis for design guidance, as shown in **Appendix A**.

CONSTRUCTION TRAFFIC MANAGEMENT

The transportation network may be affected during construction. The City will develop a Construction Traffic Management Plan to manage traffic and circulation while projects are under development. Traffic Control Plans traffic control devices and signage shall conform to the lastest revision of the California Manual on Uniform Traffic Control Devices (CA-MUTCD) and Caltrans Standard Specifications and Plans.

Reviewers will ensure that, to the extent possible, pedestrian and bicycle facilities are maintained during construction. Where this is not feasible, safe and alternative facilities will be temporarily implemented. These facilities will prioritize separation and follow the most direct path for pedestrians and bicyclists, and sight distance will be evaluated to improve visibility. Clear signage is important to communicate new traffic patterns to pedestrians, bicyclists, and drivers.

IMPLEMENTATION PHASING & SEQUENCING

Implementing countermeasures, policies, and projects identified in the Plan typically requires an ongoing, longer-term commitment from the City. To facilitate the evaluation and prioritization of funding, it is desirable to consider the implementation of safety projects through different time horizons.

Beyond time horizons, the City will seek overlapping opportunities where safety improvements will be implemented as part of an upcoming effort such as the repaving program or CIP. Implementation will happen proactively as part of the City's impact review process to ensure that new developments align with the Safe System Approach and meet the City's safety requirements. All transportation construction projects will be reviewed to ensure they align with the Safe System Approach and follow recommendations in this Plan.

As this Safety Action Plan builds on additional roadway safety projects in Palo Alto, the current backlog of high priority work requests and projects will continue to increase. Some of these requests are currently requiring a few months for the Traffic Control Maintenance team to complete. It is recommended that that the Traffic Control Maintainer II position in Public Works (eliminated during the pandemic) be restored, so City staff can respond more quickly to add, maintain, or repair roadway safety infrastructure such as delineators, bollards, signage, guardrails, crash attenuators, faded striping and curb paints, and other features.

NEAR-TERM IMPLEMENTATION

Near-Term priorities are those that can address one or more key risk factors around exposure (where, when, and why people are at risk, with a focus on equity and schools), likelihood (high conflict zones), and severity (locations with high speed and heavy vehicles). Many times, these projects will fall on the high-injury network. The City will address speed through self-enforcing roadways (e.g. lane narrowing and horizontal/vertical deflection) and traffic calming measures. The City will also focus on projects that reduce exposure related risks by separating users traveling at different speeds or different directions with physical separation, to minimize conflicts and reduce the risk of crashes. These projects have a 5 year or less timeline.

LONGER-TERM IMPLEMENTATION

Longer-term implementation projects will focus on continued bicycle, pedestrian, and motor vehicle safety education and the implementation of vehicle safety enhancements. This can include addressing speed through speed safety cameras. Although speed safety cameras are not yet legal in California, six cities in are testing the cameras, three being Bay Area cities (San Francisco, San Jose, and Oakland). These projects and programs would fall within the 10 year horizon.

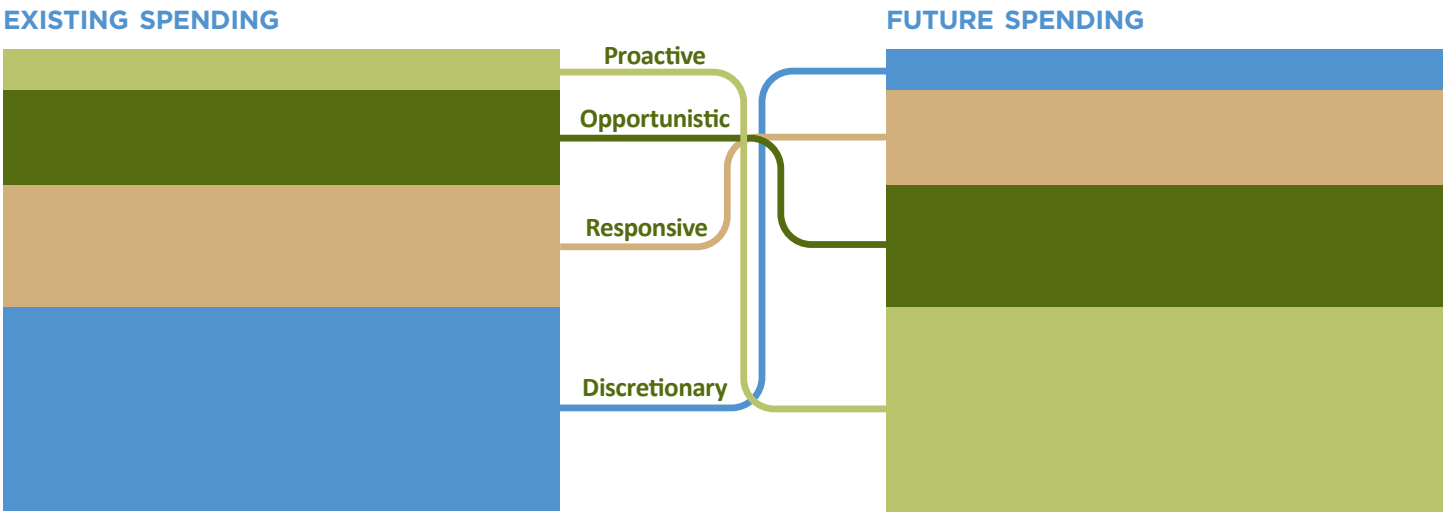
ONGOING EFFORTS

Ongoing efforts, those that the City should be continually trying to implement or update, focus on institutionalizing the Safe System into existing projects, policies, and programs and reprioritizing funding for strategic planning and opportunistic projects. Strategic planning focuses on projects that prevent fatal and severe injury crashes through reducing speeds on roadways and vulnerable user exposure-related risks. Opportunistic projects are projects that can be folded into existing funding mechanisms and work plans such as CIP funding and developer fees.

FUNDING

Four primary funding sources are available to implement safety in all projects: proactive, responsive, opportunistic, and discretionary funding sources. Proactive funding sources focus on preventing fatal and severe crashes through systemic safety efforts. Responsive funding addresses locations with a crash history, such as the HIN. Opportunistic funding uses existing funding mechanisms and work plans that have the opportunity to incorporate safety elements. Discretionary funding are flexible responsive sources that allow the City to be agile in meeting community needs that may arise during a given year.

Figure 16 is an example of how the City will consider using funding sources in the future through an audit of the annual CIP budget. Shifting toward more proactive and opportunistic funding sources enables the City to efficiently address safety upgrades before a fatal or severe crash occurs. **Appendix F** includes a full list of funding sources.



Proactive funding sources include Safe Streets for All grants, Safe Routes to School grants, Highway Safety Improvement plan (systemic focused), and capital spending plan (CSP).

Opportunistic funding sources include repaving, agency collaboration and cost sharing, developer contributions, and other capital projects (e.g., maintenance).

Responsive funding sources include highway safety improvement plan grants (hot spot focus), and Vision Zero High-Injury Network project funds.

Discretionary funding sources include annual capital plan surplus budget (as applicable) and other annual/ ongoing funding sources.

Figure 16: Safety Funding Sources

PERFORMANCE MEASURES

This Plan is a policy document and requires regular updates and monitoring to evaluate its efficacy and to ensure the City is on track to achieve zero KSIs by 2035/2040. The City will monitor the following performance measures on an annual basis and make additional adjustments to the Plan as needed to meet the zero goal. The goal of monitoring is to understand if the measures are effective at reducing crashes as the City works toward zero fatalities and serious injuries. Additionally, ongoing monitoring will help to identify locations with high propensity for KSIs based on exposure, likelihood, and severity. Historic crash patterns can inform these considerations, but design decisions will be proactive and based on kinetic energy reduction. Every five (5) years, the City will update their Safety Action Plan to reevaluate the crash data and performance measures. Performance measures will be added or removed to meet the goal of reducing fatal and severe injury crashes to zero.

TABLE 2: PERFORMANCE MEASURES

Measure
Plan Implementation
Number of barriers reduced by enhancing travel along and across arterials for pedestrians and bicyclists
The alignment of countermeasure selection with the Safe System Roadway Design Hierarchy
The number of miles of protected bike lanes or separated pathways facilities built
The number of signals updated with Safe System timing and phasing changes
The percentage of streets where the operating speed matches the target speed
The number of projects implemented with the systemic deployment of countermeasures
The number of projects implemented using the FHWA Safe System Alignment tool
Policy and Programmatic Changes
The provision of continuous sidewalks, protected bicycle facilities, and traffic calming improvements alongside land use zoning changes
Set contextually appropriate target speeds and prioritize and implement speed management strategies to meet those targets
Standardize the selection and implementation of pedestrian and bicycle improvements based on contextual factors such as speed and volume
The prioritization of projects for transportation connections to Equity Priority Communities and underserved populations along Walk and Roll Routes and key transit corridors
The collaboration with transit, land use, and social service partners for strategies at the base of the Safe Systems Pyramid
The review and reprioritization of the City's annual CIP budget to shift funding toward proactive and opportunistic opportunities to efficiently address safety priorities
The collaboration with agency partners to make meaningful progress on cross-jurisdictional efforts
The sharing of resources for media to inform best practices in reporting on crashes.
The creation of a rapid response program to evaluate roadway design and context of crash locations after KSI crashes
City-Wide Crash Statistics
The number of KSI crashes on the High-Injury Network
The number of crashes where the crash type was identified as unsafe speed
The number of DUI-related crashes
The number of crashes on key transit corridors
The number of crashes on Walk and Roll Routes

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APPENDIX A:

FEDERAL & STATE SAFETY GUIDANCE

SS4A

The Safe Streets and Roads for All (SS4A) grant program was established by the Bipartisan Infrastructure Law in 2022, centered around the Department of Transportation's National Roadway Safety Strategy and its goal of zero deaths and serious injuries on America's roadways. It will provide $5 billion in grant funding over its five-year duration to develop and implement safety plans and projects.

The SS4A grant program provides funding for local agencies to create Comprehensive Safety Action Plans (CSAPs). It also provides funding to implement safety projects, but only to those agencies that have an adopted CSAP or an equivalent. In order to qualify as a CSAP (and allow an agency to be eligible for implementation planning grant funding), a plan must meet a nine-point criteria as set forth by the Department of Transportation. The USDOT includes an official commitment and goal to eliminate roadway fatalities and serious injuries; the creation of a standing task force or working group that will lead and monitor the implementation of the plan; data-driven safety analysis; public engagement and inter-governmental collaboration; consideration of equity in the planning process; assessment of current policies and guidelines to identify changes that will better prioritize safety; identification of a comprehensive set of projects and strategies that address safety issues; posting of the plan online along with description of how future progress will be measured; and that the plan would be updated every five years.

FHWA Safe System Roadway Design Hierarchy

The Safe System Roadway Design Hierarchy (Hierarchy), created by the FHWA in 2024, provides guidance in contextualizing and assessing infrastructure-based countermeasures and strategies on their alignment with the principles of the Safe System Approach.

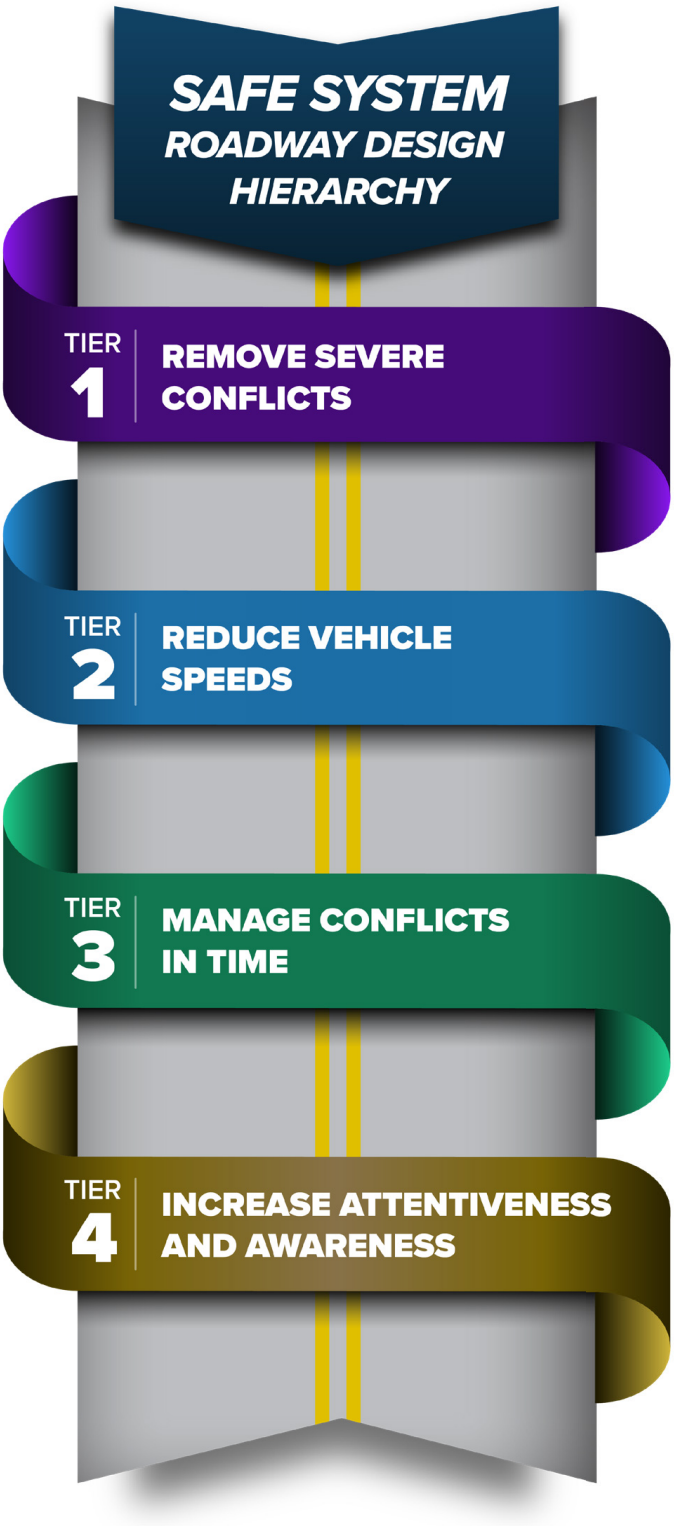
The Hierarchy classifies countermeasures into four tiers, from most to least aligned with Safe System principles. These tiers are:

- Removing severe conflicts, which will act to eliminate high-risk conditions that involve users with different speeds or moving in different directions sharing space. This tier includes countermeasures that remove potential points of conflict (for example, removing conflicting turning movements), and those that separate vulnerable users from vehicles in space (for example, protecting people biking through a separated bike lane).
- Reducing vehicle speeds, which reduces the kinetic energy present within systems and thereby reduces the severity of crashes that do occur. As driver behavior- especially when it comes to speed- is highly influenced by roadway features, countermeasures that reduce prevailing speeds can include lane narrowing and features that channelize vehicle traffic such as median islands.
- Managing conflicts in time, which covers instances (such as intersections) where space needs to be shared between different users, but where they can be separated in time. An example is the Leading Pedestrian Interval, which

allows people walking to have a "head start" interval at a signalized intersection before conflicting vehicle traffic enters the crosswalk.
- Increasing attentiveness and awareness, which involves alerting users to conflicts and potential risks, will involve countermeasures such as intersection daylighting and warning signage.

Crucially, the Hierarchy prioritizes improvements and countermeasures that make physical changes to the system for the whole population as more effective than measures that rely on roadway users and individual decisions. This is consistent with the Safe System Approach's central premise that humans make mistakes, and that the roadway system will explore designs to accommodate them through redundant and proactive interventions.

In addition to presenting this tiered hierarchy as a framework for understanding countermeasures as they relate to the principles of the Safe System Approach, the guidance also presents examples of both common and novel countermeasures that fall under each tier.



The Safe System Roadway Design Hierarchy
Source: FHWA

FHWA Safe System Approach For Speed Management

Speeding continues to be one of the leading causes of crashes across the country, especially those causing fatalities and severe injuries, and the relationship between higher speeds and increased crash severity is well-documented. The FHWA's 2023 report on the Safe System Approach for Speed Management provides targeted recommendations around speed management. The report notes the need for agencies to place safety and the prevention of injury crashes (as opposed to throughput or travel times) as the highest priority when it comes to speed setting on roadways, and highlights the need to change the physical design and context of the roadway beyond merely changing regulatory speed limits in order to achieve target speeds.

The FHWA report outlines a five-stage framework to speed management that is consistent with the Safe System Approach. The process begins with establishing a vision and building consensus within the community to manage speeds; the creation of a strategic safety plan, such as this Plan will serve this purpose. Second, speed data will be collected and analyzed, which will help both guide the rest of the process and provide the backing to build public support. Third, locations for speed management will be prioritized proactively, taking into account both crash and speeding history as well as contextual factors (such as the presence of vulnerable users or traffic generators like schools and commercial areas). Countermeasures will then be selected for prioritized locations. Finally, ongoing monitoring and evaluation will be conducted to ensure efficacy and allow for flexibility and adjustment. The report also provides real-world case studies of how these principles were applied in practice.

FHWA Primer On Safe System Approach For Pedestrians And Bicyclists

The *Primer on Safe System Approach for Pedestrians and Bicyclists* (Primer), released by the FHWA in 2021, emphasizes the importance of protecting pedestrians and bicyclists, as vulnerable users, under the Safe System Approach. The Primer details the considerations surrounding pedestrians and bicyclists under each of the five elements of the Safe System Approach – Safe Speeds, Safe Roads, Safe Vehicles, Safe Road Users, and Post-Crash Care. It also provides strategies and actions that can be taken at the Federal, State, and local levels towards implementing the Safe System Approach. Also included in the Primer is an appendix on benchmarking policies, programs, and practices for Safe System consistency.

FHWA Informational Guide: Improving Intersections For Pedestrians And Bicyclists

The *Informational Guide: Improving Intersections for Pedestrians and Bicyclists*, released by the FHWA in 2022, highlights the importance of designing intersections to facilitate safe, accessible, convenient, and comfortable walking and bicycling. Part 1 of the guide lays the foundation for including pedestrians and bicyclists at intersections, creating a place for all ages and abilities. Part 2 provides examples of designs for various intersection types and design considerations.

FHWA Guide For Improving Pedestrian Safety At Uncontrolled Crossing Locations

The Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations, released by the FHWA in 2018, provides guidance on the appropriate pedestrian crossing improvements at uncontrolled crossing locations. This guide, often referred to as STEP, is part of the Safe Transportation for Every Pedestrian program (STEP) whose purpose is to help transportation agencies address countermeasures with known safety benefits at uncontrolled crossing locations.

FHWA Safe System-Based Framework And Analytical Methodology For Assessing Intersections

The Safe System-Based Framework and Analytical Methodology for Assessing Intersections report, released by the FHWA in 2021, outlines a Safe System method for Intersections (SSI) method that practitioners can apply in the course of the typical project development process, with commonly-available data to produce quantifiable measures of effectiveness (MOEs) that then allow for comparisons across alternative designs for an intersection. The focus of the report is to align with the Safe System principle of limiting and managing kinetic energy in the transportation system. The metrics produced by the SSI method can be used to quantify kinetic energy transfer, number of conflict points, and complexity of movements, to identify designs that align best with that principle.

FHWA Improving Pedestrian Safety on Urban Arterials: Learning from Australasia

The *Improving Pedestrian Safety on Urban Arterials: Learning from Australasia* report, part of its Global Benchmarking Program, was released in 2023 to document lessons learned from FHWA researchers' review of literature, practices, and tour of its case studies in Australia, New Zealand, and adjacent islands (collectively referred to as "Australasia" in the report). These jurisdictions have operated under a Safe System framework since the early 2000's, and the report provides key takeaways that can be learned in the American context.

A primary shift in mindset is treating walking as the elemental form of transportation, shaped by policies and laws that put human wellbeing at the center of policy goals. Another key takeaway is the interconnectedness between movement and place, acknowledging that planning for land uses accommodating for active transportation modes and transit can create places that are safer and less autocentric. Finally, there is an emphasis on the interdisciplinary nature of planning for pedestrian safety – as is in the Safe System Approach – that transportation issues must not be siloed in order to generate effective, cross-cutting solutions.

OTHER NATIONAL GUIDANCE

In addition to policy and guidance from Federal agencies, other national-level documents provide additional guidance towards applying and implementing the Safe System Approach for local agencies.

The Safe Systems Pyramid

The Safe Systems Pyramid is a new framework for traffic safety proposed in a 2023 paper by David Ederer of the Center for Disease Control (CDC), along with his co-authors Rachael Thompson Panik, Nisha Botchwey, and Kari Watkins. Ederer's paper adapts the Health Impact Pyramid framework into the Safe Systems Pyramid for roadway safety practitioners. Building on established public health practice, the Safe Systems Pyramid illustrates how interventions that have the largest reach and require the least personal effort will be the most impactful. In addition to identifying the kinetic energy transfer as the cause of injury, the Safe Systems Pyramid also relates energy to exposure. It explains how the many possible safety interventions differ in their effectiveness at reducing risk in the transportation system by prioritizing interventions that reduce exposure to kinetic energy transfer at the system level. Those that require more individual effort, such as driver education programs, have the least impact on improving system-wide safety. Meanwhile, those that change the quality of people's lives and the built

environment in which they travel more broadly, such as affordable housing near transit, zoning reform, traffic calming, and limiting crossing distances at intersections, have the largest impacts on safety.

At the top of the Safe System Pyramid is education, which generally corresponds to Tier 4 of the Safe System Hierarchy and encompasses driver education programs and campaigns – for example, asking drivers to slow down and obey the speed limit. As the authors of the paper note, "the need to urge behavioral change is symptomatic of failure to establish contexts in which healthy choices are default actions," and education programs are thus considered to be most reliant on individual behavior and least effective in producing improvements.

Below education on the Pyramid are active and latent safety measures, which generally correspond to Tier 3 of the Hierarchy. Active safety measures encompass such countermeasures as warning signals and signs, as well as in-vehicle devices such as seat belts and crash warnings. These safety measures are effective when used, but rely on individual opt-in (for example, for a driver to react to signage or to a crash warning) to function. Latent safety measures encompass countermeasures such as signal timing modifications (for example, leading pedestrian intervals [LPIs] that create redundancy), as well as vehicle features such as lane departure prevention and automated emergency braking. Latent measures are considered more effective than active measures, as they require less individual opt-in, but their efficacy is still limited by the fact that they are applied individually. For example, while automated braking is superior to a warning signal that warns the driver to manually brake, only those who choose and have the means to drive a vehicle with the feature will have access to this technology.

