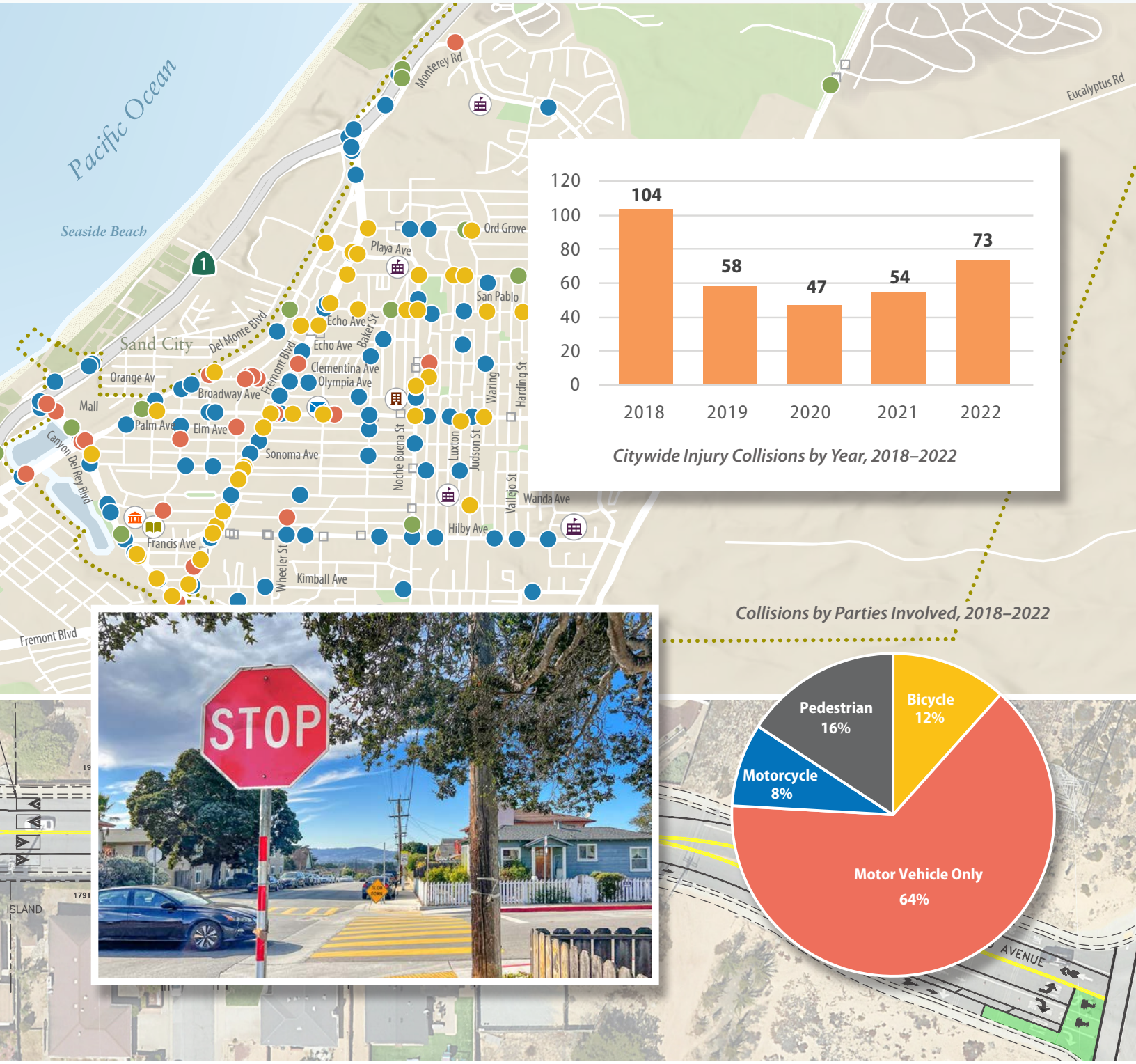
City of Seaside
Local Road Safety Plan



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Prepared for the City of Seaside by Parametrix

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2024 CITY OF SEASIDE LOCAL ROAD SAFETY PLAN

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ACRONYMS AND ABBREVIATIONS

ADA	Americans with Disabilities Act
HCN	High Collision Network
LRSP	Local Road Safety Plan
NHTSA	National Highway Traffic Safety Administration
PCF	Primary Collision Factor
RRFB	Rectangular Rapid Flashing Beacon
RTP	Regional Transportation Plan
SHSP	Strategic Highway Safety Plan
TAC	Technical Advisory Committee
TAMC	Transportation Agency of Monterey County
TIMS	Transportation Injury Mapping System

EXECUTIVE SUMMARY

Based on the latest full year of data available, in the United States, almost 43,000 people were killed in motor vehicle collisions in 2022.[1] This marks a 1.7% decrease from 2021, which had the highest number of traffic-related fatalities since 2005. However, traffic fatalities among vulnerable users – pedestrians, bicyclists, and motorcyclists – increased compared to 2021, with fatalities involving bicyclists increasing as much as 13%. In the state of California, 2022 saw more than 4,200, a 1.9% decrease from 2021.

