Santa Barbara County, California

Local Road Safety Plan

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U.S. Department of Transportation
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Gary Smart and Chris Sneddon from Santa Barbara County coordinated the reviews and inputs from the local stakeholders.

16. Abstract

The purpose of this local road safety plan (LRSP) is to serve as a guide and roadmap for improving safety on Santa Barbara County roadways by reducing fatalities and serious injuries. As a safety stakeholder for developing and implementing California's SHSP, Santa Barbara County's investment in infrastructure, behavioral education, enforcement, and other transportation safety activities supports the State's vision of zero roadway deaths. Santa Barbara County is dedicated to transportation safety efforts, and its mission is to ensure a safe and sustainable transportation system for all motorized and non-motorized users on public roads throughout the County. This LRSP will support that mission. While the LRSP proposes a 5-year implementation plan, the plan is a living document and can be amended if additional information and funds become available. The LRSP will enhance and guide the future of transportation safety efforts in Santa Barbara County, reducing roadway fatalities and injuries and leading to zero deaths.

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Executive Summary

The purpose of this local road safety plan (LRSP) is to serve as a guide and roadmap for improving safety on Santa Barbara County roadways by reducing fatalities and serious injuries.

From 2005 to 2012, California's roadway fatalities showed a 30 percent decline, from 4,304 to 2,857. This decline was due in large part to the State having implemented key safety improvement strategies outlined in its first Strategic Highway Safety Plan (SHSP), developed in 2005 and amended in 2010. However, after 2012, California experienced a 23 percent increase in traffic fatalities, which rose from 3,107 in 2013 to 3,837 in 2016. Strengthening its efforts, the State managed to achieve a 6 percent decrease in 2017 with 3,602 recorded fatalities. To keep this momentum going, California's latest SHSP emphasized a focus on non-state roadways, where local and county roads account for two-thirds of fatalities and severe injuries.

As a safety stakeholder for developing and implementing California's SHSP, Santa Barbara County's investment in infrastructure, behavioral education, enforcement, and other transportation safety activities supports the State's vision of zero roadway deaths. Santa Barbara County is dedicated to transportation safety efforts, and its mission is to ensure a safe and sustainable transportation system for all motorized and non-motorized users on public roads throughout the County. This LRSP will support that mission.

The development of Santa Barbara's LRSP consisted of multiple steps. This process included a kickoff meeting followed by:

- A document review of County and State safety plans, programs, policy information, and activities.
- Data analysis to identify focus crash types.
- A workshop to select potential safety countermeasures.
- Development of a list of projects to address locations with focus crash types.
- Compiling these findings to complete the LRSP.

The crash, roadway, and traffic data for the years 2012 through 2016 were analyzed for the LRSP development. Using the data analysis results and keeping in mind California's SHSP emphasis areas, Santa Barbara County selected the following as the five main emphasis areas:

- Lane departure.
- Intersections.
- Pedestrian/bicycle.
- Speeding and aggressive driving.
- Impaired driving.

Figure 1 presents the emphasis areas for all three severity categories (fatalities, fatal + injury crashes, total crashes) in a single combined chart and labels the top five emphasis areas for each severity category.

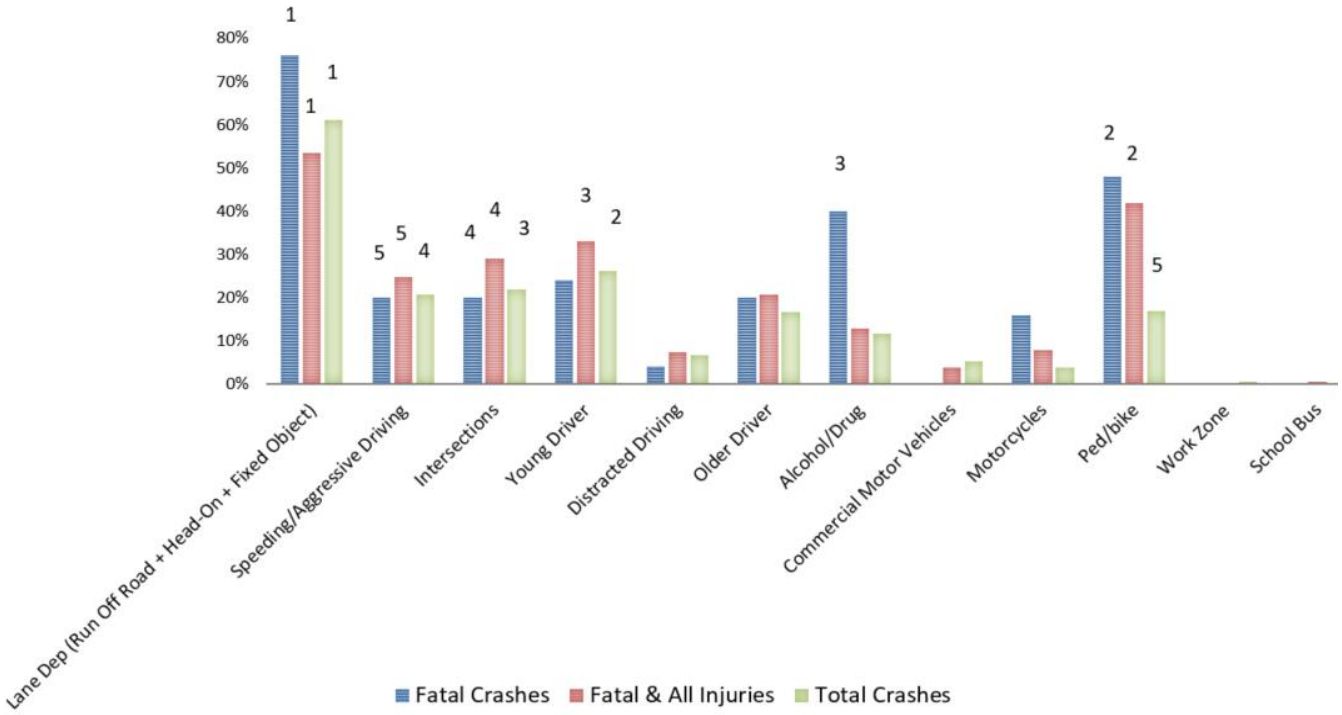

Figure 1. Emphasis Area Rankings for Crash Severity Categories (Fatal, Fatal+Injury, and Total Crashes) and Type on Santa Barbara County Roads, 2012-2016.

Using resources from the FHWA's Office of Safety website, the PEDBIKESAFE website, the CMF Clearinghouse, and the National Highway Traffic Safety Administration (NHTSA), potential groups of countermeasures were chosen for each emphasis area. Example countermeasures for each emphasis area are summarized below.

Table 1. Example Recommended Countermeasures.

Emphasis Area	Example Recommended Countermeasures							
	Basic Signing and Marking Packages	Pavement Treatments	Fixed Object Delineation or Removal	Signalized Intersection Treatments	Lighting	Road Diets	Roadway Geometry Changes	Enforcement & Education
Lane Departure	✓	✓	✓				✓	✓
Intersections				✓	✓	✓	✓	✓
Pedestrian & Bicycles				✓	✓	✓	✓	✓
Speeding & Aggressive Driving	✓	✓	✓			✓	✓	✓
Impaired Driving								✓

Extensive data analysis, including crash history details and systemic prioritization,[1] coupled with proposed safety improvements at specific locations and an assessment of projected cumulative project costs, guided the selection of safety projects included in this plan. The project team also suggested a number of optional projects as potential solutions to advance a site's long-term safety or for further analysis to determine their feasibility.

Santa Barbara County will establish and monitor performance measures to assess the effectiveness of the plan as the recommended projects are implemented. The County will engage and work together with partner agencies and safety stakeholders to move towards zero deaths. This partnership and collaboration is critical to achieving both California's SHSP and Santa Barbara County's safety goals.

While the LRSP proposes a 5-year implementation plan, the plan is a living document and can be amended if additional information and funds become available. The LRSP will enhance and guide the future of transportation safety efforts in Santa Barbara County, reducing roadway fatalities and injuries and leading to zero deaths.

[1] A systemic approach to safety involves widely implemented improvements based on high-risk roadway features correlated with specific severe crash types. The proactive approach helps agencies broaden an agency's traffic safety efforts at relatively low cost and is effective in preventing crashes before they happen.

1. Introduction

Santa Barbara County has a wide-ranging topography. In mountainous areas, roadways tend to be curvy and narrow, with little or no shoulder. Conversely, in the valleys, roadways are flat, straight, and wide and often have shoulders. The Transportation Division of Santa Barbara County Public Works Department maintains 1,650 lane miles in the unincorporated areas of the County, with the majority being rural in nature, and with road volumes ranging from high to very light.

From 2005 to 2012, California's roadway fatalities showed a 30 percent decline, from 4,304 to 2,857. This decline is due in large part to the State having implemented key strategies outlined in its first Strategic Highway Safety Plan (SHSP),[2] developed in 2005 and amended in 2010. However, California experienced a 23 percent increase in traffic fatalities after 2012—from 3,107 in 2013 to 3,837 in 2016. The State was able to achieve a 6 percent decrease in 2017 with 3,602 recorded fatalities.[3]

During the same time period, Santa Barbara County experienced a similar growth and decline in roadway fatalities, while the total crash count reached its highest level in 2016.[4]

Table 2. Roadway Safety Statistics of Santa Barbara County Roads, 2012-2016.

	Fatalities	Injuries	Crashes
2012	5	289	729
2013	10	255	679
2014	3	299	676
2015	4	269	650
2016	3	298	819
Total	25	1,410	3,553

[2] Caltrans Strategic Highway Safety Plan (SHSP) 2015 Update. Available at: http://www.dot.ca.gov/trafficops/shsp/docs/SHSP15_Update.pdf

[3] NHTSA Fatality Analysis Reporting System (FARS) Encyclopedia. https://www-fars.nhtsa.dot.gov/

[4] This LRSP was developed using data from 2012 to 2016, the last year a complete data set was available at the time of plan development.

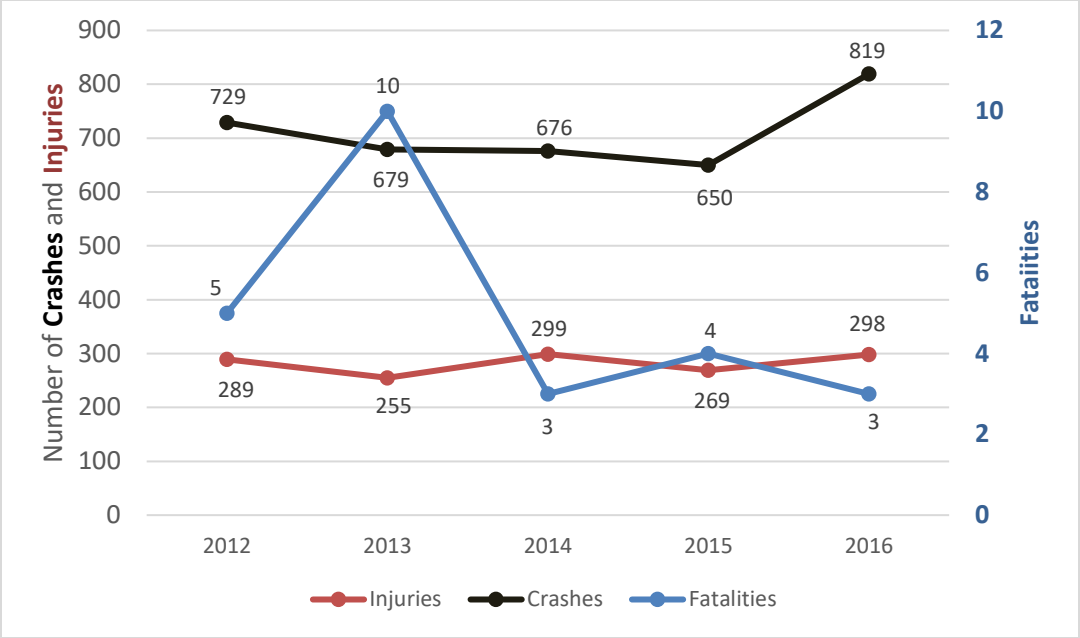

Figure 2. Fatalities, Injuries, and Crashes on Santa Barbara County Roads, 2012-2016.

Figure 2 indicates that the number of injuries also displays an almost flat line during the same time period, while the total count of crashes increase dramatically in 2016 after 3 years of consecutive decreases.

California's SHSP states that the majority of fatalities and severe injuries occur on the Non-State Highway System (Non-SHS), which includes municipal and county roads. The SHSP recommends ensuring placement of sufficient safety focus on non-state roadways, where two-thirds of fatalities and severe injuries occur. Toward Zero Deaths is the aspirational goal in California, and the State established realistic and achievable steps within the SHSP to move closer to zero deaths.

State DOTs historically led safety management and safety improvement strategies. However, to ensure traffic fatalities continue to decline, it is imperative that local agencies deploy appropriate safety countermeasures and strategies on their roadway network.

This Local Road Safety Plan will serve as a roadmap for Santa Barbara County to plan and implement safety projects, support California's SHSP goals, and reduce traffic fatalities and serious injuries.

Background

The Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) established the requirement for states to develop SHSPs and to report fatality and serious injury data on both state and local roadway systems. The provisions of the Moving Ahead for Progress in the 21st Century (MAP-21) Act, continued to require that States develop SHSPs and use the basic plan elements established in SAFETEA-LU, such as accounting for all roads, focusing on data-driven approaches, and involving multidisciplinary stakeholders. MAP-21 also established roadway safety as a national goal, required the Secretary of Transportation to establish national safety performance measures, and mandated that State departments of transportation (DOTs) determine targets for those performance

measures. The latest reauthorization bill – Fixing America's Surface Transportation (FAST) Act, continues these performance measure requirements. States are working with their local and regional planning partners to establish targets for the following Safety performance measures: number of fatalities, rate of fatalities per hundred million vehicle miles traveled (HMVMT), number of serious injuries, rate of serious injuries per HMVMT, and number of non-motorized fatalities and serious injuries.

As an integral stakeholder in developing and implementing California's SHSP, Santa Barbara County has structured its investments in infrastructure, behavioral education, and enforcement, as well as other transportation safety activities, to support the State's goal of zero roadway deaths.

Designing this LRSP starts with an established vision, mission, and objective:

***Vision**: Santa Barbara County will have a safe transportation system for all users.*

***Mission**: The mission is to ensure a safe and sustainable transportation system for all motorized and non-motorized users on all public roads in the County. The plan will achieve this mission by utilizing a data-driven 4E approach of engineering, enforcement, education, and emergency medical services to improve infrastructure and assist with behavior change and by focusing efforts in those areas where the greatest opportunity for reductions in traffic-related fatalities and severe injuries exist.*

***Objective:** Apply budgeted County funds to implement tier 1 improvements beginning with high fatality rate conditions, apply for additional Highway Safety Improvement Program funding to accelerate improvements, and update the LRSP and track progress.*

***Goal**: The goal of Santa Barbara County's LRSP is to contribute to California's Strategic Highway Safety Plan in achieving Toward Zero Deaths.*

State SHSP, Regional Safety Plan, and County LRSP Connection

California's large and complex public roadway system comprises nearly 225,000 miles of Federal, State, and local roads.[5] Caltrans owns approximately 15,000 miles of the public roads, while locally owned roads make up the remaining 183,775 miles. Approximately 57 percent of traffic fatalities occur on local highways, while 43 percent occur on the California State Highway System.[6] As stated in the SHSP, Caltrans' goal is to achieve a 3 percent annual reduction in the number and rate of fatalities and a 1.5 percent annual reduction in the number and rate[7] of severe injuries. To meet these goals, Caltrans must implement key strategies on targeted roadways throughout the State system.

Santa Barbara County has opportunities to compete for Statewide project funding to improve transportation safety on the local system. The County can use the countermeasures and locations identified in this plan to seek funding for safety improvement projects at these locations.

LRSPs are an effective tool for helping to achieve fatal and serious injury reductions on the local roadway system. This plan ties directly to MAP-21 and California's SHSP, which recommends the State focus its efforts on non-state roadways, where two-thirds of fatalities and severe injuries occur.

Existing Efforts

Analyzing the performance of a County's current roadway safety activities is critical to determining whether a practice is successful and should be continued or unsuccessful and should be modified or discontinued. Examining efforts currently underway or performed in the past can also provide insights on potentially innovative approaches for the county to undertake in implementation of this plan. The County will use these existing efforts as applicable to help leverage implementation of the recommendations within the plan.

The County participates in the **Caltrans Highway Safety Improvement Program** by submitting projects for funding.

It also budgets safety improvements from the County's capital improvement plan and **Road Maintenance Annual Plan** (called "Roadmap"). The Roadmap includes activities and efforts that support overall road safety. For example, the Countywide Sign & Stripe Crew conduct traffic control maintenance that includes striping, stenciling, curb painting, sign maintenance and repair, traffic signal maintenance and repair, traffic safety marker placement, guardrail maintenance and repair, and other traffic maintenance items.

Santa Barbara County also has a **collision reduction program**. Under this program, staff log crashes that occur on County roadways into a database and then analyze and map out locations with high crash rates

[5] Federal Highway Administration. (2015). "Table HM-10 Public Road Length – 2014." *Highway Statistics 2014.* Washington, DC. Available at: https://www.fhwa.dot.gov/policyinformation/statistics/2014/hm10.cfm. Last accessed February 1, 2019.

[6] California Department of Transportation, Federal Highway Administration, and Safe Transportation Education and Research Center. (2018). Local Roadway Safety – A Manual for California's Local Road Owners. Version 1.4: 06/08/2018. Available at: http://dot.ca.gov/hq/LocalPrograms/HSIP/2018/CA-LRSM.pdf. Last accessed February 1, 2019.

[7] Rate refers to the number of fatalities and severe injuries per 100 million VMT.

or high crash occurrences. The County investigates the crash patterns and locations, develops recommendations, and then seeks funding for improvements. Staff currently use a safety approach, which addresses only hotspots or citizen complaints about specific safety issues. The County's goal is to prevent crashes by addressing safety issues in a more proactive manner.

The **Preventive Maintenance Program** encompasses traffic signal equipment and includes a 24-hour call system for emergencies. Staff routinely inspect traffic signal equipment and update signalized intersection timing as needed to provide the safest, most efficient system possible.

In response to **public input and requests**, the Traffic Section and Maintenance crews follow up on public comments associated with parking restrictions, traffic calming, sight distance, and stop sign requests. The public frequently identifies transportation issues using a Project Initiation Request Form (PIR). The Transportation Division keeps a database to track the large volume of PIRs received each year, and performs studies to determine the viability and priority for requests. Staff present many of these issues to the Traffic Engineering Committee, which is comprised of stakeholders and experts who help find appropriate solutions. Due to the limited funding available, they only implement a small number of these projects each year.[8]

The County's annual operating budget encompasses its roadway **signing and striping maintenance program**. As remaining funds allow, the County addresses as many small projects as it can from the PIR and its own priorities, saving larger projects to apply for funding under the Caltrans Highway Safety Improvement Program.

The Santa Barbara County **Bicycle Master Plan** guides the construction of new bicycle-related infrastructure. The County Bicycle Master Plan provides guidance for developing regional linkages, and considerations for cross-county trips. The plan lists recommended, prioritized bicycle projects. To develop the Santa Barbara County Bicycle Master Plan, staff and elected officials involved the community in plan development through neighborhood summits, outreach roadshows, community open houses, and meetings with the Downtown Parking Committee, Planning Commission, Transportation and Circulation Committee, City Council, and the Neighborhood Advisory Council. Successful bicycle educational programs in Santa Barbara include Bike-to-Work Week, Bike to School Days, Team Bike Challenge, CycleMAYnia, and "Take a Vacation from your Car."[9]

The Santa Barbara County Association of Governments (SBCAG), with input from member governments, advocacy groups, the public, and various stakeholders prepared the County's **Regional Active Transportation Plan**. The plan creates a regional vision for improving the bicycle and pedestrian network by integrating the bicycle and pedestrian planning of the region's nine member governments. The goals of the plan are to enhance mobility, increase connectivity, promote equity for all users in all communities, and improve safety and public health.

[8] The committee has representatives from Santa Barbara Public Works Transportation Division, California Highway Patrol, Automobile Club of Southern California, Santa Barbara Bike Coalition, Santa Barbara County Sheriff's Department, South County Transit Provider, County School Superintendent's Office, and Vandenberg Air Force Base Civil Engineer's Office.

[9] Santa Barbara County Bicycle Master Plan, page 16.

The County's **Safe Routes to School** (SR2S) program takes a 4E (engineering, education, enforcement, and emergency services) approach and collaborates with area schools to make walking and bicycling to and from school safe, convenient, and attractive. An example of a successful SR2S program is the Walk and Roll program at La Cumbre Junior High School.

2. Methodology and Approach

Local road safety plan development is a methodical, repeatable process designed to ensure that a variety of stakeholder needs and inputs are considered, that the plan is actionable, and the results are measurable. Applying the overall steps of the LRSP development process shown below guided development of Santa Barbara's plan.

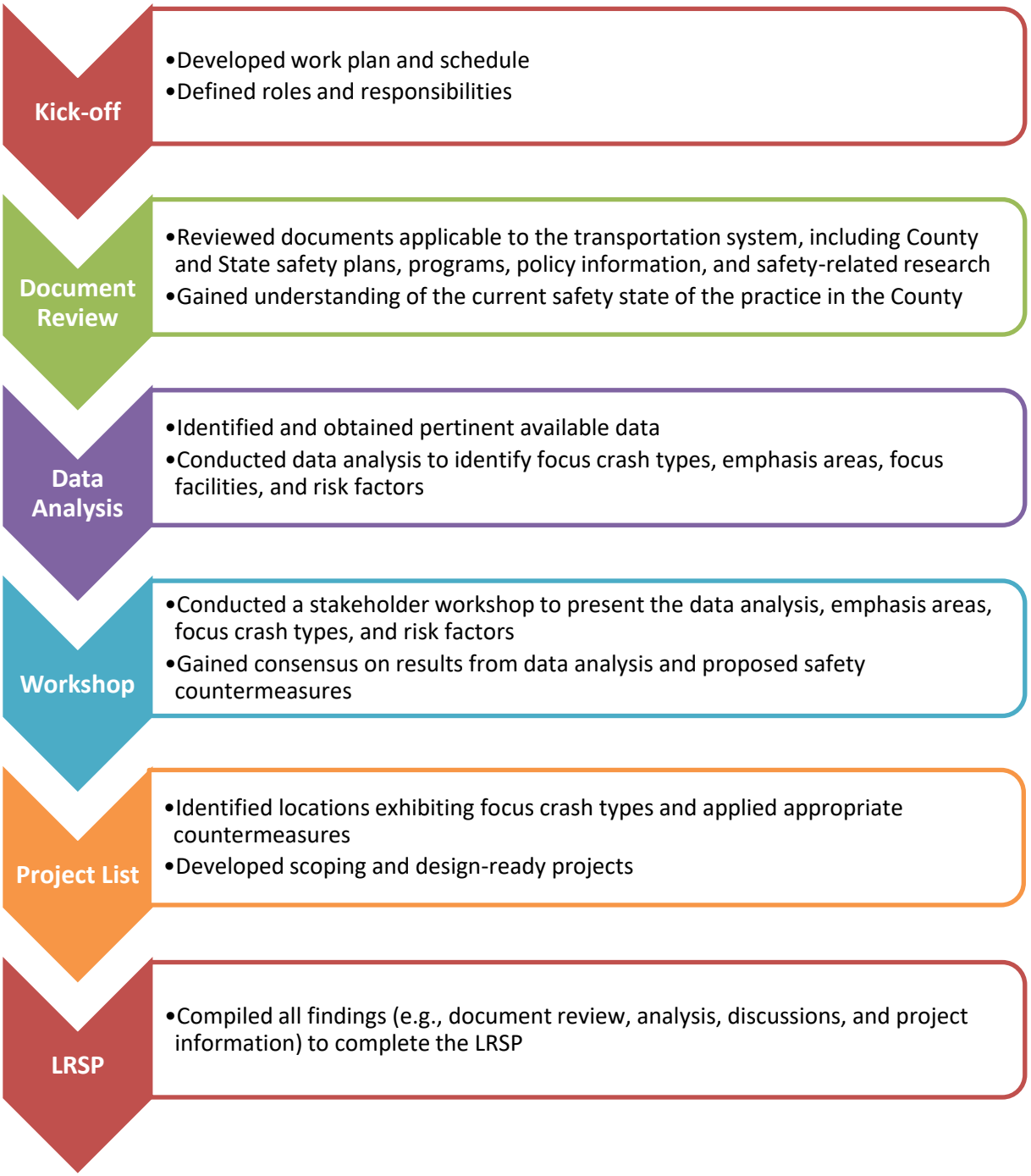

Figure 3. LRSP Development Steps.