Further down on the pyramid is the built environment level, which corresponds to Tiers 1 and 2 of the Hierarchy and refers to physical alterations to the roadway that promote slower speeds, physically separate vulnerable users, and reduce the number of high-risk conflicts. Such interventions can also improve the experience for walking and biking and reduce the number of vehicle trips by encouraging mode shift. Unlike the higher levels of the pyramid, changes to the environment create

The Safe Systems Pyramid

Source: the Safe Systems Pyramid was adapted from the Health Impact Pyramid to more fully address roadway safety needs. Image designed by Michelle Lieberman of the University of California at Davis.

contexts that encourage safer user behaviors (for example, narrower lanes that induce lower speeds), and are thus less dependent on active user participation and are more effective.

Finally, the socioeconomic factors level lies at the base of the pyramid. Typically, roadway safety interventions do not go beyond the roadway infrastructure, but today's safety outcomes are inexorably linked by socioeconomic factors of the places that our roadways serve. Across the country, communities of color and low-income communities are disproportionately exposed to the most dangerous roadways that feature high speeds, high traffic volumes, and outdated design and safety features. Moreover, many communities across the country are also trapped by a lack of viable alternative transportation options as a result of car dependency – a crisis that is likely going to persist as the national phenomenon of the suburbanization of poverty continues. These are overarching socioeconomic factors that dictate urban form and the built environment, which in turn dictate safety outcomes. This category of interventions is often considered outside the traditional purview of transportation professionals, as they must come in the form of policy around land use, zoning, and economics that go beyond (but work in tandem with) transportation policy. However, they also must be considered when attempting to address roadway safety, as these socioeconomic factors form the root causes of roadway safety issues.

The pyramid will be seen as a structure for prioritizing the roadway design and operations tools that will have the most impact for safety while also collaborating outside the safety silo with other agency and community stakeholders to engage in upstream and more wide-ranging root cause topics.

NCHRP 1036: Roadway Cross-Section Reallocation Guide

NCHRP Report 1036, the Roadway Cross-Section Reallocation Guide, was developed in 2023 as a tool for practitioners to use in the development of roadway cross-sections that better assess the tradeoffs that are involved in the allocation of the limited width of a roadway. The guide begins with the premise that roadway space is scarce, and trade-offs are inevitable, and provides guidance for planning roadway cross-sections that center community priorities for that limited space. The guidelines also infuse Safe System considerations by establishing minimum floors for safety standards, such as the provisions of pedestrian and bike facilities and minimum widths for sidewalks and bike lanes. Finally, the guide discusses approaches for community engagement and operational analysis to facilitate the decision-making process consistent with the goals and minimum standards outlined in the guide. The guide also includes a companion Excel spreadsheet that can be used for new roadway and retrofit planning.

A Safe System Guide For Transportation: Sharing This Approach To Lead Your Community To Action

The Safe System Guide for Transportation: Sharing this Approach to Lead your Community to Action was commissioned by the AAA Foundation for Traffic Safety and serves as a resource for advocates, practitioners, and stakeholders at the local community level implementing the Safe System Approach. Specifically, it offers guidance on how to communicate the contents, importance, and benefits of the new approach to both key stakeholders and the public and is a primary resource for creating culture shifts in agencies and communities towards Safe System practices and building capacity within agency staff and elected officials to institutionalize these practices in day-to-day operations.

RESOURCES FROM ITE SAFETY COUNCIL

The Institute of Transportation Engineers (ITE) has developed a number of technical briefs that provide guidance on how the Safe System Approach fits into specific disciplines within transportation planning and engineering.

Two briefs from 2022 and 2023, respectively titled "Incorporating Big Data into Safety Analysis: An Integrated and Proactive Approach" and "Applications of Big Data in Safety Analysis", explore the ways in which big data sources, such as near-miss, hard-braking, and speeding data, can be used to bolster safety analyses. They augment traditional data sources such as crash data, which tend to be reactive in nature and can suffer from small data sample sizes. The briefs offer case studies on how big data can be leveraged in roadway safety planning and provide guidance around how to use these sources responsibly and informedly.

The 2022 brief "Essential Components of Incorporating Safety in Transportation Impact Analysis" provides guidance around institutionalizing the Safe System Approach in transportation impact analyses (TIAs) by moving beyond the traditional model of using vehicle throughput and delay times as the primary quantifiers of transportation impacts, and instead prioritizing vulnerable users such as bicyclists and pedestrians. This produces TIA processes that integrate safety considerations and helps promote land uses that are conducive to safety for all modes of travel.

The 2023 brief "Institutionalizing the Safe System Approach in Local Road Safety Plans" provides guidance for aligning the older, pre-Safe System Approach adoption LRSP program with Safe System standards. The brief matches the components to the LRSP with their counterparts in the CSAP requirements outlined in the SS4A program and identifies locations where the Safe System Approach can be incorporated in the roadmap to creating an LRSP.

CALIFORNIA POLICY CONSIDERATIONS

The California Department of Transportation (Caltrans), like Federal authorities, has also adopted the Safe System Approach and committed to Vision Zero. Similarly, recent legislation at the State level has supported prioritization and cross-department collaboration consistent with the Safe Systems Pyramid strategies and hierarchy. As shown in the graphic below, several Caltrans Deputy Directives (DD) and Directors' Policies (DPs) as well as State Senate and Assembly Bills have been essential policy building blocks to support the ongoing Safe System Pivot in California.

DP 36

In Caltrans Director's Policy (DP) 36, made effective in February of 2022, the agency committed to eliminating fatal and serious injury crashes by the year 2050, and committed to achieving this goal through the application of the Safe System Approach.

DP 37

DP 37, issued in December 2021, establishes creating complete streets that support people walking, biking, taking transit, and accessing passenger rail. It recognizes these priorities as a means of advancing State goals in climate and the environment, in public health, and in equity and repairing harm to underserved communities. It also recognizes complete streets as valuable community spaces that can boost economic vitality and resiliency. To these ends, it directs that "all transportation projects funded or overseen by Caltrans will provide comfortable, convenient, and connected complete streets facilities for people walking, biking, and taking transit or passenger rail unless an exception is documented and approved."

DIB 94

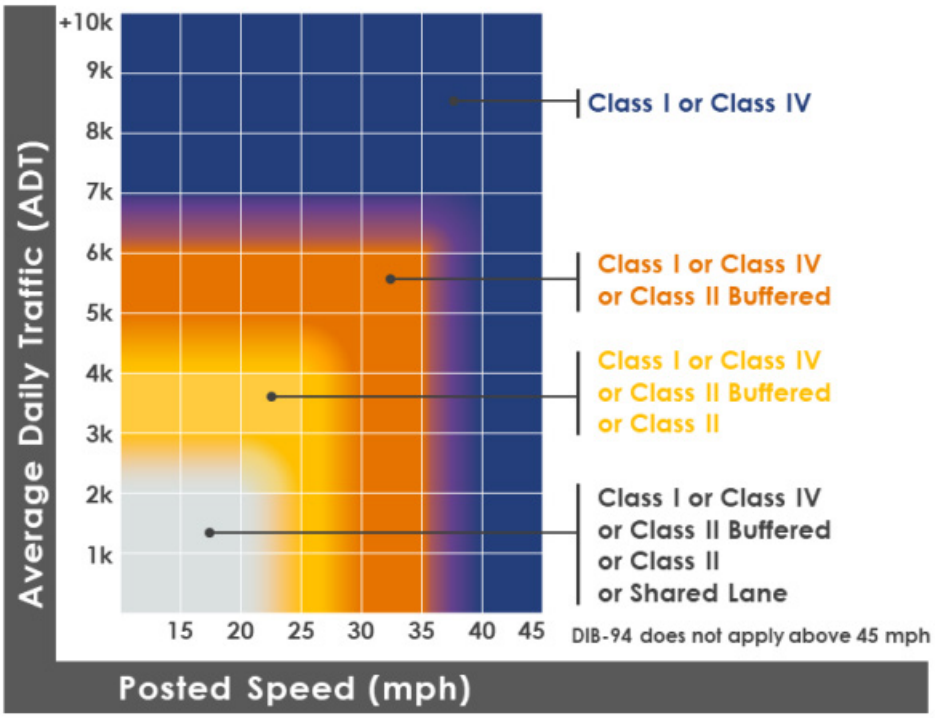
Caltrans Design Information Bulletin (DIB) 94, entitled "Complete Streets: Contextual Design Guidance," is a set of design implementation guidance for complete streets projects on the State Highway System that integrates the Safe System Approach and reflects the Safe System Hierarchy. DIB 94 was published in January 2024, and applies DP 37 with an eye towards specific implementation.

DIB 94 is applicable to State highways located in an urban or suburban area, or that act as a rural main street, where posted speeds do not exceed 45 MPH and where at least one bicycle, pedestrian, or transit facility is present. As such, DIB 94 is applicable to many of the State highway facilities in the region that feature sizable crash histories or crash risk factors as identified by this Plan.

For each of the contexts that it covers – city centers, other urban areas, suburban areas, and rural main streets, DIB 94 sets minimum expectations for the provision of complete streets facilities like crosswalks, sidewalks, bike facilities, and others. These expectations are set with the surrounding context in mind and include instructions, guidance, and recommendations on implementing specific complete streets features and countermeasures, ranging from pedestrian beacons to lane narrowing. Caltrans intends for DIB 94 guidance to create "context-sensitive facilities that serve travelers of all ages and abilities."

Recommended Bicycle Facilities for Urban Areas, Suburban Areas, and Rural Main Streets Based on Average Daily Traffic (ADT) and Posted Speed Limits
Source: Caltrans, DIB 94

Note: The facility selection process should begin by identifying opportunities to provide the most physical separation for bicyclists. Bicycle facilities should be reviewed and evaluated using the speeds and annual daily traffic (ADT) of the existing route to determine the appropriate bicycle facility as shown in the figure above.



AB 43

California Assembly Bill (AB) 43 was passed in 2021 to provide additional flexibility to local jurisdictions to set speed limits on their roadways. Specifically, it offers them a means to lower speed limits on corridors that meet additional criteria as noted below. Cities will have increasing flexibility starting in 2024 to enforce context-sensitive speed limits. AB 43 features the following five major components, focused on giving local jurisdictions more flexibility in setting speed limits, especially regarding vulnerable road users:

- Engineering & Traffic Survey (E&TS): An option to extend enforceable time period
- Post E&TS: An agency can elect to retain current or immediately prior speed limit
- Speed Limit Reduction: Reduction of additional 5 mph based on several factors, including designation of local "Safety Corridors"
- Prima Facie Speed Limits: Options for 15 and 25 mph in certain areas depending on context
- Business Activity Districts: Option for 20 or 25 mph
- In particular, the designation of "Safety Corridors" could be applied to roadways where the highest number of serious injury and fatality crashes occur, identifying specific locations or corridor-level segments with high crash occurrences, and stratified by mode. These designations must be approved by a professional engineer.

AB 413

AB 413, passed in October 2023, requires daylighting intersections to ensure better sight distance between motorists and vulnerable road users crossing the roadway. The law would require cities to prohibit where drivers may park, stop, or leave any vehicle (e.g., on a sidewalk, in a crosswalk, etc.) to within 20 ft of the approach side of a marked or unmarked crosswalk, unless authorized by a local ordinance.

AB 645

AB 645, the speed safety camera pilot program, allows for automated enforcement through cameras. Deployment of automated red light and speed enforcement cameras in jurisdictions around the country have had positive results in terms of their ability to reduce violations, crashes, injuries, and fatalities. These results exceed the efficacy of traditional enforcement as cameras can operate continuously and independently, and do not require the presence of on-duty personnel. This is especially helpful as many law enforcement agencies statewide, including Palo Alto, are short-staffed. Automated enforcement also eliminates instances of bias in enforcement based on arbitrary characteristics. Thus, on the Safe Systems Pyramid, automated enforcement is categorized into a higher level of efficacy – as a latent measure – than traditional enforcement, which is categorized as an active measure.

Historically, automated red-light cameras are permitted in California, while automated speed enforcement cameras are not. However, AB 645, which came into effect in 2023, legalized speed enforcement cameras on a pilot basis for six cities across the State – Los Angeles, Long Beach, Glendale, Oakland, San Francisco, and San Jose – for use in school zones, designated safety corridors, high-injury intersections, and known street racing corridors.

SB 743

Senate Bill (SB) 743, passed by the California legislature in 2013, represented a sweeping policy change in the State's environmental review process for transportation. Under SB 743, transportation impacts are no longer quantified in terms of congestion caused as measured by Level of Service (LOS) during CEQA review, but rather in terms of amount of driving as measured by Vehicle Miles Traveled (VMT). This shift is intended to better align the quantification of transportation impacts with the State's climate goals, as the shift towards using VMT as a metric under SB 743 is intended to induce more infill and mixed-use developments as opposed to auto-centric sprawl, which is in turn intended to promote non-auto modes of transportation and reduce greenhouse gas emissions.

This shift is important to roadway safety on two fronts. First, the impact of SB 743 will likely lead to shifts in land-use patterns in the State that are more compact and conducive to walking, biking, and transit use, which aligns with the broad socioeconomic and built environment changes most effective in improving safety outcomes in the Safe Systems Pyramid. Second, the replacement of LOS by VMT will shift focus away from vehicle speed, capacity, and throughput in the design of the transportation network, which allows for roadway safety considerations to be better prioritized.

APPENDIX B: BENCHMARKING SURVEY

SAFE USERS				
	Benchmark	**Assessed Level of City Practice**	**State of Current Practice in Palo Alto (City Input)**	**State of Current Practice in Palo Alto (F&P Input)**
Education	Perform outreach through educational programs on rules of the road and the use of protective equipment, with a focus on those behaviors and target audiences most linked to death and serious injuries.	Occasional Practice	This is true for SRTS in K-2, 3, 5, 6 grades.	Institutionalized for biking. PA does annual SRTS education.
	Install advisory signs for curves and speed zones, as well as speed feedback signs and changeable message signs, to provide warnings and encourage safe behavior.	Institu-tionalized Practice		Institutionalized practice.
	Pedestrian and bicycle education programs are data-driven and focused on local safety context; education programs are customized for different groups.	Not a Current Practice	VTA utilizes Measure B tax money to teach bicycle safety through SV Bike Coalition. Palo Alto advertises these events, but not many are offered in person locally. City is advocating to have programs in Palo Alto.	
	Use demonstration projects to raise awareness of new designs and encourage support for controversial safety projects among stakeholders.	Occasional Practice	The forthcoming South Palo Alto Bikeways Demonstration Project is funded by SS4A funds. To support a quick-build program that deploys safety treatments citywide, additional engineering capacity will be required for design, project management, and signal work.	Occasional practice.

SAFE USERS				
	Benchmark	**Assessed Level of City Practice**	**State of Current Practice in Palo Alto (City Input)**	**State of Current Practice in Palo Alto (F&P Input)**
Enforcement	Investigate and document the impacts of traffic safety enforcement and traffic safety surveillance on minority communities.	Occasional Practice		
	Local ordinances allow for context-specific flexibility in sidewalk riding policies and enforcement (e.g., is there an adjacent bike facility?).	Institu-tionalized Practice	Legal to ride a bike on all sidewalks except in business districts, University Avenue undercrossing below Alma Street and the Palo Alto train station or in the California Avenue undercrossing below Alma Street and the California Avenue train station when others are present.	
	Police Department conducts sustained and data-driven enforcement efforts focused on behavior and locations related to most severe bicycle and pedestrian crashes. Reallocate enforcement activities to target those behaviors and locations most linked to death and serious injury. Enforcement activities are designed to consider equity implications.	Not a Current Practice	Targeting based on geographic areas with high crashes. Police will react to KSI crashes and temporarily monitor those areas. Police department does not currently have a traffic team.	
Research	Develop and implement strategies for robust demographic data collection in crash reporting including partnering with organizations such as Stanford Healthcare or Santa Clara County Public Health Department.	Not a Current Practice	Partners with the Santa Clara County Public Health Department for SRTS. City of San Jose Vision Zero staff have initiated development of a trauma center data sharing agreement with the County. City staff have reached out to the City of San Jose to partner in acquisition of this critical data.	

SAFE ROADWAYS				
	Benchmark	**Assessed Level of City Practice**	**State of Current Practice in Palo Alto (City Input)**	**State of Current Practice in Palo Alto (F&P Input)**
Crash avoidance	Systemically install proven countermeasures to separate users in space, separate users in time, and increase attentiveness and awareness, such as: dedicated left turn lanes, protected signal phases, clear zones, and vertical and horizontal separation for pedestrians and bicyclists.	Occasional Practice	This is done on as part of major CIP projects that often take many years to complete. The City will require additional engineering capacity (signals, design, project management) to quickly deploy safety countermeasures as quick-build projects citywide to meet the Vision Zero target date.	Occasional practice- some things are common practice, many others less so.
	Design standards require implementation of the sidewalk zone system citywide. Does not allow apron parking or attached (unbuffered) sidewalks anywhere in the city.	Occasional Practice	City has rolled curbs in some areas. Some planter strips downtown and in older neighborhoods.	
	Has a crosswalk policy that reflects best practices for signalized and uncontrolled crosswalk treatments (FHWA Field Guide), including consideration of Pedestrian Hybrid Beacons.	Occasional Practice	No defined policy. Engineers use FHWA list of countermeasures for uncontrolled intersections. City could consider a city-wide assessment of uncontrolled crosswalks. Some QOL trade-offs.	
	Complete infrastructure connectivity for pedestrians and bicyclists and make progress toward providing separation where needed based on crash exposure, crash history, and characteristics of the roadway and adjacent land use associated with higher levels of use.	Occasional Practice	This is done as part of major CIP projects that often take many years to complete. The City will require additional engineering capacity (signals, design, project management) to quickly deploy safety countermeasures as quick-build projects citywide to meet the Vision Zero target date.	Not refined at this point, would expect this to be an outcome of this project and BPTP Update.
Kinetic energy reduction	Systemically install proven countermeasures to manage motor vehicle speed and crash angles, such as roadside appurtenances, roundabouts, refuge islands, hardened center lines, and roadway space reallocations.	Occasional Practice	This is done as part of major CIP projects that often take many years to complete. The City will require additional engineering capacity (signals, design, project management) to quickly deploy safety countermeasures as quick-build projects citywide to meet the Vision Zero target date. Conversion to permanent features would occur after quick-build projects demonstrate efficacy.	Fairly common practice where able.

SAFE ROADWAYS				
	Benchmark	**Assessed Level of City Practice**	**State of Current Practice in Palo Alto (City Input)**	**State of Current Practice in Palo Alto (F&P Input)**
Policies and Tradeoffs	Uses national best practices focused on bicycle and pedestrian safety for roadway and facility design guidelines and standards.	Occasional Practice	City uses standards from Federal Highway Administration (FHWA), National Association of City Transportation Officials (NACTO), California Manual of Uniform Traffic Control Devices (MUTCD), and Caltrans' Highway Design Manual (HDM).	City has 2012 Bicycle and Pedestrian Plan. Would be further updated as part of BPTP Update to meet newest national best practices.
	Roadway resurfacing projects and debris removal are prioritized for bicycle routes.	Occasional Practice	City's Complete Streets Policy requires resurfacing projects to consider all modes of travel and coordinate with the Pedestrian and Bicycle Advisory Committee. The Office of Transportation, Public Works, and PABAC collaborate yearly on pavement management projects. Planning and engineering capacity is needed to engage community and design treatments prior to Public Works resurfacing projects.	
	Age 8 to 80 bicyclist considerations are applied and/or level of traffic stress is considered.	Not a Current Practice	BPTP Update includes Level of Traffic Stress Analysis.	Suggest policy consideration in BPTP Update.
	Colored bike lanes and other innovative treatments, including geometric enhancements, are provided at intersections and interchanges.	Occasional Practice	Colored bike lanes are implemented throughout the city, particularly to highlight merge zones and high-use bike lanes.	
	Has moderate to high densities in the CBD and mixed-use zones and progressive parking policies, and transportation impact analysis for new development considers multi-modal trade-offs, rather than reliance on LOS.	Occasional Practice	The City is not compliant with the MTC Transit-Oriented Communities Policy.	Some institutionalization of land use densities near transit (e.g., California Avenue Pedestrian and Transit Oriented Development). Still implements parking minimums. Not sure if City is MTC TOC compliant?

SAFE ROADWAYS				
	Benchmark	**Assessed Level of City Practice**	**State of Current Practice in Palo Alto (City Input)**	**State of Current Practice in Palo Alto (F&P Input)**
Policies and Tradeoffs	Has a recently updated policy and comprehensive inventory of barriers. Has design guidelines for addressing barriers.	Not a Current Practice	City uses VTA Bicycle Technical Guidelines.	
	Designate functional class and modal priority for roadways to pinpoint the most effective safety countermeasures and streamline tradeoff decisions.	Not a Current Practice	Resources are needed to classify roadways by functional classification and modal priority to set contextually appropriate target speeds, and to design roads that align with the posted speed.	
	Has curbside management, shared mobility, or micromobility policies (e.g., permitting, enforcement) in place that prioritize pedestrian and bicyclist safety.	Not a Current Practice	Will develop shared micromobility pilot program.	
	Has a street tree ordinance that improves pedestrian safety and access.	Occasional Practice		Street Tree Ordinance updated in 2022, but does not focus on improving ped safety/access.
	Bicycle supportive amenities (parking, routing/wayfinding, water fountains, repair stations) are found community-wide.	Institu-tionalized Practice		
	Ensure safety for all users is prioritized, and accessibility maintained, during construction and road maintenance projects.	Occasional Practice	Traffic Control Guidelines have been updated for this purpose. Building Division enforces Traffic Control Plans.	This is a required in their Requirements for Traffic Control Plan Submission document. Is this enforced in practice?
Innovation	Provide infrastructure for smarter roadways and intelligent transportation systems (ITS) in support of data collection and analysis, as well as proactive system management.	Occasional Practice	City staff is working towards implementation but currently limited by staff resources	
	Use pilot projects to measure safety effects, and encourage innovation and design flexibility.	Occasional Practice		Somewhat institutionalized (e.g., Car free streets, Crescent Park Traffic Calming)

SAFE ROADWAYS				
	Benchmark	**Assessed Level of City Practice**	**State of Current Practice in Palo Alto (City Input)**	**State of Current Practice in Palo Alto (F&P Input)**
ADA improvements	Has ADA transition plan in place and an ADA coordinator.	Institu-tionalized Practice		Has transition plan (2022) and a coordinator in place.
	Uses state-of-the-practice (PROWAG) ADA improvements with consistent installation practices.	Occasional Practice		

SAFE VEHICLES				
	Benchmark	**Assessed Level of City Practice**	**State of Current Practice in Palo Alto (City Input)**	**State of Current Practice in Palo Alto (F&P Input)**
AVs	Provide supportive infrastructure for autonomous vehicles to enable active safety technology.	Occasional Practice	Current connected vehicle infrastructure is limited and not updated. Upgrade is dependent on staff resources.	
Data	Collect data about the involvement of AVs in crashes for future data analysis, and to inform design and policies.	Not a Current Practice	Will work with PD to collect this data.	
Vehicle interaction with pedestrians and bicyclists	Require new fleet vehicles to have ped/bike detection.	Not a Current Practice		
	Focus on SRTS efforts for mode shift to reduce exposure to heavy vehicles (SUVs) at a schools.	Institu-tionalized Practice	Robust SRTS program continues to make mode shift gains. New traffic control guidelines include SRTS considerations.	
	Design truck routes to keep trucks away from vulnerable road users. Through time of day policies and route locations.	Occasional Practice	Truck routes are not in residential areas. City provides wide load permits upon request and will focus on reducing conflicts during after school peak periods. City staff are working with Greenwaste to reduce conflicts during school arrival/dismissal times.	