To combat the number of fatal collisions – and collisions more generally – Caltrans developed a Strategic Highway Safety Plan (SHSP). The purpose of the SHSP is to coordinate statewide efforts to reduce severe injuries and fatalities resulting from traffic collisions throughout the state. The SHSP establishes goals, objectives, and emphasis areas to address road user safety.

This Local Road Safety Plan (LRSP) – focused on the City of Seaside – builds on the foundation of the SHSP while providing the City with an opportunity to address its own, unique roadway safety needs.

WHAT IS AN LRSP?

An LRSP is a plan that provides a framework to identify, analyze, and prioritize potential roadway safety improvements for local and rural roads, thereby increasing safety for all road users. The LRSP facilitates local agency partnerships and collaboration to systematically address road safety issues, ultimately resulting in a list of prioritized projects and actions that can be used to obtain federal funding. It provides a proactive approach to address safety needs and demonstrates agency responsiveness to safety challenges.

This LRSP has been developed by the City of Seaside with input from a number of stakeholders (described in Chapter 3). It aims to align the City with the principles of Vision Zero through the plan's vision statement and goals, which are presented in Chapter 2.

VISION ZERO PRINCIPLES

Vision Zero is a broad strategy to eliminate all traffic fatalities and severe injuries while increasing safe, healthy, equitable mobility for all users. It was first implemented in Sweden in the 1990s and has since been adopted by cities throughout Europe, the United States, and elsewhere. Vision Zero differs from traditional approaches in that it recognizes traffic deaths as preventable and integrates the reality and expectation that humans will make mistakes into its multidisciplinary, systemic approach. Vision Zero's safe system approach is holistic, requiring that road systems be considered in their entirety from infrastructure to policy. This LRSP incorporates a safe system approach into its analysis and strategies for improving road user safety in the City of Seaside.

DATA ANALYSIS

The LRSP makes use of reported collision data to identify trends, pinpoint needs, and develop strategies to address road user safety in the City of Seaside. Analyses were conducted using 2018–2022 data from SafeTREC's Transportation Injury Mapping System (TIMS), the most recent full year of data available. Only collisions resulting in an injury or fatality were included in the analysis: collisions resulting in property damage only were not considered.

[1] National Highway Traffic Safety Administration. 2024. Overview of Motor Vehicle Traffic Crashes in 2022. US Department of Transportation, Washington, DC

From 2018–2022, a total of 336 collisions resulting in an injury or fatality were reported to occur in the City of Seaside. While there were no fatal collisions, 32 collisions (10%) resulted in a severe injury. Collisions peaked in 2018, with 104, before dropping to a low of 47 in 2020 and rising to 71 in 2022. While overall collisions were down by approximately 20% in 2018–2022 compared to 2013-2017, severe injury collisions increased by 77% during this time period.

Vulnerable road users made up a disproportionate amount of the severe injuries in Seaside. Pedestrians were involved in 16% of citywide collisions but 34% of severe injury collisions; bicyclists were involved in 12% of collisions but 34% of severe injury collisions; and motorcyclists were involved in 8% of collisions but 19% of severe injury collisions.

The top collision factor in Seaside was automobile right-of-way violation, which caused approximately 18% of collisions in the City. Approximately 16% were caused by unsafe speeds, while 13% resulted from both improper turning and traffic signal and sign violations.

A High Collision Network (HCN) was developed for the City, including intersections and road segments with high numbers of collisions. HCN locations were confirmed through coordination with City officials. Seaside's HCN includes 15 road segments and 15 intersections spread throughout the City. Fremont Boulevard, Broadway Avenue, Noche Buena Street, Canyon Del Rey Boulevard, and Del Monte Boulevard all had multiple roadway segments on the HCN; Fremont Boulevard from Francis Avenue to Sonoma Avenue had the highest number of collisions, with 26 total. Canyon Del Rey Boulevard and Del Monte Boulevard was the intersection with the highest number of collisions (11).

Emphasis Areas were identified for the City based on the collision analysis results and were refined through stakeholder input. Emphasis Areas are collision characteristics – road users, collision factors, types, or other factors – that can help provide a framework for developing and implementing strategies to increase road user safety in Seaside. Each Emphasis Area is accompanied by quantifiable goals to facilitate evaluation of the plan's effectiveness in reducing collisions, particularly those resulting in severe injuries or fatalities. Strategies are provided to reach each Emphasis Area's goal. These are grouped based on the Caltrans Strategic Highway Safety Plan Five E's: education, enforcement, engineering, emergency response, and emerging technology.