Data and Analysis

Data analysis plays a crucial part in LRSP development and includes identifying existing and emerging safety issues, determining potential improvement locations, and prioritizing and addressing the locations and issues within budget. However, the effectiveness of the analysis results highly depend on the comprehensiveness, quality, and the accessibility of available data.

The available data sources and types used in the analysis step of the LRSP include:

- Santa Barbara County Public Works Collision Database (MS Access) – crashes.
- County maintained roads (GIS shapefile) – roadway inventory (including width and number of lanes).
- List of schools within the County (MS Excel) – reduced speed zones.
- List of signalized intersections and their owners (MS Excel) – traffic control indicators.
- Santa Barbara County Sign Inventory (MS Access) – type, location, and direction/orientation of roadway signing.
- Traffic Counts Database (PDF and MS Access) – traffic volumes.

During the LRSP development, differences in data format and structure caused issues and delays when integrating multiple databases, which was needed for a robust analysis. Several important pieces of information were missing in the available databases, including:

- Distinction among severity levels for crashes involving the injury indicator.
- Speed limit.
- Roadway alignment.
- Shoulder width.

Separate storage of the intersection control data and traffic counts from the crash database posed challenges when integrating this data into safety analyses, causing non-matching road or intersection names and unknown road directions (north-south-east-west). Such challenges required development of alternative solutions.

To maximize the available data, the team manually joined the sign inventory with the crash data. The sign inventory contained information regarding curve warning and speed limit signs, which assisted the data analysts in locating the presence of horizontal curvature and posted speed limits, respectively, at crash locations. The analysis revealed that the current traffic volume data was outdated. As a result, the County decided not to use this data in the analysis.

Analysis of the crash data supplemented with other aforementioned databases offered insight into the distribution and characteristics of the crashes that occurred on Santa Barbara County roads only between the years 2012 and 2016.

As the data in Figure 4 shows, 61 percent of the *total crashes* were due to lane departures (i.e., run-off-road, head-on, or fixed object crashes), 26 percent involved young drivers, 22 percent were at intersections, and 21 percent involved speeding and/or aggressive driving. Pedestrian/bicycle and older drivers each accounted for 17 percent of total crashes. These categories are not mutually exclusive; some crashes may fall into more than one category.

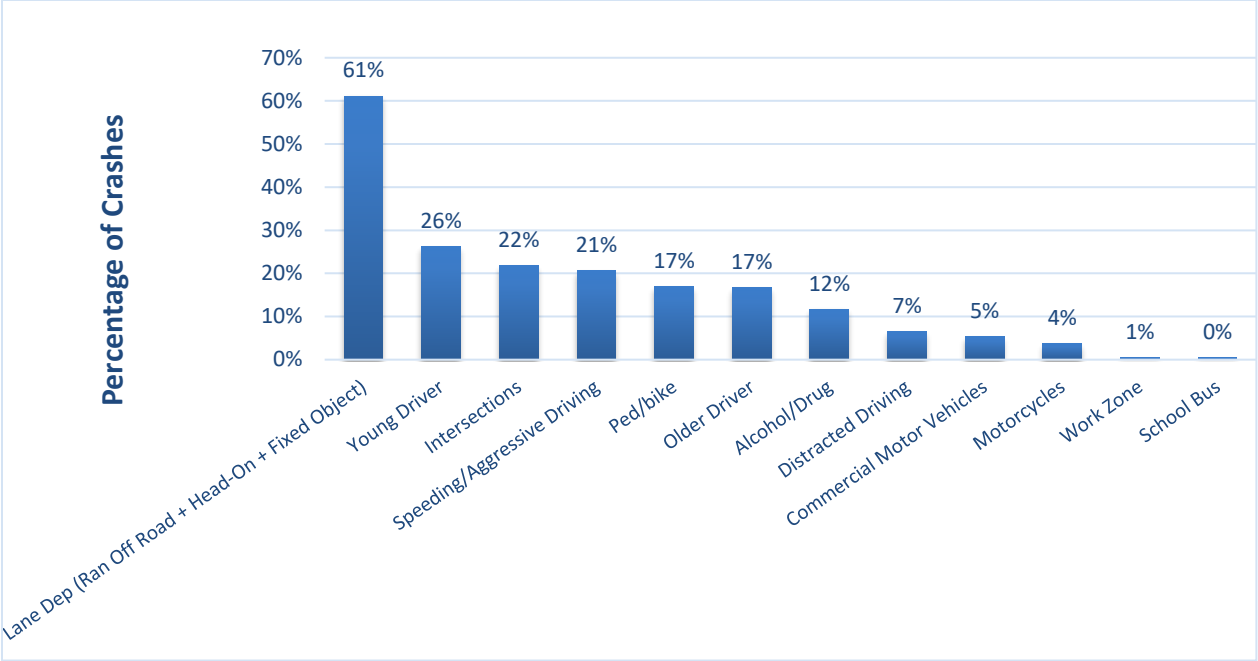

Figure 4. Distribution of All Crashes on Santa Barbara County roads by Crash Type, 2012-2016.

Figure 5 shows that lane departure crashes accounted for 76 percent of the 25 *fatalities* that occurred in Santa Barbara from 2012-2016. Pedestrian and bicycle crashes accounted for 48 percent of roadway fatalities, 40 percent of fatalities were alcohol and drug related, and 24 percent were due to inexperienced young drivers. These categories are not mutually exclusive; some crashes may fall into more than one category, so the total distribution shown does not equal 100 percent.

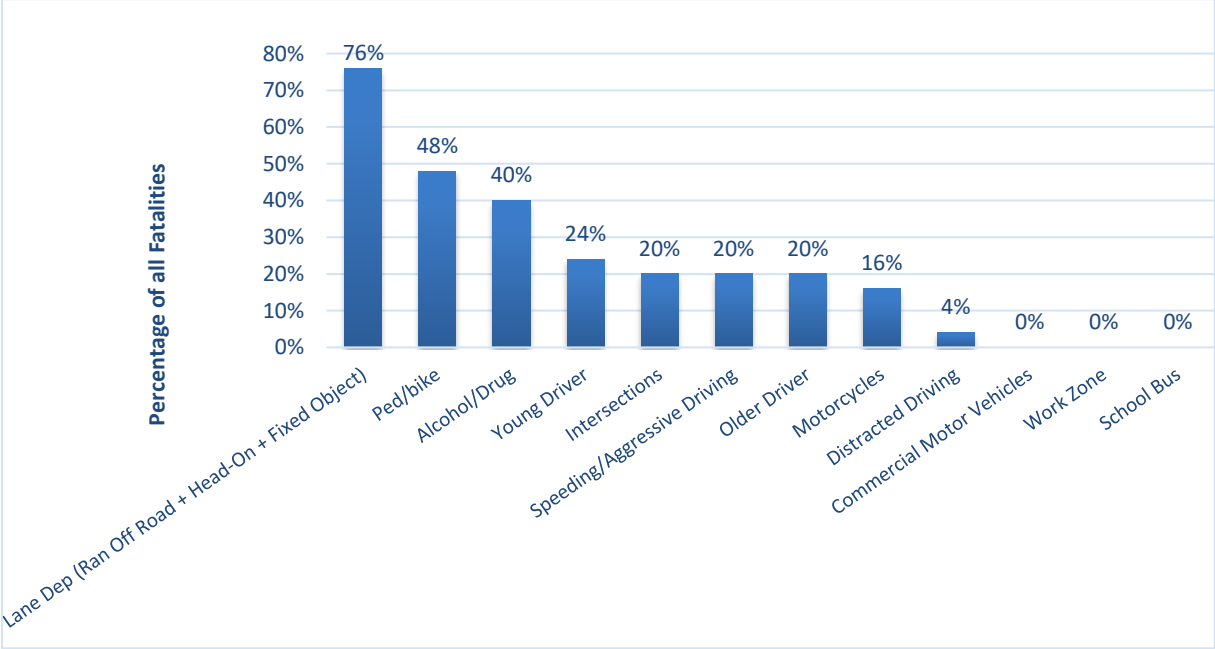

Figure 5. Distribution of Fatalities on Santa Barbara County roads by Crash Type, 2012-2016.

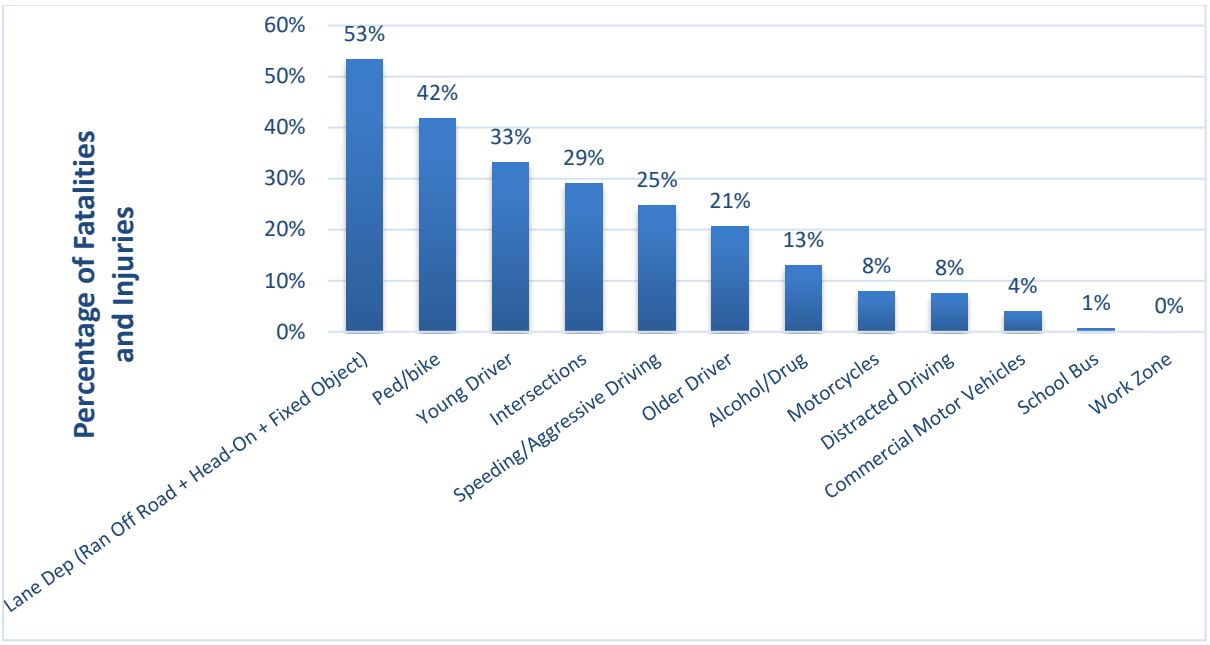

Figure 6. Distribution of Roadway Injuries and Fatalities on Santa Barbara County roads by Crash Type, 2012-2016.

As show in Figure 6, 53 percent of all injuries and fatalities resulted from lane departure crashes, while 42 percent involved pedestrians and bicycles. Young drivers accounted for 33 percent while intersections contributed to 29 percent of fatalities and injuries. These categories are not mutually exclusive; some crashes may fall into more than one category, so the total distribution shown does not equal 100 percent.

3. Emphasis Areas, Focus Crash Types, and Risk Factors

Using the data analysis results and keeping in mind California's SHSP emphasis areas, Santa Barbara County selected the following as the five main emphasis areas for its LRSP:

- Lane departure.
- Intersections.
- Pedestrian/bicycle.
- Speeding/aggressive driving.
- Impaired driving.

Figure 7 presents the emphasis areas for all three severity categories (fatalities, fatal + injury crashes, total crashes) in a single combined chart and labels the top five emphasis areas for each severity category.

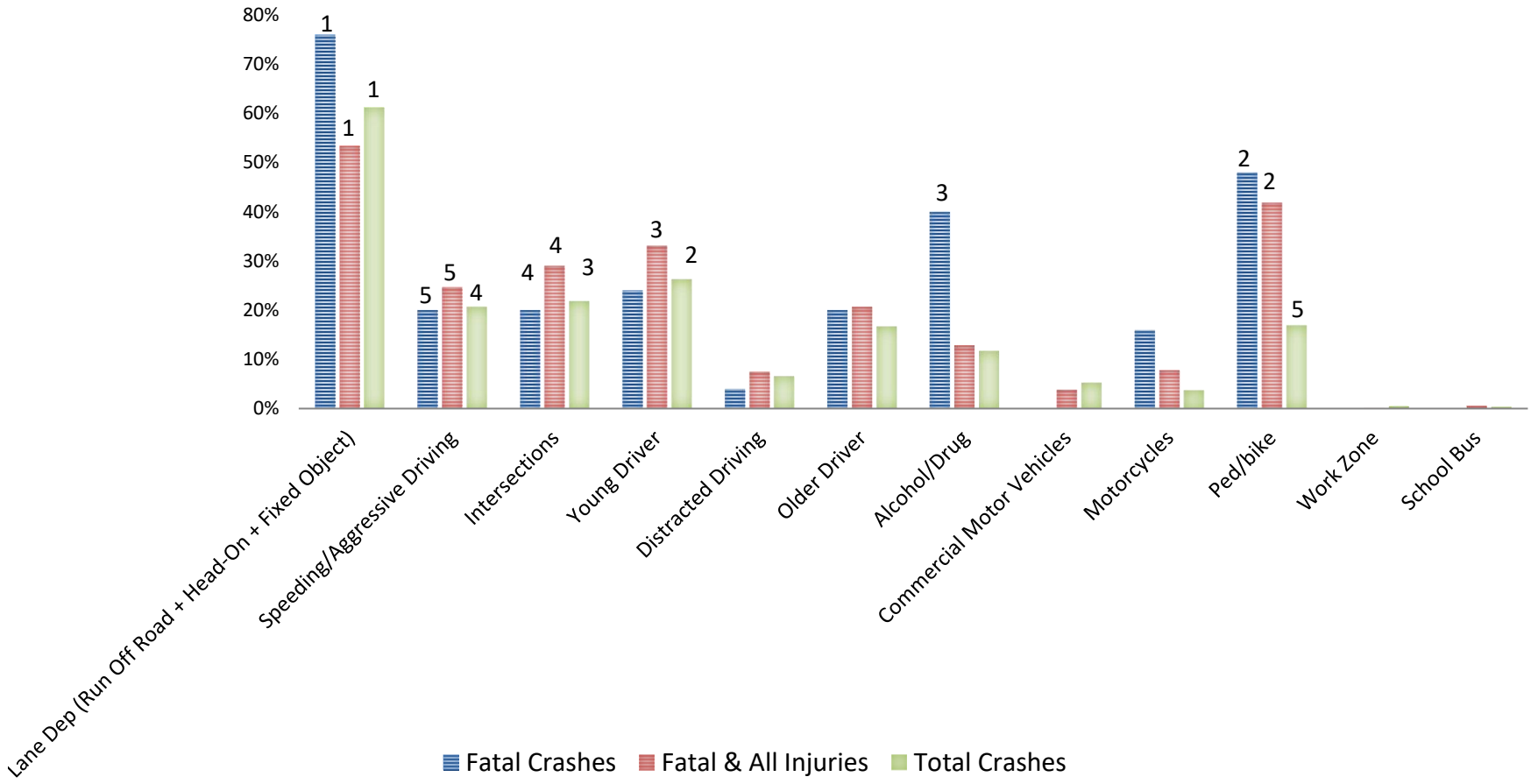

Figure 7. Emphasis Area Rankings for Crash Severity Categories (Fatal, Fatal + Injury, and Total Crashes) and Type on Santa Barbara County Roads, 2012-2016.

Addressing Emphasis Areas

After identifying and confirming the emphasis areas, the team developed crash trees using a two-step approach:

1. Break down the distribution of crashes by facility to identify focus facilities where the number of crashes, serious injuries, and fatalities were overrepresented.
2. Identify the issues at these focus facilities by taking a closer look at predominant crash types within the established emphasis areas.

Development of a crash tree involves dividing the total number of fatalities, injuries, and crashes into smaller and smaller categories. The crash trees below start with dividing fatalities, injuries, and crashes by facility type to identify focus facilities that experience the highest percentage of crash severities, and then differentiating among crash types on the focus facilities to pin point the most common. This approach allows more precise risk factor analysis that focuses on each overrepresented crash type at each facility type, thus leading to solutions tailored to the predominant issues specific to each focus facility. Figures 8 and 9 illustrate the focus facilities and the predominant crash types for rural and urban areas in the county, respectively.

For Figure 8, all crashes on the County's network were identified (3,553 crashes, 1,410 fatal plus injury crashes, and 25 fatalities), and further subdivided into those occurring in rural and urban areas. For Figure 8, the focus is solely on the County's rural system, rural crashes are further categorized into whether they occurred on intersections or segments. Following the segments path, the focus facilities are then determined. In Santa Barbara County, segment facilities comprised two-lane and three-lane roadways. The components of the data set did not allow for differentiation between tangents and curved segments, so these types of crashes were not further broken out.

Analyzing crash types attributed to one or more emphasis areas for rural two-lane segments showed that the following emphasis areas and associated crash types are represented on this facility type:

- Lane departures (run-off-road, fixed object, sideswipe, overturn, head-on).
- Speeding/aggressive driving.
- Impaired driving.

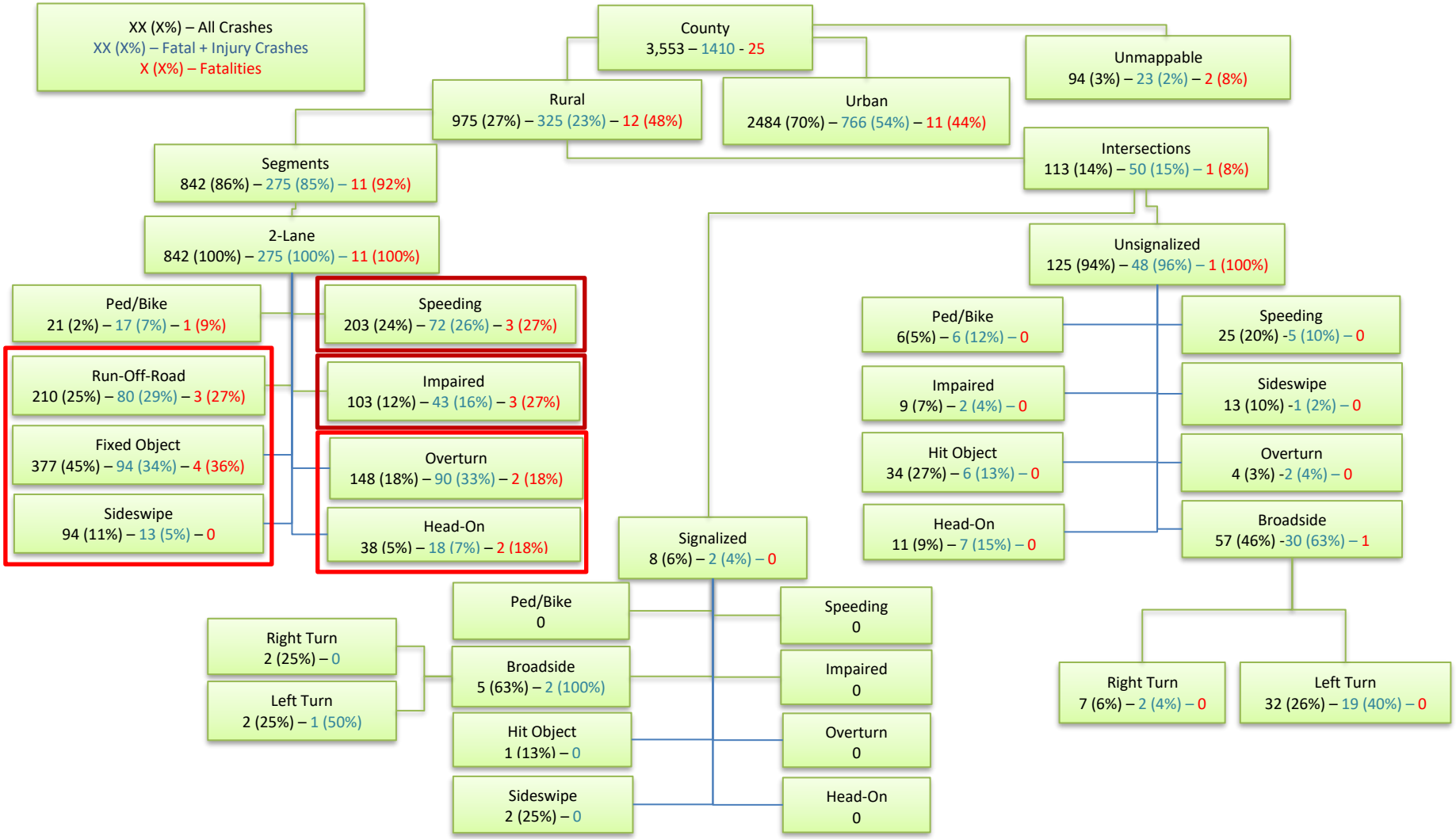

Figure 8. Crash Tree for Rural Roads in Santa Barbara County, 2012-2016.