SAFE SPEEDS				
	Benchmark	**Assessed Level of City Practice**	**State of Current Practice in Palo Alto (City Input)**	**State of Current Practice in Palo Alto (F&P Input)**
Design and operations	Adopt roadway design standards that are focused on speed management, such as target speed-based design. Adjust roadway geometries for context-appropriate speeds.	Occasional Practice	Recent projects have included this focus. Roadway design changes are needed in additional locations to achieve target speeds.	This is pretty well institutionalized. They have used alternate methods to speed limit setting for years. Speeds set low but vehicles still speed. Need roadway design changes.
	Use speed harmonization strategies to achieve safe speeds in congested areas. Speed harmonization is a method to reduce congestion and improve traffic performance. This method is applied at points where lanes merge and form bottlenecks. The strategy involves gradually lowering speeds before a heavily congested area in order to reduce the stop-and-go traffic that contributes to frustration and crashes.	Not a Current Practice	Need engineering capacity to implement speed harmonization.	
Enforcement	Deploy automated speed enforcement, with a focus on equitable fee structures.	Not a Current Practice		Not yet permitted in California

SAFE SPEEDS				
	Benchmark	**Assessed Level of City Practice**	**State of Current Practice in Palo Alto (City Input)**	**State of Current Practice in Palo Alto (F&P Input)**
Policy and training	Follow speed limit setting methodologies that determine appropriate speeds based on roadway context and modal priority, rather than the historic behavior of road users. Set speed limits based on the human body's ability to tolerate crash forces.	Institu-tionalized Practice	School zone speeds have been reduced to 20mph, and speeds are set at 25mph where possible. Council preference is not to raise speeds to 85th percentile speeds from traffic and engineering studies. Staff are exploring AB 43 components to manage speeds. City has an active Traffic Calming program available to residents concerned about speeding.	
	Provide speed management training to staff focused on injury minimization.	Not a Current Practice	Will need to update traffic calming program guidance and staff training.	They have a traffic calming program based on community requests. Traffic calming program guidance is from 2001 and refers to the E's or safety. Training will be updated to reflect the Safe System Approach.
Data and monitoring	Use big data and technology to proactively monitor speed and speed delta from target speeds	Not a Current Practice	Speed surveys are completed periodically. Staff are exploring the reliability of big data sources.	

POST-CRASH CARE				
	Benchmark	**Assessed Level of City Practice**	**State of Current Practice in Palo Alto (City Input)**	**State of Current Practice in Palo Alto (F&P Input)**
Crash investigation	Enhance reporting practices to ensure complete and accurate data collection and documentation of road user behavior and infrastructure.	Occasional Practice		
	Create a feedback loop such that key insights from crash investigations are shared with roadway designers and/or influence outreach and education.	Not a Current Practice	PD reports out on youth-involved ped and bike crashes at monthly CSTSC meetings	
Partnerships	Emergency response is involved in all aspects of bicycle/pedestrian facility planning and design (including pilot testing), and they balance response times with bicyclist/pedestrian safety.	Not a Current Practice	Fire/EMS review proposed roadway reconfigurations and conduct test runs of built projects.	
	Share data across agencies and organizations, including first responders and hospitals, to develop a holistic understanding of the safety landscape and improve accuracy.	Occasional Practice	City of San Jose Vision Zero staff have initiated development of a trauma center data sharing agreement with the County. City staff have reached out to the City of San Jose to partner in acquisition of this critical data.	
	Connect with victims' families and the advocacy community to offer support and resources, and encourage partnerships with outreach and education.	Not a Current Practice	Police Department refers families to resources on a case-by-case basis.	
	Provide staff support for post crash care trauma.	Occasional Practice	Provide group mental health support to non-EMS staff for post crash care trauma. Current EAP program provides individual short-term counseling but no group counseling.	
Communications	Create a communications protocol for acknowledging KSI crashes, sharing City/Partner follow-up actions, and directing concerns to appropriate committees/task forces, and establishing meeting protocols for discussing concerns and suggested improvements.	Occasional Practice	Need to work with Communications team and other internal partners to develop this protocol.	

SAFETY PLANNING AND CULTURE				
	Benchmark	**Assessed Level of City Practice**	**State of Current Practice in Palo Alto (City Input)**	**State of Current Practice in Palo Alto (F&P Input)**
Data and analysis	Apply a proactive and transparent approach to data-driven safety analysis, including the use of systemic profiles, roadway and roadside condition, and modal specific condition assessments (e.g., bicycle network stress or distance between marked crossings).	Not a Current Practice		Will achieve as part of this Plan.
	Focus network screening and benefit/cost calculations on fatal and serious injuries, instead of all crashes to identify the core safety issues for human vulnerability.	Not a Current Practice		Will achieve as part of this Plan. Occasional as part of HSIP applications
	Connect each emphasis area in a Safety Plan to roadway or contextual safety contributing factors, such as the disproportionate number of fatalities and serious injuries among pedestrians in communities of color, and recognize this specific factor for pedestrian crashes—higher rates of crashes in minority communities—where transportation system gaps (e.g., sidewalks/bike lanes/crossing opportunities) can help proactively inform recommendations.	Occasional Practice		Will achieve as part of this Plan.
	Collect pedestrian and bicyclist volumes routinely with intersection counts and has a GIS database of counts.	Not a Current Practice	BPTP Update should provide recommendations for count protocol. BPTP Update will not create a GIS database of counts	
	Maintain an inventory of missing and existing bikeways in GIS and includes bikeway projects in the CIP.	Occasional Practice		Currently institutionalized practice and will be updated as part of the BPTP Update.
	Maintain an inventory of missing and existing sidewalks in GIS and includes sidewalk projects in the CIP.	Occasional Practice		Currently institutionalized practice and will be updated as part of the BPTP Update.
	Maintain an inventory of pedestrian and bicycle signs, markings, and signals in GIS.	Not a Current Practice	Investigate City resources to establish and maintain this level of GIS mapping.	
	Employ a data-driven systemic safety or Vision Zero approach to regularly analyze crash data citywide.	Not a Current Practice		Will achieve as part of this Plan.

SAFETY PLANNING AND CULTURE				
	Benchmark	**Assessed Level of City Practice**	**State of Current Practice in Palo Alto (City Input)**	**State of Current Practice in Palo Alto (F&P Input)**
Redundancy	When deploying safety interventions, define primary and secondary countermeasures as packages across the Safe System elements to provide redundancy.	Not a Current Practice		Will achieve as part of this Plan.
Leadership and commitment	Organize a Safety Plan around the Safe System Core Principles and Elements OR perform a Safe System assessment to determine how well each Safety Plan emphasis area aligns with the Safe System elements and principles, and make adjustments as necessary.	Not a Current Practice		Will achieve as part of this Plan.
	Commit to a "Zero" Goal and establish performance management strategies.	Occasional Practice		Will achieve as part of this Plan. Also included as a goal in General Plan, but City needs to operationalize.
	Backcast to establish the rate of decrease in fatalities and serious injuries needed to achieve zero by the target year. This approach will show the level of investments necessary to reach long-term goals.	Not a Current Practice		Will achieve as part of this Plan.
	Implement a monitoring process to measure against the backcasting trend and force intervention changes.	Not a Current Practice		Will achieve as part of this Plan.
	Establish key performance indicators (KPIs). These key performance indicators could be tied to each of the five Safe System elements or a particular strategy.	Not a Current Practice		Will achieve as part of this Plan.
	Train decision makers on Safe System Approach and engage with peer cities to provide support for implementing the Safe System Approach.	Not a Current Practice		Will achieve as part of this Plan.
Public Relations	Safety leaders show buy-in for the Safe System Approach through media, public events, and support for related policies and programs.	Not a Current Practice		Will achieve as part of this Plan.

SAFETY PLANNING AND CULTURE				
	Benchmark	**Assessed Level of City Practice**	**State of Current Practice in Palo Alto (City Input)**	**State of Current Practice in Palo Alto (F&P Input)**
Funding	Change project evaluation methods for funding to primarily focus on fatal and serious injury crash reduction opportunities.	Occasional Practice		Will achieve as part of this Plan.
	Use equity considerations in project prioritization, with a change to benefit-cost analysis or through a set-aside program.	Not a Current Practice		Will achieve as part of this Plan.
	Has a dedicated annual funding stream for pedestrian and bicycle projects and local grant matches.	Institu-tionalized Practice	City funds a Bicycle and Pedestrian Transportation Plan Implementation CIP and a Safe Routes to School CIP.	
	Institutionalize safety considerations in all project types to systematically fund projects through operations and maintenance efforts (such as repaving projects).	Occasional Practice		This is either occasional or institutionalized-they do this when they can.
	Review Capital Improvement Program to check for safe system consistency in all projects.	Not a Current Practice	Need to work with internal partners to review and adjust projects if needed.	
Development Review	Conduct safety impact assessments of new developments to identify mitigation and cost sharing opportunities.	Occasional Practice	Currently done in the development review process. City has a Transportation Impact Fee.	
	During the development review process ensure circulation to, from, and within the development along with recommended TDM measures align with safety best practices and encourage active transportation modes.	Occasional Practice	Currently done in the development review process. City has a Transportation Impact Fee.	
Equity First	Clearly define equity in Safety Plans and include equity considerations throughout the emphasis areas and strategies.	Not a Current Practice		Will achieve as part of this Plan.
	Incorporate equity considerations in implementation and assessment plans, such as goals related to safety improvements for populations that are traditionally underserved.	Not a Current Practice		Will achieve as part of this Plan where possible.

SAFETY PLANNING AND CULTURE				
	Benchmark	**Assessed Level of City Practice**	**State of Current Practice in Palo Alto (City Input)**	**State of Current Practice in Palo Alto (F&P Input)**
Stakeholder engagement	Meaningfully engage populations that are traditionally underserved in shared decision-making for the SHSP and subsequent safety programs, policies, or infrastructure projects.	Not a Current Practice		Will achieve as part of this Plan where possible.
Pedestrian and Bicycle Planning	Has a Coordinator on staff who manages the agency's pedestrian and bicycle programs.	Institu-tionalized Practice	There is a manager and team of staff tasked with implementing these.	Institutionalized practice.
	Has a formal, active Transportation Advisory Committee that address bicycle/ pedestrian issues.	Institu-tionalized Practice		Institutionalized practice.
	Has a recently-updated Active Transportation Plan (or similar) with strategic prioritized list of projects that reflects current best practices (e.g., Level of Traffic Stress analysis, inclusion of Class IV protected bicycle facilities).	Occasional Practice	Will achieve with the in-progress BPTP Update.	Will achieve with BPTP Update.
	Has an ongoing Safe Routes to Schools program and funding for recent projects.	Institu-tionalized Practice		Institutionalized practice.
Research	Develop safety performance functions specifically for fatal and serious injury crashes.	Not a Current Practice		Will achieve as part of this Plan.
	Review existing crash data records to estimate the crash magnitude, in terms of kinetic energy, that was carried by involved parties prior to the crashes. After determining the range of kinetic energy magnitudes, make safety intervention and prioritize decisions with this in mind.	Not a Current Practice		Will achieve as part of this Plan.

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APPENDIX C:

SURVEY & INTERACTIVE WEBMAP RESPONSES FROM ENGAGEMENT

Purpose

The City of Palo Alto has been working hard to put out better programs and infrastructure for safer, more connected streets. Through the online survey, the community provided the City and consultant team with a quantitative understanding of what the community is in favor of or unfavorable to when it comes to having to make tough decisions on policy and guidance documentation. Streamlining the type of responses allows policymakers to not have to make exceptions to citywide decisions. The interactive map, originally prepared for the Bicycle and Pedestrian Transportation Plan (BPTP) Update project, allowed community members to specify locations where safety could be enhanced. The Palo Alto Safety Action Plan collaborated with BPTP Update to use the responses from the map to identify locations where the high-injury network and destinations for bicyclists and pedestrians would interact.

Survey Period

September 27, 2023 – December 29, 2023

Survey Mechanism

The survey was administered online through the City's website. The survey was open to all citizens and was posted to the SS4A Safety Action Plan Webpage. A total of 766 responses were received. The survey questions can be found below.

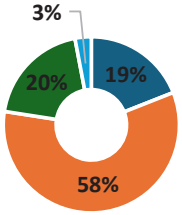
Survey Dissemination

- Project website
- Palo Alto Commissions and Committees
- Human Relations Commission
- Planning and Transportation Commission
- Pedestrian and Bicycle Advisory Committee
- City/School Transportation Safety Committee
- Palo Alto Unified School District – Principal Liaisons
- Palo Alto Council of PTAs
- Alta Housing
- Avenidas
- California Avenue Farmer's Market
- College Terrace Residents Association
- La Comida
- Lytton Gardens
- Palo Alto High School's Verde Magazine
- Palo Alto Jewish Community Center
- Second Harvest Food Bank
- Stanford Campus Community
- Stanford Research Park

Survey Questions

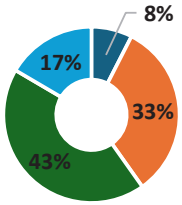
1. Where do you live?
2. Have you or your family been personally affected by a fatal or severe traffic crash
3. When making decisions about road or street design, pedestrian and bicyclists' safety should be prioritized over motor vehicle delays.
4. When making decisions about road or street design, pedestrian and bicyclists' safety should be prioritized over on-street parking.
5. In areas where children or elderly may be present, the road or street should be designed for cars to drive 20 mph or slower.
6. Roadway changes that reduce roadway lanes or parking should be prioritized to enhance safety for pedestrians and bicyclists.
7. In downtown areas or commercial corridors, space for people to walk, bike, and cross the street safely should be prioritized over on-street parking for cars.
8. In areas that do not have a history of crashes but have a similar context or design as other areas experiencing high crashes we should implement countermeasures to proactively prevent similar crashes from occurring.
9. I would support the installation of speed safety cameras (automated enforcement) once approved for use in California.
10. I support the goal of eliminating traffic fatalities and serious injuries on roads in Palo Alto.
11. I believe it is possible to eliminate traffic fatalities and serious injuries on roads and streets in Palo Alto through different road engineering, public education, and enforcement strategies.
12. I am willing to change my behavior when driving to help reduce the risk of fatally or seriously injuring myself or another person.
13. Roadway or street lighting should be used to improve nighttime visibility.
14. I would like to see more roundabouts implemented at high-risk locations.
15. I feel safe walking with my family along or crossing streets in the downtown/University Avenue area.
16. I feel safe biking with my family along or crossing streets in the downtown/University Avenue area.
17. I feel safe walking with my family along or crossing streets in the California Avenue area.
18. I feel safe biking with my family along or crossing streets in the California Avenue area.
19. I feel safe walking with my family along or crossing streets in neighborhoods.
20. I feel safe biking along or crossing streets in neighborhoods.
21. I feel safe walking along or crossing El Camino Real.
22. I feel safe biking along El Camino Real.
23. I feel safe crossing El Camino Real while riding on my bike.
24. I feel safe walking to and from the Palo Alto Caltrain Station
25. I feel safe biking to and from the Palo Alto Caltrain Station
26. I feel safe walking to and from the California Avenue Caltrain Station
27. I feel safe biking to and from the California Avenue Caltrain Station
28. What is your race? (optional)
29. What is your annual household income? (optional)

I feel safe walking with my family along or crossing streets in the downtown/University Avenue area.



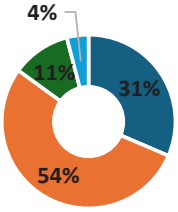
Strongly Agree Agree Disagree Strongly Disagree

I feel safe biking with my family along or crossing streets in the downtown/University Avenue area.



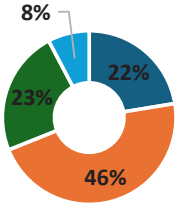
Strongly Agree Agree Disagree Strongly Disagree

I feel safe walking with my family along or crossing streets in the California Avenue area.



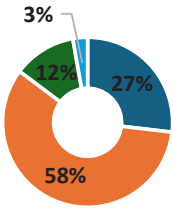
Strongly Agree Agree Disagree Strongly Disagree

I feel safe biking with my family along or crossing streets in the California Avenue area.



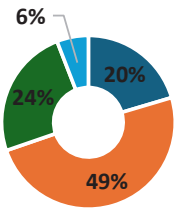
Strongly Agree Agree Disagree Strongly Disagree

I feel safe walking with my family along or crossing streets in neighborhoods.

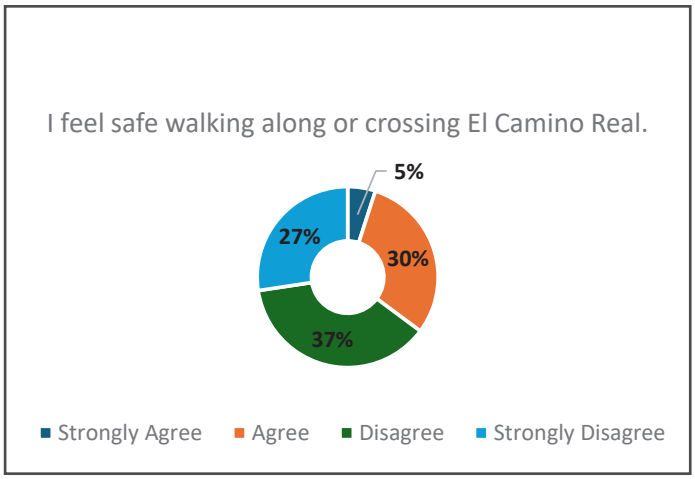


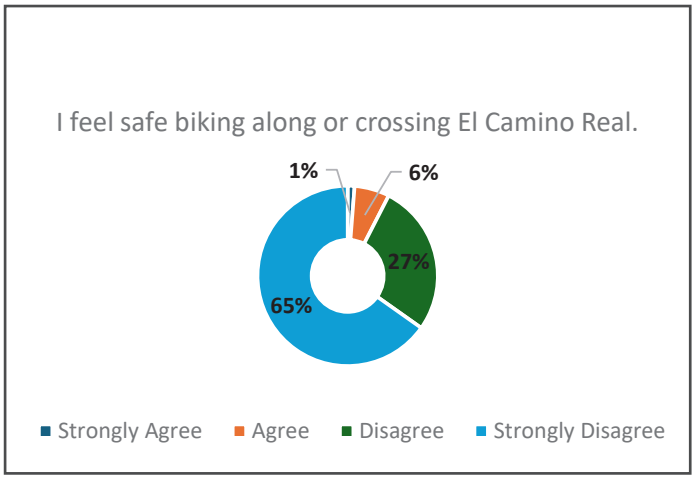
Strongly Agree Agree Disagree Strongly Disagree

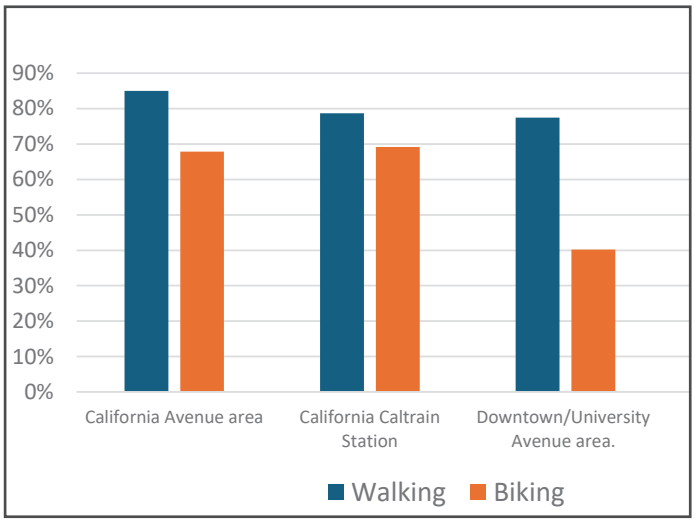
I feel safe biking with my family along or crossing streets in neighborhoods.