PRIORITY PROJECT IDENTIFICATION

Following the creation of the HCN, the collision patterns at intersections and segments were analyzed to determine potential countermeasures. Countermeasures are engineering treatments that have the potential to reduce collisions in locations based on the collision trends (see Appendix A). In collaboration with City officials, a subset of priority project locations was selected to recommend specific improvements based on the collision rates, trends, and potential improvement impacts.

IMPLEMENTATION AND MONITORING

This LRSP identifies implementation and monitoring considerations that will be important to jurisdictions as they work towards achieving the LRSP goals. These include funding, coordination and partnership, policy support, and timeline considerations. It also provides metrics that can be used to evaluate progress. This LRSP is meant to be a living document and should be revised as needed to reflect evolving trends, community needs, and priorities.

CHAPTER ONE: INTRODUCTION

A local road safety plan (LRSP) is a plan that provides a framework to identify, analyze, and prioritize potential roadway safety improvements for local and rural roads, thereby increasing safety for all road users. The LRSP facilitates local agency partnerships and collaboration to systematically address road safety issues, improving agency responsiveness to identified challenges and ultimately resulting in a list of prioritized projects and actions that can be used to obtain federal funding. The LRSP provides a proactive approach to address safety needs and demonstrates agency responsiveness to safety challenges. A living document, the LRSP can be revised as needed to reflect evolving trends, community needs, and priorities.

This LRSP was developed by the City of Seaside, with input from a number of stakeholders and the public (see Chapter 3 and Chapter 4.3).

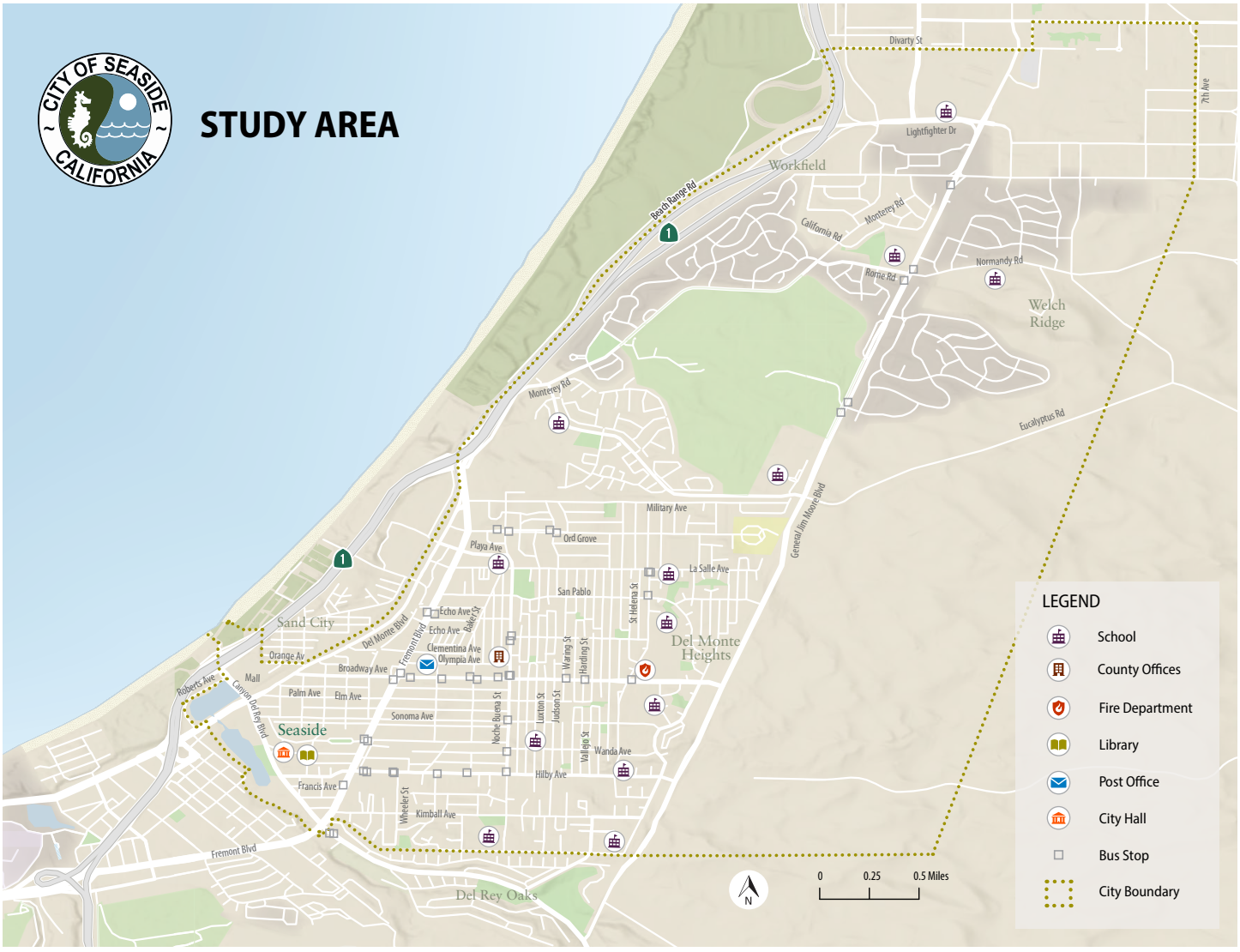


Figure 1. LRSP Study Area

1.1 STUDY AREA

The City of Seaside is on the central coast of California, covering an area of 9.84 square miles and with a population of 32,631 residents, according to the 2021 American Community Survey.[2] The City is within Monterey County and is adjacent to the cities of Monterey, Del Rey Oaks, and Marina. A map of the study area can be found in Figure 1.