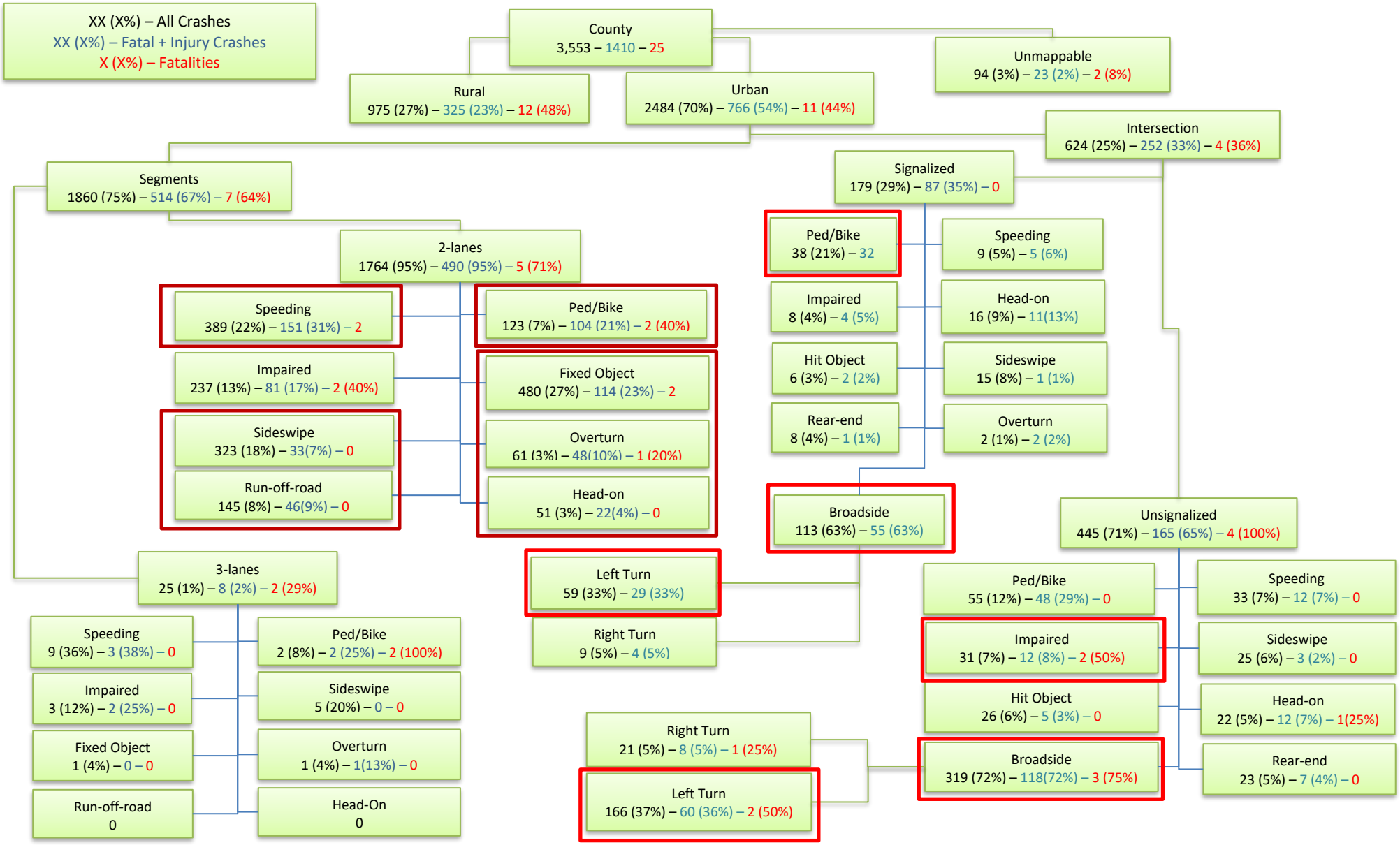

Figure 9. Crash Tree for Urban Roads in Santa Barbara County, 2012-2016.

The next step of the analysis focused on determining the high risk factors for these crash types occurring on two-lane rural segments. The presence of each risk factor's overrepresentation for a crash type at a focus facility indicates its level of risk. The example in Figure 10 shows how shoulder width varies for lane departure crashes on two-lane rural undivided segments, and reveals an overrepresentation of crashes at locations with a 3-ft. shoulder width. Notably, the Highway Safety Manual identifies rural two-lane roads with shoulders less than 6 ft. wide as a risk factor.

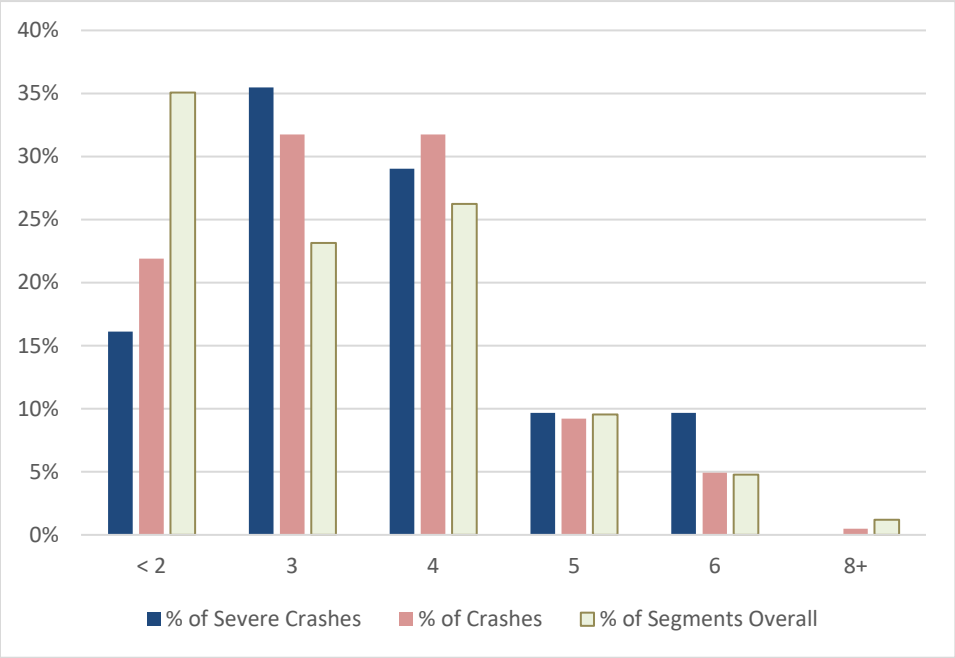

Figure 10. Example Risk Factor Analysis for Shoulder Width.

On further analysis, when selecting project locations, we can identify other circumstances that contributed to these crash types, and thus select appropriate countermeasures based on both the crash types and location characteristics.

These findings were vetted through a stakeholder working group, which helped to ensure the development of an actionable plan that covers the broad range of disciplines involved in transportation safety.

During the development of the LRSP, stakeholders reviewed, discussed, and approved potential countermeasures for each emphasis area. These countermeasures are described in the respective emphasis area sections below. The countermeasures for each section below represent an array of solutions that address crash types within each emphasis area. Countermeasures are stratified and grouped under Tier 1 through Tier 4. In general, first consideration is for Tier 1 countermeasures, as they are typically lower cost and easier to implement with proven safety benefits. If Tier 1 countermeasures are already in place or do not address the situation, Tier 2 countermeasures are then considered. This progression continues through Tiers 3 and 4. Tables 3 through 7 display the tiered countermeasures specific to each emphasis area of this plan.

Lane Departure

Background

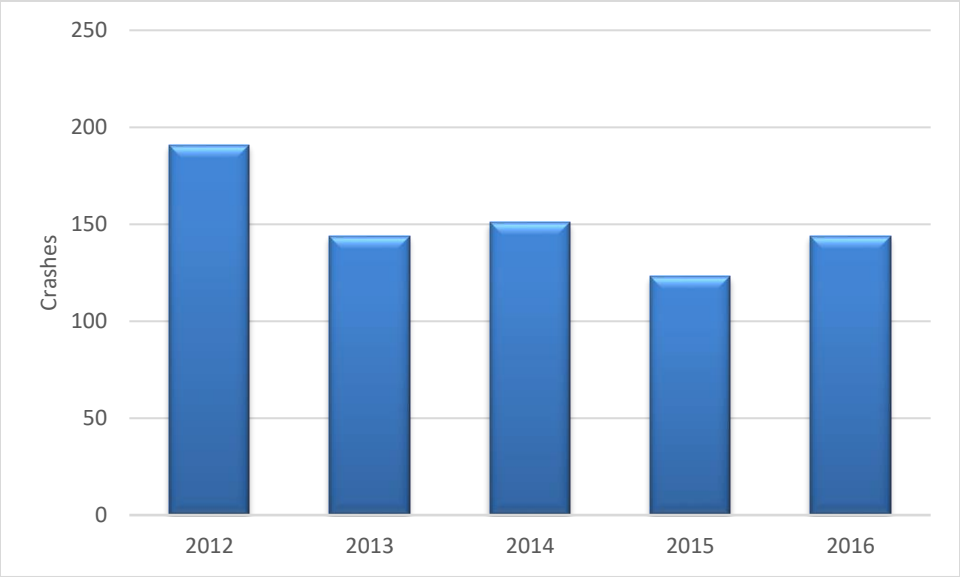

Figure 11. Distribution of Lane Departure Crashes on County Roads Resulting in Fatalities or Injuries, 2012-2016.

Roadway departures (RwD) crashes accounted for 61 percent of all crashes on Santa Barbara roads from 2012 through 2016. Fatal crashes involving RwD accounted for 76 percent of all highway fatalities and 53 percent of all injuries and fatalities, respectively, making RwD the leading crash type in all severity categories. Figure 11 shows the variation over the analysis period in lane departure crashes that resulted in fatalities or injuries on Santa Barbara county roads.

The crash trees depicted in Figures 8 and 9 indicate that *rural* two-lane segments experienced nine fatalities due to lane departure crashes between 2012 and 2016, which represents 82 percent of all fatalities on this segment type and 75 percent of fatalities overall. By comparison, two fatalities occurred on *urban* two-lane segments due to vehicles leaving the roadway.

Winding, low-volume roads in rural Santa Barbara account for many center line miles, and workshop participants identified these as locations as being at high risk of RwD crashes. The stakeholders also identified impaired driving and speeding as contributing factors to RwD crashes in rural areas.

Objective

The objective for this emphasis area is to address RwD crashes by recommending proven countermeasures that will reduce specific types of crashes at high-risk locations. In recent years, the County's approach of treating hot spot locations has reduced the number of crashes and fatalities to some degree, but other locations are now experiencing RwD crashes that must be addressed. The County now wishes to employ a more proactive approach to treating RwD on low volume rural roads.

As shown in the crash trees in Figures 8 and 9, rural and urban two-lane segments experience most of the County's RwD crashes, with fixed object and run-off-road crashes being the two major contributing

crash types. Addressing this subset of RwD crashes will enable the County to achieve a significant reduction in crashes for the overall RwD emphasis area.

Performance Measures

To monitor and measure progress on an annual basis, the County will incorporate the last complete year's data set into the data analysis described in this chapter and Chapter 2 of this plan and develop trends that show progress with respect to lane departure crashes. This trend data will be overlaid with the improvements made each year to fully implement the plan over a five year period.

Strategies and Approved Countermeasures

Santa Barbara County stakeholders discussed the merits of addressing RwD crashes using a tiered countermeasure approach, as discussed previously. The workshop discussions in Santa Barbara County led to the approval of the following list of countermeasures to address lane departure crashes. However, consideration of other countermeasures for implementation based on specific location needs is also possible.

Table 3. Tiered Countermeasures for Lane Departure Crashes.

Tier 1	**Tier 2**
Fundamental signing for curves (e.g., curve warning signs, advisory speed plaques, chevrons, arrow board – as defined in the MUTCD[10])	Enhanced signing and marking for curves
Centerline and/or edge line pavement marking	Raised thermoplastic centerline rumble strips
Centerline and/or edge line rumble stripes	Alignment delineation
Wider centerline pavement marking (where rumble stripes cannot be installed)	Tree removal/utility pole relocation
SafetyEdge$_{SM}$ treatment	
Fixed object delineation	
Tier 3	**Tier 4**
High friction surface treatment	Wider shoulders
Enhanced signing and marking for curves plus flashing beacons	Reconstruction of curve
Enhanced signing and marking for curves plus dynamic curve warning system	Alternate passing lanes design
Lighting	Road diet
Shield fixed objects	Median buffer
	Corridor or area-wide 3E improvements

[10] Manual on Uniform Traffic Control Devices (MUTCD). Available at: https://mutcd.fhwa.dot.gov/pdfs/2009/pdf_index.htm

Intersections

Background

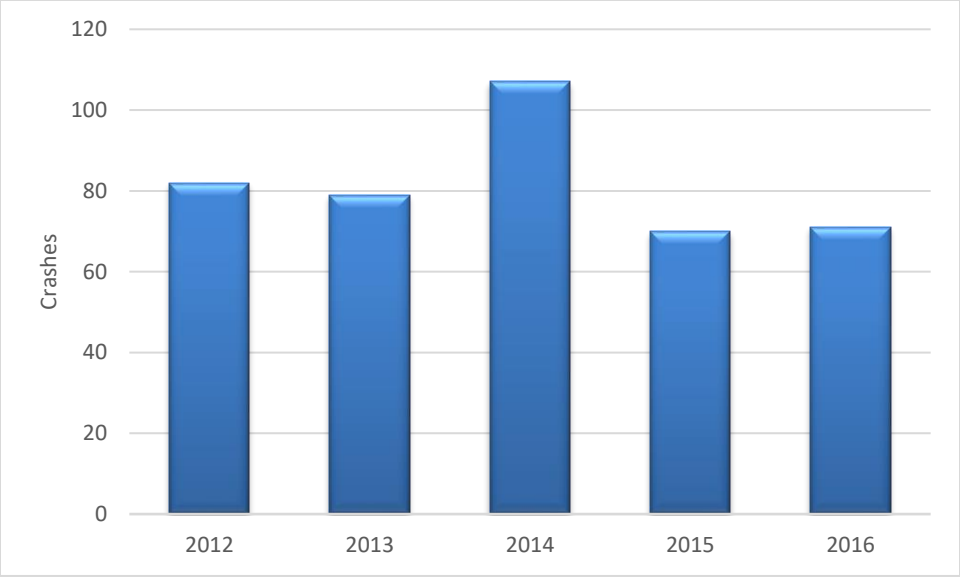

Figure 12. Distribution of Intersection Crashes on Santa Barbara County Roads Resulting in Fatalities or Injuries, 2012-2016.

Intersection crashes accounted for 22 percent of all crashes on the County's system between 2012 and 2016, being among the top three leading crash types in all severity categories. Fatal crashes at signalized and unsignalized intersections accounted for 20 percent of all highway fatalities on Santa Barbara County roads and 29 percent of all fatal and injury crashes, respectively. Figure 12 shows the variation over the analysis period in intersection crashes that resulted in fatalities or injuries on Santa Barbara county roads.

Stakeholders identified the Isla Vista area of Santa Barbara County, known for its high number of urban intersections and concentrated pedestrian and bicycle traffic, as a special area where intersections need further analysis and improvement. The area comprises a university and many residential and recreational facilities. Analysis specific to the Isla Vista area is included as a part of the countywide intersection analysis.

Objective

The objective of this emphasis area is to address intersection crashes, especially on urban roads with high pedestrian and bicycle traffic, such as corridors in Isla Vista.

The crash trees shown indicate that urban unsignalized intersections account for a large proportion of intersection crashes, with left-turn broadside crashes being the crash type most overrepresented, followed by pedestrian and bicycle crashes, which have a higher potential to result in a severe injury. By primarily addressing these crash types, the County can effectively achieve an overall reduction in intersection crashes.

Performance Measures

To monitor and measure progress on an annual basis, the County will incorporate the last complete year's data set to the data analysis described in this chapter and in Chapter 2 of this plan. It will also look for trends that show progress with respect to intersection crashes. This trend data will be overlaid with the improvements made each year as part of the full 5-year plan implementation period.

Strategies and Approved Countermeasures

The Santa Barbara County stakeholders discussed the merits of addressing intersection-related crashes using a tiered countermeasure approach. The workshop discussions in Santa Barbara County led the County and stakeholders to approve the following list of countermeasures to address intersection crashes. However, the County may consider and implement other countermeasures based on specific location needs as plan implementation proceeds.

Table 4. Tiered Countermeasures for Intersection Crashes.

Tier 1	**Tier 2**
Basic intersection signing and pavement markings (e.g., intersection/stop/signal ahead and corresponding pavement marking, reflective posts)	Flashing solar powered LED beacons on advance intersection warning signs and STOP signs
Clear sight distance triangles	Flashing overhead intersection beacons (red/red)
Lane narrowing using pavement marking and raised pavement markers	Dynamic intersection warning signs
Enhanced signing and pavement marking	Lane narrowing using pavement marking and shoulder rumble strips
Backplates with retroreflective borders	Dynamic speed warning sign to reduce speed
Flashing yellow arrow	High friction surface treatment
Change of permitted and protected left-turn phase to protected-only	Raised median divider on stop approach
Signal coordination	Lighting
Pedestrian ladder or cross-hatched crosswalk and advanced pedestrian warning signs	Advance detection control systems for signals
	Restricted crossing U-turn intersection design
	Pedestrian countdown signals
	Separate pedestrian phasing
	Bicycle boxes
Tier 3	**Tier 4**
Left-turn lane	Roundabout
Right-turn lane	Corridor or area-wide improvements in engineering, education, and enforcement
Reduce or eliminate intersection skew or create offset T-intersections	

Pedestrian/Bicycle

Background

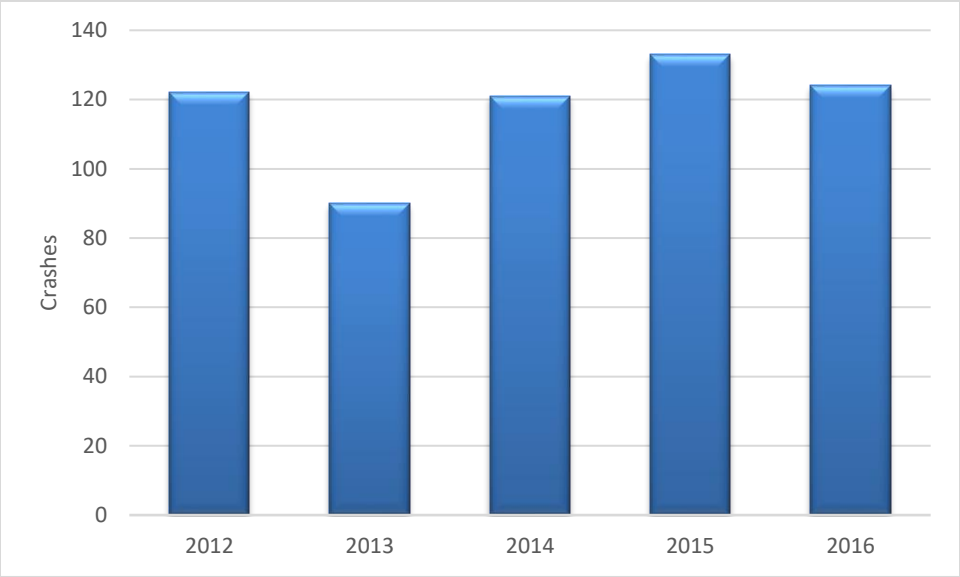

Figure 13. Distribution of Pedestrian and Bicycle Crashes on Santa Barbara County Roads Resulting in Fatalities or Injuries, 2012-2016.

Seventeen percent of all crashes on the County's roads involve pedestrians and bicyclists from 2012 to 2016. Crashes involving pedestrians and bicycles accounted for 48 percent of all roadway fatalities on Santa Barbara County roads, and pedestrian and bicycle crashes accounted for 42 percent of fatal and all injury crashes in Santa Barbara County. Based on this data, pedestrian and bicycle crashes result in the second greatest number of fatalities and injuries after RwD crashes. Figure 13 shows the variation over the analysis period in pedestrian and bicycle crashes that resulted in fatalities or injuries on Santa Barbara local county roads.

The Isla Vista area of Santa Barbara County, known for its high number of densely located urban intersections high rates of bicycle and pedestrian traffic, was identified by stakeholders as a special area needing further analysis. Participants noted that bicycle traffic is also common in rural areas, becoming an issue especially on curvy mountainous roads where narrow uphill roads lack bicycle climbing lanes or a shoulder.

Objective

The objective for this emphasis area is to address crashes involving pedestrians and bicycles by recommending crash type-specific countermeasures at high-risk locations. With ever increasing pedestrian and bicycle traffic, the County is interested in a proactive approach to addressing these vulnerable users.

The crash trees show that two-lane urban segments have the highest occurrence of pedestrian and bicycle crashes, followed by unsignalized urban intersections. Rural and urban segments, rather than intersections, experience the highest number of bicycle and pedestrian fatalities.

Performance Measures

To monitor and measure progress on an annual basis, the County will incorporate the last complete year's data set to the data analysis described in this chapter and in Chapter 2 of this plan. It will also look for trends that show progress with respect to pedestrian and bicycle crashes. This trend data will be overlaid with the improvements made each year as part of the full 5-year plan implementation period.

Strategies and Approved Countermeasures

Santa Barbara County stakeholders discussed the merits of addressing bicycle and pedestrian-related crashes using a tiered countermeasure approach. The workshop discussions in Santa Barbara County led the County and stakeholders to approve the following list of countermeasures to address pedestrian and bicycle crashes. However, the County may consider and approve other countermeasures for implementation based on specific location needs as plan implementation proceeds.

Table 5. Tiered Countermeasures for Pedestrian and Bicycle Crashes.

Tier 1	**Tier 2**
Crosswalk visibility enhancements	Road Diets
Leading Pedestrian Interval	Pedestrian hybrid beacons
Bicycle lanes	Raised crosswalk
	Pedestrian refuge islands
	Bike boulevard
Tier 3	**Tier 4**
Sidewalks, walkways, and paved shoulders	Enforcement and education of pedestrian and bicycle safety measures
Separated bicycle lanes	
School zone improvements	
Curb extensions	

Speeding/Aggressive Driving

Background

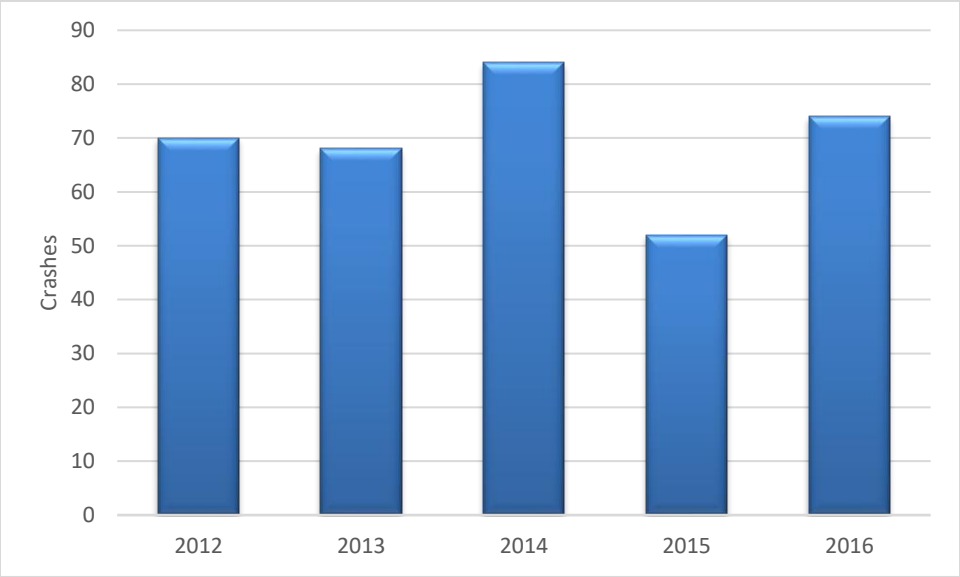

Figure 14. Distribution of Speeding and Aggressive Driving Crashes on Santa Barbara County Roads Resulting in Fatalities or Injuries, 2012-2016.

Speeding and aggressive driving was cited as the cause of 21 percent of all crashes on the County's roads 2012 through 2016. This type of crash was responsible for 20 percent of all highway fatalities on Santa Barbara County roads and 25 percent of fatal and all injury crashes, respectively. Stakeholder discussion revealed that speeding is a common issue in low-volume rural roads within the county, whether resulting in a crash or not. Law enforcement stakeholders cited the random nature of such incidents combined with unposted speed limits as challenges to adequately addressing the issue. Figure 14 shows the variation over the analysis period in speeding and aggressive driving crashes that resulted in fatalities or injuries on Santa Barbara local county roads.

Objective

The objective of this emphasis area is to address speeding-related crashes across the County in a systemic manner. The County's hot spot approach reduced the number of speeding-related crashes and fatalities; however, employing a proactive, systemic approach to deploying countermeasures to address this issue could have a greater impact. As indicated in the crash trees speeding has been an overrepresented contributing factor in crashes occurring on two-lane segments, both rural and urban, resulting in five fatalities from 2012 through 2016.