Strongly Agree Agree Disagree Strongly Disagree







Interactive Webmap

The key concerns identified through the webmap include:

Bike and pedestrian facilities and access

- Improve bike lanes to downtown
- Include safety enhancements along school routes – upgrade rolled curbs, install RRFBs, traffic calming, repaint high-visibility crosswalks
- Include additional safety enhancements in the Downtown area – longer pedestrian signal timings, bike box, upgrade signal heads
- Identify ways to mitigate vehicles parking/driving in the bike lanes

Road design

- Conduct roadway space reallocation feasibility studies
- Improve sight distance and intersections to enhance visibility of pedestrians and bicyclists

Safety education

- Increase education for all road users
- Prepare policy and promote education around electric bicycles

APPENDIX D:

SAFETY FOCUS AREAS

TABLE D-1: SAFETY FOCUS AREAS

Safety Focus Area	Factors	Number of Crashes	Potential Roadway Design Countermeasures in addition to Systemic Speed Management	Additional Notes
Pedestrians on Arterials at Night[1]	Pedestrians and vehicles involved parties, time of day, location is classified as arterial	22 crashes 4 KSI (9%)	Curb extensions (with GSI where feasible), extended pedestrian crossing time, pedestrian refuge islands and median (with GSI where feasible), signing and striping improvements, daylighting intersections, improved pedestrian scale lighting, rest in red signal timing, enhanced uncontrolled crosswalks, sidewalks, roundabouts	95% of crashes occurred at intersections
Pedestrians on Major Downtown Streets[2]	Pedestrians and vehicles involved parties, location is Downtown	3 KSI (6%)	Curb extensions (with GSI where feasible), extended pedestrian crossing time, raised crosswalks, pedestrian refuge island and median, signing and striping improvements, daylighting intersections, improved pedestrian scale lighting, roundabouts, pedestrian scrambles, protected or restricted turns	• 1 KSI occurred in 2019 prior to Slow Streets • 2 KSIs occurred in late 2020 while downtown streets were closed • Most crashes occurred during the day • All crashes occurred at intersections
90 Degree Angle Conflicts with Bicyclists	Bicyclists and vehicles involved parties	144 crashes 6 KSI (13%)	Bike boxes, two stage turn boxes, turn restrictions, lane reductions, protected intersections, roundabouts	74% of these crashes occurred on streets with existing bicycle facilities
Walk & Roll Routes Crossing Higher Stress Streets	Bicyclists and vehicles involved parties, Walk & Roll Bike Route, LTS[3]	82 crashes 2 KSI (4%)	Roundabouts, protected intersections, enhanced uncontrolled crosswalks, daylighting, or separate signal phasing	• 99% of crashes occurred at intersections • 88% of crashes occurred on streets with existing bicycle facilities intersections

TABLE D-1: SAFETY FOCUS AREAS				
Safety Focus Area	**Factors**	**Number of Crashes**	**Potential Roadway Design Countermeasures in addition to Systemic Speed Management**	**Additional Notes**
Children Riding Bicycles[4]	Bicyclists and vehicles involved parties, youth	68 crashes 3 KSI (6%)	Bicycle boulevards and separated bikeways	
Drivers on Residential Arterials	Vehicle to vehicle involved parties, location is classified as arterial	6 KSI (13%)	Signing and striping improvements; access management; intersection treatment such as dedicated left turn lanes, protected left turns, rest in red, extended clearance times, and no right turn on red	• 96% of crashes occurred at intersections • ~2/3 of crashes occurred at night
Alcohol Involved	Vehicle is involved party, at least one party was under the influence of drugs or alcohol	40 crashes 7 KSI (15%)	Rest in red signal timing, rumble strips, guardrails and barriers, improved lighting, signage and striping enhancements, medians, uncontrolled crosswalk enhancements, roundabouts	• 86% of crashes occurred at night • ~1/2 occurred between Friday and Sunday

Notes:

1. 6 PM – 6 AM
2. Downtown is bounded by Middlefield Road to the north, El Camino Real to the south, Channing Avenue to the east, and Hawthorne to the west
3. Level of traffic stress (LTS) measures a bicyclist's perceived stress along different streets. LTS is ranked from 1-4, with 1 being the most comfortable facilities such as a dedicated bike path.
4. The data does not include the two recent youth crashes that occurred in 2023

APPENDIX E: COUNTERMEASURES TOOLBOX

LIST OF COUNTERMEASURES

Bikeways

Bicycle Crossing (Solid Green Paint)
Bicycle Ramp
Bicycle Signal/Exclusive Bike Phase
Bicycles May Use Full Lane Sign
Bike Box
Bike Detection
Bike Lane
Bike-Friendly Drain
Buffered Bike Lane
Door Zone Markings
Extend Bike Lane to Intersection
Extend Green Time For Bikes
Floating Transit Island or Bus Boarding Island
Green Conflict Striping
Mixing Zone
Separated Bikeway
Shared-Use Path
Two-Stage Turn Queue Bike Box

Pedestrian Facilities

Add Sidewalk
Audible Push Button Upgrade
Co-Locate Bus Stops and Pedestrian Crossings
Curb Extensions
Extend Time Push Button
High-Visibility Crosswalk
Landscape Buffer
Leading Pedestrian Interval and Pedestrian Recall
Pedestrian Countdown Timer
Pedestrian Hybrid Beacon
Rectangular Rapid Flashing Beacon
Remove Crossing Prohibition
Restripe Crosswalk
Upgrade Curb Ramp
Widen Sidewalk

Signals

Advanced Dilemma Zone Detection
Extend Pedestrian Crossing Time
Extend Yellow and All Red Time
Flashing Yellow Turn Phase
Pedestrian Scramble
Prohibit Left Turn
Prohibit Right-Turn-on-Red
Prohibit Turns During Pedestrian Phase
Protected Left Turns
Retroreflective Tape on Signals
Separate Right-Turn Phasing
Shorten Cycle Length
Signal Interconnectivity and Coordination / Green Wave
Speed Sensitive Rest in Red Signal
Supplemental Signal Heads
Upgrade Signal Head

Signing and Striping

- Advance Stop Bar
- Advance Yield Markings
- Chevron Signs on Horizontal Curves
- Curve Advance Warning Sign
- Flashing Beacon as Advance Warning
- LED-Enhanced Sign
- Painted Centerline and Raised Pavement Markers at Curves on Residential Streets
- Speed Feedback Sign
- Speed Legends on Pavement at Neighborhood Entries
- Striping Through Intersection
- Time-Based Turn Restriction
- Upgrade Intersection Pavement Markings
- Upgrade Signs with Fluorescent Sheeting
- Upgrade Striping
- Upgrade to Larger Warning Signs
- Wayfinding
- Yield To Pedestrians Sign

Intersections & Roadways

- All-Way Stop Control
- Centerline Hardening
- Close Slip Lane
- Directional Median Openings to Restrict Left Turns
- Guardrail
- Improved Pavement Friction
- Intersection Reconstruction and Tightening
- Lane Narrowing
- Left Turn Enhanced Daylighting/ Slow Turn Wedge
- Median Barrier
- Neighborhood Traffic Circle
- Partial Closure/Diverter
- Protected Intersection
- Raised Crosswalk
- Raised Intersection
- Raised Median
- Reduced Left-Turn Conflict Intersection
- Refuge Island
- Roadway Space Reallocation
- Roundabout
- Rumble Strips
- Safety Edge
- Signal
- Speed Hump or Speed Table
- Splitter Island
- Straighten Crosswalk
- Superelevation at Horizontal Curve Locations
- Widen/Pave Shoulder

Other

- Access Management/ Close Driveway
- Back-In Angled Parking
- Create or Increase Clear Zone
- Curbside Management
- Delineators, Reflectors, and/ or Object Markers
- Far-Side Bus Stop
- Impact Attenuators
- Intersection Lighting
- Median Guardrail
- Red Light Camera
- Relocate Select Hazardous Utility Poles
- Remove Obstructions For Sightlines
- Segment Lighting
- Speed Limit Reduction
- Upgrade Lighting to LED

WHAT YOU'LL SEE IN THIS TOOLBOX

Countermeasure category

Countermeasure icon

Countermeasure title

Countermeasure description

Countermeasure cost (excluding ROW costs) and the availability of low cost/quick build alternatives

$ = less than $15k

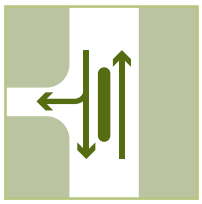
$$ = from $15k to $150k

$$$ = greater than $150k

Relevant crash type(s) addressed by the countermeasure

Safe System Hierarchy tier(s)

INTERSECTIONS & ROADWAYS



Median Barrier

Barrier in the center of the roadway that physically separates opposing vehicular traffic. Median barriers can also help control access to and from side streets and driveways, reducing the number of conflict points.

Cost **$$$**

Low Cost / Quick Build alternative available

LRSM ID **R03**

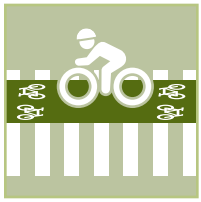
Other Reference Information

FHWA Manual for Selecting Safety Improvements on High Risk Rural Roads

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
Remove Severe Conflicts			

BIKEWAYS



Bicycle Crossing (Solid Green Paint)

Solid green paint across an intersection signifies the path of the bicycle crossing. Increases visibility of bicyclists' anticipated path of travel through an intersection.

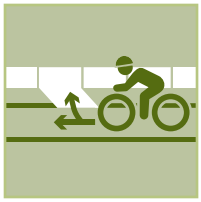
Cost **$**

Low Cost / Quick Build alternative available

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
			Increase Attentiveness and Awareness

BIKEWAYS



Bicycle Ramp

A ramp that connects bicyclists from the road to the sidewalk or a shared use path.

Cost **$**

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
Remove Severe Conflicts			

BIKEWAYS

Bicycle Signal/ Exclusive Bike Phase

A traffic signal directing bicycle traffic across an intersection. Separates in time bicycle movements from conflicting motor vehicle, streetcar, light rail, or pedestrian movements. May be applicable for Class IV facilities when the bikeway is brought up to the intersection.

Cost **$$$**

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
Remove Severe Conflicts		Manage Conflicts in Time	

BIKEWAYS

Bicycles May Use Full Lane Sign

A sign placed on roads with lanes that are too narrow to allow safe side-by-side in-lane passing of a bicyclist by a motorist - signs indicate that bicyclists may occupy the full lane. Intended to encourage motorists to provide ample space between side of the vehicle and an adjacent bicyclist when passing.

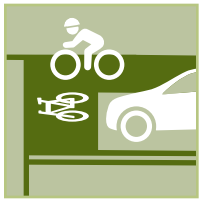
Cost **$**

Low Cost / Quick Build alternative available

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
			Increase Attentiveness and Awareness

BIKEWAYS



Bike Box

A designated area between the crosswalk and vehicle stop bar at a signalized intersection that is often painted green where bicyclists can wait during a red signal phase. The use of the bike box places bicyclists in a location where they are more visible to motorists.

Cost **$**

Low Cost / Quick Build alternative available

LRSM ID **S20PB**

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
Remove Severe Conflicts		Manage Conflicts in Time	Increase Attentiveness and Awareness

BIKEWAYS

Bike Detection

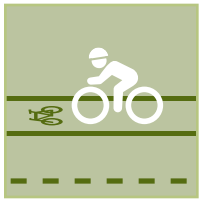
Technology used at signalized intersections, either through use of push-buttons, in-pavement loops, or by video or infrared cameras, to call a green light for bicyclists and reduce delay for bicycle travel. Discourages red light running by bicyclists and increases convenience of bicycling.

Cost **$$**

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
		Manage Conflicts in Time	

BIKEWAYS



Bike Lane

Bike lanes designate an exclusive space for bicyclists using pavement markings and signage. The bike lane is located adjacent to motor vehicle travel lanes and flows in the same direction as motor vehicle traffic. Bike lanes are typically on the right side of the street, between the adjacent travel lane and curb, road edge, or travel lane.

Cost **$$**

Low Cost / Quick Build alternative available

LRSM ID **R32PB**

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
Remove Severe Conflicts			

BIKEWAYS

Bike-Friendly Drain

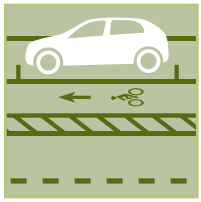
Drains that avoid placing grating in the right-of-way that may pose a hazard to bicyclists by increasing their risk of falling.

Cost **$$**

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
Remove Severe Conflicts			

BIKEWAYS



Buffered Bike Lane

Buffered Bike Lanes are standard bike lanes paired with a designated horizontal buffer space, separating the bicycle lane from the adjacent motor vehicle travel lane and/or parking lane. This type of bikeway provides greater distance between vehicles and bicycles; provides space for bicyclists to pass each other; provides greater space for bicycling without making the bike lane appear so wide that it might be mistaken for a travel lane; and encourages bicycling by contributing to the perception of safety.

Cost **$$**

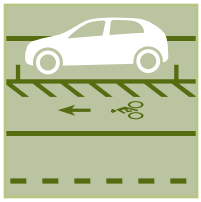
Low Cost / Quick Build alternative available

LRSM ID **R32PB**

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
Remove Severe Conflicts			

BIKEWAYS



Door Zone Markings

Pavement markings denoting door zone of parked vehicles to raise awareness of bicyclists and motorists of that conflict area where an open car door could obstruct the path of a passing bicyclist.

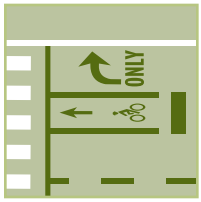
Cost **$**

Low Cost / Quick Build alternative available

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
			Increase Attentiveness and Awareness

BIKEWAYS



Extend Bike Lane to Intersection

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 bicyclists to move to the left side of right turning vehicles ahead of reaching the intersection.

Cost **$**

Low Cost / Quick Build alternative available

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
Remove Severe Conflicts			Increase Attentiveness and Awareness

BIKEWAYS

Extend Green Time For Bikes

Prolongs the green phase when bicyclists are present to provide additional time for bicyclists to clear the intersection. Can occur automatically in the signal phasing or when prompted with bicycle detection. Topography should be considered in clearance time.

Cost **$**

LRSM ID **S03**

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
		Manage Conflicts in Time	

BIKEWAYS

Floating Transit Island or Bus Boarding Island

Transit boarding island that is designed to allow bicycles to pass between the sidewalk and island thereby avoiding a bus-bike conflict when the bus stops at the boarding island. Can be used in combination with a bike lane, bufferred bike lane, or separated bike lane. The treatment can also reduce vehicle speeds as the island itself visually narrows the roadway and can have a traffic calming effect.

Cost **$$**

Low Cost / Quick Build alternative available

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
Remove Severe Conflicts	Reduce Vehicle Speeds		

BIKEWAYS

Green Conflict Striping

Green conflict striping is green pavement markings in a dashed pattern that extend across bike lanes approaching an intersection and/or going through an intersection. Green conflict striping improves and increases the visibility of bicyclists and potential conflict points so motorists and bicyclists can use caution when traveling toward and through an intersection.

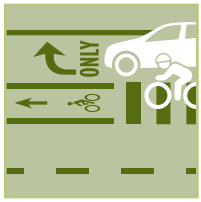
Cost **$**

Low Cost / Quick Build alternative available

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
			Increase Attentiveness and Awareness

BIKEWAYS



Mixing Zone

A mixing zone is where a suggested bike lane is within the inside portion of a dedicated motor vehicle turn lane. Lane markings delineate space for bicyclists and motorists within the same lane and indicate the intended path for bicyclists to reduce conflict with turning motor vehicles.

Cost **$**

Low Cost / Quick Build alternative available

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
			Increase Attentiveness and Awareness

BIKEWAYS

Separated Bikeway

A separated bikeway, also called a cycletrack, provides dedicated street space, typically adjacent to outer vehicle travel lanes, with physical separation from vehicle traffic, designated lane markings, pavement legends, and signage. Physical separation may consist of plastic posts, parked vehicles, raised median, or a curb (if the separated bike lane is raised to sidewalk level). Separated bikeways reduce conflicts between people biking and motorists. They also provide more physical protection that further reduces the risk of severe conflicts between bicycles and vehicles on the road. Separated bike lanes can also help manage or reduce vehicle speeds as some of the design features can have a traffic calming effect.

Cost **$$$**

Low Cost / Quick Build alternative available

LRSM ID **R33PB**

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
Remove Severe Conflicts			

BIKEWAYS

Shared-Use Path

Shared-use paths or trails are off-street facilities that provide exclusive use for nonmotorized travel, including bicyclists and pedestrians. They could be located alongside a roadway, or exist in a separate right-of-way. Bike paths have minimal cross flow with motorists and can be utilized for both recreational and commute trips.

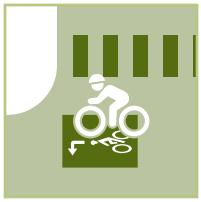
Cost **$$$**

Low Cost / Quick Build alternative available

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
Remove Severe Conflicts			

BIKEWAYS



Two-Stage Turn Queue Bike Box

This roadway treatment provides bicyclists with a means of making a left turn at a multi-lane signalized intersection from a bike lane or cycle track on the far right side of the roadway. In this way, bicyclists are removed from the flow of traffic while waiting to turn. Use of this treatment could be mirrored for right-turns from a one-way street with a left-side bikeway.

Cost **$**

Low Cost / Quick Build alternative available

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
Remove Severe Conflicts		Manage Conflicts in Time	Increase Attentiveness and Awareness

INTERSECTIONS & ROADWAYS

All-Way Stop Control

An all-way stop-controlled intersection requires all vehicles to stop before crossing the intersection. An all-way stop-controlled intersection reduces the risk of severe conflicts as long as all road users see and obey the stop signs. The MUTCD (Manual on Uniform Traffic Control Devices) includes information on when and how to implement "All Way" Or "Multi-Way" stop control intersections.

Cost $

LRSM ID NS02

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
Remove Severe Conflicts	Reduce Vehicle Speeds	Manage Conflicts in Time	Increase Attentiveness and Awareness

INTERSECTIONS & ROADWAYS

Centerline Hardening

Centerline hardening involves placing durable plastic bollards, flex posts, and/or rubber curbs along the centerline. When used at intersections, they can be effective at requiring motorists to make left-turn movements at a 90-degree angle, thereby slowing vehicle speeds and improving motorists' visibility of the crosswalks across which they travel when turning. When used along a roadway segment, they can be effective at generally slowing vehicle speeds and preventing undesirable left-turning and/or U-turns between intersections.

Cost $

Low Cost / Quick Build alternative available

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
	Reduce Vehicle Speeds		Increase Attentiveness and Awareness

INTERSECTIONS & ROADWAYS

Close Slip Lane

Modifies the corner of an intersection to remove the sweeping right turn lane for vehicles. Results in shorter crossings for pedestrians, reduced speed for turning vehicles, better sight lines, and space for landscaping and other amenities.

Cost **$$$**

Other Reference Information
FHWA Pedestrian Safety Guide and Countermeasure Selection System. http://www.pedbikesafe.org/PEDSAFE/countermeasures_detail.cfm?CM_NUM=24

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
Remove Severe Conflicts	Reduce Vehicle Speeds		

INTERSECTIONS & ROADWAYS

Directional Median Openings to Restrict Left Turns

A directional median opening restricts specific turning movements, such as allowing a left-turn from a major street but not from a minor street. A directional median opening to restrict left turn improves safety by reducing the number of conflict points.

Cost **$$**
Low Cost / Quick Build alternative available

LRSM ID **S14**

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
Remove Severe Conflicts			

INTERSECTIONS & ROADWAYS

Guardrail

Guardrail redirects a vehicle away from embankment slopes or fixed objects and dissipates the energy of an errant vehicle. Guardrail is installed to reduce the severity of lane departure crashes. However, guardrail can reduce crash severity only for those conditions where striking the guardrail is less severe than going down an embankment or striking a fixed object.

Cost **$$**

LRSM ID **R04**

Other Reference Information
FHWA Manual for Selecting Safety Improvements on High Risk Rural Roads

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
Remove Severe Conflicts			

INTERSECTIONS & ROADWAYS

Improved Pavement Friction

High friction surface treatments improve a vehicles' ability to stay on the roadway as well as come to a stop over a shorter distance. The treatment can be used to help address roadway departure crashes and/or intersection crashes on approach to unsignalized intersections.

Cost **$$**

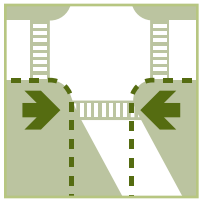
LRSM ID **R21**

Other Reference Information
FHWA Manual for Selecting Safety Improvements on High Risk Rural Roads

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
Remove Severe Conflicts	Reduce Vehicle Speeds		

INTERSECTIONS & ROADWAYS



Intersection Reconstruction and Tightening

Intersections that intersect at a skewed angle or angle notably different than 90-degrees have a greater likelihood of collisions. Squaring up the intersection helps reduce the likelihood of collisions. "Squaring up" an intersection as close to 90 degrees as possible involves intersection reconstruction and approach realignment to provide better visibility for all road users, also reducing high speed turns, reducing length exposure for vehicles and/or bikes passing through the intersection, and reducing pedestrian crossing length.

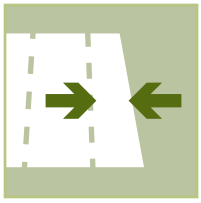
Cost **$$$**

Low Cost / Quick Build alternative available

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
Remove Severe Conflicts	Reduce Vehicle Speeds		Increase Attentiveness and Awareness

INTERSECTIONS & ROADWAYS



Lane Narrowing

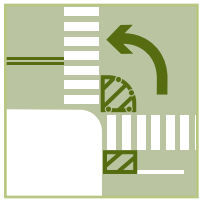
Lane narrowing reduces the width of the marked vehicle lanes to encourage motorists to travel at slower speeds. Lane narrowing can also help reallocate existing roadway space to other road users.

Cost **$**

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
	Reduce Vehicle Speeds		

INTERSECTIONS & ROADWAYS



Left Turn Enhanced Daylighting/Slow Turn Wedge

Uses paint and bollards to extend the curb and slow left turns at intersections of one-way to one-way or two-way streets. Widening the turning radii of left-turning vehicles expands the field of vision for drivers and increases the visibility of pedestrians.

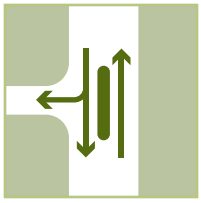
Cost **$**

Low Cost / Quick Build alternative available

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
	Reduce Vehicle Speeds		Increase Attentiveness and Awareness

INTERSECTIONS & ROADWAYS



Median Barrier

Barrier in the center of the roadway that physically separates opposing vehicular traffic. Median barriers can also help control access to and from side streets and driveways, reducing the number of conflict points.

Cost **$$$**

Low Cost / Quick Build alternative available

LRSM ID **R03**

Other Reference Information

FHWA Manual for Selecting Safety Improvements on High Risk Rural Roads

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
Remove Severe Conflicts			

INTERSECTIONS & ROADWAYS

Neighborhood Traffic Circle

Neighborhood traffic circles are circular intersections similar to roundabouts, but are stop controlled on the approach and intended for smaller intersections. Typically, they supplement existing stop-controlled intersections with a circular island in the center that is designed to slow traffic and eliminates severe conflict points (such as conflicting left-turn movements).

Cost **$**

Low Cost / Quick Build alternative available

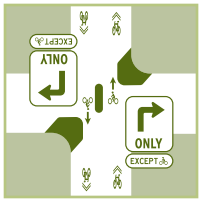
Other Reference Information

FHWA Pedestrian Safety Guide and Countermeasure Selection System. http://www.pedbikesafe.org/PEDSAFE/countermeasures_detail.cfm?CM_NUM=34

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
Remove Severe Conflicts	Reduce Vehicle Speeds		

INTERSECTIONS & ROADWAYS



Partial Closure/Diverter

A roadway treatment that restricts through vehicle movements using physical diversion while allowing bicyclists and pedestrians to proceed through an intersection in all directions.