Seaside generally fares better than other Monterey County jurisdictions when it comes to traffic safety. Based on the Office of Traffic Safety's rankings for 2021, the most recent year of data available, the City ranks 77th out of 93 jurisdictions for total fatal and injury collisions. However, the City's unique characteristics result in high numbers of certain types of collisions compared to the rest of the county's jurisdictions. Seaside ranks eighth for fatal and injury collisions involving pedestrians younger than 15 and 26th for fatal and injury collisions involving pedestrians regardless of age.

The City's roads can be difficult to navigate on foot.

1.2 DOCUMENT ORGANIZATION

This LRSP is organized into the following chapters:

Chapter 1: Introduction
Gives an overview of LRSPs and the study area, and outlines the plan's structure.

Chapter 2: Vision Statement and Goals
Provides the vision statement and goals that guide the LRSP development and implementation.

Chapter 3: Safety Partners
Introduces the partners who provided advice in developing the LRSP, including the vision statement, goals, emphasis areas, and strategies.

Chapter 4: Process
Describes the methodology used to analyze countywide collision data as well as the process for soliciting feedback during the LRSP development process.

Chapter 5: Existing Efforts
Outlines efforts, activities, programs, policies, and plans in existence or development to address transportation safety in the City.

Chapter 6: Collision Analysis Results
Provides an overview of countywide collision trends on arterial and collector roadways, including an introduction to the countywide High Collision Network.

Chapter 7: Emphasis Areas
Features an overview of overrepresented 'emphasis area' collision characteristics and goals ad strategies to improve road safety in these areas.

Chapter 8: Priority Projects
Provides more detail on crash trends and recommended countermeasures at high-priority locations on the City's High Collision Network.

Chapter 9: Implementation and Monitoring
Describes the process that will be used to monitor implementation, evaluate the success of the plan, and update the plan as needed.

2 U.S. Census Bureau. 2017-2021 American Community Survey 5-Year Estimates

CHAPTER TWO: VISION STATEMENTS AND GOALS

Seaside's vision for this LRSP was developed through feedback with the Technical Advisory Committee (TAC), described in Chapter 3. The vision statement reflects the city's commitment to Vision Zero, an international strategy to eliminate all traffic fatalities and severe injuries while increasing safe, healthy, and equitable mobility for all. The accompanying goals represent a path forward to achieving this vision.

2.1 VISION STATEMENT

Seaside is committed to eliminating all traffic-related fatalities and severe injuries by 2040 by developing road networks that prioritize safety for all modes of transportation. Its streets will be designed with safe speeds, clear signage, and proper infrastructure for pedestrians and cyclists, making them easily accessible and enjoyable for everyone.

The vision is not static; it involves a commitment to ongoing improvement and innovation in road safety practices. Seaside will continuously evaluate the effectiveness of its strategies and adapt to emerging challenges and opportunities.

2.2 GOALS

- Ensure that multimodal safety investments are made in a data-driven manner that is fair and equitable for all Seaside residents.
- Advocate for cohesive road safety strategies, integrating the Traffic Advisory Committee and community insights to create streets that prioritize the well-being of all residents and visitors.
- Implement projects, public outreach, and agency cooperation to promote safe travel for all road network users, including those using non-vehicular modes and differently abled people.
- Increase the implementation of roadway and intersection improvements that reduce conflict points, especially at intersections and along high-speed roadways.

Bicyclists must navigate turning vehicles at the intersection of San Pablo Avenue and General Jim Moore Boulevard.

CHAPTER THREE: SAFETY PARTNERS

The LRSP development process was informed by a number of stakeholders who formed the project's TAC. The TAC provided input on the vision statement, goals, collision analysis, emphasis areas, and strategies. TAC members represented various agencies and organizations.

TAC MEMBERS

CITY OF SEASIDE
Carolyn Burke, Assistant Public Works Director;
Patrick Grogan, Associate Engineer;
Leslie Llantero, Assistant Engineer

TRANSPORTATION AGENCY FOR MONTEREY COUNTY
Doug Bilse,
Principal Transportation Engineer

SEASIDE FIRE DEPARTMENT
Paul Blaha,
Deputy Chief

MONTEREY PENINSULA UNIFIED SCHOOL DISTRICT
Tom Thorpe,
Transportation Director

SEASIDE POLICE DEPARTMENT
Nick Borges,
Police Chief

CHAPTER FOUR: PROCESS

This chapter provides an overview of the methodology used to develop the Plan and its component parts.