Performance Measures

To monitor and measure progress on an annual basis, the County will incorporate the last complete year's data set to the data analysis described in Chapter 2 and in this chapter. It will also look for trends that show progress with respect to reducing speeding-related crashes. This trend data will be overlaid with the improvements made each year as part of the full 5-year plan implementation period.

Strategies and Approved Countermeasures

The workshop discussions in Santa Barbara County led the County and stakeholders to approve the following list of countermeasures to address speeding and aggressive driving-related crashes. However, consideration of other countermeasures for implementation based on specific location needs is also possible.

Table 6. Tiered Countermeasures for Speeding-related Crashes.

Tier 1	**Tier 2**
Basic Curve Signing (e.g., advanced warning, chevrons, speed plates)	Add flashers to existing curve warning signs
Delineator Posts	Add flags to existing curve warning signs
Longitudinal rumble strips	Enhanced signing/delineation
Transverse rumble strips	Sequential dynamic curve warning system
Converging chevron marking pattern	Speed feedback signs
Transverse markings	Speed activated warning sign
Optical Speed Bars	Variable speed limit sign
Add shoulder markings to narrow lane	Speed limit sign with LED
Enhanced pavement marking (e.g., Speed Limit XX Pavement Legend, "Slow" pavement legend, "XX MPH" + Curve Symbol)	Road diet
"Radar Enforced" signs	In-roadway warning lights
Red signal enforcement lights (tattletale lights)	Internally illuminated raised pavement markers
Policy related: Speed Limit Setting Guidelines	High friction surface treatment
Policy related: Speed Limit Reviews	Speed hump, cushion, or table
Policy related: USLIMITS2	Gateway treatment
Tier 3	**Tier 4**
Roundabout	Corridor enforcement and education
Raised intersection	Corridor 3-E Initiative (engineering, education, enforcement)
Choker	
Neckdown	
Chicane	
Lateral Shift	
Center Island	
Tubular channelizers	
Landscaping	

Impaired Driving

Background

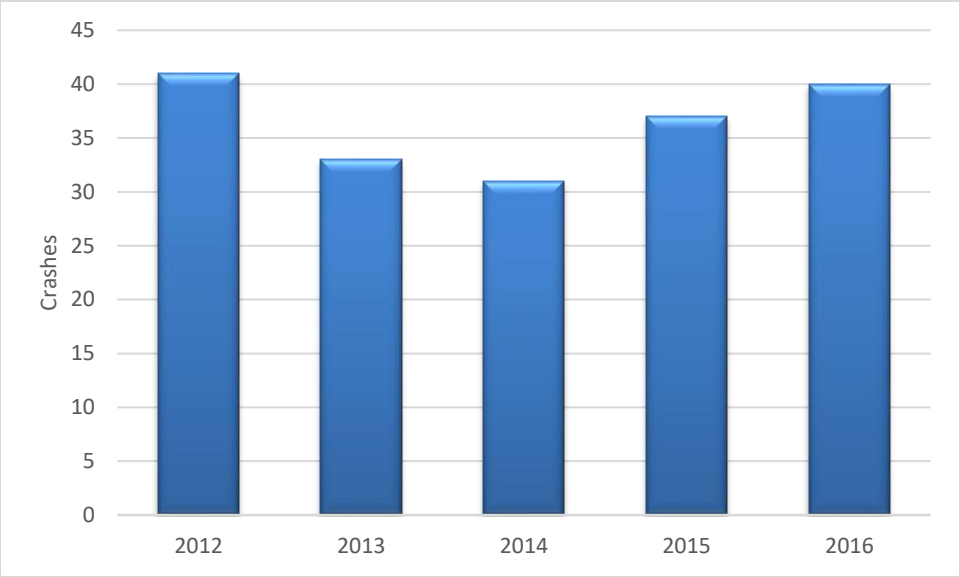

Figure 15. Distribution of Impaired Driving Crashes on Santa Barbara County Roads Resulting in Fatalities or Injuries, 2012-2016.

Impaired driving crashes accounted for 40 percent of all highway fatalities on Santa Barbara County roads from 2012 through 2016. Impaired driving was a contributing factor in 13 percent of all fatal and injury crashes and 12 percent of all crashes on county roads during the same time period. During discussions with County stakeholders, impaired driving has been identified as an issue commonly encountered on rural, winding mountain roads as well as on urban roads in areas with a younger population and higher rates of pedestrian and bicycle traffic. Figure 15 shows the variation over the analysis period in impaired driving crashes that resulted in fatalities or injuries on Santa Barbara local county roads.

Objective

The objective for this emphasis area is to address impaired driving crashes across the County by recommending crash type-specific countermeasures at high-risk locations. As the contributing factor to 2 fatalities and 81 injuries on urban two-lane segments, reducing impaired driving-related crashes would result in a significant decrease in the overall number of crashes in Santa Barbara County.

Performance Measures

To monitor and measure progress on an annual basis, the County will incorporate the last complete year's data set to the data analysis described in Chapter 2 and in this chapter. It will also look for trends that show progress with respect to impaired driving-related crashes, and will coordinate with law enforcement. Identified trend data will be overlaid with the improvements made each year as part of the full 5-year plan implementation period.

Strategies and Approved Countermeasures

The workshop discussions in Santa Barbara County led to the approval of the following list of countermeasures to address impaired driving related crashes. Consideration of other countermeasures for implementation based on specific location needs is also possible, including infrastructure countermeasures typically used to mitigate roadway departure and speeding crashes (e.g., rumble strips/stripes, SafetyEdge$_{SM}$).

Table 7. Tiered Countermeasures for Alcohol-related Crashes.

TIER 1	
Ignition interlocks	Ignition interlocks installed in cars measure alcohol on the driver's breath. Interlocks keep the car from starting if the driver has a BAC above a certain level, usually 0.02 percent. They are for people convicted of drunk driving and are highly effective in preventing repeat offenses. Mandating interlocks for all offenders, including first-time offenders may have greater impact. County's increased communication and collaboration with judiciary branch can help more frequent implementation of ignition interlocks.
TIER 2	
High-visibility enforcement	High-visibility enforcement (HVE) is a well-coordinated and targeted strategy of actively conducting and publicizing law enforcement activities to detect and arrest impaired drivers. Effective countermeasures for reducing impaired-driving fatalities including a combination of periodic high-intensity and sustained high-visibility enforcement efforts supported by a coordinated media campaign. The enforcement component of the HVE strategy includes a variety of enforcement activities such as saturation patrols and sobriety checkpoints.
Alcohol restrictions in public locations	Communities can prohibit or restrict the use of alcohol on public property such as parks, beaches, and parking lots. These types of ordinances can deter alcohol-fueled disturbances, fighting, vandalism, youth access to alcohol, and overconsumption of alcohol.
TIER 3	
Media campaigns	Mass media campaigns spread messages about the physical dangers and legal consequences of drunk driving. They persuade people not to drink and drive and encourage them to keep other drivers from doing so. Campaigns are most effective when supporting other impaired driving prevention strategies.
Alcohol screening and brief intervention	Typically administered by a health care provider, alcohol screening consists of an interview to determine a person's level and frequency of drinking. If a person is potentially at risk for alcohol use problems, the health care provider conducts a brief intervention—a short counseling session designed to assist the person in confronting the negative consequences of his or her alcohol consumption.
Designated driver programs	Include advanced planning, coordination with a variety of local community organizations and representatives, and clear and targeted messages and guidelines to get people home safely.
Responsible beverage service	The intention of the responsible beverage service (RBS) programs is to prevent sales to minors and over-service to intoxicated patrons, in turn preventing alcohol impaired driving. RBS programs include development of standards, practices, and procedures for the sale and service of alcohol as well as training on compliance with laws, identification verification, and techniques to monitor sales and service

TIER 4	
Alternative Transportation Services	Characteristics of these programs vary by mode of transportation, organization type, and operation. One example is a service that takes impaired people and their vehicles home. See NHTSA's *Alternative Transportation Programs: A Countermeasures for Reducing Impaired Driving* for more info.
Open-container ordinances	An open-container ordinance prohibits people from publicly consuming or possessing an open container of alcohol. This ordinance allows communities to discourage people from drinking alcoholic beverages while driving.
DWI Courts	A DWI court is a specialized court dedicated to changing the behavior of the higher risk offenders arrested for DWI. The goal of a DWI court is to protect the public by using the highly successful model of accountability, supervision, and long-term treatment

4. Implementation Process and Project List

Santa Barbara County plans to budget approximately $300-400 thousand annually for prioritizing and addressing the improvements recommended in this plan. This investment will be balanced with ongoing traffic maintenance needs also addressed from the Department of Public Works' annual operating budget. Projects selected through input from the public and elected officials, combined with the County's already identified needs, receive funding through the operating budget and are typically no more than $50,000. The County can also pursue grant or Federal funding for capital improvement projects.

The County plans to apply for Highway Safety Improvement Program funds administered by Caltrans. The County plans to use the Highway Safety Improvement Program to fund larger projects where benefit-cost analyses are competitively viable, since competition for the State funds is significant.

Improving the overall safety of a local road network depends on both properly identifying collision-prone sites or sites with prevalent risk factors as well as applying appropriate safety countermeasures. Selecting appropriate and effective countermeasures at a specific site depends largely on the facility type and site characteristics. For each project herein, the safety countermeasure selection process was based on three key elements: 1) pre-identified emphasis areas, 2) factors that contribute to collisions and specific crash types, and 3) site observations.

To develop each project identified in this plan, the project team and stakeholders engaged in a multi-step process that started with identifying focus facilities and the types of crashes that were overrepresented on each. As part of the process, the group identified high-risk factors for these crash types and analyzed the existing data to locate sites with high risk factors for each of the focus crash types (within the selected emphasis areas) from among the determined focus facilities. A review of the project locations and discussions with the stakeholders revealed site-specific crash types (e.g., left-turn, head-on, fixed object), contributing factors (e.g., nighttime, wet pavement), and characteristics that helped the team appropriately pair effective countermeasures.

Projects developed for Santa Barbara County's LRSP focused on intersections, segments, and a corridor (which involves a combination of segments and intersections) with known safety issues, which exhibit the determined risk factors for different site categories (e.g., signalized intersection and unsignalized intersections), or both. The risk factors used for Santa Barbara LRSP were based on data available countywide that includes presence of bicycle lanes, functional class, road width, and speed limit information that was concluded for some locations through the sign inventory, as the speed limit data were not available within the county road inventory.

Table 8 depicts the identified risk factors for lane departure, speeding or aggressive driving, and pedestrian and bicycle crashes on **urban road segments**:

Table 8. Risk Factors for Crashes on Urban Road Segments.

Crash type:	*Lane Departure*	*Speeding*	*Pedestrian and Bicycle*
Road Width	20 to 22 ft.	40 ft. or more	-
Functional Classification	Urban Collector	Urban Minor Arterial and Urban Collector	Urban Collector
Speed Limit	50 mph	40 mph or more	15 mph
Bike Lane	-	-	Yes

Table 9 contains the identified risk factors for lane departure, impaired driving, and speeding or aggressive driving crashes on **rural road segments**:

Table 9. Risk Factors for Crashes on Rural Road Segments.

Crash type:	*Lane Departure*	*Impaired Driving*	*Speeding*
Road Width	23 to 24 ft.	23 to 24 ft.	23 to 27 ft.
Functional Classification	Rural Major Collector	Rural Major Collector	Rural Major Collector
Speed Limit	15 mph	30 mph	15 mph

Table 10 contains the identified risk factors for left-turn crashes and pedestrian and bicycle crashes at **signalized intersections on 2-lane urban roads**:

Table 10. Risk Factors for Crashes at Signalized Urban Intersections.

Crash type:	*Pedestrian and Bicycle*	*Left-Turn*
Road Width	33 to 40 ft.	28 to 32 ft.
Functional Classification	Urban Principal Arterial - Other	Urban Principal Arterial - Other
Bike Lane	No	Yes

Table 11 contains the identified risk factors for pedestrian and bicycle crashes and broadside or left-turn crashes and at **unsignalized intersections on 2-lane urban roads**:

Table 11. Risk Factors for Crashes at Unsignalized Urban Intersections.

Crash type:	*Pedestrian and Bicycle*	*Broadside & Left-Turn*
Road Width	35 ft. or less	40 ft. or more
Functional Classification	Urban Local	Urban Minor Arterial
Bike Lane	Yes	Yes

Google Maps and Google Maps Street View were used to record site observations and other contextual characteristics of the surrounding area. Using these tools, deficiencies related to road geometry, signalization, or both for each site were identified and examined. Revisiting some project limits ensured consistency between each site and its adjacent facilities.

By vetting the data analysis results and site review findings and by engaging in extensive discussion with stakeholders, the County finalized the list of safety improvement targets that includes eight intersections (four signalized and four unsignalized in an urban environment setting), nine segments, and seven sites within the Isla Vista community, as shown in Figure 16.

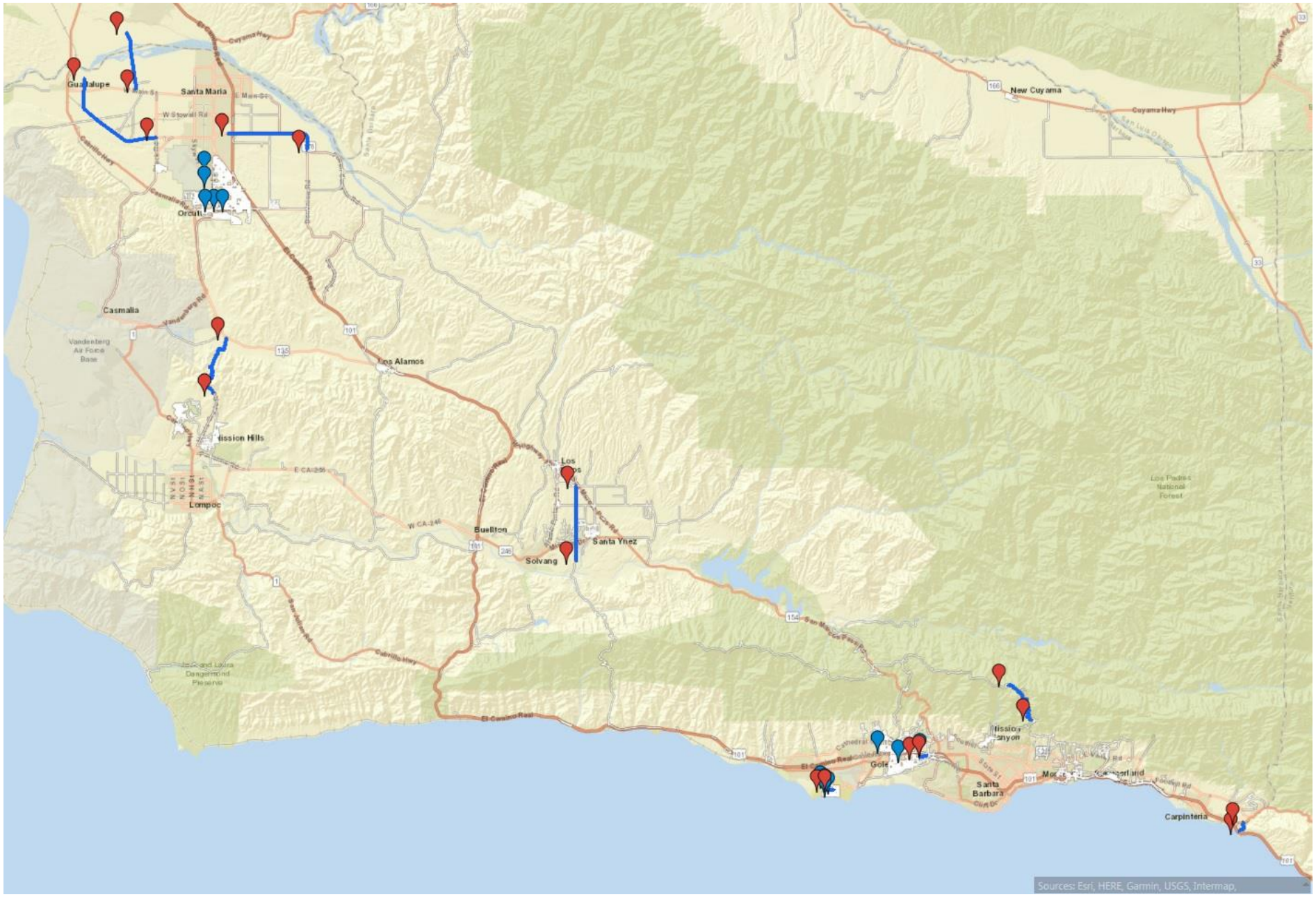

Figure 16. Proposed Project Locations.

Figure 17 is an example of one project summary developed for the LRSP and its specific components.

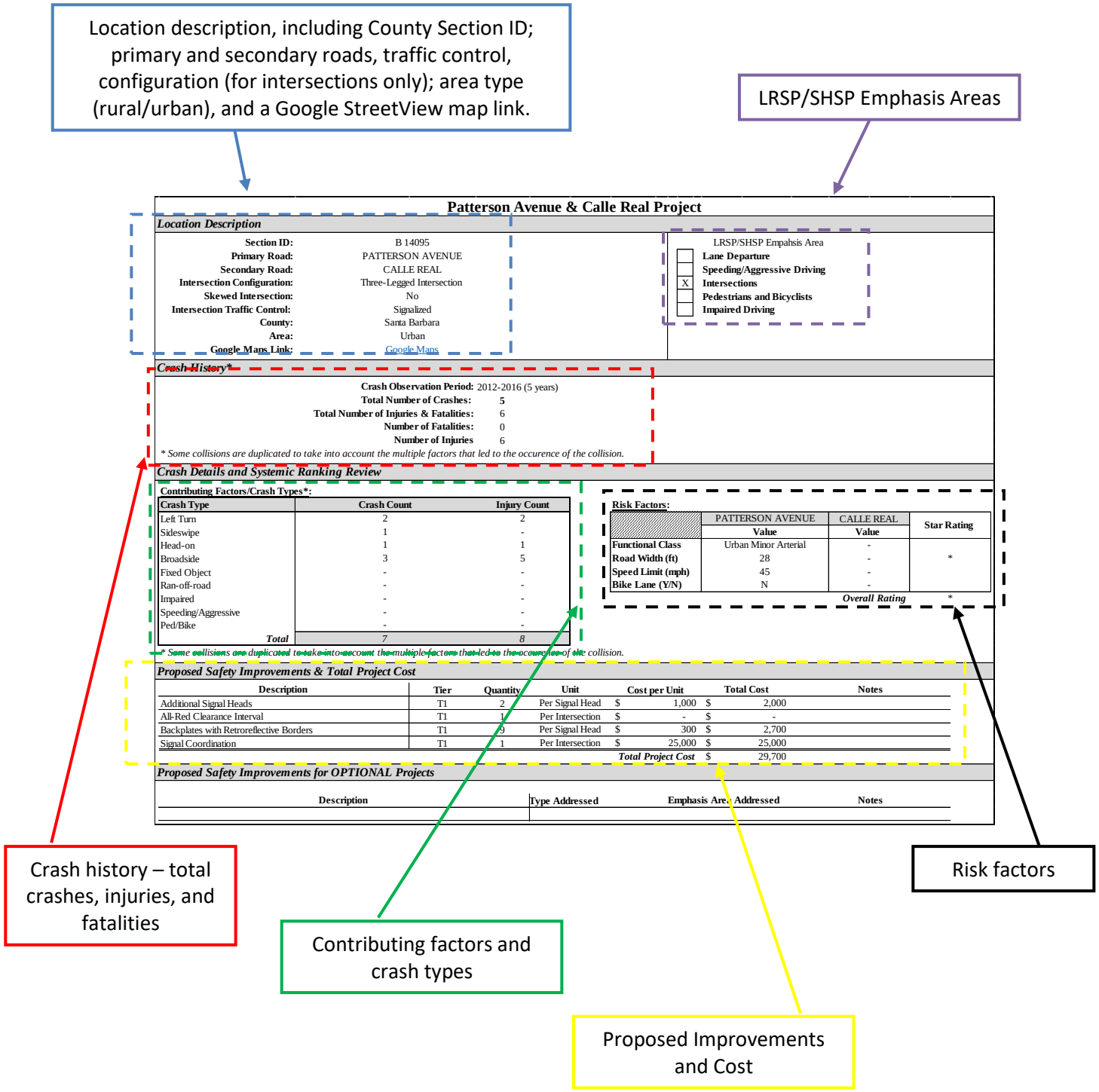

Figure 17. Example Project Summary with Component Descriptions.

Figure 18 through Figure 41 provide a summary of each site's location description, crash history, systemic ranking, proposed safety improvements, and total project cost. In addition, a list of optional projects is included for certain projects. Optional projects are potential solutions that 1) are expected to improve long-term safety at a site, or 2) whose recommendation for implementation is dependent on a need for further analysis (e.g., traffic studies). The total project cost does not include optional projects.

Selected Projects: Intersections

Patterson Avenue & Calle Real Project

Location Description

Section ID:	B 14095
Primary Road:	PATTERSON AVENUE
Secondary Road:	CALLE REAL
Intersection Configuration:	Three-Legged Intersection
Skewed Intersection:	No
Intersection Traffic Control:	Signalized
County:	Santa Barbara
Area:	Urban
Google Maps Link:	Google Maps

LRSP/SHSP Empahsis Area

	Lane Departure
	Speeding/Aggressive Driving
X	**Intersections**
	Pedestrians and Bicyclists
	Impaired Driving

*Crash History**

Crash Observation Period:	2012-2016 (5 years)
Total Number of Crashes:	**5**
Total Number of Injuries & Fatalities:	6
Number of Fatalities:	0
Number of Injuries	6

** Some collisions are duplicated to take into account the multiple factors that led to the occurence of the collision.*

Crash Details and Systemic Ranking Review

Contributing Factors/Crash Types*:

Crash Type	Crash Count	Injury Count
Left Turn	2	2
Sideswipe	1	-
Head-on	1	1
Broadside	3	5
Fixed Object	-	-
Ran-off-road	-	-
Impaired	-	-
Speeding/Aggressive	-	-
Ped/Bike	-	-
Total	*7*	*8*

Risk Factors:

	PATTERSON AVENUE	CALLE REAL	Star Rating
	Value	**Value**	
Functional Class	Urban Minor Arterial	-	
Road Width (ft)	28	-	*
Speed Limit (mph)	45	-	
Bike Lane (Y/N)	N	-	
		Overall Rating	*

** Some collisions are duplicated to take into account the multiple factors that led to the occurence of the collision.*

Proposed Safety Improvements & Total Project Cost

Description	Tier	Quantity	Unit	Cost per Unit	Total Cost	Notes
Additional Signal Heads	T1	2	Per Signal Head	$ 1,000	$ 2,000	
All-Red Clearance Interval	T1	1	Per Intersection	$ -	$ -	
Backplates with Retroreflective Borders	T1	9	Per Signal Head	$ 300	$ 2,700	
Signal Coordination	T1	1	Per Intersection	$ 25,000	$ 25,000	
				Total Project Cost	$ 29,700	

Proposed Safety Improvements for OPTIONAL Projects

Description	Type Addressed	Emphasis Area Addressed	Notes

Figure 18. Patterson Avenue and Calle Real Intersection.