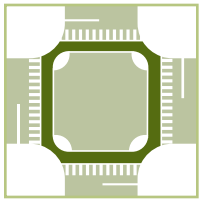
Cost **$**

Low Cost / Quick Build alternative available

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
Remove Severe Conflicts			

INTERSECTIONS & ROADWAYS



Protected Intersection

Protected intersections use corner islands, curb extensions, and colored paint to delineate bicycle and pedestrian movements across an intersection. Slower driving speeds and shorter crossing distance increase safety for pedestrians. Separates bicycles from pedestrians as well as moving vehicles.

Cost **$$$**

Low Cost / Quick Build alternative available

Other Reference Information

Evolution of the Protected Intersection, Alta Planning and Design, December 2015. https://altaplanning.com/wp-content/uploads/Evolution-of-the-Protected-Intersection_ALTA-2015.pdf

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
Remove Severe Conflicts	Reduce Vehicle Speeds		

INTERSECTIONS & ROADWAYS

Raised Crosswalk

A Raised Crosswalk is a pedestrian crosswalk that is typically elevated 3-6 inches above the road or at sidewalk level. A Raised Crosswalk improves increases crosswalk and pedestrian visibility and slows down motorists.

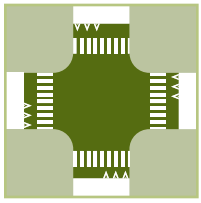
Cost **$$**

LRSM ID **R36PB**

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
	Reduce Vehicle Speeds		Increase Attentiveness and Awareness

INTERSECTIONS & ROADWAYS



Raised Intersection

Elevates the intersection to bring vehicles to the sidewalk level. Serves as a traffic calming measure by extending the sidewalk context across the road.

Cost **$$$**

Other Reference Information

Note: some studies in CMF Clearinghouse show an increase in crashes. See additional source below showing decrease. (1) Perkins+Will Consultant Team. "Pedestrians at Multi-Modal Intersections." Better Market Street Existing Conditions & Best Practices, Part Two: Best Practices 36-58, City & County of San Francisco, San Francisco. http://www.bettermarketstreetsf.org/about-reports-existing-conditions.html (2) Bhatt, Shailen, Natalie Barnhart, Mark Luszcz, Tom Meyer, & Michael Sommers. "Delaware Traffic Calming Design Manual." Delaware Department of Transportation, State of Delaware, Dover, DE. https://nacto.org/wp-content/uploads/2015/04/DE-Trafc-Calming-Manual_2012.pdf (3) King, Michael R, Jon A Carnegie, and Reid Ewing. "Pedestrian Safety through a Raised Median and Redesigned Intersections." Journal of the Transportation Research Board 1828 (1), 56-66, Transportation Research Board, Washington, DC. https://trid.trb.org/view/663867 (4) Fitzpatrick, Kay, Mark D Wooldridge, and Joseph D Blaschke. "Urban Intersection Design Guide: Volume 1–Guidelines." Texas Transportation Institute, Texas A&M University System, Texas Department of Transportation, Austin, TX. https://static.tti.tamu.edu/tti.tamu.edu/documents/0-4365-P2.pdf

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
	Reduce Vehicle Speeds		Increase Attentiveness and Awareness

INTERSECTIONS & ROADWAYS

Raised Median

Curbed sections in the center of the roadway that are physically separated from vehicular traffic. Raised medians can also help control access to and from side streets and driveways, reducing conflict points.

Cost **$$**

Low Cost / Quick Build alternative available

LRSM ID **S12/NS14/R08**

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
Remove Severe Conflicts	Reduce Vehicle Speeds		

INTERSECTIONS & ROADWAYS

Reduced Left-Turn Conflict Intersection

Geometric designs that alter how left-turn movements occur can simplify decisions and minimize the potential for left-turn related crashes. Two designs that rely on U-turns to complete certain left-turn movements are known as the restricted crossing U-turn (RCUT) and the median U-turn (MUT). Both designs require some out of direction travel for vehicles.

Cost **$$$**

LRSM ID **NS16**

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
Remove Severe Conflicts			

INTERSECTIONS & ROADWAYS

Refuge Island

A Raised Median, or Refuge Island, is a raised barrier in the center of the roadway that can restrict certain turning movements and provide a place for pedestrians to wait if they are unable to finish crossing the intersection. A Raised Median reduces the number of potential conflict points with designated zones for vehicles to turn, and a pedestrian refuge island reduces the exposure for pedestrians crossing the intersection. Pedestrian refuge areas constructed from paint and plastic may be implemented as part of a low-cost/quick build project.

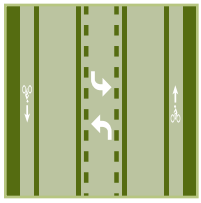
Cost **$$**
Low Cost / Quick Build alternative available

LRSM ID **NS19PB**

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
Remove Severe Conflicts	Reduce Vehicle Speeds		

INTERSECTIONS & ROADWAYS



Roadway Space Reallocation

Reallocating roadway space by reducing space dedicated to vehicle travel lanes to create room for bicycle facilities, wider sidewalks, or center turn lanescan reduce vehicle speeds and creates designated space for all road users.

Cost **$$**

Low Cost / Quick Build alternative available

LRSM ID **R14**

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
Remove Severe Conflicts	Reduce Vehicle Speeds		

INTERSECTIONS & ROADWAYS

Roundabout

A roundabout is a type of circular intersection in which road traffic is permitted to flow in one direction around a central island, and priority is typically given to traffic already in the junction. The types of conflicts that occur at roundabouts are different from those occurring at conventional intersections; namely, severe conflicts from crossing and left-turn movements are not present in a roundabout. The geometry of a roundabout forces drivers to reduce speeds as they proceed through the intersection; the range of vehicle speeds is also narrowed, reducing the severity of crashes when they do occur. Pedestrians also only have to cross one direction of traffic at a time at roundabouts, thus reducing exposure to vehicle traffic.

Cost **$$$**

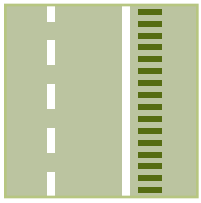
Low Cost / Quick Build alternative available

LRSM ID **S16/NS04**

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
Remove Severe Conflicts	Reduce Vehicle Speeds		

INTERSECTIONS & ROADWAYS



Rumble Strips

Rumble strips create noise and vibration inside the vehicle that alert a driver as they cross the centerline or edge line. Treatment can help with lane keeping instances where a driver is distracted or drowsy. Rumble strips also alert drivers to the lane limits when conditions such as rain, fog, snow, or dust reduce driver visibility.

Cost $

LRSM ID R30/R31

Other Reference Information
FHWA Manual for Selecting Safety Improvements on High Risk Rural Roads

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
			Increase Attentiveness and Awareness

INTERSECTIONS & ROADWAYS

Safety Edge

When a vehicle leaves the traveled way and encounters a pavement-shoulder drop-off, it can be difficult for the driver to return safely to the roadway. A safety edge is a treatment intended to minimize the severity of roadway or lane departure crashes. With this treatment, the shoulder pavement edge is sloped at an angle (30-35 degrees) to make it easier for a driver to safely reenter the roadway after inadvertently driving onto the shoulder. This treatment could be incorporated as a standard practice in overlay or roadway resurfacing projects.

Cost $

Other Reference Information
FHWA Manual for Selecting Safety Improvements on High Risk Rural Roads

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
Remove Severe Conflicts			

INTERSECTIONS & ROADWAYS

Signal

Traffic signals at intersections control the flow of traffic by assigning right-of-way to different movements at different times. Some traffic signal phasing is more effective at reducing the likelihood of severe injury collisions. For example, protected left-turn signal phasing reduces the likelihood of severe left-turn collisions more effectively than permitted left-turn signal phasing.

Cost **$$$**

LRSM ID **NS03**

Other Reference Information
Currently the CMF Clearinghouse has only one reference for ped/vehicle collisions which indicates an increase in crash likelihood. However, a majority of references for all crash types show a decrease in collisions. See additional reference: FHWA Manual for Selecting Safety Improvements on High Risk Rural Roads

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
		Manage Conflicts in Time	

INTERSECTIONS & ROADWAYS

Speed Hump or Speed Table

These traffic calming devices use vertical deflection to raise the entire wheelbase of a vehicle and encourage motorists to travel at slower speeds.

Cost **$**

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
	Reduce Vehicle Speeds		Increase Attentiveness and Awareness

INTERSECTIONS & ROADWAYS

Splitter Island

A raised area that separates the two directions of travel on the minor street approach at an unsignalized intersection or roundabout. Helps channelize traffic in opposing directions of travel. Also helps improve the visibility of an intersection when approaching it. Provides a refuge for pedestrians.

Cost **$$**
Low Cost / Quick Build alternative available

LRSM ID **NS13**

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
Remove Severe Conflicts	Reduce Vehicle Speeds		Increase Attentiveness and Awareness

INTERSECTIONS & ROADWAYS

Straighten Crosswalk

Straightening crosswalks improves sight lines, making pedestrians more visible to oncoming drivers, and may shorten the crossing distance, reducing the length of time required for pedestrians to cross an intersection.

Cost **$**
Low Cost / Quick Build alternative available

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
Remove Severe Conflicts			Increase Attentiveness and Awareness

INTERSECTIONS & ROADWAYS

Superelevation at Horizontal Curve Locations

Superelevation is the rotation of the pavement on the approach to and through a horizontal curve and is intended to assist the driver in negotiating the curve by counteracting the lateral acceleration produced by tracking. In other words, the road is designed so that the pavement rises as it curves, offsetting the horizontal sideways momentum of the approaching vehicle. Superelevation can help vehicles stay on the roadway. Superelevation can also inadvertently make it easier for drivers to drive at higher than desirable speeds. Consider the target or desired speed for a roadway and relevant design guidance when selecting appropriate superelevation.

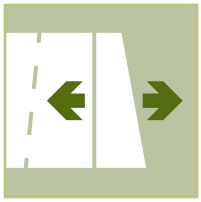
Cost **$$**

Other Reference Information
FHWA Manual for Selecting Safety Improvements on High Risk Rural Roads

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
Remove Severe Conflicts			

INTERSECTIONS & ROADWAYS



Widen/Pave Shoulder

Widened and paved shoulders, which may also include flattening the slopes along the sides of the roadway, create a separated space for bicyclists, create space for a driver to safely recover if they inadvertently depart the travel lane, and also provide space for inoperable vehicles to pull out of the travel lane. The addition of a paved shoulder to an existing road can help to reduce run-off-road crashes. Benefits can be realized for high-risk rural roads without paved shoulders, regardless of existing lane pavement width. Adding paved shoulders within horizontal curve sections may help agencies maximize the benefits of the treatment while minimizing costs as opposed to adding paved shoulders to an entire corridor.

Cost **$$**

LRSM ID **R15**

Other Reference Information
FHWA Manual for Selecting Safety Improvements on High Risk Rural Roads

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
Remove Severe Conflicts			

PEDESTRIAN FACILITIES

Add Sidewalk

Adding sidewalks provides a separated and continuous facility for people to walk along the roadway.

Cost **$$$**

LRSM ID **R34PB**

Other Reference Information
Data in the CMF Clearinghouse is currently limited to bicycle/vehicle collisions. See additional reference: FHWA Pedestrian Safety Guide and Countermeasure Selection System. http://www.pedbikesafe.org/PEDSAFE/countermeasures_detail.cfm?CM_NUM=1

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
Remove Severe Conflicts			

PEDESTRIAN FACILITIES

Audible Push Button Upgrade

Push buttons must comply with the Americans with Disability Act (ADA) standards for accessibility. Pushbuttons should be visible and conveniently located for pedestrians waiting at a crosswalk. Accessible pedestrian signals, including audible push buttons, improve access for pedestrians who are blind or have low vision. Public Rights of Way Accessibility Guidelines (PROWAG) includes accessibility design guidance.

Cost **$**

Other Reference Information
Audible Push Button Upgrade and Extended Time Pushbutton: FHWA Pedestrian Safety Guide and Countermeasure Selection System. http://www.pedbikesafe.org/PEDSAFE/countermeasures_detail.cfm?CM_NUM=52

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
		Manage Conflicts in Time	Increase Attentiveness and Awareness

PEDESTRIAN FACILITIES

Co-Locate Bus Stops and Pedestrian Crossings

Place bus stops and pedestrian crossings in close proximity to allow transit riders to cross the street at well-designed crossing locations.

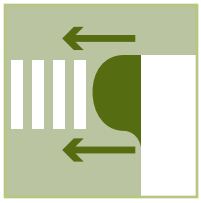
Cost **$**

Low Cost / Quick Build alternative available

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
			Increase Attentiveness and Awareness

PEDESTRIAN FACILITIES



Curb Extensions

A curb extension is a traffic calming measure that widens the sidewalk for a short distance to enhance the pedestrian crossing. This reduces the crossing distance and allows pedestrians and drivers to see each other when parked vehicles would otherwise block visibility. Paint and plastic curb extensions are a low-cost/quick-build option.

Cost **$$**

Low Cost / Quick Build alternative available

LRSM ID **NS21PB**

Other Reference Information

(1) Application of Pedestrian Crossing Treatments for Streets and Highways, NCHRP, 2016. https://www.nap.edu/catalog/24634/application-of-pedestrian-crossing-treatments-for-streets-and-highways (2) Development of Crash Modification Factors for Uncontrolled Pedestrian Crossing Treatments, NCHRP, 2017. https://www.nap.edu/catalog/24627/development-of-crash-modifcation-factors-for-uncontrolled-pedestrian-crossing-treatments (3) Evaluation of Pedestrian-Related Roadway Measures, Pedestrian and Bicycle Information Center, 2014. http://www.pedbikeinfo.org/cms/downloads/PedestrianLitReview_April2014.pdf

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
	Reduce Vehicle Speeds		Increase Attentiveness and Awareness

PEDESTRIAN FACILITIES

Extend Time Push Button

A push button that can be pressed to request extra time for using the crosswalk, beyond the standard crossing time. Ideal near senior-serving land uses.

Cost $

Other Reference Information
Audible Push Button Upgrade and Extended Time Pushbutton: FHWA Pedestrian Safety Guide and Countermeasure Selection System. http://www.pedbikesafe.org/PEDSAFE/countermeasures_detail.cfm?CM_NUM=52

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
		Manage Conflicts in Time	

PEDESTRIAN FACILITIES

High-Visibility Crosswalk

A high-visibility crosswalk has a striped pattern with ladder markings made of high-visibility material, such as thermoplastic tape, instead of paint. A high-visibility crosswalk improves the visibility of marked crosswalks and provides motorists a cue to slow down and yield to pedestrians.

Cost $
Low Cost / Quick Build alternative available

LRSM ID S18/NS20

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
			Increase Attentiveness and Awareness

PEDESTRIAN FACILITIES

Landscape Buffer

Separating drivers from bicyclists and pedestrians using landscaping provides more space between the modes and can produce a traffic calming effect by encouraging drivers to drive at slower speeds, lowering the risk of crashing.

Cost $$

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
Remove Severe Conflicts	Reduce Vehicle Speeds		

PEDESTRIAN FACILITIES

Leading Pedestrian Interval and Pedestrian Recall

At intersection locations that have a high volume of turning vehicles and have high pedestrian vs. vehicle crashes, a leading pedestrian interval gives pedestrians the opportunity to enter an intersection 3 - 7 seconds before vehicles are given a green indication. With this head start, pedestrians can better establish their presence in the crosswalk before vehicles have priority to turn left or right. Pedestrian recall is a traffic signal timing function that causes a pedestrian walk phase to activate automatically every cycle.

Cost $

LRSM ID S21PB

Other Reference Information

Pedestrian Phase Recall: Evaluation of Pedestrian-Related Roadway Measures, Pedestrian and Bicycle Information Center, 2014. http://www.pedbikeinfo.org/cms/downloads/PedestrianLitReview_April2014.pdf

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
		Manage Conflicts in Time	

PEDESTRIAN FACILITIES

Pedestrian Countdown Timer

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

Cost $$

LRSM ID S17PB

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
			Increase Attentiveness and Awareness

PEDESTRIAN FACILITIES

Pedestrian Hybrid Beacon

A pedestrian-hybrid beacon (PHB) is used at unsignalized intersections or mid-block crosswalks to notify oncoming motorists to stop with a series of red and yellow lights. Unlike a traffic signal, the PHB rests in dark until a pedestrian activates it via pushbutton or other form of detection.

Cost $$$

LRSM ID NS23PB

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
		Manage Conflicts in Time	Increase Attentiveness and Awareness

PEDESTRIAN FACILITIES

Rectangular Rapid Flashing Beacon

A rectangular rapid flashing beacon (RRFB) is a pedestrian-activated flashing light with additional signage to alert motorists of a pedestrian crossing. An RRFB increases the visibility of marked crosswalks and provides motorists a cue to slow down and yield to pedestrians. RRFBs and other pedestrian devices are evaluated using NCHRP 562 methodology.

Cost **$$**

LRSM ID **NS22PB**

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
			Increase Attentiveness and Awareness

PEDESTRIAN FACILITIES

Remove Crossing Prohibition

Removes existing crossing prohibitions and provides marked crosswalk and other crossing enhancements for pedestrians to cross the street.

Cost **$**

Low Cost / Quick Build alternative available

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
			Increase Attentiveness and Awareness

PEDESTRIAN FACILITIES

Restripe Crosswalk

Periodic restriping of crosswalks is necessary to maintaing visibility of the traffic markings. Crosswalk may be restriped with high visibility markings.

Cost **$**

Low Cost / Quick Build alternative available

Other Reference Information
FHWA Pedestrian Safety Guide and Countermeasure Selection System. http://www.pedbikesafe.org/PEDSAFE/countermeasures_detail.cfm?CM_NUM=4

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
			Increase Attentiveness and Awareness

PEDESTRIAN FACILITIES

Upgrade Curb Ramp

Tactile warning devices must be detectable to visually impaired pedestrians. Curb ramps must follow PROWAG and local design guidelines.

Cost **$$**

Other Reference Information
FHWA Pedestrian Safety Guide and Countermeasure Selection System. http://www.pedbikesafe.org/PEDSAFE/countermeasures_detail.cfm?CM_NUM=3

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
Remove Severe Conflicts			Increase Attentiveness and Awareness

PEDESTRIAN FACILITIES

Widen Sidewalk

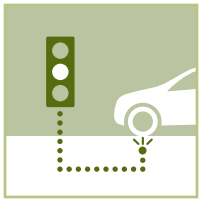
Widening sidewalks provides a more comfortable space for pedestrians, particularly in locations with high volumes of pedestrians, and provides space to accommodate people in wheelchairs. Widening sidewalks reduces the likelihood of collisions with pedestrians walking in the road.

Cost $$

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
Remove Severe Conflicts			

SIGNALS



Advanced Dilemma Zone Detection

The Advanced Dilemma-Zone Detection system adjusts the start time of the yellow-signal phase (i.e. earlier or later) based on observed vehicle locations and speeds. The Advanced Dilemma-Zone Detection system minimizes the number of drivers that are faced with the dilemma of determining if they should stop at the intersection or drive through the intersection based on their speed and distance from the intersection.

Cost $$

LRSM ID S04

Other Reference Information
FHWA Manual for Selecting Safety Improvements on High Risk Rural Roads

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
		Manage Conflicts in Time	

SIGNALS

Extend Pedestrian Crossing Time

Increases time for pedestrian walk phases, especially to accommodate vulnerable populations, such as children and the elderly.

Cost **$**

Low Cost / Quick Build alternative available

LRSM ID **S03**

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
		Manage Conflicts in Time	

SIGNALS

Extend Yellow and All Red Time

Extending yellow and all red time increases the time allotted for the yellow and red lights during a signal phase. Extending yellow and all red time allows drivers and bicyclists a few additional seconds of time at the end of a signal phase to cross through a signalized intersection before conflicting traffic movements are permitted to enter the intersection.

Cost **$**

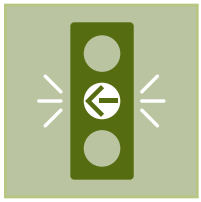
Low Cost / Quick Build alternative available

LRSM ID **S03**

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
		Manage Conflicts in Time	

SIGNALS



Flashing Yellow Turn Phase

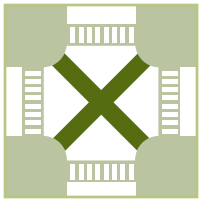
Flashing yellow turn arrow alerts drivers to proceed with caution and decide if there is a sufficient gap in oncoming traffic to safely make a turn. To be used only when a pedestrian walk phase is not called. Protected-only phases should be used when pedestrians are present.

Cost $$

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
			Increase Attentiveness and Awareness

SIGNALS



Pedestrian Scramble

A form of pedestrian "WALK" phase at a signalized intersection in which all vehicular traffic is required to stop, allowing pedestrians to cross through the intersection in any direction, including diagonally.

Cost $$

LRSM ID S03

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
Remove Severe Conflicts		Manage Conflicts in Time	

SIGNALS

Prohibit Left Turn

Prohibitions of left turns at locations where a turning vehicle may conflict with pedestrians in the crosswalk or where opposing traffic volume is high. Reduces pedestrian interaction with vehicles when crossing.

Cost **$**

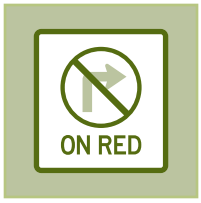
Low Cost / Quick Build alternative available

LRSM ID **S15/NS16**

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
Remove Severe Conflicts		Manage Conflicts in Time	

SIGNALS



Prohibit Right-Turn-on-Red

Prohibiting right-turn-on-red movements should be considered at skewed intersections, or where exclusive pedestrian "WALK" phases, Leading Pedestrian Intervals (LPIs), sight distance issues, or high pedestrian volumes are present. Can help prevent crashes between vehicles turning right on red from one street and through vehicles on the cross street, and crashes involving pedestrians.

Cost **$**

Low Cost / Quick Build alternative available

Other Reference Information

Currently the CMF Clearinghouse does not include specific studies; however, permitting right-turns-on-red shows an increase in ped/vehicle crashes. Additional information is available at the FHWA Pedestrian Safety Guide and Countermeasure Selection System. http://www.pedbikesafe.org/PEDSAFE/countermeasures_detail.cfm?CM_NUM=49

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
Remove Severe Conflicts		Manage Conflicts in Time	

SIGNALS

Prohibit Turns During Pedestrian Phase

Restricts left or right turns during the pedestrian crossing phase at locations where a turning vehicle may conflict with pedestrians in the crosswalk. This restriction may be displayed with a blank-out sign.