4.1 DATA ANALYSIS

To develop the LRSP, collision data for the five most recent finalized years (2018–2022) and the previous five-year period (2013-2017) were downloaded from SafeTREC's Transportation Injury Mapping System (TIMS) and analyzed in Microsoft Excel and ArcGIS Pro. Only collisions resulting in an injury or fatality and occurring within City of Seaside jurisdictional boundaries were included in this analysis: non-injury collisions were not included in this analysis. Spatial analysis involved mapping collision locations to identify hot spots. This initial descriptive analysis was performed to assess trends in road users involved, collision types, primary collision factors, geography, and other collision characteristics. Demographic factors were included in the analysis to understand potential equity concerns and vulnerable road users.

A High Collision Network (HCN) was developed for the City based on the results of the collision analysis. Seaside's HCN includes intersections and road segments with the highest numbers of collisions. HCN locations were confirmed through coordination with City officials.

4.2 PRIORITY PROJECT IDENTIFICATION

Following the creation of the HCN, the collision patterns at these intersections and segments were analyzed to determine potential countermeasures. These countermeasures are engineering treatments that have the potential to reduce collisions in these locations based on the collision trends. See Appendix A for more detailed information on the countermeasures. In collaboration with the City, a subset of priority project locations was selected to recommend specific improvements based on the collision rates, trends, and potential improvement impacts.

4.3 OUTREACH

Community input from local residents and various stakeholders is essential for the project's success. Feedback to help inform the Plan was gathered through in-person outreach events and a community survey. The feedback gathered from these outreach efforts was carefully considered and used to refine and improve the project plan, ensuring it aligns with the community's needs and priorities.

Outreach events were publicized in both English and Spanish.

Public Outreach Events

To gather this input, two outreach events were conducted. The first meeting took place on Thursday, January 11, 2024, at the Oldemeyer Center in Seaside, and was publicized with flyers distributed throughout the community. The second meeting was held on July 19, 2024, at City Hall and was promoted through both flyers and mailers sent to residents. Bilingual materials were made available and a Spanish interpreter was present at both events to ensure inclusive participation.

Both events were also promoted through City media and announcements at City Council meetings. Special effort was made to advertise the events to local businesses as well as residents of key corridors.

During these meetings, the project team presented their analysis and findings, and discussed the emphasis areas that had been chosen. These sessions provided an opportunity for the community to offer their feedback and ask questions. Residents expressed their desire to slow traffic on Seaside's roadways and expressed concern about topics including pedestrian and bicyclist safety and adequate street lighting.

Community Survey

In addition to the in-person events, a community survey was conducted to gather further input. This survey collected detailed information about road users, the modes of transportation being used, and other relevant data. The survey was made available both online and in paper format.

The survey was advertised on the City's website, through flyers, and at a community meeting in both English and Spanish to ensure broad participation. Over six weeks, 190 participants provided insights into their transportation modes and safety concerns. Almost one third of survey respondents were aged 65 and over (32%), followed by those 45-54 (20%) and 55-64 (19%). Most respondents (89%) live in Seaside, while a smaller percentage either work (5%) or visit Seaside for shopping, dining, or recreation (4%).

The findings revealed that 62% of respondents use cars daily, while 28% walk daily. Bicycle usage is notably low, with only 5% cycling daily and 38% never using a bicycle. Public transit and motorcycles are also infrequently used. As drivers, the top concerns were speeding vehicles (57%), poor roadway surfaces (49%), and distracted drivers (42%). For pedestrians, speeding vehicles (63%) were also a major concern, followed by drivers failing to yield (51%) and distracted drivers (49%). Bicyclists highlighted speeding vehicles (24%) and distracted drivers (12%) as their primary issues, along with the lack of bicycle lanes (11%).

When it comes to the types of crashes that are of concern, the survey shows that head-on collisions and right-of-way issues were the largest issues to respondents, with 48% of respondents being very concerned about each crash type. Broadside collisions and crashes involving pedestrians and bicyclists also draw significant concern, with 35% and 43% of respondents being very concerned, respectively.

When asked about the most effective ways to improve road user safety in Seaside, the survey found that 26% of respondents prioritize engineering solutions to improve road design, 24% focus on enforcement to reduce high-risk behaviors, and 18% advocate for emerging technology in roadways and vehicles. Education and emergency response are seen as less effective, with 11% and 3% respectively. The survey also found that 18% of respondents prioritize traffic calming measures and improving sight lines at intersections and driveways for safety improvements in residential areas.. Pedestrian infrastructure enhancements, such as raised crosswalks, are important to 16% of respondents, while 14% focus on installing additional crosswalks and pedestrian signals. Bicycle infrastructure improvements are supported by 12% and enhancing street lighting is a priority for 8%.