Hollister Avenue & Turnpike Road Project

Location Description

Section ID:	B 13310
Primary Road:	HOLLISTER AVENUE
Secondary Road:	TURNPIKE ROAD
Intersection Configuration:	Four-Legged Intersection
Skewed Intersection:	Yes
Intersection Traffic Control:	Signalized
County:	Santa Barbara
Area:	Urban
Google Maps Link:	Google Maps

LRSP/SHSP Empahsis Area

- [ ] **Lane Departure**
- [ ] **Speeding/Aggressive Driving**
- [X] **Intersections**
- [ ] **Pedestrians and Bicyclists**
- [ ] **Impaired Driving**

*Crash History**

Crash Observation Period:	2012-2016 (5 years)
Total Number of Crashes:	**3**
Total Number of Injuries & Fatalities:	1
Number of Fatalities:	0
Number of Injuries	1

** Some collisions are duplicated to take into account the multiple factors that led to the occurence of the collision.*

Crash Details and Systemic Ranking Review

Contributing Factors/Crash Types*:

Crash Type	Crash Count	Injury Count
Left Turn	2	1
Rollover	-	-
Impaired	-	-
Speeding/Aggressive	-	-
Ped/Bike	-	-
Rear End	-	-
Sideswipe	1	-
Head-on	-	-
Broadside	2	1
Total	*5*	*2*

Risk Factors:

	HOLLISTER AVENUE	TURNPIKE	Star Rating
	Value	**Value**	
Functional Class	Urban Collector	Urban Collector	*
Road Width (ft)	30	30	*
Speed Limit (mph)	-	-	
Bike Lane (Y/N)	Y	Y	*
		Overall Rating	***

** Some collisions are duplicated to take into account the multiple factors that led to the occurence of the collision.*

Proposed Safety Improvements & Total Project Cost

Description	Tier	Quantity	Unit	Cost per Unit	Total Cost	Notes
Additional Signal Heads	T1	4	Per Signal Head	$ 1,000	$ 4,000	
All-Red Clearance Interval	T1	1	Per Intersection	$ -	$ -	
Crosswalk visibility enhancements	T1	4	Ea.	$ 4,000	$ 16,000	
Backplates with Retroreflective Borders	T1	13	Per Signal Head	$ 300	$ 3,900	
Signal Coordination	T1	1	Per Intersection	$ 25,000	$ 25,000	
Advance Cross Street Name Signs for High-Speed Approaches	T1	2	Per Intersection	$ 2,000	$ 4,000	
				Total Project Cost	$ 52,900	

Proposed Safety Improvements for OPTIONAL Projects

Description	Type Addressed	Emphasis Area Addressed	Notes

Figure 19. Hollister Avenue and Turnpike Road Intersection.

Clark Avenue & Bradley Road Project

Location Description

Section ID:	E 7035
Primary Road:	CLARK AVENUE
Secondary Road:	BRADLEY ROAD
Intersection Configuration:	Three-Legged Intersection
Skewed Intersection:	No
Intersection Traffic Control:	Signalized
County:	Santa Barbara
Area:	Urban
Google Maps Link:	Google Maps

LRSP/SHSP Empahsis Area

	Lane Departure
	Speeding/Aggressive Driving
X	**Intersections**
X	**Pedestrians and Bicyclists**
	Impaired Driving

*Crash History**

Crash Observation Period:	2012-2016 (5 years)
Total Number of Crashes:	**5**
Total Number of Injuries & Fatalities:	4
Number of Fatalities:	0
Number of Injuries	4

** Some collisions are duplicated to take into account the multiple factors that led to the occurence of the collision.*

Crash Details and Systemic Ranking Review

Contributing Factors/Crash Types*:

Crash Type	Crash Count	Injury Count
Left Turn	3	3
Rollover	-	-
Impaired	-	-
Speeding/Aggressive	-	-
Ped/Bike	1	1
Rear End	-	-
Sideswipe	1	-
Head-on	-	-
Broadside	3	3
Total	*8*	*7*

Risk Factors:

	CLARK AVENUE	BRADLEY ROAD	Star Rating
	Value	**Value**	
Functional Class	Urban Minor Arterial	-	
Road Width (ft)	30	-	*
Speed Limit (mph)	-	-	
Bike Lane (Y/N)	Y	-	*
		Overall Rating	***

** Some collisions are duplicated to take into account the multiple factors that led to the occurence of the collision.*

Proposed Safety Improvements & Total Project Cost

Description	Tier	Quantity	Unit	Cost per Unit	Total Cost	Notes
All-Red Clearance Interval	T1		Per Intersection	$ -	$ -	
Backplates with Retroreflective Borders	T1	14	Per Signal Head	$ 300	$ 4,200	
Signal Coordination	T1	1	Per Intersection	$ 25,000	$ 25,000	
Advance Cross Street Name Signs for High-Speed Approaches	T1	1	Per Intersection	$ 4,000	$ 4,000	
Pedestrian Countdown Signals	T2	1	Per Intersection	$ 10,000	$ 10,000	
				Total Project Cost	$ 43,200	

Proposed Safety Improvements for OPTIONAL Projects

Description	Type Addressed	Emphasis Area Addressed	Notes

Figure 20. Clark Avenue and Bradley Road Intersection.

Clark Avenue & Orcutt Road Project

Location Description

Section ID:	E 7040
Primary Road:	CLARK AVENUE
Secondary Road:	ORCUTT ROAD
Intersection Configuration:	Four-Legged Intersection
Skewed Intersection:	Yes
Intersection Traffic Control:	Signalized
County:	Santa Barbara
Area:	Urban
Google Maps Link:	Google Maps

LRSP/SHSP Empahsis Area

	Lane Departure
X	**Speeding/Aggressive Driving**
X	**Intersections**
X	**Pedestrians and Bicyclists**
X	**Impaired Driving**

*Crash History**

Crash Observation Period:	2012-2016 (5 years)
Total Number of Crashes:	**11**
Total Number of Injuries & Fatalities:	12
Number of Fatalities:	0
Number of Injuries	12

** Some collisions are duplicated to take into account the multiple factors that led to the occurence of the collision.*

Crash Details and Systemic Ranking Review

Contributing Factors/Crash Types*:

Crash Type	Crash Count	Injury Count
Left Turn	-	-
Rollover	-	-
Impaired	1	1
Speeding/Aggressive	1	1
Ped/Bike	1	1
Rear End	1	1
Sideswipe	-	-
Head-on	1	2
Broadside	8	8
Total	*13*	*14*

Risk Factors:

	CLARK AVENUE	ORCUTT ROAD	Star Rating
	Value	Value	
Functional Class	Urban Minor Arterial	-	
Road Width (ft)	30 to 37	-	**
Speed Limit (mph)	-	-	
Bike Lane (Y/N)	Y	-	*
		Overall Rating	***

** Some collisions are duplicated to take into account the multiple factors that led to the occurence of the collision.*

Proposed Safety Improvements & Total Project Cost

Description	Tier	Quantity	Unit	Cost per Unit	Total Cost	Notes
High-Visibility Enforcement	T2	1	Per Location	$ 102,000	$ 102,000	$52k per section[δ] for enforcement + $50k for education = $102,000
Basic Set of Sign and Marking Improvements	T1	1	Per Intersection	$ 10,000	$ 10,000	Relocate Signal Head on Southbound Orcutt to Right Side of Roadway. Align Signal Head Over Receiving Lane.
Additional Signal Heads	T1	1	Per Signal Head	$ 1,000	$ 1,000	
All-Red Clearance Interval	T2	1	Per Intersection	$ -	$ -	
Backplates with Retroreflective Borders	T1	9	Per Signal Head	$ 300	$ 2,700	
Signal Coordination	T1	1	Per Intersection	$ 25,000	$ 25,000	
Advance Cross Street Name Signs for High-Speed Approaches	T1	2	Per Intersection	$ 2,000	$ 4,000	
Pedestrian Countdown Signals	T2	1	Per Intersection	$ 10,000	$ 10,000	
Basic Set of Sign and Marking Improvements	T1	1	Per Intersection	$ 1,000	$ 1,000	Standard Marking
Clear Sight Triangles	T1	1	Per Intersection	$ 15,000	$ 15,000	
				Total Project Cost	$ 170,700	

*[δ] Enforcement cost assumption: 1 officer * $40/hr * 10 hrs/week * 26 weeks/yr * 5 yr program*

Proposed Safety Improvements for OPTIONAL Projects

Description	Crash Type Addressed	Emphasis Area Addressed	Notes
Relocate Intersection Farther East.	Broadside	Intersections	

Figure 21. Clark Avenue and Orcutt Road Intersection.

Lakeview Road & Orcutt Road Project

Location Description

Section ID:	E 4005, E 4010, E 8420, E 8430
Primary Road:	LAKEVIEW ROAD
Secondary Road:	ORCUTT ROAD
Intersection Configuration:	Four-Legged Intersection
Skewed Intersection	Yes
Intersection Traffic Control:	Unsignalized
Traffic Control Location:	Stop Sign on Lakeview
County:	Santa Barbara
Area:	Urban
Google Maps Link:	Google Maps

LRSP/SHSP Empahsis Area

- [ ] **Lane Departure**
- [ ] **Speeding/Aggressive Driving**
- [X] **Intersections**
- [ ] **Pedestrians and Bicyclists**
- [ ] **Impaired Driving**

*Crash History**

Crash Observation Period:	2012-2016 (5 years)
Total Number of Crashes:	**18**
Total Number of injuries & fatalities:	6
Number of Fatalities:	0
Number of Injuries	6

** Some collisions are duplicated to take into account the multiple factors that led to the occurence of the collision.*

Crash Details and Systemic Ranking Review

Contributing Factors/Crash Types*:

Crash Type	Crash Count	Injury Count
Left Turn	3	1
Rollover	-	-
Impaired	-	-
Speeding/Aggressive	1	1
Ped/Bike	-	-
Rear End	-	-
Sideswipe	1	-
Head-on	-	-
Broadside	17	6
Total	*22*	*8*

Risk Factors:

	LAKEVIEW ROAD	ORCUTT ROAD	Star Rating
	Value	**Value**	
Functional Class	Urban Collector	Urban Collector	
Road Width (ft)	42 to 50	28 to 37	**
Speed Limit (mph)	-	-	
Bike Lane (Y/N)	Y	Y	*
			***

** Some collisions are duplicated to take into account the multiple factors that led to the occurence of the collision.*

Proposed Safety Improvements & Total Project Cost

Description	Tier	Quantity	Unit	Cost per Unit	Total Cost	Notes
Convert Orcutt Road Approaches to Right-In/Right-Out from Skyway	T2	1	Per Intersection	$ 75,000	$ 75,000	
			Total Project Cost		$ 75,000	

Proposed Safety Improvements for OPTIONAL Projects

Description	Crash Type Addressed	Emphasis Area Addressed	Notes
Adding Traffic Signals And Signal Cooridnation	Broadside	Intersections	
Implementing a Roundabout	Broadside	Intersections	

Figure 22. Lakeview Road and Orcutt Road Intersection.

Foster Road & Orcutt Road Project

Location Description

Section ID:	E 4020, E 4025, E 7924, E 7925, E 7930
Primary Road:	FOSTER ROAD
Secondary Road:	ORCUTT ROAD
Intersection Configuration:	Four-Legged Intersection
Skewed Intersection	Yes
Intersection Traffic Control:	Unsignalized
Traffic Control Location:	All-Way Stop Sign
County:	Santa Barbara
Area:	Urban
Google Maps Link:	Google Maps

LRSP/SHSP Empahsis Area

- [ ] **Lane Departure**
- [ ] **Speeding/Aggressive Driving**
- [X] **Intersections**
- [ ] **Pedestrians and Bicyclists**
- [ ] **Impaired Driving**

*Crash History**

Crash Observation Period:	2012-2016 (5 years)
Total Number of Crashes:	**15**
Total Number of injuries & fatalities:	3
Number of Fatalities:	0
Number of Injuries	3

** Some collisions are duplicated to take into account the multiple factors that led to the occurence of the collision.*

Crash Details and Systemic Ranking Review

Contributing Factors/Crash Types*:

Crash Type	Crash Count	Injury Count
Left Turn	1	-
Rollover	-	-
Impaired	-	-
Speeding/Aggressive	-	-
Ped/Bike	-	-
Rear End	-	-
Sideswipe	-	-
Head-on	-	-
Broadside	15	3
Total	*16*	*3*

** Some collisions are duplicated to take into account the multiple factors that led to the occurence of the collision.*

Risk Factors:

	FOSTER ROAD	ORCUTT ROAD	Star Rating
	Value	**Value**	
Functional Class	Urban Minor Arterial	Urban Collector	*
Road Width (ft)	37	29 to 40	*
Speed Limit (mph)	-	-	
Bike Lane (Y/N)	N	Y	*
			***

Proposed Safety Improvements & Total Project Cost

Description	Tier	Quantity	Unit	Cost per Unit	Total Cost	Notes
Convert Orcutt Road Approaches to Right-In/Right-Out from Foster	T2	1	Per Intersection	$ 75,000	$ 75,000	
			Total Project Cost		$ 75,000	

Proposed Safety Improvements for OPTIONAL Projects

Description	Crash Type Addressed	Emphasis Area Addressed	Notes
Adding Traffic Signals And Signal Cooridnation	Broadside	Intersections	
Implementing a Roundabout	Broadside	Intersections	
	Broadside	Intersections	

Figure 23. Foster Road and Orcutt Road Intersection.

Calle Real & El Sueno Road Project

Location Description

Section ID:	b 11993, b 11990, b 11975
Primary Road:	CALLE REAL
Secondary Road:	EL SUENO ROAD
Intersection Configuration:	Five-Legged Intersection
Skewed Intersection	Yes
Intersection Traffic Control:	Unsignalized
Traffic Control Location:	4-Way Stop Sign
County:	Santa Barbara
Area:	Urban
Google Maps Link:	Google Maps

LRSP/SHSP Empahsis Area

	Lane Departure
X	**Speeding/Aggressive Driving**
X	**Intersections**
	Pedestrians and Bicyclists
	Impaired Driving

*Crash History**

Crash Observation Period:	2012-2016 (5 years)
Total Number of Crashes:	**4**
Total Number of injuries & fatalities:	3
Number of Fatalities:	0
Number of Injuries	3

** Some collisions are duplicated to take into account the multiple factors that led to the occurence of the collision.*

Crash Details and Systemic Ranking Review

Contributing Factors/Crash Types*:

Crash Type	Crash Count	Injury Count
Left Turn	4	3
Rollover	1	1
Impaired	-	-
Speeding/Aggressive	-	-
Ped/Bike	1	1
Rear End	-	-
Sideswipe	-	-
Head-on	-	-
Broadside	3	2
Total	*9*	*7*

Risk Factors:

	CALLE REAL	EL SUENO ROAD	Star Rating
	Value	**Value**	
Functional Class	Urban Minor Arterial	Urban Local	*
Road Width (ft)	30 to 52	25	**
Speed Limit (mph)	-	-	
Bike Lane (Y/N)	Y	N	*
			****

** Some collisions are duplicated to take into account the multiple factors that led to the occurence of the collision.*

Proposed Safety Improvements & Total Project Cost

Description	Tier	Quantity	Unit	Cost per Unit	Total Cost	Notes
Add Curb on North West Quadrant	T1	100	LFT.	$ 40	$ 4,000	
Use Reflectorive Strips on Stop Signs	T1	2	Per Approach	$ 500	$ 1,000	
Basic Set of Sign and Marking Improvements	T1	1	Per Intersection	$ 8,000	$ 8,000	Use wider stop bar markings to "narrow" the intersection area.
Advance Cross Street Name Signs for High-Speed Approaches on Arterial Highways	T1	2	Per Intersection	$ 2,000	$ 4,000	
				Total Project Cost	$ 17,000	

Proposed Safety Improvements for OPTIONAL Projects

Description	Crash Type Addressed	Emphasis Area Addressed	Notes
Implementing a Roundabout	Broadside	Intersections	
	Left-turn	Intersections	

Figure 24. Calle Real and El Sueno Road Intersection.

Clark Avenue & Cherry Avenue Project

Location Description

Section ID:	E 7040
Primary Road:	CLARK AVENUE
Secondary Road:	CHERRY AVENUE
Intersection Configuration:	Three-Legged Intersection
Skewed Intersection	No
Intersection Traffic Control:	Unsignalized
Traffic Control Location:	Stop-sign controlled
County:	Santa Barbara
Area:	Urban
Google Maps Link:	Google Maps

LRSP/SHSP Empahsis Area

	Lane Departure
	Speeding/Aggressive Driving
X	**Intersections**
	Pedestrians and Bicyclists
	Impaired Driving

*Crash History**

Crash Observation Period: 2012-2016 (5 years)

Total Number of Crashes:	**4**
Total Number of injuries & fatalities:	3
Number of Fatalities:	0
Number of Injuries	3

** Some collisions are duplicated to take into account the multiple factors that led to the occurence of the collision.*

Crash Details and Systemic Ranking Review

Contributing Factors/Crash Types*:

Crash Type	Crash Count	Injury Count
Left Turn	3	2
Rollover	-	-
Impaired	-	-
Speeding/Aggressive	-	-
Ped/Bike	-	-
Rear End	-	-
Sideswipe	1	-
Head-on	-	-
Broadside	3	3
Total	*7*	*5*

Risk Factors:

	CLARK AVENUE	CHERRY	Star Rating
	Value	**Value**	
Functional Class	Urban Minor Arterial	-	**
Road Width (ft)	30	-	**
Speed Limit (mph)	-	-	
Bike Lane (Y/N)	Y	-	*
			*****

** Some collisions are duplicated to take into account the multiple factors that led to the occurence of the collision.*

Proposed Safety Improvements & Total Project Cost

Description	Tier	Quantity	Unit	Cost per Unit	Total Cost	Notes
Convert Cherry Ave Approaches to Right-In/Right-Out from	T2	1	Per Intersection	$ 75,000	$ 75,000	
Speed Limit Reviews	T1	1	Per Approach	$ -	$ -	
Clear Sight Triangles	T1	1	Per Intersection	$ 5,000	$ 5,000	Stop line can be slightly advanced. Small decorative bushes can be trimmed.
Basic Set of Sign and Marking Improvements	T1	1	Per Intersection	$ 8,000	$ 8,000	
Advance Cross Street Name Signs for High-Speed Approaches on Arterial Highways	T1	2	Per Intersection	$ 2,000	$ 4,000	
				Total Project Cost	$ 92,000	

Proposed Safety Improvements for OPTIONAL Projects

Description	Crash Type Addressed	Emphasis Area Addressed	Notes
Adding Traffic Signals And Signal Cooridnation	Broadside	Intersections	
	Left-turn	Intersections	
Implementing a Roundabout	Broadside	Intersections	
	Left-turn	Intersections	

Figure 25. Clark Avenue and Cherry Avenue Intersection.

Selected Projects: Segments

Harris Grade Rd From 3.6 Mi N Hwy 1 To Hwy 135 Project

Location Description

Section ID:	D 27940, D 27950, D27960, D 27970, D 27980	**Functional Class:**	RMaC
Local Road Name:	HARRIS GRADE RD	**Road Width (ft):**	24
Start:	3.6 MI N HWY 1	**Number of Lanes:**	2
End:	HWY 135	**Speed Limit (mph):**	-
Length (mi):	4	**AADT:**	-
Area:	Rural	**Bike Lane (Y/N):**	-
County:	Santa Barbara	**Pavement depth:**	-
Google Maps Link:	Google Maps	**Surface Type:**	A-AC
		PCI:	57

LRSP/SHSP Empahsis Area

- [X] **Lane Departure**
- [X] **Speeding/Aggressive Driving**
- [ ] **Intersections**
- [ ] **Pedestrians and Bicyclists**
- [X] **Impaired Driving**

*Crash History**

Crash Observation Period:	2012-2016 (5 years)
Total Number of Crashes:	**93**
Total Number of Injuries & Fatalities:	38
Number of Fatalities:	0
Number of Injuries	38

** Some collisions are duplicated to take into account the multiple factors that led to the occurence of the collision.*

Crash Details and Systemic Ranking Review

Contributing Factors/Crash Types*:

Crash Type	Crash Count	Injury Count
Fixed Object	39	16
Ran-off-road	33	13
Impaired	6	5
Speeding/Aggressive	83	34
Total	*161*	*68*

Risk Factors:

	Value	Star Rating
Functional Class	RMaC	**
Road Width (ft)	24	**
Speed Limit (mph)	-	
PCI	57	*
	Overall Rating	*****

** Some collisions are duplicated to take into account the multiple factors that led to the occurence of the collision.*

Proposed Safety Improvements & Total Project Cost

Description	Tier	Quantity	Unit	Cost per Unit	Total Cost	Notes
Edge Line Rumble Stripes or Shoulder Rumble Strips	T1	4	Per Mile	$ 10,000	$ 40,000	Edge Line Rumble Stripes.
Fundamental Signs and Markings for Curves	T1	40	Per Curve	$ 3,000	$ 120,000	Pavement Markers Within Curves and Chevrons.
Transverse Rumble Strips	T1	2	Per Set/Approach	$ 5,000	$ 10,000	
Fixed Object Delineation	T1	4	Per Mile	$ 1,000	$ 4,000	
Tree Removal / Utility Pole Relocation	T2	4	Per Mile	$ 100,000	$ 400,000	
High Friction Surfaces	T2	1	Per Mile	$ 102,000	$ 102,000	
Wider Shoulders	T4	4	Per Mile	$ 300,000	$ 1,200,000	
				Total Project Cost	***$ 1,876,000***	

Proposed Safety Improvements for OPTIONAL Projects

Description	Crash Type Addressed	Emphasis Area Addressed	Notes

Figure 26. Harris Grade Segment.

Bonita School Rd From County Boundary (W Main Street) To Division St Project

Location Description

Section ID:	E 470, E 480, E 490	**Functional Class:**	Rural Minor Collector
Local Road Name:	BONITA SCHOOL RD	**Road Width (ft):**	Ranging from 24 to 32
Start:	COUNTY BOUNDARY (W MAIN STREET)	**Number of Lanes:**	2
End:	DIVISION ST	**Speed Limit (mph):**	-
Length (mi):	3.3	**AADT:**	-
Area:	Rural	**Bike Lane (Y/N):**	Y
County:	Santa Barbara	**Pavement depth:**	-
Google Maps Link:	Google Maps	**Surface Type:**	AC, Gravel
		PCI:	72

LRSP/SHSP Empahsis Area

- [X] **Lane Departure**
- [X] **Speeding/Aggressive Driving**
- [ ] **Intersections**
- [ ] **Pedestrians and Bicyclists**
- [X] **Impaired Driving**

*Crash History**

Crash Observation Period: 2012-2016 (5 years)

Total Number of Crashes*: **29**

Total Number of Injuries & Fatalities: 8

Number of Fatalities: 0

Number of Injuries 8

** Some collisions are duplicated to take into account the multiple factors that led to the occurence of the collision.*

Crash Details and Systemic Ranking Review

Contributing Factors/Crash Types*:

Crash Type	Crash Count	Injury Count
Fixed Object	7	2
Ran-off-road	6	1
Impaired	3	-
Speeding/Aggressive	21	7
Ped/Bike	-	-
Rollover	5	2
Total	*42*	*12*

Risk Factors:

	Value	Star Rating
Functional Class	Rural Minor Collector	**
Road Width (ft)	Ranging from 24 to 32	**
Speed Limit (mph)	-	
PCI	72	*
	Overall Rating	*****

** Some collisions are duplicated to take into account the multiple factors that led to the occurence of the collision.*

Proposed Safety Improvements & Total Project Cost

Description	Tier	Quantity	Unit	Cost per Unit	Total Cost	Notes
Edge Line Rumble Stripes or Shoulder Rumble Strips	T1	3.3	Per Mile	$ 10,000	$ 33,000	Edge Line Rumble Stripes.
Refreshed Center Line Stripes	T1	3.3	Per Mile	$ 1,000	$ 3,300	
Tree Removal / Utility Pole Relocation	T2	3.3	Per Mile	$ 100,000	$ 330,000	
Speed Feedback Signs	T2	3.3	Per set/Location	$ 30,000	$ 99,000	
High-Visibility Enforcement	T2	1	Per Location	$ 102,000	$ 102,000	$52k per section[δ] for enforcement + $50k for education = $102,000
				Total Project Cost	***$ 567,300***	

*[δ] Enforcement cost assumption: 1 officer * $40/hr * 10 hrs/week * 26 weeks/yr * 5 yr program*

Proposed Safety Improvements for OPTIONAL Projects

Description	Crash Type Addressed	Emphasis Area Addressed	Notes
Add Shoulder Markings to Narrow Lane	Speeding/Aggressive	Speeding/Aggressive	Need to revisit wide "earth shoulders", large commercial entrances, potential need for left/right turn lanes.