Cost $

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
		Manage Conflicts in Time	

SIGNALS

Protected Left Turns

A protected left turn can be implemented at signalized intersections (with existing left turns pockets) that currently have a permissive left-turn or no left-turn protection. Providing protected left-turn phases for signalized intersections removes the need for the drivers to navigate through gaps in oncoming/opposing through vehicles.

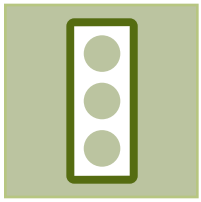
Cost $$

LRSM ID S06/S07

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
Remove Severe Conflicts		Manage Conflicts in Time	

SIGNALS



Retroreflective Tape on Signals

Retroreflective borders enhance the visibility of traffic signals for aging and color-vision-impaired drivers, enabling them to understand which signal indication is illuminated. Retroreflective borders may also alert drivers to signalized intersections during periods of power outages when the signals would otherwise be dark and non–reflective signal heads and backplates would not be visible.

Cost **$**

Low Cost / Quick Build alternative available

LRSM ID **S02**

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
			Increase Attentiveness and Awareness

SIGNALS

Separate Right-Turn Phasing

Provides a green arrow phase for right-turning vehicles. Avoids conflicts between right-turning traffic and bicyclists or pedestrians crossing the intersection on their right.

Cost **$$$**

Other Reference Information

(1) Evaluation of Pedestrian-Related Roadway Measures, Pedestrian and Bicycle Information Center, 2014. http://www.pedbikeinfo.org/cms/downloads/PedestrianLitReview_April2014.pdf (2) FHWA Manual for Selecting Safety Improvements on High Risk Rural Roads

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
		Manage Conflicts in Time	

SIGNALS

Shorten Cycle Length

Traffic signal cycle lengths have a significant impact on the quality of the urban realm and consequently, the opportunities for bicyclists, pedestrians, and transit vehicles to operate effectively along a corridor. Long signal cycles, compounded over multiple intersections, can make crossing a street or walking even a short distance prohibitive and frustrating. Short cycle lengths of 60–90 seconds are ideal for urban areas.

Cost **$**

Low Cost / Quick Build alternative available

Other Reference Information
FHWA Pedestrian Safety Guide and Countermeasure Selection System. http://www.pedbikesafe.org/PEDSAFE/countermeasures_detail.cfm?CM_NUM=45

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
		Manage Conflicts in Time	

SIGNALS

Signal Interconnectivity and Coordination / Green Wave

The emphasis on improving signal coordination for this countermeasure is to provide an opportunity for slow-speed signal coordination. Coordinating signals to allow for bicyclist progression, also known as a 'green wave,' gives bicyclists and pedestrians more time to cross through the 'green wave' intersections. It also slows vehicle speeds, helping to reduce the likelihood of severe collisions.

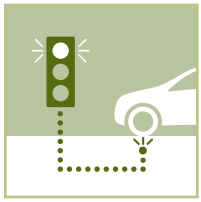
Cost **$$**

LRSM ID **S03**

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
	Reduce Vehicle Speeds		

SIGNALS



Speed Sensitive Rest in Red Signal

At certain hours (e.g. late night) a signal remains red for all approaches or certain approaches until a vehicle arrives at the intersection. If the vehicle is going faster than the desired speed, the signal will not turn green until after vehicle stops. If the vehicle is going the desired speed the signal will change to green before the vehicle arrives. This signal timing provides operational benefit to drivers traveling at the desired speed limit. Can be paired with variable speed warning signs.

Cost $$

LRSM ID R26

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
	Reduce Vehicle Speeds	Manage Conflicts in Time	

SIGNALS

Supplemental Signal Heads

Additional signal heads allow drivers to anticipate signal changes farther away from intersections. Supplemental traffic signals may be placed on the near side of an intersection, far-left, far-right, or very high.

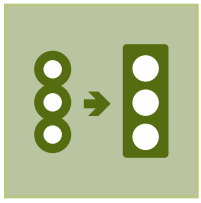
Cost $$

LRSM ID S02

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
			Increase Attentiveness and Awareness

SIGNALS



Upgrade Signal Head

Upgrading Signal Heads replaces existing 8-inch signal heads with 12-inch signal heads to comply with the California MUTCD's 2014 guidelines. Upgrading signal heads provides better visibility of intersection signals and by aiding drivers' advanced perception of upcoming intersections.

Cost $

LRSM ID S02

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
			Increase Attentiveness and Awareness

SIGNING & STRIPING

Advance Stop Bar

An advanced stop bar is a horizontal stripe painted ahead of the crosswalk at stop signs and signals to indicate where drivers should stop. An advanced stop bar reduces instances of vehicles encroaching on the crosswalk. Creating a wider stop bar or setting the stop bar further back may be appropriate for locations with known crosswalk encroachment issues.

Cost $

Low Cost / Quick Build alternative available

LRSM ID S20PB

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
			Increase Attentiveness and Awareness

SIGNING & STRIPING

Advance Yield Markings

Yield lines are placed 20 to 50 feet in advance of multi-lane pedestrian crossings to increase visibility of pedestrians. They can reduce the likelihood of a multiple-threat crash.

Cost **$**
Low Cost / Quick Build alternative available

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
			Increase Attentiveness and Awareness

SIGNING & STRIPING

Chevron Signs on Horizontal Curves

Post-mounted chevrons are intended to warn drivers of an approaching curve and provide tracking information and guidance to the drivers.

Cost **$**
Low Cost / Quick Build alternative available

LRSM ID **R23**

Other Reference Information
FHWA Manual for Selecting Safety Improvements on High Risk Rural Roads

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
			Increase Attentiveness and Awareness

SIGNING & STRIPING

Curve Advance Warning Sign

A curve advance warning sign notifies drivers of an approaching curve and may include an advisory speed limit as drivers navigate around the curve. This warning sign is ideally combined with other infrastructure that alerts drivers of the curve, such as chevron signs, delineators, and flashing beacons. A curve advance warning sign provides drivers additional time to slow down for the curve.

Cost **$**

Low Cost / Quick Build alternative available

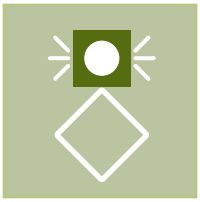
LRSM ID **R24**

Other Reference Information
FHWA Manual for Selecting Safety Improvements on High Risk Rural Roads

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
			Increase Attentiveness and Awareness

SIGNING & STRIPING



Flashing Beacon as Advance Warning

A flashing beacon as an Advanced Warning is a blinking light with signage to notify motorists of an upcoming intersection or crosswalk. A flashing beacon provides motorists more time to be aware of and slow down for an intersection or yield to pedestrians crossing a crosswalk.

Cost **$$**

LRSM ID **S10**

Other Reference Information
FHWA Manual for Selecting Safety Improvements on High Risk Rural Roads

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
			Increase Attentiveness and Awareness

SIGNING & STRIPING

LED-Enhanced Sign

An LED-Enhanced Sign has LED lights embedded in the sign to outline the sign itself or the words and symbols on the sign. The LEDs may be set to flash or operate in a steady mode. An LED-enhanced sign improves the visibility of signs at locations with visibility limitations or with a documented history of drivers failing to see or obey the sign (e.g. at STOP signs).

Cost **$**

Low Cost / Quick Build alternative available

LRSM ID **NS08**

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
			Increase Attentiveness and Awareness

SIGNING & STRIPING

Painted Centerline and Raised Pavement Markers at Curves on Residential Streets

A raised pavement marker is a small device attached to the road and used as a positioning guide for drivers.

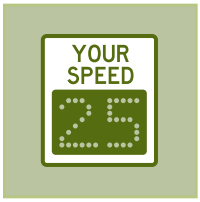
Cost **$**

Low Cost / Quick Build alternative available

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
			Increase Attentiveness and Awareness

SIGNING & STRIPING



Speed Feedback Sign

A speed feedback sign notifies drivers of their current speed, usually followed by a reminder of the posted speed limit. A speed feedback sign provides a cue for drivers to check their speed and slow down, if necessary.

Cost **$**

Low Cost / Quick Build alternative available

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
			Increase Attentiveness and Awareness

SIGNING & STRIPING

Speed Legends on Pavement at Neighborhood Entries

Speed legends are numerals painted on the roadway indicating the current speed limit in miles per hour. They are usually placed near speed limit signposts.

Cost **$**

Low Cost / Quick Build alternative available

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
			Increase Attentiveness and Awareness

SIGNING & STRIPING

Striping Through Intersection

Adding clear pavement markings can guide motorists through complex intersections. Intersections where the lane designations are not clearly visible to approaching motorists and/or intersections noted as being complex and experiencing crashes that could be attributed to a driver's unsuccessful attempt to navigate the intersection can benefit from this treatment.

Cost **$**

Low Cost / Quick Build alternative available

LRSM ID **S09**

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
			Increase Attentiveness and Awareness

SIGNING & STRIPING

Time-Based Turn Restriction

Restricts left-turns or right-turns during certain time periods when there may be increased potential for conflict (e.g., peak periods, school hours).

Cost **$**

Low Cost / Quick Build alternative available

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
		Manage Conflicts in Time	

SIGNING & STRIPING

Upgrade Intersection Pavement Markings

Upgrading intersection pavement marking can include "Stop Ahead" markings and the addition of centerlines and stop bars. Upgrading intersection pavement markings can increase the visibility of intersections for drivers approaching and at the intersection.

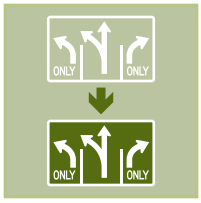
Cost **$**
Low Cost / Quick Build alternative available

LRSM ID **NS07**

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
			Increase Attentiveness and Awareness

SIGNING & STRIPING



Upgrade Signs with Fluorescent Sheeting

Upgrading signs with fluorescent sheeting replaces existing signs with new signs that can clearly display warnings by reflecting headlamp light back to vehicles. Upgrading signs with fluorescent sheeting improves visibility of signs to drivers at night.

Cost **$**
Low Cost / Quick Build alternative available

LRSM ID **R22**

Other Reference Information
FHWA Manual for Selecting Safety Improvements on High Risk Rural Roads

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
			Increase Attentiveness and Awareness

SIGNING & STRIPING

Upgrade Striping

Restripe lanes with reflective striping to improve striping visibility and clarify lane assignment, especially where the number of lanes changes.

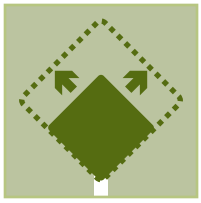
Cost **$**

Low Cost / Quick Build alternative available

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
			Increase Attentiveness and Awareness

SIGNING & STRIPING



Upgrade to Larger Warning Signs

Upgrading to larger warning signs replaces existing signs with physically larger signs with larger warning information. Upgrading to larger warning signs increases the visibility of the information provided, particularly for older drivers.

Cost **$**

Low Cost / Quick Build alternative available

LRSM ID **NS06**

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
			Increase Attentiveness and Awareness

SIGNING & STRIPING

Wayfinding

A network of signs that highlight nearby pedestrian and bicycle facilities. Can help to reduce crossings at locations with poor sight distance or limited crossing enhancements.

Cost $

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
			Increase Attentiveness and Awareness

SIGNING & STRIPING

Yield To Pedestrians Sign

"Yield Here to Pedestrians" signs alert drivers about the presence of pedestrians. These signs are required with advance yield lines. Other sign types can be placed on the centerline in the roadway.

Cost $

Low Cost / Quick Build alternative available

LRSM ID NS06

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
			Increase Attentiveness and Awareness

OTHER

Access Management/ Close Driveway

Vehicles entering and exiting driveways may conflict with pedestrians and with vehicles on the main road, especially at driveways within 250 feet of intersections. Driveway consolidation reduces conflict points along a segment and/or near intersections.

Cost $$

Other Reference Information
The CMF Clearinghouse has limited research related to vehicle/pedestrian crashes. See additional reference: FHWA Pedestrian Safety Guide and Countermeasure Selection System. http://www.pedbikesafe.org/PEDSAFE/countermeasures_detail.cfm?CM_NUM=20

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
Remove Severe Conflicts			

OTHER

Back-In Angled Parking

Back-In Angled Parking requires motorists to back into an angled on-street parking spot and to drive forward when exiting a parking spot. Back-in angled parking increases the visibility of passing vehicles and bicycles while exiting a spot, particularly if large adjacent vehicles obstruct sight, and allows trunk unloading to happen on the curb instead of in the street.

Cost $

Low Cost / Quick Build alternative available

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
			Increase Attentiveness and Awareness

OTHER

Create or Increase Clear Zone

A clear zone is an unobstructed, traversable roadside area that allows a driver to stop safely or regain control of a vehicle that has left the roadway. The width of the clear zone is informed by roadway context, desired vehicle speeds, and agency design standards.

Cost $$

Other Reference Information
FHWA Manual for Selecting Safety Improvements on High Risk Rural Roads

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
			Increase Attentiveness and Awareness

OTHER

Curbside Management

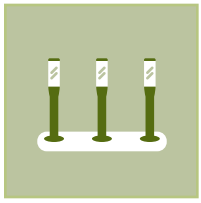
Curbside management helps prioritize different uses that would otherwise be in conflict with one another such as location of bus stops, bicycle infrastructure, freight deliveries, passenger pick-ups/drop-offs, green stormwater infrastructure, public spaces, and parking management.

Cost $

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
Remove Severe Conflicts			

OTHER



Delineators, Reflectors, and/or Object Markers

Delineators, reflectors and/or object markers are intended to warn drivers of an approaching curve or fixed object that cannot easily be removed. They are generally less costly than Chevron Signs as they don't require posts to place along the roadside.

Cost **$**

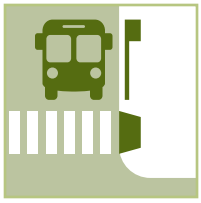
Low Cost / Quick Build alternative available

LRSM ID **R27**

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
			Increase Attentiveness and Awareness

OTHER



Far-Side Bus Stop

Far-side bus stops are located immediately after an intersection, allowing the bus to pass through the intersection before stopping for passenger loading and unloading. Far-side stops encourage pedestrians to cross behind the bus for greater visibility and can improve transit service reliability.

Cost **$**

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
			Increase Attentiveness and Awareness

OTHER

Impact Attenuators

Impact attenuators bring an errant vehicle to a more-controlled stop or redirect the vehicle away from a rigid object. Impact attenuators are typically used to shield rigid roadside objects such as concrete barrier ends, steel guardrail ends and bridge pillars from oncoming automobiles. Attenuators tend to be installed where it is impractical for the objects to be removed.

Cost $$

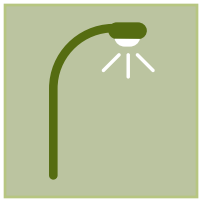
LRSM ID R05

Other Reference Information
FHWA Manual for Selecting Safety Improvements on High Risk Rural Roads

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
Remove Severe Conflicts			Increase Attentiveness and Awareness

OTHER



Intersection Lighting

Adding intersection and/or pedestrian-scale lighting at intersections increases the visibility of all road users. This countermeasure is most effective at reducing or preventing collisions at intersections at night or in low-light conditions. When lighting pedestrian crosswalks, it is helpful to use lighting analysis to avoid designs that inadvertently introduce glare or backlight pedestrians, making it hard for motorists to see them.

Cost $$

LRSM ID NS01

Other Reference Information
Pedestrian-Level Lighting: FHWA Pedestrian Safety Guide and Countermeasure Selection System. http://www.pedbikesafe.org/PEDSAFE/countermeasures_detail.cfm?CM_NUM=8

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
			Increase Attentiveness and Awareness

OTHER

Median Guardrail

The installation of median guardrail is most suitable for use in traversable medians having no or little change in grade and cross slope. While these systems may not reduce the frequency of crashes due to roadway departure, they can help prevent a lane-departure crash from becoming a head-on collision.

Cost $$

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
Remove Severe Conflicts			

OTHER

Red Light Camera

A red light camera enforces traffic signal compliance by capturing the image of a vehicle that has entered an intersection in spite of the traffic signal indicating red. The automatic photographic evidence is used by authorities to enforce traffic laws and issue traffic violation tickets.

Cost $$

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
			Increase Attentiveness and Awareness

OTHER

Relocate Select Hazardous Utility Poles

Relocating or removing utility poles from within the clear zone alleviates the potential for fixed-object crashes. If utility poles cannot be completely eliminated from within the clear zone, efforts can be made to either relocate the poles to a greater offset from the road or given high-visibility treatments.

Cost **$$**

Other Reference Information
FHWA Manual for Selecting Safety Improvements on High Risk Rural Roads

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
Remove Severe Conflicts			

OTHER

Remove Obstructions For Sightlines

Remove objects that may prevent drivers and pedestrians from having a clear sightline. May include installing red curb at intersection approaches to remove parked vehicles (also called "daylighting"), trimming or removing landscaping, or removing or relocating large signs.

Cost **$**
Low Cost / Quick Build alternative available

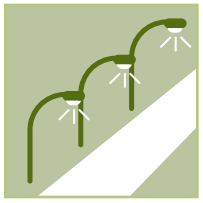
LRSM ID **NS11**

Other Reference Information
FHWA Manual for Selecting Safety Improvements on High Risk Rural Roads

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
			Increase Attentiveness and Awareness

OTHER



Segment Lighting

Providing roadway lighting increases driver awareness and can improve visibility of other road users and/or objects in the roadway.

Cost **$$**

LRSM ID **R01**

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
			Increase Attentiveness and Awareness

OTHER

Speed Limit Reduction

As an industry, there is a consistent movement away from setting speed limits solely based on 85th percentile vehicle speeds. Roadway characteristics, adjacent land use context, as well as the risk higher speeds create for all road users are now considered. Where separate space is not available for vulnerable road users and/or severe conflicts (e.g., crossing or turning conflicts) are present between motorvehicles speeds of 25 mph are preferable to reduce the risk of severe collisions. Where separated space is provided for vulnerable road users and severe conflicts between vehicles are managed, speed limits above 25 mph can be considered.

Cost **$**

Other Reference Information

TRB Study on Setting Speed Limits; also Richard, C. M., Magee, K., Bacon-Abdelmoteleb, P., & Brown, J. L. (2018, April). Countermeasures that work: A highway safety countermeasure guide for State Highway Safety Offices, Ninth edition (Report No. DOT HS 812 478). Washington, DC: National Highway Traffic Safety Administration.

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
	Reduce Vehicle Speeds		Increase Attentiveness and Awareness

OTHER

Upgrade Lighting to LED

Upgrading Lighting to LED replaces high-pressure sodium light bulbs with LED light bulbs in street lights. Upgrading Lighting to LED increases the visibility of pedestrians in crosswalks through greater color contrast and larger areas of light distribution.

Cost $$

Safe System Hierarchy

Tier 1	Tier 2	Tier 3	Tier 4
			Increase Attentiveness and Awareness

APPENDIX F: FUNDING SOURCES

FEDERAL FUNDING	
Funding Source	**Program Purpose**
Safe Streets and Roads for All (SS4A) Grant Program	The Safe Streets & Roads for All (SS4A) grant program is a new Federal grant program established by the Bipartisan Infrastructure Law centered around the Department of Transportation's National Roadway Safety Strategy and its goal of zero deaths and serious injuries on America's roadways. It will provide $5 billion in grant funding over 5 years to develop safety action plans and implement safety projects.
Congestion Mitigation and Air Quality (CMAQ) Improvement Program	The FAST Act continued the CMAQ program to provide a flexible funding source to State and local governments for transportation projects and programs to help meet the requirements of the Clean Air Act. Funding is available to reduce congestion and improve air quality for areas that do not meet the National Ambient Air Quality Standards for ozone, carbon monoxide, or particulate matter (nonattainment areas) and for former nonattainment areas that are now in compliance (maintenance areas).
Rebuilding American Infrastructure with Sustainability and Equity (RAISE)	This program supports projects that for surface transportation infrastructure projects that will improve: safety; environmental sustainability; quality of life; mobility and community connectivity; economic competitiveness and opportunity including tourism; state of good repair; partnership and collaboration; and innovation.
Reconnecting Communities and Neighborhoods Program	The Reconnecting Communities and Neighborhoods program combines the Reconnecting Communities Pilot (RCP) and Neighborhood Access and Equity (NAE) discretionary grant programs into a single funding opportunity. The program funds projects that address the impact of transportation infrastructure, such as freeways and railroads, that form barriers for travel in communities. The program funds the removal, retrofit, mitigation, or replacement of the infrastructure in question.
Community Development Block Grant (CDBG) Program	The Community Development Block Grant (CDBG) program is a flexible program that provides communities with resources to address a wide range of unique community development needs. Communities often use CDBG funds to construct and repair streets and sidewalks.

STATE FUNDING	
Funding Source	**Program Purpose**
Highway Safety Improvement Program (HSIP)	California's Local HSIP focuses on infrastructure projects with nationally recognized crash reduction factors (CRFs). Local HSIP projects must be identified on the basis of crash experience, crash potential, crash rate, or other data-supported means.
Active Transportation Program (ATP)	ATP is a statewide competitive grant application process with the goal of encouraging increased use of active modes of transportation. The ATP consolidates existing federal and state transportation programs, including the Transportation Alternatives Program (TAP), Bicycle Transportation Account (BTA), and State Safe Routes to School (SR2S), into a single program with a focus to make California a national leader in active transportation. The ATP administered by the Division of Local Assistance, Office of State Programs.
SB-1 Transportation Funding	The State Transportation Improvement Program (STIP) is the biennial five-year plan for future allocations of certain state transportation funds for state highway improvements, intercity rail, and regional highway and transit improvements.
Caltrans Sustainable Transportation Planning Grant Program	This program is intended to encourage local and regional planning that furthers state goals, including, but not limited to, the goals and best practices cited in the Regional Transportation Plan Guidelines adopted by the California Transportation Commission.
California Office of Traffic Safety (OTS)	OTS administers traffic safety grants in the following areas: Alcohol Impaired Driving, Distracted Driving, Drug-Impaired Driving, Emergency Medical Services, Motorcycle Safety, Occupant Protection, Pedestrian and Bicycle Safety, Police Traffic Services, Public Relations, Advertising, and Roadway Safety and Traffic Records.
Affordable Housing and Sustainable Communities (AHSC)	The Affordable Housing and Sustainable Communities (AHSC) Program makes it easier for Californians to drive less by making housing, jobs, and key destinations accessible by walking, biking, and transit.