An open-ended question allowed respondents to provide additional suggestions. Key issues included dangerous intersections, obstructive on-street parking, significant safety risks for bicyclists and pedestrians due to the lack of bike lanes and poor visibility, and poor road maintenance. Widespread concerns about speeding and traffic violations were also highlighted. The word cloud below (Figure 2) represents the most frequently mentioned issues and locations from these responses.

Figure **2.** *Word Cloud of Open-Ended Survey Responses*

CHAPTER FIVE: EXISTING EFFORTS

In recent years, Seaside's efforts to improve safety have been most visible through a range of plans, studies, and projects. This chapter describes these existing and ongoing efforts supporting safety in Seaside.

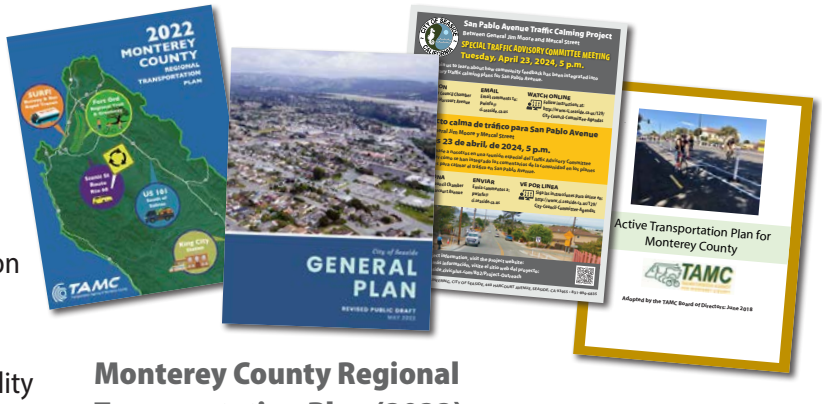
5.1 PLANS AND STUDIES

City of Seaside General Plan (2023)

The updated Seaside General Plan serves as a comprehensive blueprint for the city's future growth and development, embracing its distinct character while fostering new land uses, educational opportunities, and economic prosperity. The plan emphasizes the preservation of the coastal ecosystem and natural habitats, a balance that complements Seaside's vision of becoming a well-rounded mixed-use community. Notably, within the Mobility Element, the plan prioritizes roadway safety through targeted intersection enhancements, speed reduction initiatives, and collaborative efforts involving multiple jurisdictions. These measures, combined with data-driven analyses of bicycle and pedestrian collisions, underscore the city's commitment to comprehensive safety improvements. Additionally, the plan outlines specific goals and policies, including prioritizing pedestrian safety, implementing Safe Routes to Schools programs, and exploring innovative enforcement methods. Collectively, the Seaside General Plan envisions a future where safety and sustainability converge, resulting in a vibrant community that prioritizes the well-being of its residents and visitors.

Traffic Calming Program (2022)

The City of Seaside's Traffic Calming Program is a resident-driven initiative aimed at addressing speed-related traffic concerns on local and collector streets within the city. Through this application-based approach, residents identify speed-related issues, which prompts the installation of traffic calming measures following a comprehensive evaluation by the City's Public Works Department. Developed with input from the Traffic Advisory Committee, the updated program underscores its commitment to enhancing street safety and neighborhood livability. The Traffic Calming Program encompasses various traffic calming measures, including signs, markings, lane adjustments, feedback signs, medians, speed cushions, tables, raised crosswalks, and more. Eligible residential streets typically include those classified as "Local" or "Collector" in the Seaside General Plan, streets with two travel lanes, no bus routes, and no fire stations.



Monterey County Regional Transportation Plan (2022)

The Regional Transportation Plan (RTP) for Monterey County outlines a forward-looking strategy spanning 20 years to address the county's transportation needs, aligning with state and federal mandates. Aiming to cultivate a safe and health-promoting transportation system, the RTP emphasizes investment in solutions that reduce fatalities and injuries across all travel modes, employing a Vision Zero approach. This plan also underscores the importance of enhancing public safety and security for all modes of transportation, while advocating for increased utilization of active transportation alternatives in commuting. Additionally, the RTP incorporates performance measures, including metrics such as injuries and fatalities per vehicle miles traveled, population and job proximity to bike facilities, and alternate active transportation trips, to evaluate progress and ensure the success of its safety, health, and transportation goals.

Seaside and Marina Safe Walking and Biking to School: Complete Streets Plan (2020)

The Plan provides recommendations to improve safety at the 15 public schools of the Monterey Peninsula Unified School District located in Seaside and Marina. It includes a prioritized list of short-, medium-, and long-term infrastructure improvements and program recommendations to encourage more active transportation trips to school and improve the safety of children while walking and rolling to school. Infrastructure improvements include installing new bicycle infrastructure, sidewalks, and other tools to improve pedestrian visibility. Non-infrastructure recommendations include safety education campaigns and targeted enforcement efforts.