Figure 27. Bonita School Segment.

Betteravia Rd From 0.6 Mi N W Main St To Black Rd Project

Location Description

Section ID:	E 720, 730, 740, 750, 760, 770	**Functional Class:**	RMaC
Local Road Name:	BETTERAVIA RD	**Road Width (ft):**	40
Start:	0.6 MI N W MAIN ST	**Number of Lanes:**	2
End:	BLACK RD	**Speed Limit (mph):**	-
Length (mi):	6	**AADT:**	-
Area:	Rural	**Bike Lane (Y/N):**	Y
County:	Santa Barbara	**Pavement depth:**	-
Google Maps Link:	Google Maps	**Surface Type:**	AC
		PCI:	57

LRSP/SHSP Empahsis Area

- [X] **Lane Departure**
- [X] **Speeding/Aggressive Driving**
- [ ] **Intersections**
- [ ] **Pedestrians and Bicyclists**
- [X] **Impaired Driving**

*Crash History**

Crash Observation Period: 2012-2016 (5 years)
Total Number of Crashes: **34**
Total Number of Injuries & Fatalities: 19
Number of Fatalities: 0
Number of Injuries 19

** Some collisions are duplicated to take into account the multiple factors that led to the occurence of the collision.*

Crash Details and Systemic Ranking Review

Contributing Factors/Crash Types*:

Crash Type	Crash Count	Injury Count
Fixed Object	5	1
Ran-off-road	6	3
Impaired	4	7
Speeding/Aggressive	18	6
Rollover	5	3
Broadside	3	3
Total	*41*	*23*

Risk Factors:

	Value	Star Rating
Functional Class	RMaC	**
Road Width (ft)	40	
Speed Limit (mph)	-	
PCI	57	*
	Overall Rating	***

** Some collisions are duplicated to take into account the multiple factors that led to the occurence of the collision.*

Proposed Safety Improvements & Total Project Cost

Description	Tier	Quantity	Unit	Cost per Unit	Total Cost	Notes
Edge Line Rumble Stripes or Shoulder Rumble Strips	T1	6	Per Mile	$ 10,000	$ 60,000	Edge Line Rumble Stripes.
Fixed Object Delineation	T1	6	Per Mile	$ 1,000	$ 6,000	
Speed Feedback Signs	T2	6	Per set/Location	$ 30,000	$ 180,000	
High-Visibility Enforcement	T2	1	Per Location	$ 102,000	$ 102,000	$52k per section[δ] for enforcement + $50k for education = $102,000
				Total Project Cost	***$ 348,000***	

*[δ] Enforcement cost assumption: 1 officer * $40/hr * 10 hrs/week * 26 weeks/yr * 5 yr program*

Proposed Safety Improvements for OPTIONAL Projects

Description	Crash Type Addressed	Emphasis Area Addressed	Notes
	Speeding/Aggressive	Speeding/Aggressive	Need to revisit wide "earth shoulders", large commercial entrances, potential need for left/right turn lanes.

Figure 28. Betteravia Road Segment (from 0.6 miles north of W Main Street to Black Road).

Betteravia Rd From Hwy 101 To Dominion Rd Project

Location Description

Section ID:	E 840, 850, 860	**Functional Class:**	RMaC
Local Road Name:	BETTERAVIA RD	**Road Width (ft):**	38-40
Start:	HWY 101	**Number of Lanes:**	2
End:	DOMINION RD	**Speed Limit (mph):**	-
Length (mi):	4.8	**AADT:**	-
Area:	Rural	**Bike Lane (Y/N):**	Y
County:	Santa Barbara	**Pavement depth:**	-
Google Maps Link:	Google Maps	**Surface Type:**	AC
		PCI:	74

LRSP/SHSP Empahsis Area

- [X] **Lane Departure**
- [X] **Speeding/Aggressive Driving**
- [X] **Intersections**
- [ ] **Pedestrians and Bicyclists**
- [X] **Impaired Driving**

*Crash History**

Crash Observation Period:	2012-2016 (5 years)
Total Number of Crashes:	**34**
Total Number of Injuries & Fatalities:	7
Number of Fatalities:	0
Number of Injuries	7

** Some collisions are duplicated to take into account the multiple factors that led to the occurence of the collision.*

Crash Details and Systemic Ranking Review

Contributing Factors/Crash Types*:

Crash Type	Crash Count	Injury Count
Fixed Object	7	2
Ran-off-road	2	1
Impaired	3	1
Speeding/Aggressive	15	6
Rear End	8	4
Total	*35*	*14*

Risk Factors:

	Value	Star Rating
Functional Class	RMaC	**
Road Width (ft)	38-40	
Speed Limit (mph)	-	
PCI	74	
	Overall Rating	**

** Some collisions are duplicated to take into account the multiple factors that led to the occurence of the collision.*

Proposed Safety Improvements & Total Project Cost

Description	Tier	Quantity	Unit	Cost per Unit	Total Cost	Notes
Advance Cross Street Name Signs for High-Speed Approaches	T1	1	Per Intersection	$ 6,000	$ 6,000	
Clear Sight Triangles	T1	1	Per Mile	$ 2,000	$ 2,000	
Lane Narrowing Using Pavement Marking and Shoulder Rumble	T1	1	Per Intersection	$ 15,000	$ 15,000	
Install Right-Turn Lane	T2	1	Per Intersection	$ 30,000	$ 30,000	
				Total Project Cost	***$ 56,000***	

Proposed Safety Improvements for OPTIONAL Projects

Description	Crash Type Addressed	Emphasis Area Addressed	Notes

Figure 29. Betteravia Road Segment (from Highway 101 to Dominion Road).

Gibraltar Rd From 3.0 Mi N City Limit To E Camino Cielo Project

Location Description

Section ID:	A 11075, A 11080, A 11085	**Functional Class:**	RMiA - RL
Local Road Name:	GIBRALTAR RD	**Road Width (ft):**	20
Start:	3.0 MI N CITY LIMIT	**Number of Lanes:**	2
End:	E CAMINO CIELO	**Speed Limit (mph):**	-
Length (mi):	3.8	**AADT:**	-
Area:	Rural	**Bike Lane (Y/N):**	-
County:	Santa Barbara	**Pavement depth:**	-
Google Maps Link:	Google Maps	**Surface Type:**	O-AC/AC
		PCI:	97

LRSP/SHSP Empahsis Area

- [X] **Lane Departure**
- [X] **Speeding/Aggressive Driving**
- [ ] **Intersections**
- [X] **Pedestrians and Bicyclists**
- [ ] **Impaired Driving**

*Crash History**

Crash Observation Period: 2012-2016 (5 years)

Total Number of Crashes:	**9**
Total Number of Injuries & Fatalities:	9
Number of Fatalities:	0
Number of Injuries	9

** Some collisions are duplicated to take into account the multiple factors that led to the occurence of the collision.*

Crash Details and Systemic Ranking Review

Contributing Factors/Crash Types*:

Crash Type	Crash Count	Injury Count
Fixed Object	2	3
Ran-off-road	2	3
Impaired	-	-
Speeding/Aggressive	3	3
Ped/Bike	2	2
Rollover	3	3
Head-on	3	2
Total	*15*	*16*

Risk Factors:

	Value	Star Rating
Functional Class	RMiA - RL	**
Road Width (ft)	20	*
Speed Limit (mph)	-	
PCI	97	
	Overall Rating	***

** Some collisions are duplicated to take into account the multiple factors that led to the occurence of the collision.*

Proposed Safety Improvements & Total Project Cost

Description	Tier	Quantity	Unit	Cost per Unit	Total Cost	Notes
Standard Edge Line Markings		3.8	Per Mile	$ 1,000	$ 3,800	
Fixed Object Delineation		3.8	Per Mile	$ 1,000	$ 3,800	
Alignment Delineation		65	Ea.	$ 5,000	$ 325,000	
Improved Recovery Areas, Slope Flattening		3.8	Per Mile	$ 250,000	$ 950,000	
Wider Shoulders		3.8	Per Mile	$ 350,000	$ 1,330,000	
Curve Treatment Level 1: Basic Curve Signing (advanced warning, chevrons, speed plates)		65	Per Curve	$ 3,000	$ 195,000	
				Total Project Cost	***$ 2,807,600***	

Proposed Safety Improvements for OPTIONAL Projects

Description	Crash Type Addressed	Emphasis Area Addressed	Notes
Pull-Off areas for Vehicles, Bikes, and Pededtrians	Ped/Bike	Ped/Bike	
Enforcement and Education compaign	Ped/Bike	Ped/Bike	

Figure 30. Gibraltar Road Segment.

Hollister Av From .6 Mi E Turnpike To Modoc Rd Project

Location Description

Section ID:	B 12195, B 12200	**Functional Class:**	Urban Collector
Local Road Name:	HOLLISTER AV	**Road Width (ft):**	50-54
Start:	.6 MI E TURNPIKE	**Number of Lanes:**	3
End:	MODOC RD	**Speed Limit (mph):**	-
Length (mi):	0.5	**AADT:**	-
Area:	Urban	**Bike Lane (Y/N):**	Y
County:	Santa Barbara	**Pavement depth:**	-
Google Maps Link:	Google Maps	**Surface Type:**	AC
		PCI:	49

LRSP/SHSP Empahsis Area

- [ ] **Lane Departure**
- [X] **Speeding/Aggressive Driving**
- [ ] **Intersections**
- [X] **Pedestrians and Bicyclists**
- [ ] **Impaired Driving**

*Crash History**

Crash Observation Period: 2012-2016 (5 years)

Total Number of Crashes:	**20**
Total Number of Injuries & Fatalities:	7
Number of Fatalities:	2
Number of Injuries	5

** Some collisions are duplicated to take into account the multiple factors that led to the occurence of the collision.*

Crash Details and Systemic Ranking Review

Contributing Factors/Crash Types*:

Crash Type	Crash Count	Injury Count
Fixed Object	1	-
Ran-off-road	-	-
Impaired	1	-
Speeding/Aggressive	11	4
Ped/Bike	2	-
Rear End	12	5
Sideswipe	3	-
Total	*30*	*9*

** Some collisions are duplicated to take into account the multiple factors that led to the occurence of the collision.*

Risk Factors:

	Value	Star Rating
Functional Class	Urban Collector	**
Road Width (ft)	50-54	*
Speed Limit (mph)	-	
Presence of Bike (Y/N)	Y	*
	Overall Rating	****

Proposed Safety Improvements & Total Project Cost

Description	Tier	Quantity	Unit	Cost per Unit	Total Cost	Notes
Crosswalk Visibility Enhancements	T1	6	Ea.	$ 8,000	$ 48,000	
Pedestrian Refuge Islands	T1	2	Per Approach	$ 20,000	$ 40,000	
Sidewalks, Walkways, and Paved Shoulders	T3	2640	LFT.	$ 150	$ 396,000	Add on One Side of the Street
Pedestrian Countdown Signals	T2	8	Per Intersection	$ 10,000	$ 80,000	
Speed Feedback Signs	T2	1	Per set/Location	$ 30,000	$ 30,000	
Speed Table	T2	2	Ea.	$ 5,000	$ 10,000	
				Total Project Cost	***$ 604,000***	

Proposed Safety Improvements for OPTIONAL Projects

Description	Crash Type Addressed	Emphasis Area Addressed	Notes
Enforcement and Education compaign	Ped/Bike	Ped/Bike	

Figure 31. Hollister Avenue Segment.

Rincon Hill Rd From North Bridge Abutment @ Ventura Co. Line To Hwy 150 Project

Location Description

Section ID:	A 10000	**Functional Class:**	Urban Local
Local Road Name:	RINCON HILL RD	**Road Width (ft):**	21
Start:	NORTH BRIDGE ABUTMENT @ VENTURA CO. LINE	**Number of Lanes:**	2
End:	HWY 150	**Speed Limit (mph):**	-
Length (mi):	0.7	**AADT:**	-
Area:	Suburban/Rural	**Bike Lane (Y/N):**	-
County:	Santa Barbara	**Pavement depth:**	-
Google Maps Link:	Google Maps	**Surface Type:**	O-AC/AC
		PCI:	38

LRSP/SHSP Empahsis Area

- [X] **Lane Departure**
- [X] **Speeding/Aggressive Driving**
- [ ] **Intersections**
- [X] **Pedestrians and Bicyclists**
- [X] **Impaired Driving**

*Crash History**

Crash Observation Period: 2012-2016 (5 years)

Total Number of Crashes:	**44**
Total Number of Injuries & Fatalities:	20
Number of Fatalities:	0
Number of Injuries	20

** Some collisions are duplicated to take into account the multiple factors that led to the occurence of the collision.*

Crash Details and Systemic Ranking Review

Contributing Factors/Crash Types*:

Crash Type	Crash Count	Injury Count
Fixed Object	13	6
Ran-off-road	7	6
Impaired	3	1
Speeding/Aggressive	24	13
Ped/Bike	5	6
Rear End	13	6
Sideswipe	7	-
Head-on	2	2
Total	*74*	*40*

Risk Factors:

	Value	Star Rating
Functional Class	Urban Local	*
Road Width (ft)	21	*
Speed Limit (mph)	-	
Presence of Bike (Y/N)	-	*
	Overall Rating	***

** Some collisions are duplicated to take into account the multiple factors that led to the occurence of the collision.*

Proposed Safety Improvements & Total Project Cost

Description	Tier	Quantity	Unit	Cost per Unit	Total Cost	Notes
Edge Line Rumble Stripes or Shoulder Rumble Strips	T1	0.7	Per Mile	$ 10,000	$ 7,000	Edge Line Rumble Stripes.
Alignment Delineation	T2	0.7	Ea.	$ 5,000	$ 3,500	Guardrail Delineation. Bridge Rail Delineation.
Enhanced Signs and Markings for Curves	T2	0.7	Per Curve	$ 10,000	$ 7,000	
Tree Removal / Utility Pole Relocation	T2	0.7	Per Mile	$ 100,000	$ 70,000	
Wider Shoulders	T4	0.7	Per Mile	$ 200,000	$ 140,000	
Bike Signs	T1	1	Per Site	$ 2,000	$ 2,000	Share the Road Bike Signs.
High-Visibility Enforcement	T2	1	Per Location	$ 102,000	$ 102,000	$52k per section[δ] for enforcement + $50k for education = $102,000.
				Total Project Cost	***$ 331,500***	

*[δ] Enforcement cost assumption: 1 officer * $40/hr * 10 hrs/week * 26 weeks/yr * 5 yr program*

Proposed Safety Improvements for OPTIONAL Projects

Description	Crash Type Addressed	Emphasis Area Addressed	Notes

Figure 32. Rincon Hill Road Segment.

Refugio Rd From Roblar Av To 1.0 Mi S Hwy 246 Project

Location Description

Section ID:	C 32820, C 32830, C 31840	**Functional Class:**	Urban Local, Urban Collector
Local Road Name:	REFUGIO RD	**Road Width (ft):**	25 to 34
Start:	ROBLAR AV	**Number of Lanes:**	2
End:	1.0 MI S HWY 246	**Speed Limit (mph):**	35 to 45 mph (Limit change zone)
Length (mi):	4.2	**AADT:**	-
Area:	Urban	**Bike Lane (Y/N):**	Y (partially)
County:	Santa Barbara	**Pavement depth:**	-
Google Maps Link:	Google Maps	**Surface Type:**	AC
		PCI:	40 to 66

LRSP/SHSP Empahsis Area

- [X] **Lane Departure**
- [X] **Speeding/Aggressive Driving**
- [ ] **Intersections**
- [X] **Pedestrians and Bicyclists**
- [ ] **Impaired Driving**

*Crash History**

Crash Observation Period: 2012-2016 (5 years)

Total Number of Crashes:	**10**
Total Number of Injuries & Fatalities:	2
Number of Fatalities:	1
Number of Injuries	1

** Some collisions are duplicated to take into account the multiple factors that led to the occurence of the collision.*

Crash Details and Systemic Ranking Review

Contributing Factors/Crash Types*:

Crash Type	Crash Count	Injury Count
Fixed Object	3	1
Ran-off-road	2	1
Impaired	1	1
Speeding/Aggressive	3	-
Ped/Bike	1	-
Rear End	2	-
Sideswipe	1	-
Rollover	1	-
Total	*14*	*3*

Risk Factors:

	Value	Star Rating
Functional Class	Urban Local, Urban Collector	**
Road Width (ft)	25 to 34	*
Speed Limit (mph)	35 to 45 mph (Limit change zone)	*
Presence of Bike (Y/N)	Y (partially)	*
	Overall Rating	*****

** Some collisions are duplicated to take into account the multiple factors that led to the occurence of the collision.*

Proposed Safety Improvements & Total Project Cost

Description	Tier	Quantity	Unit	Cost per Unit	Total Cost	Notes
Low Noise Rumble Strips (mumble strips)	T1	4.2	Per Mile	$ 10,000	$ 42,000	
Alignment Delineation	T2	4	Ea.	$ 5,000	$ 20,000	
Tree Removal / Utility Pole Relocation	T2	4.2	Per Mile	$ 100,000	$ 420,000	
Wider Shoulders	T4	4.2	Per Mile	$ 250,000	$ 1,050,000	
Sidewalks, Walkways	T3	44352	LFT.	$ 150	$ 6,652,800	Both Sides of the Road.
Bicycle Lanes	T1	4.2	Per Site	$ 400,000	$ 1,680,000	
				Total Project Cost	***$ 9,904,800***	

Proposed Safety Improvements for OPTIONAL Projects

Description	Crash Type Addressed	Emphasis Area Addressed	Notes
Enforcement and Education compaign	Ped/Bike	Ped/Bike	

Figure 33. Refugio Road Segment.

Bradley Rd Nb From Via Pavion To Santa Maria Wy Project

Location Description

Section ID:	E 4640, E 4660, E 4680, E 4700, E 4740, E 4760	**Functional Class:**	Urban Collector/Minor Arterial
Local Road Name:	BRADLEY RD NB	**Road Width (ft):**	30 to 36
Start:	VIA PAVION	**Number of Lanes:**	2
End:	SANTA MARIA WY	**Speed Limit (mph):**	40 to 45 mph
Length (mi):	3.4	**AADT:**	-
Area:	Urban	**Bike Lane (Y/N):**	Y
County:	Santa Barbara	**Pavement depth:**	-
Google Maps Link:	Google Maps	**Surface Type:**	O-AC/AC
		PCI:	79

LRSP/SHSP Empahsis Area

- [X] **Lane Departure**
- [X] **Speeding/Aggressive Driving**
- [X] **Intersections**
- [X] **Pedestrians and Bicyclists**
- [X] **Impaired Driving**

*Crash History**

Crash Observation Period: 2012-2016 (5 years)
Total Number of Crashes: **93**
Total Number of Injuries & Fatalities: 36
Number of Fatalities: 0
Number of Injuries 36

** Some collisions are duplicated to take into account the multiple factors that led to the occurence of the collision.*

Crash Details and Systemic Ranking Review

Contributing Factors/Crash Types*:

Crash Type	Crash Count	Injury Count
Fixed Object	16	3
Ran-off-road	6	2
Impaired	3	2
Speeding/Aggressive	50	20
Ped/Bike	5	4
Rear End	45	22
Sideswipe	12	-
Head-on	3	3
Total	*140*	*56*

** Some collisions are duplicated to take into account the multiple factors that led to the occurence of the collision.*

Risk Factors:

	Value	Star Rating
Functional Class	Urban Collector/Minor Arterial	**
Road Width (ft)	30 to 36	*
Speed Limit (mph)	40 to 45 mph	
Presence of Bike (Y/N)	Y	*
	Overall Rating	****

Proposed Safety Improvements & Total Project Cost

Description	Tier	Quantity	Unit	Cost per Unit	Total Cost	Notes
Basic Set of Sign and Marking Improvements (Including Curves)	T1	1	Per Site	$ 8,000	$ 8,000	
Standard Edge Line Markings	T1	3.4	Per Mile	$ 1,000	$ 3,400	
Fixed Object Delineation	T1	3.4	Per Mile	$ 1,000	$ 3,400	
Pedestrian Refuge Islands	T1	12	Per Approach	$ 30,000	$ 360,000	
Remove On-Street Parking on One Side of the Road	T1	12	LFT.	$ 2,000	$ 24,000	
Speed Feedback Signs	T2	3	Per Site	$ 30,000	$ 90,000	
Speed Cushion	T2	4	Ea.	$ 5,000	$ 20,000	
Clear Sight Triangles	T1	3	Per Intersection	$ 5,000	$ 15,000	
Backplates With Retroreflective Borders	T1	72	Per Signal Head	$ 300	$ 21,600	
Advance Cross Street Name Signs for High-Speed Approaches	T1	1	Per Intersection	$ 15,000	$ 15,000	
Install Right-Turn Lane	T3	4	Per Intersection	$ 100,000	$ 400,000	
				Total Project Cost	***$ 960,400***	

Proposed Safety Improvements for OPTIONAL Projects

Description	Crash Type Addressed	Emphasis Area Addressed	Notes
Shield Fixed Objects	Fixed Object	Lane Departure	If objects are already delineated or cannot be removed.
Lighting	Fixed Object	Lane Departure	Alternative to object removal/delineation.
Separated Bicycle Lanes	Ped/Bike	Ped/Bike	
Midblock Pedestrian Signals	Ped/Bike	Ped/Bike	
Red Signal Enforcement Lights (Tattletale Lights)	Rear End	Speeding/Aggressive	
Tubular Channelizers	Speeding/Aggressive	Speeding/Aggressive	
High-Visibility Enforcement	Impaired	Impaired	
	Speeding/Aggressive	Speeding/Aggressive	

Figure 34. Bradley Road Segment.