REGIONAL AND LOCAL FUNDING	
Funding Source	**Program Purpose**
MTC One Bay Area Grant (OBAG) Program	Federally funded program administered by MTC to invest in local street and road maintenance, streetscape enhancements, bicycle and pedestrian improvements, transportation planning, and Safe Routes to School while advancing regional housing goals.
Measure B	Santa Clara County's 2016 Measure B is a voter approved, 30-year, half-cent countywide sales tax to enhance transit, highways, expressways, and active transportation projects.
City of Palo Alto Capital Budget	The City's Capital Budget is focused on capital and infrastructure project investments.

OTHER FUNDING	
Funding Source	**Program Purpose**
Bloomberg Philanthropies Asphalt Art	This program is intended to promote the use of asphalt art to enhance safety challenges.

APPENDIX G:

UPDATED POLICIES & PROGRAMS LIST

Legend

Policies and Programs are labeled with colored triangles corresponding to their corresponding tiers in the Safe System Hierarchy, if applicable

- **Tier 1: Remove Severe Conflicts**
- **Tier 2: Reduce Vehicle Speeds**
- **Tier 3: Manage Conflicts in Time**
- **Tier 4: Increase Attentiveness and Awareness**

Long-Term Education Program

Source
Comprehensive Plan

Phasing
Longer-Term

Consistent with Safe System Approach
Safe Users

Existing Program/Policy Description
Create a long-term education program to change the travel habits of residents, visitors, shoppers, and workers by informing them about transportation alternatives, incentives, and impacts. Work with the PAUSD and with other public and private interests, such as the Chamber of Commerce and Commuter Wallet partners, to develop and implement this program.

Recommended Safe System Pivot
Prioritize education of decision makers and media/press.

Street Closures - Open Streets

Source
Comprehensive Plan

Phasing
Near-Term

Consistent with Safe System Approach
Safe Roads

Existing Program/Policy Description
Consider marketing strategies such as a recurring Palo Alto Open Streets program of events, potentially in coordination with local business groups, which would include street closures and programming.

Recommended Safe System Pivot
Prioritize street closures on areas located on the HIN, or where high bicycle and pedestrian activity is expected

Coordination
Bicycle and Pedestrian Transportation Plan, Small Businesses

Street Closures - School Streets

Source
Staff working group

Phasing
Near-Term

Consistent with Safe System Approach
Safe Roads

Existing Program/Policy Description
N/A

Recommended Safe System Pivot
School streets implement timed closures that prevent vehicles from entering the specified school zone. Restrictions are in place for approximately 15 to 90 minutes during drop-off and pick-up times and are enforced using signage and physical barrier(s). During this time, only pedestrians and cyclists can enter the School Street zone, aside from exempt vehicles (e.g. residents living in the zone). This program should be implemented at all schools, with a prioritization of schools located on or crossing an HIN corridor.

Coordination
Bicycle and Pedestrian Transportation Plan, SRTS Program, and CSTC

Walk and Roll for Private Schools

Source
Comprehensive Plan

Phasing
Near-Term

Consistent with Safe System Approach
Safe Users

Existing Program/Policy Description
Encourage private schools to develop Walk and Roll Maps as part of Transportation Demand Management strategies to reduce vehicle trips. Evaluate locations near schools for potential quickbuild improvements.

Recommended Safe System Pivot
Add Walk and Roll routes on low stress streets: LTS network map and HIN

Coordination
Bicycle and Pedestrian Transportation Plan, SRTS Program, and CSTC

Design and Emergency Response Vehicles

Source
Comprehensive Plan

Phasing
Near-Term

Consistent with Safe System Approach
Post-Crash Care

Existing Program/Policy Description
Establish procedures for considering the effects of street design on emergency vehicle response time.

Recommended Safe System Pivot
Consider how to balance safer pedestrian and bicycle facilities/designs with designing to reduce emergency vehicle response time. Coordinate proactively with the Fire Department to establish traffic calming device guidelines that satisfy both needs.

Coordination
PAFD, PAPD, Stanford Health

Safe Routes to Work, Shopping, Downtown, Community Services, and Parks

Source
Comprehensive Plan

Phasing
Near-Term

Consistent with Safe System Approach
Safe Users

Existing Program/Policy Description
Follow the principles of the Safe Routes to Schools program to implement traffic safety measures that focus on Safe Routes to work, shopping, downtown, community services, parks, and schools, including all designated school commute corridors. Consider the Adopted School Commute Corridors Network and adopted "Walk and Roll" maps when reviewing development applications and making land use and transportation planning decisions. Incorporate these requirements into City code when feasible.

Recommended Safe System Pivot
Where safe routes overlap with HIN, prioritize speed management and pedestrian/bicycle enhancements, especially at intersections: FHWA Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations, FHWA Improving Intersections for Pedestrians and Bicyclists, DIB 94, FHWA Safe System Approach for Speed Management.

Establish non-HIN routes as primary access routes where possible and prioritize improvements on access routes with speeds over 25 mph: AB 43, countermeasure toolbox, DIB 94

Coordination
SRTS Program

Update CIP Funding to Prioritize Bicycle and Pedestrian Access and Route

Source
Comprehensive Plan

Phasing
Ongoing

Consistent with Safe System Approach
Safe Roads

Existing Program/Policy Description
Adjust the street evaluation criteria of the City's Pavement Management Program to ensure that areas of the road used by bicyclists are maintained at the same standards as, or at standards higher than, areas used by motor vehicles. Include bicycle and e-bike detection in intersection upgrades. Prioritize investments for enhanced pedestrian access and bicycle use within Palo Alto and to/from surrounding communities, including by incorporating improvements from related City plans, for example the 2012 Bicycle + Pedestrian Transportation Plan and the Parks, Trails & Open Space Master Plan, as amended, into the Capital Improvements Program.

Recommended Safe System Pivot
Prioritize paving bike routes, streets on HIN, equity considerations: BPTP, HIN, East Palo Alto Walk and Roll Routes, Palo Alto Population Below Poverty, Palo Alto Transit Corridors.

Ensure funding is allocated beyond signing/striping so intersections are also addressed through these projects: FHWA Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations, FHWA Improving Intersections for Pedestrians and Bicyclists.

CIP Projects will align with Safe System Approach: FHWA Safe System Roadway Design Hierarchy, CIP Implementation Guidance

Coordination
Bicycle and Pedestrian Transportation Plan

Systemic Uncontrolled Crosswalk Placement/ Enhancement Program

Source
Comprehensive Plan

Phasing
Near-Term

Consistent with Safe System Approach
Safe Roads

Existing Program/Policy Description
Improve pedestrian crossings by creating protected areas and better pedestrian and traffic visibility. Use a toolbox including bulb outs, small curb radii, high visibility crosswalks, and landscaping.

Recommended Safe System Pivot
Develop a systemic uncontrolled crosswalk placement/enhancement program for ped safety and accessibility: DIB 94, FHWA Safe System Roadway Design Hierarchy, FHWA Guide for Improving Pedestrian Safety at Uncontrolled Locations

Coordination
Bicycle and Pedestrian Transportation Plan, CIP, and systemic signalized intersection enhancement program for pedestrians and bicyclists.

E-bike Street Ordinance

Source
Community feedback

Phasing
Near-Term

Consistent with Safe System Approach
Safe Vehicles

Existing Program/Policy Description
Develop an e-bike ordinance that embraces e-bikes and e-scooters as emerging mobility options while establishing speed limits while operating on-street. Determine the level of e-bikes allowed in bike facilities. Reference available means-based e-bike subsidies.

Recommended Safe System Pivot
Pair ordinance with bicycle traffic calming on major bike corridors. Consider partnering with SV Bike Coalition and SRTS to provide education on e-bike use: DIB 94, NACTO Urban Bikeway Design Guide, FHWA Safe System Roadway Design Hierarchy, FHWA Primer on Safe System Approach for Pedestrians and Bicyclists

Coordination
Bicycle and Pedestrian Transportation Plan, CSTC, SRTS Program

Update Traffic Calming Program

Source
Comprehensive Plan

Phasing
Near-Term

Consistent with Safe System Approach
Safe Speeds

Existing Program/Policy Description
Systemically identify speed management needs and opportunities (such as speed humps and neighborhood traffic circle) and prioritize into a yearly implementation program based on kinetic energy risk, equity, proximity to schools, and similar factors. Most funds should be programmed proactively, but some can be reserved for quick response discretionary purposes. Add or reallocate staff to administer program, including coordination, evaluation, planning, and engineering.

Recommended Safe System Pivot
Implement speed management strategies to slow vehicles to a contextually appropriate target speed: AB 43, countermeasure toolbox, FHWA Safe System Approach for Speed Management

Crossing Guards

Source
Comprehensive Plan

Phasing
Near-Term

Consistent with Safe System Approach
Safe Users

Existing Program/Policy Description
In collaboration with PAUSD, continue to provide adult crossing guards at school crossings that meet established warrants.

Recommended Safe System Pivot
Consider crossing guards on all Walk and Roll routes

Coordination
PAUSD, CSTC, SRTS Program

Impact Review Updates

Source
Staff working group

Phasing
Ongoing

Consistent with Safe System Approach
Safe Roads ●

Existing Program/Policy Description
All street, land use, and development projects will be reviewed for compliance with Safe System principles.

Recommended Safe System Pivot
Remove level of service as a criteria from impact reviews and roadway design. Level of service is a performance metric that focuses on vehicle capacity and delay, which therefore results in justifications to increase vehicle capacity at the cost of roadway safety. Impact review and roadway design will instead be evaluated by metrics that focus on safety risk, user comfort, and access for all users including pedestrians and bicyclists such as kinetic energy risk, level of traffic stress, and travel time by mode.

Media Safety Training

Source
Staff working group

Phasing
Near-Term

Consistent with Safe System Approach
Post-Crash Care

Existing Program/Policy Description
The City of Palo Alto will share best practices on how to communicate traffic crashes and roadway safety to the public from a Safe System Approach. . Coverage may include developing press releases, news coverage, talking points for elected officials, etc. City invite Safe System Approach experts to present, answer questions and provide examples.

Recommended Safe System Pivot
N/A

Rapid Response Team

Source
Staff working group

Phasing
Ongoing

Consistent with Safe System Approach
Post-Crash Care ●

Existing Program/Policy Description
Work with standing committees and City staff across departments to develop a rapid response team that evaluates roadway design and context of crash locations after KSI crashes

Recommended Safe System Pivot
Coordinate with other agencies to evaluate the causes of the crash.

Evaluate historic crash data to understand crash trends. Apply safety improvements systemically throughout the City.

Upgrade Repaving Program

Source
Staff working group

Phasing
Near-Term

Consistent with Safe System Approach
Safe Roads ??

Existing Program/Policy Description
Change approach to repaving program to include pedestrian improvements including sidewalk widening and curb extensions. This would require additional funding.

Recommended Safe System Pivot
Repaving Projects will align with the Safe System Approach: FHWA Safe System Roadway Design Hierarchy, FHWA Safe System Alignment Framework, NCHRP 1036, countermeasure toolbox

Construction Traffic Management Plan

Source
Staff working group

Phasing
Near Term

Consistent with Safe System Approach
Safe Roads ●

Existing Program/Policy Description
N/A

Recommended Safe System Pivot
Create a Construction Traffic Management Plan to manage traffic and circulation while projects are under development. Reviewers will ensure that, to the extent possible, pedestrian and bicycle facilities are maintained during construction. Where this is not feasible, safe and alternative facilities should be temporarily implemented. These facilities will prioritize separation and follow the most direct path for pedestrians and bicyclists, and sight distance should be evaluated to improve visibility. Clear signage is important to communicate new traffic patterns to pedestrians, bicyclists, and drivers.

APPENDIX H: UPDATED PROJECT LIST

Legend

Projects are labeled with colored triangles corresponding to their corresponding tiers in the Safe System Hierarchy, if applicable

- **Tier 1: Remove Severe Conflicts**
- **Tier 2: Reduce Vehicle Speeds**
- **Tier 3: Manage Conflicts in Time**
- **Tier 4: Increase Attentiveness and Awareness**

Additional Bicycle and Pedestrian Crossings Along the Caltrain Corridor

Source
Valley Transportation Plan 2040, 2012 Bicycle and Pedestrian Transportation Plan

Consistent with Safe System Approach
Safe Users

Existing Concept
Construct grade separated bicycle/pedestrian crossing between California Ave. Caltrain station and at-grade crossing on E. Meadow Dr.

Recommended Safe System Pivot
Future BPTP Update should include this connection

Prioritize vulnerable users (pedestrians, bicyclists). Identify weakest links present in first/last mile connections: FHWA Primer Safe System Approach for Pedestrian and Bicyclists. Guide for Improving Pedestrian Safety at Uncontrolled Locations

Phasing
Alternatives Analysis In Progress

On HIN?
No

Coordination
Future BPTP Update, Caltrans, Caltrain, Stanford

California Avenue Tunnel

Source
Valley Transportation Plan 2040, 2012 Bicycle and Pedestrian Transportation Plan

Consistent with Safe System Approach
Safe Users

Existing Concept
Replacement of California Ave. bicycle/pedestrian undercrossing of Caltrain tracks with new ADA compliant structure.

Recommended Safe System Pivot
Future BPTP Update should include this connection

Prioritize vulnerable users (pedestrians, bicyclists). Identify weakest links present in first/last mile connections: FHWA Primer Safe System Approach for Pedestrian and Bicyclists. Guide for Improving Pedestrian Safety at Uncontrolled Locations

Phasing
Near-Term

On HIN?
No

Coordination
Future BPTP Update, Caltrans, Caltrain, Stanford

California Avenue Caltrain Station and Transit Improvements

Source
Comprehensive Plan

Consistent with Safe System Approach
Safe Users

Existing Concept
In collaboration with Caltrain and Stanford Research Park, pursue expansion of service to the California Avenue Caltrain Station including connections to VTA bus service, the Marguerite, and other private shuttles serving the Research Park and create an enhanced transit center at the Station.

Recommended Safe System Pivot
Future BPTP Update should include this connection

Prioritize vulnerable users (pedestrians, bicyclists). Identify weakest links present in first/last mile connections: FHWA Primer Safe System Approach for Pedestrian and Bicyclists. Guide for Improving Pedestrian Safety at Uncontrolled Locations

Phasing
Longer-Term

On HIN?
No

Coordination
Future BPTP Update, Caltrans, Caltrain, Stanford

Faber Place Bike Route

Source
2012 BPTP, Community feedback

Consistent with Safe System Approach
Safe Roads ●

Existing Concept
Designate Faber Place as a bike route at a minimum. It connects the Renzel Trail to Embarcadero Road. Right now, it has very minimal signage.

Recommended Safe System Pivot
Manage speeds: AB 43, countermeasure toolbox, FHWA Safe System Approach for Speed Management

Add appropriate bike facilities: DIB 94 and NACTO Urban Bikeway Design Guide

Phasing
Near-Term

On HIN?
Yes

Coordination
Valley Water Project and Future BPTP Update

Pedestrian Access Improvements to Palo Alto Caltrain Center

Source
Comprehensive Plan, Valley Transportation Plan, 2012 Bicycle and Pedestrian Transportation Plan

Consistent with Safe System Approach
Safe Roads ●

Existing Concept
Collaborate with Stanford University, VTA, Caltrain, and other agencies to pursue improvements to the Palo Alto Transit Center area aimed at enhancing pedestrian experience and improving circulation and access for all modes, including direct access to El Camino Real for transit vehicles. Construct new bicycle/pedestrian undercrossing of Caltrain tracks, near Everett or Lytton Streets, to connect Downtown with the University, Medical Center, and multi-modal transit center.

Recommended Safe System Pivot
Future BPTP Update should include this connection.

Prioritize vulnerable users. Identify weakest links present in first/last mile connections: FHWA Primer on Safe System Approach for Pedestrian and Bicyclists; Guide for Improving Pedestrian Safety at Uncontrolled Locations

Phasing
Longer-Term

On HIN?
Yes

Coordination
Future BPTP Update, Ongoing ECR project, Caltrans, Caltrain, Stanford, VTA

Pedestrian Safety on Alma Street

Source
Comprehensive Plan, Community feedback, 2012 Bicycle and Pedestrian Transportation Plan

Consistent with Safe System Approach
Safe Roads ●

Existing Concept
Address pedestrian safety along Alma Street between Embarcadero Road and Lytton Street. Increase the number of east-west pedestrian and bicycle crossings across Alma Street and the Caltrain corridor, particularly south of Oregon Expressway. Address the Churchill Aveue and Alma Street intersection in coordination with Connecting Palo Alto project. . . OOT has a consultant on board for the project to conceptually design up to 2 additional crossings south of California Ave. Near-term, safety improvements for Alma Street and Churchill Avenue are currently under construction.

Recommended Safe System Pivot
Manage speeds: AB 43, countermeasure toolbox, FHWA Safe System Approach for Speed Management

Add appropriate crossing improvements to improve access and encourage crossings at the designated locations where safety mitigations have been deployed: FHWA Guide for Improving Pedestrian Safety at Uncontrolled Locations, FHWA Improving Intersections for Pedestrians and Bicyclists

Phasing
Near-Term

On HIN?
Yes

Coordination
Future BPTP Update, Connecting Palo Alto project

Safety Improvements at Stanford Shopping Center

Source
Comprehensive Plan, 2012 Bicycle and Pedestrian Transportation Plan

Consistent with Safe System Approach
Safe Roads ●

Existing Concept
Provide safe, convenient pedestrian, bicycle, and transit connections between the Stanford Shopping Center/Medical Center areas and housing along the Sand Hill Road/ Quarry Road corridors to Palo Alto Caltrain Station, Downtown Palo Alto, and other primary destinations. Consider upgrading existing Class II bike lanes to include buffer and evaluate improvements to multi-use paths along Sand Hill Road.

Recommended Safe System Pivot
Consider pedestrian connections on both Sand Hill Road and Quarry Road: Countermeasures toolbox, FHWA Safe System Roadway Design Hierarchy, DIB 94

Phasing
Longer-Term

On HIN?
Yes

Coordination
Future BPTP Update

Signalized Intersection Enhancements

Source
Comprehensive Plan, Valley Transportation Plan

Consistent with Safe System Approach
Safe Speeds ●

Existing Concept
Implement a program to monitor, coordinate, and optimize traffic signal timing a minimum of every two years along arterial and residential arterial streets. Project includes upgrades to signalized pedestrian facilities to enhance safety and update pedestrian crossing times. Project is a citywide program to adjust signal timing to give priority to emergency vehicles.

Recommended Safe System Pivot
Update signal coordination to manage speeds on arterials to contextually appropriate target speeds: AB 43, FHWA Safe System Approach for Speed Management

Signalized intersection enhancements should be categorized into 1) Operations optimization/ enhancement of existing conditions, upgrade hardware; and 2) Capital Improvement projects to modify signals, phasing, lane configurations, multi-modal facilities. Signalized intersection treatments may include implementation of LPI, rest on red at night, no RTOR in the downtown and with LPIs, protected left turn phasing, pedestrian countdown timers, and adequate pedestrian crossing times: MUTCD, FHWA Improving Intersections for Pedestrians and Bicyclists, Countermeasures toolbox.

Suggest that technology be employed to allow for real time near miss and other surrogate safety monitoring: City of Bellevue

Phasing
Near-Term

On HIN?
No

Coordination
CIP

Grade separation for Caltrain

Source
Comprehensive Plan

Consistent with Safe System Approach
Safe Roads ●, Safe Users ●

Existing Concept
Undertake studies and outreach necessary to advance grade separation of Caltrain to become a “shovel ready” project and strongly advocate for adequate State, regional, and federal funding for design and construction of railroad grade separations.

Recommended Safe System Pivot
Consider pedestrian and bicycle sense of comfort (good lighting and wayfinding) and develop short and direct routes: NACTO Urban Street Design Guidelines, FHWA Primer on Safe System Approach for Pedestrian and Bicyclists

Upgrade multi-use paths and separated bikeways where appropriate: DIB 94 and NACTO Urban Bikeway Design Guide

Phasing
Near-Term

On HIN?
Yes

Coordination
Future BPTP Update, Caltrain

Quarry Road Transit Connection to Palo Alto Caltrain Station

Source
2012 Bicycle and Pedestrian Transportation Plan, Standford University Land Use and Environmental Planning

Consistent with Safe System Approach
Safe Roads ●, Safe Users ●

Existing Concept
As envisioned in the Palo Alto Comprehensive Plan as Program T3.10.4 (2017), the proposed Quarry Road Transit Connection project would create a direct transit connection between the transit center bus bays and El Camino Real at the Quarry Road traffic signal. In addition to transit improvements, the project would also include multiple active transportation and safety improvements at the intersection of Quarry Road and El Camino Real. Additional active transportation and safety improvements within El Camino Park adjacent to or near the proposed transit connection, as well as within University Circle, are also being considered as part of this project.

Specifically, the proposed project would focus on:

- Upgrading pedestrian crossings at the intersection of Quarry Road and El Camino Real to accommodate pedestrians and cyclists across all legs of the redesigned intersection. The proposed design would reduce crossing distances and potentially reduce crossing time;
- Implementing safety and accessibility measures at the intersection of Quarry Road and El Camino Real (e.g., curb extensions and tighter turning radii, new pedestrian/bicycle ramps, pedestrian and bicycle refuge islands, dedicated pedestrian and bicycle crossings, high-visibility bicycle markings, enhanced wayfinding, and Leading Pedestrian Intervals (or a protected pedestrian and bicycle phase) are currently being considered)

In addition to these changes, pedestrian and bicycle wayfinding improvements within El Camino Park and short-term bicycle connectivity improvements to the Embarcadero Trail within University Circle are also being considered..

Recommended Safe System Pivot
Review final design with the following considerations: .- Consider operational plans for protected intersection to manage conflicts. Evaluate the use of bike signals and Leading Pedestrian/ Bicycle Interval Phases based on the results of the upcoming traffic analysis. The analysis will aim to balance the need for transit travel time improvements and safety improvements while maintaining acceptable traffic operations at the intersection of Quarry Road and El Camino Real. . . . FHWA Safe System Roadway Design Hierarchy, DIB 94, NACTO Urban Bikeway Design Guide, and FHWA Primer on Safe System Approach for Pedestrians and Bicyclists, Informational Guide: Improving Intersections for Pedestrians and Bicyclists

Phasing
Longer-Term

On HIN?
Yes

Coordination
Ongoing ECR project, Future BPTP Update, Caltrans, Stanford

Palo Alto Avenue Crossing Study

Source
Comprehensive Plan, 2012 Bicycle and Pedestrian Transportation Plan

Consistent with Safe System Approach
Safe Roads ●

Existing Concept
Complete a Palo Alto Avenue crossing study to identify potential near-term safety and accessibility improvements.