Monterey County Active Transportation Plan (2018)

The Transportation Agency of Monterey County (TAMC) adopted its Active Transportation Plan in 2018. This plan is an update of the 2011 Bicycle and Pedestrian Master Plan, which identified all existing and proposed bicycle and pedestrian facilities in Monterey County. It identifies remaining gaps in the active transportation network and opportunities areas for implementing innovative bikeway design. This includes a number of proposed projects in Seaside, including projects to improve pedestrian visibility at intersections and to implement new bicycle lanes on key roads such as Noche Buena Street, Fremont Boulevard, Broadway Avenue, and Del Monte Boulevard.

5.2 PLANNED, IN-PROGRESS, AND RECENTLY COMPLETED SAFETY IMPROVEMENTS

Hilby Avenue Traffic Calming Project (Ongoing)

The Hilby Avenue Traffic Calming Project, spanning 1.25 miles from Fremont Boulevard to General Jim Moore Boulevard, aims to tackle high-speed issues and safety concerns. This corridor hosts vital facilities like a school, preschool, churches, and a community center. Due to its straight layout, wide lanes, hilly terrain, and numerous blind driveways, accident rates on Hilby Avenue are five times higher than the state average. Initiated in March 2023, the project aims to enhance safety along the corridor with community support. Assessments of existing conditions led to a tailored traffic calming toolkit used in engagement activities, such as online surveys, street walks, and community workshops. Feedback from these activities was incorporated into a conceptual plan in the summer of 2023. Detailed design and actual improvements along Hilby Avenue will follow, pending further community input and City Council approval.

Broadway Avenue Complete Street Corridor Project (Ongoing)

The Broadway Avenue Complete Streets Corridor Project is set to transform the existing four-lane roadway into a two-lane configuration between Fremont and General Jim Moore Boulevards. This plan includes curb extensions, buffered and protected bike facilities, roundabouts, and Safe Routes to School improvements like an off-set crosswalk and rapid flashing beacons. This redesign addresses safety concerns of speeding and collisions, particularly affecting children and seniors. The addition of bike lanes on Broadway Avenue will create a continuous east-west bicycle route in Seaside, facilitating future biking and walking projects. Yosemite Street will also see improvements, with bikeway markings and safe routes to school enhancements between San Pablo and Wanda Avenues.

Ord Terrace Elementary School Crossing Improvements (2023)

The City of Seaside recently completed construction of a new crosswalk at La Salle Avenue and Lindenberg Court adjacent to Ord Terrace Elementary School. The existing crossing was uncontrolled and marked with obsolete school crossing signs. The improvements included updating the southwest curb ramp, adding a median refuge with a potential staggered crossing, adding a rectangular rapid flashing beacon (RRFB), and modifying the corresponding pavement markings, roadway delineators, and school area signage.

Pedestrian improvements at the Ord Terrace Elementary School were implemented in 2023.

CHAPTER SIX: COLLISION ANALYSIS RESULTS

This chapter provides an overview of the collision analysis findings, including collision trends and the High Collision Network (HCN).

6.1 DATA SUMMARY

There was a total of 336 reported collisions in Seaside, California between 2018–2022 that resulted in some form of injury, of which 10% were severe injury collisions. There were no fatalities during this time period (Table 1). For the purpose of the following data summary, "all collisions" refers to collisions resulting in injury (regardless of severity) or fatality, unless otherwise specified.

The City of Seaside experienced a 5% population decrease from 2018 to 2021. While there was an initial decline in overall collisions during this time, collisions then increased by 35% between 2020 and 2022 (Figure 4). Motor vehicle only collisions (involving one or more motor vehicle) accounted for 64% of total collisions during this five-year period. Sixteen percent (16%) of collisions involved a pedestrian, all of which were pedestrian-motor vehicle collisions; 12% involved a bicyclist; and 8% involved a motorcyclist (Table 2 and Figure 3).

Table 1. Total Collisions between 2018 -2022 by Injury Type

Injury type	# of Collisions	% of Collisions
Other Injury Collisions	304	90%
Severe Injury	32	10%
Fatality	0	0%
Total	**336**	**100%**

Table 2. Citywide Collisions by Road User Type

Road User Type	# of Collisions	% of Total Collisions
Motor Vehicle Only	216	64%
Pedestrian	53	16%
Bicycle	39	12%
Motorcycle	28	8%
Total	**336**	**100%**