Selected Projects within Isla Vista

Abrego Rd From Camino Pescadero To Camino Corto Project

Location Description

Section ID:	B 15110	**Functional Class:**	Urban Local
Local Road Name:	ABREGO RD	**Road Width (ft):**	37
Start:	CAMINO PESCADERO	**Number of Lanes:**	2
End:	CAMINO CORTO	**Speed Limit (mph):**	-
Length (mi):	0.4	**AADT:**	-
Area:	Urban	**Bike Lane (Y/N):**	Y
County:	Santa Barbara	**Pavement depth:**	-
Google Maps Link:	Google Maps	**Surface Type:**	O -AC/AC
		PCI:	76

LRSP/SHSP Empahsis Area

- [X] **Lane Departure**
- [X] **Speeding/Aggressive Driving**
- [ ] **Intersections**
- [X] **Pedestrians and Bicyclists**
- [X] **Impaired Driving**

*Crash History**

Crash Observation Period:	2012-2016 (5 years)
Total Number of Crashes:	**20**
Total Number of Injuries & Fatalities:	6
Number of Fatalities:	0
Number of Injuries	6

** Some collisions are duplicated to take into account the multiple factors that led to the occurence of the collision.*

Crash Details and Systemic Ranking Review

Contributing Factors/Crash Types*:

Crash Type	Crash Count	Injury Count
Fixed Object	1	-
Rollover	1	1
Impaired	3	-
Speeding/Aggressive	4	1
Ped/Bike	4	4
Rear End	2	-
Sideswipe	8	-
Head-on	-	-
Broadside	5	2
Total	*28*	*8*

Risk Factors:

	Value	Star Rating
Functional Class	Urban Local	*
Road Width (ft)	37	**
Speed Limit (mph)	-	
Bike Lane (Y/N)	Y	*
	Overall Rating	****

** Some collisions are duplicated to take into account the multiple factors that led to the occurence of the collision.*

Proposed Safety Improvements & Total Project Cost

Description	Tier	Quantity	Unit	Cost per Unit	Total Cost	Notes
Basic Set of Sign and Marking Improvements	T1	1	Per Intersection	$ 5,000	$ 5,000	
Clear Sight Triangles	T1	2	Per Intersection	$ 10,000	$ 20,000	Remove a few parking spots on each intersection approach to improve sight distance.
Crosswalk Visibility Enhancements	T1	12	Ea.	$ 8,000	$ 96,000	
Speed Hump	T2	2	Ea.	$ 5,000	$ 10,000	If possible, ensure that speed hump is designed to be bicyclist friendly.
Flashing Solar Powered LED Beacons on STOP Signs	T2	3	Per Intersection	$ 15,000	$ 45,000	
Sidewalks, Walkways, and Paved Shoulders	T3	2112	LFT.	$ 150	$ 316,800	
Bicycle Lanes	T1	0.4	Per Mile	$ 2,500	$ 1,000	
				Total Project Cost	***$ 493,800***	

Proposed Safety Improvements for OPTIONAL Projects

Description	Crash Type Addressed	Emphasis Area Addressed	Notes
Removing On-Street Parking on One Side of the Street	Sideswipe	Speeding/Aggressive Driving	
Considering High-Visibility Enforcement	Impaired	Impaired Driving	
Converting Two-Way Street to One-Way Street	Sideswipe	Speeding/Aggressive Driving	
Considering Bike Boulevard	Ped/Bike	Pedestrians and Bicyclists	
Performing Bike Circulation Study/Plan	Ped/Bike	Pedestrians and Bicyclists	
Improving Transit Locations (Bus Stops)	Ped/Bike	Pedestrians and Bicyclists	The segment appears to be a transit route. Location of bus stops have to be established in away that ensures pedestrian safety.

Figure 35. Abrego Road Segment.

Sabado Tarde Rd From El Embarcadero To Camino Majorca Project

Location Description

Section ID:	B 15070	**Functional Class:**	Urban Collector
Local Road Name:	SABADO TARDE RD	**Road Width (ft):**	37
Start:	EL EMBARCADERO	**Number of Lanes:**	2
End:	CAMINO MAJORCA	**Speed Limit (mph):**	-
Length (mi):	0.8	**AADT:**	-
Area:	Urban	**Bike Lane (Y/N):**	N
County:	Santa Barbara	**Pavement depth:**	-
Google Maps Link:	Google Maps	**Surface Type:**	O -AC/AC
		PCI:	83

LRSP/SHSP Empahsis Area

- [X] **Lane Departure**
- [X] **Speeding/Aggressive Driving**
- [ ] **Intersections**
- [X] **Pedestrians and Bicyclists**
- [X] **Impaired Driving**

*Crash History**

Crash Observation Period: 2012-2016 (5 years)
Total Number of Crashes: **17**
Total Number of Injuries & Fatalities: 3
Number of Fatalities: 0
Number of Injuries 3

** Some collisions are duplicated to take into account the multiple factors that led to the occurence of the collision.*

Crash Details and Systemic Ranking Review

Contributing Factors/Crash Types*:

Crash Type	Crash Count	Injury Count
Fixed Object	1	1
Rollover	2	2
Impaired	2	-
Speeding/Aggressive	1	1
Ped/Bike	1	1
Rear End	2	-
Sideswipe	6	-
Head-on	1	-
Broadside	3	-
Total	*19*	*5*

** Some collisions are duplicated to take into account the multiple factors that led to the occurence of the collision.*

Risk Factors:

	Value	Star Rating
Functional Class	Urban Collector	*
Road Width (ft)	37	**
Speed Limit (mph)	-	
Bike Lane (Y/N)	N	
	Overall Rating	***

Proposed Safety Improvements & Total Project Cost

Description	Tier	Quantity	Unit	Cost per Unit	Total Cost	Notes
Basic Set of Sign and Marking Improvements	T1	1	Per Intersection	$ 5,000	$ 5,000	
Crosswalk Visibility Enhancements	T1	24	Ea.	$ 8,000	$ 192,000	
Clear Sight Triangles	T1	4	Per Intersection	$ 10,000	$ 40,000	Remove a few parking spots on each intersection approach to improve sight distance.
Speed Hump	T2	2	Ea.	$ 5,000	$ 10,000	If possible, ensure that speed hump is designed to be bicyclist friendly.
Flashing Solar Powered LED Beacons on STOP Signs	T2	6	Per Intersection	$ 15,000	$ 90,000	
Sidewalks, Walkways, and Paved Shoulders	T3	4224	LFT.	$ 150	$ 633,600	
Bicycle Lanes	T1	0.8	Per Mile	$ 2,500	$ 2,000	
			Total Project Cost		***$ 972,600***	

Proposed Safety Improvements for OPTIONAL Projects

Description	Crash Type Addressed	Emphasis Area Addressed	Notes
Removing On-Street Parking on One Side of the Street	Sideswipe	Speeding/Aggressive Driving	
Considering High-Visibility Enforcement	Impaired	Impaired Driving	
Converting Two-Way Street to One-Way Street	Sideswipe	Speeding/Aggressive Driving	
Considering Bike Boulevard	Ped/Bike	Pedestrians and Bicyclists	
Performing Bike Circulation Study/Plan	Ped/Bike	Pedestrians and Bicyclists	
Improving Transit Locations (Bus stops)	Ped/Bike	Pedestrians and Bicyclists	The segment appears to be a transit route. Location of bus stops have to be established in a way that it ensures pedestrian safety.

Figure 36. Sabado Tarde Road Segment.

Camino Pescadero From Del Playa Dr To El Colegio Rd Project

Location Description

Section ID:	B 15090	**Functional Class:**	Urban Collector	LRSP/SHSP Empahsis Area
Local Road Name:	CAMINO PESCADERO	**Road Width (ft):**	37	[ ] **Lane Departure**
Start:	DEL PLAYA DR	**Number of Lanes:**	2	[X] **Speeding/Aggressive Driving**
End:	EL COLEGIO RD	**Speed Limit (mph):**	-	[ ] **Intersections**
Length (mi):	0.5	**AADT:**	-	[X] **Pedestrians and Bicyclists**
Area:	Urban	**Bike Lane (Y/N):**	Y	[X] **Impaired Driving**
County:	Santa Barbara	**Pavement depth:**	-	
Google Maps Link:	Google Maps	**Surface Type:**	O -AC/AC	
		PCI:	75	

*Crash History**

Crash Observation Period: 2012-2016 (5 years)
Total Number of Crashes: **12**
Total Number of Injuries & Fatalities: 7
Number of Fatalities: 0
Number of Injuries 7

** Some collisions are duplicated to take into account the multiple factors that led to the occurence of the collision.*

Crash Details and Systemic Ranking Review

Contributing Factors/Crash Types*:

Crash Type	Crash Count	Injury Count
Fixed Object	-	-
Rollover	1	1
Impaired	1	-
Speeding/Aggressive	2	2
Ped/Bike	3	4
Rear End	2	-
Sideswipe	3	-
Head-on	-	-
Broadside	3	2
Total	*15*	*9*

Risk Factors:

	Value	Star Rating
Functional Class	Urban Collector	*
Road Width (ft)	37	**
Speed Limit (mph)	-	
Bike Lane (Y/N)	Y	*
	Overall Rating	****

** Some collisions are duplicated to take into account the multiple factors that led to the occurence of the collision.*

Proposed Safety Improvements & Total Project Cost

Description	Tier	Quantity	Unit	Cost per Unit	Total Cost	Notes
Crosswalk Visibility Enhancements	T1	52	Ea.	$ 8,000	$ 416,000	Mark crosswalk using longitudinal line markings parallel to traffic flow.
Separated bicycle lanes	T2	0.5	Per Mile	$ 2,500	$ 1,250	One-way protected bicycle track; bikes can be seperated from traffic by parked vehicles.
Speed Hump	T2	2	Ea.	$ 5,000	$ 10,000	If possible, ensure that speed hump is designed to be bicyclist friendly.
Flashing Solar Powered LED Beacons on STOP Signs	T2	10	Per Intersection	$ 15,000	$ 150,000	
Sidewalks, Walkways, and Paved Shoulders	T3	75	LFT.	$ 150	$ 11,250	
				Total Project Cost	***$ 588,500***	

Proposed Safety Improvements for OPTIONAL Projects

Description	Crash Type Addressed	Emphasis Area Addressed	Notes
Removing On-Street Parking on One Side of the Street	Sideswipe	Speeding/Aggressive Driving	
Considering High-Visibility Enforcement	Impaired	Impaired Driving	
Converting Two-Way Street to One-Way Street	Sideswipe	Speeding/Aggressive Driving	
Considering Bike Boulevard	Ped/Bike	Pedestrians and Bicyclists	
Performing Bike Circulation Study/Plan	Ped/Bike	Pedestrians and Bicyclists	
Studying Access from/to Some Cross Roads Closure	Broadside	Speeding/Aggressive Driving	Refer to east leg of Picasso Rd/Camino Pescadero intersection.
Considering "Multifunctional" Sidewalks (Pedestrians and Bicyclists)	Ped/Bike	Pedestrians and Bicyclists	
Improving Transit Locations (Bus Stops)	Ped/Bike	Pedestrians and Bicyclists	The segment appears to be a transit route. Location of bus stops have to be established in a way that ensures pedestrian safety.

Figure 37. Camino Pescadero Road Segment.

El Colegio Road & Camino Del Sur Project

Location Description

Section ID:	B 14951
Primary Road:	EL COLEGIO ROAD
Secondary Road:	CAMINO DEL SUR
Intersection Configuration:	Three-Legged Intersection
Skewed Intersection:	No
Intersection Traffic Control:	Signalized
County:	Santa Barbara
Area:	Urban
Google Maps Link:	Google Maps

LRSP/SHSP Empahsis Area

- [ ] **Lane Departure**
- [ ] **Speeding/Aggressive Driving**
- [X] **Intersections**
- [X] **Pedestrians and Bicyclists**
- [ ] **Impaired Driving**

*Crash History**

Crash Observation Period:	2012-2016 (5 years)
Total Number of Crashes:	**5**
Total Number of injuries & fatalities:	4
Number of Fatalities:	0
Number of Injuries	4

** Some collisions are duplicated to take into account the multiple factors that led to the occurence of the collision.*

Crash Details and Systemic Ranking Review

Contributing Factors/Crash Types*:

Crash Type	Crash Count	Injury Count
Left-turn	1	1
Rollover	1	1
Impaired	-	-
Speeding/Aggressive	-	-
Ped/Bike	4	3
Rear End	-	-
Sideswipe	-	-
Head-on	1	1
Broadside	2	1
Total	*9*	*7*

Risk Factors:

	EL COLEGIO ROAD	CAMINO DEL	Star Rating
	Value	**Value**	
Functional Class	Urban Principal Arterial	Urban Collector	*
Road Width (ft)	34	37	**
Speed Limit (mph)	-	-	
Bike Lane (Y/N)	N	Y	*
		Overall Rating	****

** Some collisions are duplicated to take into account the multiple factors that led to the occurence of the collision.*

Proposed Safety Improvements & Total Project Cost

Description	Tier	Quantity	Unit	Cost per Unit	Total Cost	Notes
Crosswalk Visibility Enhancements	T1	4	Ea.	$ 8,000	$ 32,000	Mark crosswalk using longitudinal line markings parallel to traffic flow.
Pedestrian refuge islands	T1	2	Per Approach	$ 8,000	$ 16,000	
Backplates with retroreflective borders	T1	11	Per Signal Head	$ 300	$ 3,300	
Additional signal heads	T1	3	Per Signal Head	$ 1,000	$ 3,000	
Leading Pedestrian Interval	T1	1	Per Intersection	$ 7,000	$ 7,000	
				Total Project Cost	$ 61,300	

Proposed Safety Improvements for OPTIONAL Projects

Description	Crash Type Addressed	Emphasis Area Addressed	Notes
Considering Separated Bicycle Lane	Ped/Bike	Pedestrians and Bicyclists	
Enforcement and Education compaign	Ped/Bike	Pedestrians and Bicyclists	

Figure 38. El Colegio and Camino Del Sur Intersection.

Pardall Road & Embarcadero Del Norte Project

Location Description

Section ID:	B 15020
Primary Road:	PARDALL ROAD
Secondary Road:	EMBARCADERO DEL NORTE
Intersection Configuration:	Four-Legged Intersection
Skewed Intersection:	No
Intersection Traffic Control:	Signalized
County:	Santa Barbara
Area:	Urban
Google Maps Link:	Google Maps

LRSP/SHSP Empahsis Area

- [ ] **Lane Departure**
- [ ] **Speeding/Aggressive Driving**
- [X] **Intersections**
- [X] **Pedestrians and Bicyclists**
- [ ] **Impaired Driving**

*Crash History**

Crash Observation Period:	2012-2016 (5 years)
Total Number of Crashes:	**5**
Total Number of injuries & fatalities:	5
Number of Fatalities:	0
Number of Injuries	5

** Some collisions are duplicated to take into account the multiple factors that led to the occurence of the collision.*

Crash Details and Systemic Ranking Review

Contributing Factors/Crash Types*:

Crash Type	Crash Count	Injury Count
Left-turn	3	4
Rollover	-	-
Impaired	-	-
Speeding/Aggressive	-	-
Ped/Bike	4	3
Rear End	-	-
Sideswipe	-	-
Head-on	-	-
Broadside	4	5
Total	*11*	*12*

Risk Factors:

	PARDALL ROAD	EMBARCADERO	Star Rating
	Value	**Value**	
Functional Class	Urban Local	Urban Local	**
Road Width (ft)	37	37	**
Speed Limit (mph)	-	-	
Bike Lane (Y/N)	Y	Y	**
		Overall Rating	******

** Some collisions are duplicated to take into account the multiple factors that led to the occurence of the collision.*

Proposed Safety Improvements & Total Project Cost

Description	Tier	Quantity	Unit	Cost per Unit	Total Cost	Notes
Crosswalk Visibility Enhancements	T1	4	Ea.	$ 8,000	$ 32,000	Mark crosswalk using longitudinal line markings parallel to traffic flow.
Basic Set of Sign and Marking Improvements	T1	1	Per Intersection	$ 8,000	$ 8,000	
Backplates with retroreflective borders	T1	8	Per Signal Head	$ 300	$ 2,400	
Leading Pedestrian Interval	T1	1	Per Intersection	$ 7,000	$ 7,000	
Additional signal heads	T1	1	Per Signal Head	$ 1,000	$ 1,000	
				Total Project Cost	$ 50,400	

Proposed Safety Improvements for OPTIONAL Projects

Description	Crash Type Addressed	Emphasis Area Addressed	Notes
Adding Bike Lane Sidewalks (Multifunctional) - on Pardall RD	Ped/Bike	Pedestrians and Bicyclists	Currently large sidewalks on Pardall RD.
Considering Bike Boulevard	Ped/Bike	Pedestrians and Bicyclists	
Redesigning Pardall RD (Cutting Palm Trees, Adding Bike Lanes)	Ped/Bike	Pedestrians and Bicyclists	
Enforcement and Education compaign	Ped/Bike	Pedestrians and Bicyclists	

Figure 39. Pardall Road and Embarcadero Del Norte Intersection.

Camino Pescadero & Picasso Road Project

Location Description

Section ID:	B 15090, B 15101
Primary Road:	CAMINO PESCADERO
Secondary Road:	PICASSO ROAD
Intersection Configuration:	Four-Legged Intersection - Offset
Skewed Intersection:	No
Intersection Traffic Control:	Unsignalized
Traffic Control Location:	Stop sign on Camino Pescadero
County:	Santa Barbara
Area:	Urban
Google Maps Link:	Google Maps

LRSP/SHSP Empahsis Area

- [ ] **Lane Departure**
- [ ] **Speeding/Aggressive Driving**
- [X] **Intersections**
- [X] **Pedestrians and Bicyclists**
- [ ] **Impaired Driving**

*Crash History**

Crash Observation Period: 2012-2016 (5 years)
Total Number of Crashes: **5**
Total Number of injuries & fatalities: 5
Number of Fatalities: 0
Number of Injuries 5

** Some collisions are duplicated to take into account the multiple factors that led to the occurence of the collision.*

Crash Details and Systemic Ranking Review

Contributing Factors/Crash Types*:

Crash Type	Crash Count	Injury Count
Left-turn	-	-
Rollover	-	-
Impaired	-	-
Speeding/Aggressive	-	-
Ped/Bike	5	5
Rear End	-	-
Sideswipe	-	-
Head-on	-	-
Broadside	5	5
Total	*10*	*10*

Risk Factors:

	CAMINO PESCADERO	PICASSO ROAD	Star Rating
	Value	**Value**	
Functional Class	Urban Collector	Urban Local	**
Road Width (ft)	37	37	**
Speed Limit (mph)	-	-	
Bike Lane (Y/N)	Y	Y	*
		Overall Rating	*****

** Some collisions are duplicated to take into account the multiple factors that led to the occurence of the collision.*

Proposed Safety Improvements & Total Project Cost

Description	Tier	Quantity	Unit	Cost per Unit	Total Cost	Notes
Basic Set of Sign and Marking Improvements	T1	1	Per Intersection	$ 8,000	$ 8,000	
Crosswalk Visibility Enhancements	T1	3	Ea.	$ 8,000	$ 24,000	
Flashing Solar Powered LED Beacons on STOP Signs	T2	1	Per Intersection	$ 15,000	$ 15,000	
Curb extensions	T1	1	Per Intersection	$ 20,000	$ 20,000	East leg of intersection: Permanently restrict access of vehicles to this leg Close the south-east section of the leg. Install a bi-directional bike lane on the north-east section of the leg.
				Total Project Cost	$ 67,000	

Proposed Safety Improvements for OPTIONAL Projects

Description	Crash Type Addressed	Emphasis Area Addressed	Notes
Considering Complete Closure of East Leg of the Intersection	Broadside	Intersections	
	Ped/Bike	Pedestrians and Bicyclists	
Enforcement and Education compaign	Ped/Bike	Pedestrians and Bicyclists	

Figure 40. Camino Pescadero and Picasso Road Intersection.

Camino Pescadero & Sabado Tarde Road Project

Location Description

Section ID:	B 15090, B 15070
Primary Road:	CAMINO PESCADERO
Secondary Road:	SABADO TARDE ROAD
Intersection Configuration:	Four-Legged Intersection
Skewed Intersection:	No
Intersection Traffic Control:	Unsignalized
Traffic Control Location:	Stop-sign on Sabado Tarde Rd
County:	Santa Barbara
Area:	Urban
Google Maps Link:	Google Maps

LRSP/SHSP Empahsis Area

	Lane Departure
	Speeding/Aggressive Driving
X	**Intersections**
X	**Pedestrians and Bicyclists**
	Impaired Driving

*Crash History**

Crash Observation Period: 2012-2016 (5 years)

Total Number of Crashes:	**4**
Total Number of injuries & fatalities:	3
Number of Fatalities:	0
Number of Injuries	3

** Some collisions are duplicated to take into account the multiple factors that led to the occurence of the collision.*

Crash Details and Systemic Ranking Review

Contributing Factors/Crash Types*:

Crash Type	Crash Count	Injury Count
Left-turn	-	-
Rollover	-	-
Impaired	-	-
Speeding/Aggressive	-	-
Ped/Bike	2	3
Rear End	-	-
Sideswipe	-	-
Head-on	-	-
Broadside	4	3
Total	*6*	*6*

Risk Factors:

	CAMINO PESCADERO	SABADO TARDE	Star Rating
	Value	**Value**	
Functional Class	Urban Collector	Urban Collector	**
Road Width (ft)	37	37	**
Speed Limit (mph)	-	-	
Bike Lane (Y/N)	Y	N	*
		Overall Rating	*****

** Some collisions are duplicated to take into account the multiple factors that led to the occurence of the collision.*

Proposed Safety Improvements & Total Project Cost

Description	Tier	Quantity	Unit	Cost per Unit	Total Cost	Notes
Basic Set of Sign and Marking Improvements	T1	1	Per Intersection	$ 8,000	$ 8,000	An engineering study for the location of the Stop signs within the vicinity of this intersection is highly recommended to ensure a safe pedestrian trajectory/crossings and to increase drivers' alertness to pedestrian presence.
Crosswalk Visibility Enhancements	T1	4	Ea.	$ 8,000	$ 32,000	
Flashing Solar Powered LED Beacons on STOP Signs	T2	1	Per Intersection	$ 15,000	$ 15,000	
				Total Project Cost	$ 55,000	

Proposed Safety Improvements for OPTIONAL Projects

Description	Crash Type Addressed	Emphasis Area Addressed	Notes
Enforcement and Education compaign	Ped/Bike	Pedestrians and Bicyclists	

Figure 41. Camino Pescadero and Sabado Tarde Road Intersection.

Evaluation Process

Santa Barbara County's Public Works Transportation Department will be the lead agency implementing the plan and coordinating with stakeholders listed elsewhere, dependent on individual projects. As the County implements the projects and strategies outlined in this plan, evaluating outcomes will be a point of focus. For example, the County can begin to ask:

- What will the evaluation process entail and how often will evaluation take place?
- Is someone responsible for monitoring progress throughout the year, and when will plan revisions be made?
- How will the LRSP evaluation affect future projects funded through Highway Safety Improvement Program or other funding sources?
- How will the project evaluations in these programs affect the LRSP?

It is critical that performance measures be established, targets set, and progress monitored regularly. Annually and for the life of the plan, the County will review implemented projects and evaluate each in terms of changes in the following performance metrics:

- Crashes, fatalities, and injuries.
- Crash types at the project locations.

Besides crash data, another suite of data may be useful. For example, adjudication data may provide an understanding of the outcome of speed citations, and a public survey about attitudes toward safety efforts may provide critical insight into public perception.

5. Next Steps

This safety plan identifies implementable countermeasures related to engineering infrastructure, educational opportunities, and enforcement. The Santa Barbara County safety stakeholders should collaboratively identify the key strategies and safety implementation projects to advance first in order to focus on their top priorities. The County will implement this safety plan over a 5-year period and will adjust it according to emerging needs and priorities. Capitalizing on the County's current prioritization process, the County anticipates that it will vet and implement projects under $50,000 through its annual operating budget, and that it will obtain funding for projects above that threshold either through a capital improvement project or the State's Highway Safety Improvement Program.