Recommended Safe System Pivot
Implement speed management strategies to slow vehicles to a contextually appropriate target speed: AB 43, countermeasure toolbox, FHWA Safe System Approach for Speed Management

Identify crossing locations and enhancements consistent with the STEP guide: FHWA Guide for Improving Pedestrian Safety at Uncontrolled Locations

Phasing
Near-Term

On HIN?
No

Coordination
Future BPTP Update

Pedestrian Safety on Shared Use Paths

Source
Comprehensive Plan

Consistent with Safe System Approach
Safe Roads ●

Existing Concept
Address pedestrian safety on shared-use paths through the use of signs, pavement markings, and outreach to users, encouraging them to be safe and courteous.

Recommended Safe System Pivot
Consider bicycle traffic calming at intersections and consider implementing speeds limits for e-bike/ e-scooters: DIB 94, NACTO Urban Bikeway Design Guide, FHWA Safe System Roadway Design Hierarchy, FHWA Primer on Safe System Approach for Pedestrians and Bicyclists

Phasing
Near-Term

On HIN?
No

Coordination
Future BPTP Update

Pedestrian Improvements on Embarcadero Road

Source
Comprehensive Plan, 2012 Bicycle and Pedestrian Transportation Plan

Consistent with Safe System Approach
Safe Roads ●

Existing Concept
West of Emerson on Embarcadero, the City has approved plans that identify and design safety improvements on Embarcadero Road including traffic signal modifications, sidewalk realignment, high-visibility crosswalks, signing and striping, bicycle treatments, landscaping and traffic calming elements. Future projects include construction of a stairway on the north side of the undercrossing with a bike tunnel and implementation of bike facilities west of the Embarcadero Road underpass.

Recommended Safe System Pivot
Coordinate with BPTP to ensure there are adequate bicycle and pedestrians connections: DIB 94 and NACTO Urban Bikeway Design Guide, FHWA Primer on Safe System Approach for Pedestrians and Bicyclists

Phasing
Near-Term

On HIN?
Yes

Coordination
Future BPTP Update

Bike Connections to Region

Source
Comprehensive Plan

Consistent with Safe System Approach
Safe Roads ●

Existing Concept
Identify and improve bicycle connections to/from neighboring communities in Santa Clara and San Mateo counties to support local trips that cross city boundaries. Also advocate for reducing barriers to bicycling and walking at freeway interchanges, expressway intersections, and railroad grade crossings.

Recommended Safe System Pivot
Prioritize projects along HIN that have regional significance: HIN, DIB 94, FHWA Safe System Roadway Design Hierarchy

Phasing
Near-Term

On HIN?
No

Coordination
Future BPTP Update

Roadway Space Reallocation on El Camino Real

Source
Comment from PTC 10/11

Consistent with Safe System Approach
Safe Roads ●●

Existing Concept
Remove vehicle lane and add Class IV protected bike lanes along corridor. Long-term, vision includes working with Caltrans to seek lane conversion and create more space to better integrate bus boarding and bike lanes.

Recommended Safe System Pivot
Manage speeds: AB 43, countermeasure toolbox, FHWA Safe System Approach for Speed Management

Add appropriate pedestrian and bike facilities: DIB 94 and NACTO Urban Bikeway Design Guide

Phasing
Near-Term

On HIN?
Yes

Coordination
Ongoing ECR project, Future BPTP Update, Caltrans

East Meadow Drive

Source
Systemic Crash Analysis

Consistent with Safe System Approach
Safe Roads ●

Existing Concept
Upgrade bicycle facilities to provide protected bicycle facilities. Review intersection control on minor street at Ross Rd.

Recommended Safe System Pivot
Suggest speed management strategies and separating users where possible: AB 43, countermeasure toolbox, FHWA Safe System Approach for Speed Management, DIB 94

Phasing
Near-Term

On HIN?
Yes

Coordination
Ongoing East Meadow Dr. project

Bicycle Detected Signal Heads

Source
Pedestrian and Bicycle Advisory Committee

Consistent with Safe System Approach
Safe Roads ●

Existing Concept
Add “Bicycle Detected” signal heads to recommended bike routes intersecting with arterials where feasible. Pilot metrics to identify impacts and outcomes.

Recommended Safe System Pivot
Should be applied to Class I and Class IV bike ways and must be MUTCD compliant.

Phasing
Near-Term

On HIN?
No

Coordination
Future BPTP Update

Homer Avenue from Alma Street to High Street

Source
Community feedback, 2012 Bicycle and Pedestrian Transportation Plan

Consistent with Safe System Approach
Safe Roads

Existing Concept
Evaluate Homer Avenue and Channing Avenue as couplet. Consider reducing lanes and adding protected bike lane. Address intersection controls.

Recommended Safe System Pivot
Manage speeds: AB 43, countermeasure toolbox, FHWA Safe System Approach for Speed Management

Add appropriate pedestrian and bike facilities: DIB 94 and NACTO Urban Bikeway Design Guide

Consider uncontrolled crosswalk enhancements: FHWA Guide for Improving Pedestrian Safety at Uncontrolled Locations

Phasing
Near-Term

On HIN?
No

Coordination
Future BPTP Update

El Camino Real and California Avenue

Source
Community feedback, 2012 Bicycle and Pedestrian Transportation Plan

Consistent with Safe System Approach
Safe Roads

Existing Concept
Install Class IV bikeways on El Camino Real. eastbound approach may be reconfigured as part of the El Camino Real repaving project to include a left turn lane, bike lane, and right-turn lane. The intersection includes bike boxes and skipped bike lane striping through the intersection.

Recommended Safe System Pivot
Manage speeds: AB 43, countermeasure toolbox, FHWA Safe System Approach for Speed Management

Add appropriate pedestrian and bike facilities: DIB 94 and NACTO Urban Bikeway Design Guide

Address signal head visibility on ECR

Phasing
Near-Term

On HIN?
Yes

Coordination
Ongoing ECR project, Future BPTP Update, California Ave underpass, California Avenue Street Closure, Caltrans

El Camino Real Regional Corridor Improvements: PAMF to Churchill Avenue

Source
Valley Transportation Plan 2040

Consistent with Safe System Approach
Safe Roads

Existing Concept
Long term vision to reconfigure El Camino Real between Palo Alto Medical Foundation and Churchill Avenue. Improvements focus on utility undergrounding, new median islands and streetscape-focused improvements, and operational enhancements along adjacent streets.

Recommended Safe System Pivot
Manage speeds: AB 43, countermeasure toolbox, FHWA Safe System Approach for Speed Management

Add appropriate pedestrian and bike facilities: DIB 94 and NACTO Urban Bikeway Design Guide, FHWA Guide for Improving Pedestrian Safety at Uncontrolled Locations

Update coordination on manage speeds on arterials to contextually appropriate target speeds: AB 43, FHWA Safe System Approach for Speed Management

Phasing
Longer-Term

On HIN?
Yes

Coordination
Ongoing ECR project, Future BPTP Update, Caltrans

Middlefield Road: Midtown Corridor Improvements

Source
Valley Transportation Plan 2040

Consistent with Safe System Approach
Safe Roads ●

Existing Concept
Project includes sidewalk enhancements, transit stop. improvements, lighting improvements, and traffic signal improvements between Oregon Expressway and Loma Verde.

Recommended Safe System Pivot
Manage speeds: AB 43, countermeasure toolbox, FHWA Safe System Approach for Speed Management

Add appropriate pedestrian and bike facilities: DIB 94 and NACTO Urban Bikeway Design Guide, FHWA Guide for Improving Pedestrian Safety at Uncontrolled Locations

Phasing
Near-Term

On HIN?
Yes

Coordination
Future BPTP Update

Churchill Avenue Rail Grade Separation and Safety Improvements

Source
Capital Proposed Budget (2024 FY)

Consistent with Safe System Approach
Safe Roads ●

Existing Concept
This project provides for the planning, design, and construction of the grade separation at the existing at-grade crossing on Churchill Avenue in the Caltrain Rail Corridor. The project will provide improvements to accommodate bicycles, pedestrians, and vehicular movement at the crossing. In 2021, the City Council selected partial underpass as the preferred alternative, with closure as a backup alternative. The partial underpass will require a new bicycle and pedestrian connection. Council recently endorsed Seale Ave as the location for that connection.

Recommended Safe System Pivot
Coordinate with BPTP to ensure there are adequate bicycle and pedestrians connections: DIB 94 and NACTO Urban Bikeway Design Guide, FHWA Primer on Safe System Approach for Pedestrians and Bicyclists

Phasing
Longer-Term

On HIN?
No

Coordination
Future BPTP Update, Connecting Palo Alto

Matadero Creek Trail Undercrossing

Source
Valley Transportation Authority Resolution 2016.06.17 for Measure B, Staff working group

Consistent with Safe System Approach
Safe Roads ●

Existing Concept
This project includes a Class I shared use path along Matadero Creek. Alternatives include alignments along side the creek or off street facilities on Loma Verde.

Recommended Safe System Pivot
Coordinate with BPTP to ensure there are adequate bicycle and pedestrians connections: DIB 94 and NACTO Urban Bikeway Design Guide, FHWA Primer on Safe System Approach for Pedestrians and Bicyclists

Ensure alignment with the safe system approach: FHWA Safe System Alignment Framework

Phasing
Longer-Term

On HIN?
No

Coordination
Future BPTP Update

Meadow Drive/Charleston Road Rail Grade Separation and Safety Improvements

Source
Capital Proposed Budget (2024 FY), Valley Transportation Authority Resolution 2016.06.17 for Measure B

Consistent with Safe System Approach
Safe Roads ●

Existing Concept
This project provides for the planning, design, and construction of the grade separations at the existing at-grade crossings on Meadow Drive and Charleston Road in the Caltrain Rail Corridor. The project will provide improvements to accommodate bicycles, pedestrians, and vehicular movement at the crossings. In 2021, the City Council narrowed the alternatives under consideration at these locations to trench, hybrid, and underpass. Currently, the Rail Committee is reviewing these alternatives to further narrow and select the preferred alternative(s) for recommendation to the City Council. The project has gone out to RFP and will be designed by a consultant in partnership with the City of Palo Alto.

In addition to the bicycle and pedestrian facilities that will be incorporated into the grade separations, up to two additional crossings will be pursued prior to grade separation construction to ensure safe crossing for bicyclist and pedestrians during construction.

Recommended Safe System Pivot
Coordinate with BPTP to ensure there are adequate bicycle and pedestrians connections: DIB 94 and NACTO Urban Bikeway Design Guide, FHWA Primer on Safe System Approach for Pedestrians and Bicyclists.

Ensure alignment with the safe system approach: FHWA Safe System Alignment Framework

Phasing
Near-Term

On HIN?
Yes

Coordination
Future BPTP Update, Connecting Palo Alto

California Avenue Streetscape Update

Source
Capital Proposed Budget (2024 FY)

Consistent with Safe System Approach
Safe Roads ●

Existing Concept
This project provides initial funding for conceptual design and community engagement to develop options for expanding pedestrian and outdoor spaces in the California Avenue retail core to facilitate car-free streets. The project also provides funding to provide flexible opening and closing of streets on a trial basis in the short term

The City is currently designing the street with the goal to formally close it per State law. The City Manager's Office is leading on the design of the car-free street.

Recommended Safe System Pivot
Coordinate with BPTP to ensure there are adequate bicycle and pedestrians connections: DIB 94 and NACTO Urban Bikeway Design Guide, FHWA Primer on Safe System Approach for Pedestrians and Bicyclists

Ensure alignment with the Safe System Approach: FHWA Safe System Alignment Framework

Phasing
Near-Term

On HIN?
No

Coordination
Future BPTP Update

Oregon Expressway, Page Mill Road, and Foothill Expressway Class I Shared Paths

Source
County 2024 Draft Active Transportation Plan

Consistent with Safe System Approach
Safe Roads ●●

Existing Concept
The County's 2024 Draft Active Transportation Plan recommends a Class I shared-use path for Oregon Expressway, Page Mill Road, and Foothill Expressway.

Recommended Safe System Pivot
Coordinate with BPTP to ensure there are adequate bicycle and pedestrians connections: DIB 94 and NACTO Urban Bikeway Design Guide, FHWA Primer on Safe System Approach for Pedestrians and Bicyclists

Ensure alignment with the Safe System Approach: FHWA Safe System Alignment Framework

Phasing
Near-Term

On HIN?
Yes

Coordination
County

Oregon Expressway Traffic Calming

Source
Systemic Collision Analysis

Consistent with Safe System Approach
Safe Roads ●●

Existing Concept
This project includes various traffic calming treatments to reduce vehicle speeds.

Recommended Safe System Pivot
Coordinate with the County to identify roadway improvements to reduce speed and conflict points (e.g. with protected signal phasing, separating active transportation users from motorists). Implement speed management strategies to slow vehicles to a contextually appropriate target speed: AB 43, countermeasure toolbox, FHWA Safe System Approach for Speed Management

Phasing
Near-Term

On HIN?
Yes

Coordination
County

Future BPTP Update Quick Build Projects

Source
Staff working group

Consistent with Safe System Approach
Safe Roads ●●

Existing Concept
These are quick to install infrastructure improvements focused on bicycle and pedestrian safety. Projects should include crash analysis to identify the best quick build improvements for the location. Improvements could be piloted or temporarily installed first before adding more permanent solutions. Evaluation should be included to monitor project effectiveness. This project would require more engineering capacity (including signals, design, and project management) to meet the Vision Zero target date.

Recommended Safe System Pivot
Coordinate with BPTP to ensure there are adequate bicycle and pedestrians connections: DIB 94 and NACTO Urban Bikeway Design Guide, FHWA Safe System Roadway Design Hierarchy, FHWA Primer on Safe System Approach for Pedestrians and Bicyclists

Ensure alignment with the Safe System Approach: FHWA Safe System Alignment Framework

Phasing
Ongoing

On HIN?
Yes

Coordination
Future BPTP Update

Bicycle Detected Signal Heads

Source
Pedestrian and Bicycle Advisory Committee

Consistent with Safe System Approach
Safe Roads ●

Existing Concept
Add "Bicycle Detected" signal heads to recommended bike routes intersecting with arterials where feasible. Pilot metrics to identify impacts and outcomes.

Recommended Safe System Pivot
Should be applied to Class I and Class IV bike ways and must be MUTCD compliant.

Phasing
Near-Term

On HIN?
No

Coordination
Future BPTP Update

REPAVING PROJECTS

Source
Repaving Plan

Consistent with Safe System Approach
Safe Roads ●

Existing Concept
Repave streets and upgrade striping.

Recommended Safe System Pivot
Prioritize repaving for equity, HIN, and Vulnerable Road Users: Repaving Plan Report Section, FHWA Safe System Roadway Design Hierarchy, HIN, East Palo Alto Walk and Roll Routes, Palo Alto Population Below Poverty, Palo Alto Transit Corridors

Inform community through notifications, mailers, graphics, etc. of potential roadway changes, but for safety related improvements, reference NCHRP 1036 as guidance on when to make trade-off decisions

Add appropriate pedestrian and bike facilities: DIB 94, NACTO Urban Bikeway Design Guide, FHWA Guide for Improving Pedestrian Safety at Uncontrolled Locations, FHWA Primer on Safe System Approach for Pedestrians and Bicyclists

Ensure alignment with the Safe System Approach: FHWA Safe System Alignment Framework, NCHRP 1036, countermeasure toolbox

Phasing
Near-Term

On HIN?
No

Coordination
Future BPTP Update, Palo Alto Public Works

Middlefield Road Repaving

Source
PABAC recommendations for FY 2029 Repaving Plan

Consistent with Safe System Approach
Safe Roads ●

Existing Concept
Daylight on Middlefield Rd. from Oregon Expressway to Loma Verde Ave. by installing quickbuild curb extensions and refuge islands as part of repaving project.

Recommended Safe System Pivot
Manage speeds: AB 43, countermeasure toolbox, FHWA Safe System Approach for Speed Management . . Add appropriate pedestrian and bike facilities: DIB 94 and NACTO Urban Bikeway Design Guide, FHWA Guide for Improving Pedestrian Safety at Uncontrolled Locations

Phasing
Near-Term

On HIN?
Yes

Embarcadero Road Repaving

Source
PABAC recommendations for FY 2025 Repaving Plan, Community Feedback

Consistent with Safe System Approach
Safe Roads ●

Existing Concept
Consider improved bicycle and pedestrian crossing on Embarcadero Road from Alma Street to Emerson Street and Greer Road to Saint Francis Drive as part of repaving project. Consider dedicated left turn lanes at traffic signals and protected left turn movements.

Recommended Safe System Pivot
Consider a corridor study on Embarcadero before repaving. . Manage speeds: AB 43, countermeasure toolbox, FHWA Safe System Approach for Speed Management . . Add appropriate pedestrian and bike facilities: DIB 94, NACTO Urban Bikeway Design Guide

Phasing
Near-Term

On HIN?
Yes

University Avenue Repaving

Source
PABAC recommendations for FY 2025 Repaving Plan, Community Feedback

Consistent with Safe System Approach
Safe Roads ●

Existing Concept
Repaving to maintain existing 13 foot shared bicycle and vehicle lanes from Stanford University to the Circle. Consider dedicated left turn lanes at traffic signals and protected left turn movements.

Recommended Safe System Pivot
Add appropriate pedestrian and bike facilities. Consider designated bike lanes on University Avenue: DIB 94, NACTO Urban Bikeway Design Guide

Phasing
Near-Term

On HIN?
Yes

Louis Road Repaving

Source
PABAC recommendations for FY 2029 Repaving Plan

Consistent with Safe System Approach
Safe Roads ●

Existing Concept
Update bicycle facilities on Louis Rd. from Stelling Dr. to Loma Verde Ave. as part of repaving project.

Recommended Safe System Pivot
Add appropriate pedestrian and bike facilities: DIB 94 and NACTO Urban Bikeway Design Guide, FHWA Guide for Improving Pedestrian Safety at Uncontrolled Locations

Phasing
Near-Term

On HIN?
No

Fabian Way Repaving

Source
PABAC recommendations for FY 2026 Repaving Plan, Community Feedback

Consistent with Safe System Approach
Safe Roads ●

Existing Concept
Implement lane conversion on Fabian Way from Charleston Rd. to Bayshore Rd. as part of repaving project. A pilot demonstration project of this striping plan is funded by SS4A for potential implementation in Fall 2025.

Recommended Safe System Pivot
Add appropriate pedestrian and bike facilities. DIB 94, NACTO Urban Bikeway Design Guide, FHWA Guide for Improving Pedestrian Safety at Uncontrolled Locations

Phasing
Near-Term

On HIN?
No

Hamilton Avenue Repaving

Source
PABAC recommendations for FY 2029 Repaving Plan

Consistent with Safe System Approach
Safe Roads ●

Existing Concept
Add sharrows on Hamilton Ave. from Cowper St. to Webster St. as part of repaving project.

Recommended Safe System Pivot
Add appropriate pedestrian and bike facilities: DIB 94 and NACTO Urban Bikeway Design Guide, FHWA Guide for Improving Pedestrian Safety at Uncontrolled Locations

Phasing
Near-Term

On HIN?
No

Webster Street Repaving

Source
PABAC recommendations for FY 2027, FY 2029 Repaving Plan

Consistent with Safe System Approach
Safe Roads ●

Existing Concept
If the Future BPTP Update retains Webster as a bicycle boulevard, implement sharrows and other traffic calming elements on Webster St. from Lytton Ave. to University Ave., California Ave. to Oregon Ave., Coleridge Ave. to Lowell Ave., and Seale Ave. to Santa Rita Ave. as part of repaving project.

Recommended Safe System Pivot
Manage speeds: AB 43, countermeasure toolbox, FHWA Safe System Approach for Speed Management . . Add appropriate pedestrian and bike facilities: DIB 94, NACTO Urban Bikeway Design Guide, FHWA Guide for Improving Pedestrian Safety at Uncontrolled Locations

Phasing
Near-Term

On HIN?
No

Arastradero Road Repaving

Source
PABAC recommendations for FY 2028 Repaving Plan

Consistent with Safe System Approach
Safe Roads ●

Existing Concept
Implement sharrows and other traffic calming elements on Arastradero Rd. from City Limit to Caballo Ln. as part of repaving project near Pearson-Aratradero Preserve.

Recommended Safe System Pivot
Manage speeds: AB 43, countermeasure toolbox, FHWA Safe System Approach for Speed Management . . Add appropriate pedestrian and bike facilities: DIB 94, NACTO Urban Bikeway Design Guide, FHWA Guide for Improving Pedestrian Safety at Uncontrolled Locations

Phasing
Near-Term

On HIN?
Yes

California Avenue Repaving

Source
PABAC recommendations for FY 2029 Repaving Plan

Consistent with Safe System Approach
Safe Roads ●

Existing Concept
Consider adding bike lanes in the uphill direction on California Ave. from Dartmouth St. to Hanover St. as part of repaving project and removing parking on one side.

Recommended Safe System Pivot
Add appropriate pedestrian and bike facilities: DIB 94 and NACTO Urban Bikeway Design Guide, FHWA Guide for Improving Pedestrian Safety at Uncontrolled Locations

Phasing
Near-Term

On HIN?
No

Hamilton Avenue Repaving

Source
PABAC recommendations for FY 2028 Repaving Plan

Consistent with Safe System Approach
Safe Roads ●

Existing Concept
Implement sharrows and other traffic calming elements on Ramona St. to Waverly St. as part of repaving project.

Recommended Safe System Pivot
Manage speeds: AB 43, countermeasure toolbox, FHWA Safe System Approach for Speed Management . . Add appropriate pedestrian and bike facilities: DIB 94, NACTO Urban Bikeway Design Guide, FHWA Guide for Improving Pedestrian Safety at Uncontrolled Locations

Phasing
Near-Term

On HIN?
Yes

Addison Avenue Repaving

Source
PABAC recommendations for FY 2025 Repaving Plan, Community Feedback

Consistent with Safe System Approach
Safe Roads ●

Existing Concept
Retain Class II bike lane in one direction and convert the substandard door zone bike lane to a bike route with sharrows as part of repaving project on Addison Avenue from Bryant Street to Middlefield Road. Parking is already removed on one side of the residential street.

Recommended Safe System Pivot
Add appropriate pedestrian and bike facilities: DIB 94, NACTO Urban Bikeway Design Guide

Phasing
Near-Term

On HIN?
No

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