Recommended next steps include:

1. **Verify and Develop Projects.** The County will need to field-verify roadway information, conduct studies (if applicable), determine which countermeasures (per project) are necessary, and refine costs. The County should also determine how it will fund projects and determine a specific timeline for project development and construction.
2. **Improve Data.** Santa Barbara County has an opportunity to improve data collection and assessment efforts as a means of enhancing future transportation safety efforts. For example, by collecting traffic volume and speed data on a regular basis and inventorying roadway features, the County may make substantial advances toward identifying and applying safety treatments to the roads, corridors, and intersections most in need of safety improvements. Additionally, linking all existing and future data will enable the County to conduct more robust analyses that will refine its identification and implementation practices.
3. **Conduct Road Safety Audits.** The County may consider performing road safety audits (RSA) for corridors that appeared on numerous countermeasure lists. An RSA is a formal safety performance examination of an existing or future road or intersection by an independent, multidisciplinary team. It qualitatively estimates and reports on potential road safety issues and identifies opportunities for improvements in safety for all road users.[11] The Federal Highway Administration's Road Safety Audit website (http://safety.fhwa.dot.gov/rsa/) gives guidance as to how to conduct an RSA, who should be involved, and the potential benefits associated with RSAs.
4. **Identify Meaningful Performance Measures and Set Targets.** Rather than relying solely on measures chosen because the data is readily available, the County should identify performance measures that would prove helpful for decision-makers and program managers. This may mean implementing performance measurement using a phased-in approach—initially using measures based on available data while working toward acquiring the desired measures. Once it has solidified the performance measures it will use, the County can then establish performance targets and consistent evaluation periods. An important element of setting performance goals that should be taken into account during this process is understanding what each stakeholder considers "successful" performance.

[11] FHWA Road Safety Audit website.

5. **Engage Partner Agencies.** Although one agency may be ultimately responsible for managing the local road safety plan, successfully implementing it will require continued participation by supporting stakeholders, who may also may also have access to additional data that will support more accurate performance measurement.
6. **Assign Responsibility and Accountability and Set a Schedule.** It is important to assign responsibility for collecting and reporting performance measurements. It is equally important to assign accountability for the measures at the appropriate level. In addition, a schedule for performance reporting will need to be established. Annual performance measures are common, but in some cases a more frequent measure may help a program adjust direction if early indicators show a need to deviate from the original plan. Having a responsible party and an expected schedule will ensure performance measurements are actually taken and that they occur on a regular basis. Accountability ensures that the efforts to improve are continuous.

APPENDIX

Santa Barbara County Final Countermeasure List

This appendix records the approved countermeasures for Santa Barbara County's Local Road Safety Plan (LRSP). At the Countermeasure Workshop, stakeholders discussed potential countermeasures to apply at high-risk locations within the emphasis areas listed below. The following documents the results of this conversation and a subsequent review of the tiered list of countermeasures.

Tier 1 countermeasures are basic, fundamental strategies with proven safety benefits, many of which are low-cost and easily implemented. The tiered levels of countermeasures within each emphasis area reflect an increasing difficulty of implementation, costs, or both.

Emphasis Areas:

- Lane Departure
- Intersection
- Pedestrians and Bicycles
- Speeding/Aggressive Driving
- Impaired Driving

Lane Departure

Table 12. Lane Departure Countermeasures.

Countermeasure	Targeted Crashes	Crash Reduction[a]	Comments
TIER 1			
Fundamental Signs and Markings for Curves	All curve crashes	10%	Standard advanced curve warning sign plus advisory speed plaque and curve center and edge lines; chevrons per MUTCD.
Center Line Rumble Stripes	Head-on crashes	20%	
Wider Centerline Pavement Markings	Head-on crashes	5% [b]	Apply where centerline rumble stripes cannot be installed.
Edge Line Rumble Stripes or Shoulder Rumble Strips	Roadway departure crashes	13% (all) 18% (Injuries)	
Low Noise Rumble Strips (mumble strips)	Roadway departure crashes		Tested in several States. Uses a sinusoidal pattern that reduces road side noise levels.
Standard Edge Line Markings	Roadway departure crashes	10% [b]	
Pavement Wedge/SafetyEdge$_{SM}$	Roadway departure crashes	NA	Apply during paving operations or in areas of recurring edge drop-off.
Fixed Object Delineation	Night fixed object crashes	10% [b]	
TIER 2			
Enhanced Signs and Markings for Curves	All curve crashes	30%	Oversized, left, and right fluorescent yellow, advance warning signs; chevrons; SLOW and XX MPH pavement markings; center and edge lines.
Raised Thermoplastic Centerline Rumble Strips	Head-on crashes	20%	Apply as an alternative to centerline rumble stripes. Can be applied in urban areas where noise is a concern.
Alignment Delineation	Night roadway departure crashes	15% [b]	Post-mounted delineation (flexible or rigid) along the roadside. It is different than post sleeve delineation through curves.
Tree Removal / Utility Pole Relocation	Tree /utility pole crashes	Varies	
TIER 3			
High Friction Surfaces	Wet pavement crashes	50% (wet) 25% (all)	

Countermeasure	Targeted Crashes	Crash Reduction[a]	Comments
Enhanced Signs and Markings for Curves Plus Flashing Beacons	All curve crashes	49% combined	Same as enhanced signs and markings for curves plus solar powered flashing beacons added to warning signs.
Enhanced Signs and Markings for Curves Plus Dynamic Curve Warning System	All curve crashes	51% combined	Same as enhanced signs and markings for curves plus dynamic advanced warning signs added.
Lighting	Dark, dusk, or dawn crashes	50% (night only)	
Shield Fixed Objects	Fixed object crashes	Varies	Apply when removal is not feasible. Risk analysis will provide crash reduction factor (CRF).
TIER 4			
Wider Shoulders	Roadway departure crashes	Varies	CRF dependent on initial and final shoulder width. See Toolbox or Roadside Design Guide to determine.
Reconstruct Curve, Minor to Intermediate	All curve crashes	Varies	High friction surface, shoulder widening; increased recovery zone. CRF depends on type of improvement.
Horizontal Curve Flattening or Other Major Reconstruction	Curve crashes	38%	
Improved Recovery Areas, Slope Flattening	Run-off-road and fixed object crashes	Varies	CRF dependent on initial and final recovery zone and extent of fixed objects removed.
Alternate Passing Lanes (2+1 design)		25% [b]	Missouri data indicates reductions as high as 55 percent possible.
Four to Three Lane Conversions	All crashes	37%	Minimum of 2,030 to Maximum of 15,350 annual average daily traffic (AADT)
Median Buffer	Head-on crashes		For two-lane roads with paved shoulders, narrow shoulders to provide a flush median with rumble strips and tubular delineators. No passing allowed.
Corridor 3E Improvements	Severe (fatal and severe injury) roadway departure crashes	25%	CRFs are applied to all crashes.

Countermeasure	Targeted Crashes	Crash Reduction[a]	Comments
Area-Wide 3E Improvements	Severe (fatal and severe injury) roadway departure crashes	10% [b]	CRFs are applied to all crashes.

[a] CRFs are primarily from FHWA toolbox

[b] CRF is estimate since there is no reliable information available.

Intersection

Resources:

- Intersection Safety Strategies Brochure - https://safety.fhwa.dot.gov/intersection/conventional/signalized/FHWA-SA-15-085_Strategies_2.pdf

Table 13. Intersection-related Countermeasures.

Countermeasure	Crash Reduction	Additional Implementation Factors	Typical Implementation Cost Range per Intersection
TIER 1			
Basic set of sign and marking improvements	30%		$5,000 to $8,000
Clear sight triangles	Varies		
Lane narrowing using pavement marking and raised pavement markers	Unknown but probably less than 31%	Single through lane	$5,000 to $10,000
"Slow" pavement markings	Unknown		$2,000 to $5,000
Basic set of signal and sign improvements	30%		$5,000 to $30,000
Backplates with retroreflective borders	15% reduction for total crashes		
Change of permitted and protected left-turn phase to protected-only	41-48% of left turn crashes	None	$5,000 to $10,000
Advance cross street name signs for high-speed approaches on arterial highways	Unknown	High-speed approaches on four or more lane arterial highways	$1,000 to $5,000
Pedestrian ladder or cross-hatched crosswalk and advanced pedestrian warning signs	15% (pedestrian crashes) for signs Unknown for crosswalk	None	$1,000 to $3,000
Signal coordination	32%	Arterials with closely spaced (about 1/2 mile maximum) signals	$5,000 to $50,000
TIER 2			
Either a) flashing solar powered LED beacons on advance intersection warning signs and STOP signs or b) flashing overhead intersection beacons (red/red)	10% (13% for right angle crashes)		$5,000 to $15,000

Countermeasure	Crash Reduction	Additional Implementation Factors	Typical Implementation Cost Range per Intersection
Dynamic warning sign which advises through traffic that a stopped vehicle is at the intersection and may enter the intersection	Unknown		$10,000 to $25,000
Lane narrowing using pavement marking and shoulder rumble strips	31%	Free of noise and bicycle issues-single through lane	$20,000 to $40,000
Dynamic speed warning sign to reduce speed	30%		$10,000
High-friction surface	25% (All crashes) 50% (wet pavement crashes only)		$20,00 to $50,000
Installation of a 6 ft. wide or greater raised divider on stop approach (installed separately as a supplemental countermeasure)	15%	Widening required to install island	$25,000 to $75,000 (pavement widening but no ROW required)
New or upgraded lighting	50% (NEW), 25% (UPGRADED) of night crashes		$5,000 to $15,000
Advance detection control systems	40% (injuries)	Isolated high-speed (45 mph or greater) signalized intersections	$15,000
High-friction surface	25% (All crashes) 50% (wet pavement crashes only)		$20,00 to $50,000
RCUT modifications on high-speed divided arterials	100% cross path, 72-84% frontal impact, 43-53% all crashes	Ability to make U-turn within about ¼ to ½ mile of intersection	$5,000 to $50,000
Pedestrian countdown signals	25% (pedestrian crashes)	None	$5,000 to $15,000
Separate pedestrian phasing	34% pedestrian crashes)	None	$5,000 to $15,000
Bicycle boxes			
New or upgraded lighting	50% (NEW), 25% (UPGRADED) of night crashes	None	$5,000 to $15,000

Countermeasure	Crash Reduction	Additional Implementation Factors	Typical Implementation Cost Range per Intersection
TIER 3			
Install left-turn lane	28-48% reduction in total crashes (2-way stop controlled intersections)	Right of way restrictions; individual intersection analysis required	$350,000 to $400,000 each
Install right-turn lane	14-26% reduction in total crashes (2-way stop controlled intersections)	Right of way restrictions; individual intersection analysis required	
If intersection has skew, reduce or eliminate skew or create offset T-intersections			
TIER 4			
Roundabouts	72% to 87% (injuries and fatalities)	Right of way restrictions; individual intersection analysis required	$500,000 to $1 million each
Corridor engineering, education, and enforcement (3E) improvements on high-speed arterials with very high frequencies of severe intersection crashes	25% of corridor intersection fatal and incapacitating injury crashes	Length of corridor should be in the 5-10 mile range	$1,000,000 per corridor + $100,000 education and enforcement annually per corridor
Municipal-wide 3E improvements in municipalities with high frequencies of severe intersection crashes	10% of all intersection crashes	Consider density of severe crashes per capita	$500,000 to 1,000,000 + $100,000 to 200,000 (dependent on the size of the city) education and enforcement annually per municipality

Pedestrians and Bicycles

Resources:

- FHWA EDC-4 STEP initiative technical sheets - https://www.fhwa.dot.gov/innovation/everydaycounts/edc_4/step_tech_sheet.pdf
- PEDSAFE countermeasures website - http://www.pedbikesafe.org/PEDSAFE/countermeasures.cfm
- BIKESAFE countermeasure website - http://www.pedbikesafe.org/BIKESAFE/countermeasures.cfm

Table 14. Pedestrian and Bicycle Countermeasures.

Countermeasure	Description	Crash Reduction	Costs
TIER 1			
Crosswalk visibility enhancements	This group of countermeasures includes improved lighting, advance or in-street warning signage, pavement markings, and geometric design elements	23-48% reduction in crashes	
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.	60% reduction in pedestrian-vehicle crashes at intersections	$7,000 to upgrade to a compatible controller plus staff time to adjust timing
Bicycle lanes	Preferential or exclusive space for bicycle travel along a street. Bike lanes are typically 4 to 6 ft wide and are designated by striping and symbols placed within the lane.		
TIER 2			
Road Diets	Converting an existing four-lane undivided roadway to a three-lane roadway consisting of two through lanes and a center two-way left-turn lane (TWLTL). Benefits can include fewer lanes for pedestrian to cross; opportunity to install pedestrian refuge islands, transit stop enhancements, sidewalks, and bicycle lanes; traffic calming.	19-47% reduction in total crashes	Restriping for a road diet- $25,000-40,000/mile. If completed as part of a regularly scheduled resurfacing (that would include striping anyway), costs are minimal.

Countermeasure	Description	Crash Reduction	Costs
Pedestrian hybrid beacons	Traffic control device designed to help pedestrians safely cross busy or higher-speed roadways at midblock crossings and uncontrolled intersections.	69% reduction in pedestrian crashes; 29% reduction in total crashes; and 15% reduction in serious injury and fatal crashes.	Avg. cost - $58,000
Raised crosswalk	Raised pedestrian crossing can reduce vehicle speeds and enhance the pedestrian crossing environment		$2,000 - $20,000
Pedestrian refuge islands	Raised island, located between opposing traffic lanes at intersection or midblock locations, which separate crossing pedestrians from motor vehicles.	56% reduction in pedestrian crashes	$535 to $1,065 per foot; total construction costs range from $3,500 to $40,000, depending on the design, site conditions, etc.
Bike boulevard	Low-speed, low-volume street which has been optimized for bicycle traffic		
TIER 3			
Sidewalks, walkways, and paved shoulders	Defined space or pathway for use by a person traveling by foot or using a wheelchair	Sidewalks – 65-89% reduction in crashes involving pedestrians walking along roadways Paved shoulders – 71% reduction in crashes involving pedestrians walking along roadways	Sidewalk - $35-150/linear ft 5-6 ft paved shoulder - $100,000-350,000 per mile
Separated bicycle lanes	Bicycle facilities that run alongside a roadway separated from automobile traffic by a physical barrier, such as parked cars, bollards, a landscaped buffer, or a curb.		
School zone improvements	Sidewalks or separated walkways and paths; trained adult crossing guards equipped with a bright and reflective safety vest and a STOP paddle; police		

Countermeasure	Description	Crash Reduction	Costs
	enforcement in school zones; enhanced signs and markings.		
Curb extensions	Curb extensions—also known as bulb-outs or neckdowns—extend the sidewalk or curb line out into the parking lane, which reduces the effective street width.		$2,000 to $20,000
TIER 4			
Enforcement and education of pedestrian and bicycle safety measures	Enforcement activities and education campaigns and initiatives that help instill safe behaviors in pedestrians and bicycles, and give motorists an understanding of the effects of speed on vulnerable users.		

Speeding/Aggressive Driving

Since speeding is crosscutting into many safety areas, many countermeasures listed here are also within the roadway departure, intersections, and pedestrian section. For additional details on crash modification factors (CMFs), speed reductions, and studies: https://safety.fhwa.dot.gov/speedmgt/ref_mats/eng_count/2014/eng_ctm_crsh_14.pdf

Table 15. Speeding-related (or Aggressive Driving) Countermeasures.

Countermeasure	Description	Urban/Rural Applicability	Roadway environment
TIER 1			
One direction large arrow sign (W1-6)		Rural	Curves
Curve Treatment Level 1: Basic Curve Signing (advanced warning, chevrons, speed plates)	Installing basic curve signing to meet Manual on Uniform Traffic Control Devices minimum requirements	Rural	Curves
Delineator Post		Rural, Urban	Any roads; curves
Longitudinal rumble strips	Raised or grooved patterns installed on both inside edges of normal travel lane to narrow effective width	Rural	
Transverse rumble strips	Raised or grooved patterns installed on the roadway travel lane or shoulder pavements, perpendicular to the direction of travel	Urban, Suburban, Rural	Local; stop-controlled approaches, major
Converging chevron marking pattern	Type of transverse pavement markings forming chevron shape to create the illusion of travelling faster as well as the impression of narrower lanes	Rural, Urban	Local street, collector, arterial; exit ramps; curves on directional interchange ramps
Transverse markings	A series of white lines placed across the center of the lane and spaced progressively closer to create the illusion of travelling faster	Rural	Horizontal curves; Work zone
Optical Speed Bars	A series of white rectangular markings typically 1-ft wide placed just inside both edges of the lane and spaced progressively closer to create the illusion of travelling	Rural	Local street, collector, arterial; curves

Countermeasure	Description	Urban/Rural Applicability	Roadway environment
	faster as well as the impression of narrower lane		
Add shoulder markings to narrow lane		Rural, Urban	Two-lane road through small town; exit ramp
Speed Limit XX Pavement Legend	Speed limit painted on roadway	Rural, Urban	Any roads
"Slow" pavement legend	Slow painted on roadway	Rural, Urban	Local roads, collector, arterial; curves
"XX MPH" + Curve Symbol	Painted on roadway prior to curve		
"Radar Enforced" signs	Sign to remind drivers that a corridor is being monitored for speed on an unannounced basis.	Urban, Rural	
Red signal enforcement lights (tattletale lights)	Auxiliary lights connected to a traffic signal to help law enforcement officers more efficiently and safely issue citations for drivers who violate the red phase of the signal.	Urban	
Speed Limit Setting Guidelines			
Speed Limit Reviews			
USLIMITS2	Web based tool designed to help practitioners set reasonable, safe, and consistent speed limits for specific segments of roads.		
TIER 2			
Flashers	Add flashers to existing curve warning signs	Rural	Curves
Flags	Add flags to existing curve warning signs	Rural	Curves
Curve Treatment Level 2: Enhanced signing/delineation	Installing enhanced signing/delineation (oversized signs, florescent sheeting, full post delineation, etc.)	Rural	Curves
Sequential Dynamic Curve Warning System	series of blinking chevron signs installed throughout a curve, flashes sequentially through the curve to warn speeding drivers	Urban, Rural	Curves
Speed feedback signs	sign that dynamically displays speed of passing vehicles with the message, "YOUR SPEED XX"	Rural, Urban	Any roads; school zones, advance of

Countermeasure	Description	Urban/Rural Applicability	Roadway environment
			signalized intersection; work zones
Speed activated warning sign	sign that displays warning messages to speeding drivers	Rural, Urban	Any roads; work zones; curves
Variable speed limit sign	Signs that allow speed limit to change according to conditions	Urban	Principal arterial, interstate
Speed Limit Sign with LED	Speed limit sign enhanced with LED lights	Rural	Community entrance
Road diet	restripe road to reduce the number of lanes from two lanes in each direction to one lane in each direction with a center turn lane	Urban	Arterial road
In-Roadway Warning Lights	flashing lights installed in the roadway to warn users that they are approaching a condition on or adjacent to the roadway that might not be apparent and require the driver to slow down	Rural, Urban	Any roads; pedestrian crossing; school zones, curves
Internally illuminated raised pavement markers	Steadily illuminated lights installed in the roadway surface	Rural, Urban	Any roads; pedestrian crossing; school zones, curves
High friction surface treatment	Pavement treatment addresses friction demand issues, such as those associated with reduction in pavement friction during wet conditions, and/or a high friction demand due to vehicle speed and/or roadway geometrics	Rural, Urban	Curves, intersections
Speed Hump	rounded raised area across the road, typically 12-14 ft in length and 3-4 in high	Urban, Suburban	Local street
Speed Cushion	speed hump typically 6-7 ft wide that allows most emergency vehicles to straddle the hump	Urban	Local street
Speed Table	long speed hump typically 22 ft in length with a flat section in the middle and ramps on the ends	Urban	Local street
Gateway Treatment	placed at community entrance to remind drivers of changing roadway character	Rural	Community entrance

Countermeasure	Description	Urban/Rural Applicability	Roadway environment
TIER 3			
Roundabout	type of circular intersection configuration that safely and efficiently moves traffic through an intersection; feature channelized approaches and a center island that results in lower speeds and fewer conflict points	Urban, Rural	Local street, collector, arterial; ramp terminals
Raised Intersection	raised plateau, with ramps on all approaches, where roads intersect	Urban	Local street
Choker	mid-block curb extensions that narrow a road by extending the sidewalk or widening the planting strip	Urban	Local street
Neckdown	intersection curb extensions that narrow a road by extending the width of a sidewalk	Urban	Local street
Chicane	curb extensions that alternate from one side of the street to the other, forming S-shaped curves	Urban	Local street
Lateral Shift	curb extensions that shifts travel lanes to one side of road for extended distance and then back to the other side	Urban	Local street
Center Island	raised island along the centerline of a street that narrows the travel lanes	Urban	
Tubular channelizers	tubes used to create island in center of roadway	Rural, Urban	Local, collector, arterial
Landscaping	Roadside plantings used to create vertical friction	Urban	Collector
TIER 4			
Corridor Enforcement and Education	Enhanced, planned enforcement and education efforts on a corridor	Urban, rural	Any road
Corridor 3-E Initiative (engineering, education, enforcement)	Implementation of engineering countermeasures, along with enhanced, planned enforcement and education efforts on a corridor	Urban, Rural	Any road

Impaired Driving

Resources:

- NHTSA's *Community-Based Impaired Driving Programs: Local Ordinances and Other Strategies Addressing Impaired Driving*, https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/811678.pdf

Table 16. Impaired Driving Safety Countermeasures.

Strategies	Description/More Information
TIER 1	
Ignition interlocks	Ignition interlocks installed in cars measure alcohol on the driver's breath. Interlocks keep the car from starting if the driver has a BAC above a certain level, usually 0.02%. They are for people convicted of drunk driving and are highly effective at preventing repeat offenses while installed. Mandating interlocks for all offenders, including first-time offenders may provide greater impact. County's increased communication and collaboration with judiciary branch can help more frequent implementation of ignition interlocks. Installed ignition interlocks reduce repeat offenses for driving while intoxicated (DWI) by about 70%.
TIER 2	
High-visibility enforcement	High-visibility enforcement (HVE) is a well-coordinated and targeted strategy of actively conducting and publicizing law enforcement activities to detect and arrest impaired drivers. Effective countermeasures for reducing impaired-driving fatalities including a combination of periodic high-intensity and sustained high-visibility enforcement efforts, supported by a coordinated media campaign. The enforcement component of the HVE strategy includes a variety of enforcement activities such as saturation patrols and sobriety checkpoints.
Alcohol restrictions in public locations	Communities can prohibit or restrict the use of alcohol on public property such as parks, beaches, and parking lots. These types of ordinances can deter alcohol-fueled disturbances, fighting, vandalism, youth access to alcohol, and overconsumption of alcohol.
TIER 3	
Media campaigns	Mass media campaigns spread messages about the physical dangers and legal consequences of drunk driving. They persuade people not to drink and drive and encourage them to keep other drivers from doing so. Campaigns are most effective when supporting other impaired driving prevention strategies.
Alcohol screening and brief intervention	Typically administered by a health care provider, alcohol screening consists of an interview to determine a person's level and frequency of drinking. If a person is potentially at risk for alcohol use problems, the health care provider conducts a brief intervention—a short counseling session designed to assist the person in confronting the negative consequences of his or her alcohol consumption.
Designated driver programs	Include advanced planning, coordination with a variety of local community organizations and representatives, and clear and targeted messages and guidelines to get people home safely.

Responsible beverage service	Responsible beverage service (RBS) programs prevent sales to minors and over-service to intoxicated patrons, in turn preventing alcohol impaired driving. RBS programs include development of standards, practices, and procedures for the sale and service of alcohol as well as training on compliance with laws, identification verification, and techniques to monitor sales and service.
TIER 4	
Alternative Transportation Services	Characteristics of these programs vary by mode of transportation, organization type, and operation. One example is a service that takes impaired people and their vehicles home. See NHTSA's *Alternative Transportation Programs: A Countermeasures for Reducing Impaired Driving* for more info.
Open-container ordinances	An open-container ordinance prohibits people from publicly consuming or possessing an open container of alcohol. This ordinance allows communities to discourage people from drinking alcoholic beverages while driving.
DWI Courts	A DWI court is a specialized court dedicated to changing the behavior of the higher risk offenders arrested for DWI. The goal of a DWI court is to protect the public by using the highly successful model of accountability, supervision, and long-term treatment.