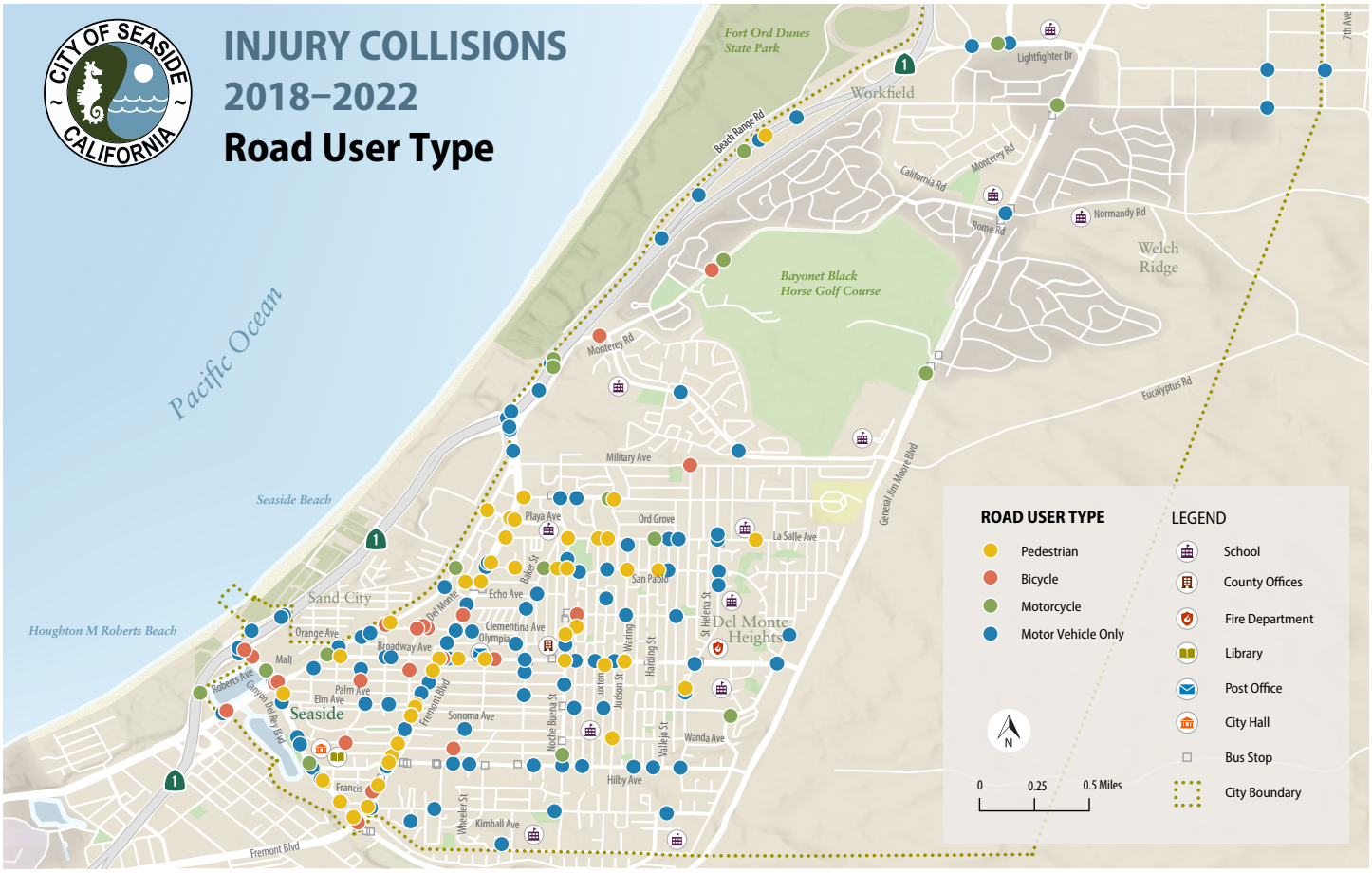


Figure 3. Road User Type, 2018–2022

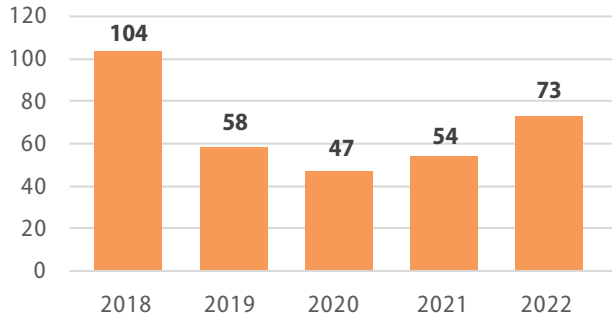


Figure 4. Citywide Injury Collisions by Year, 2018–2022

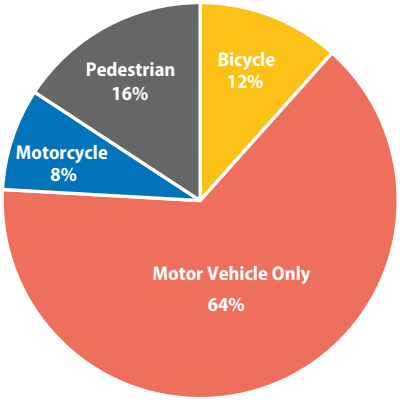


Figure 5. Collisions by Parties Involved, 2018–2022

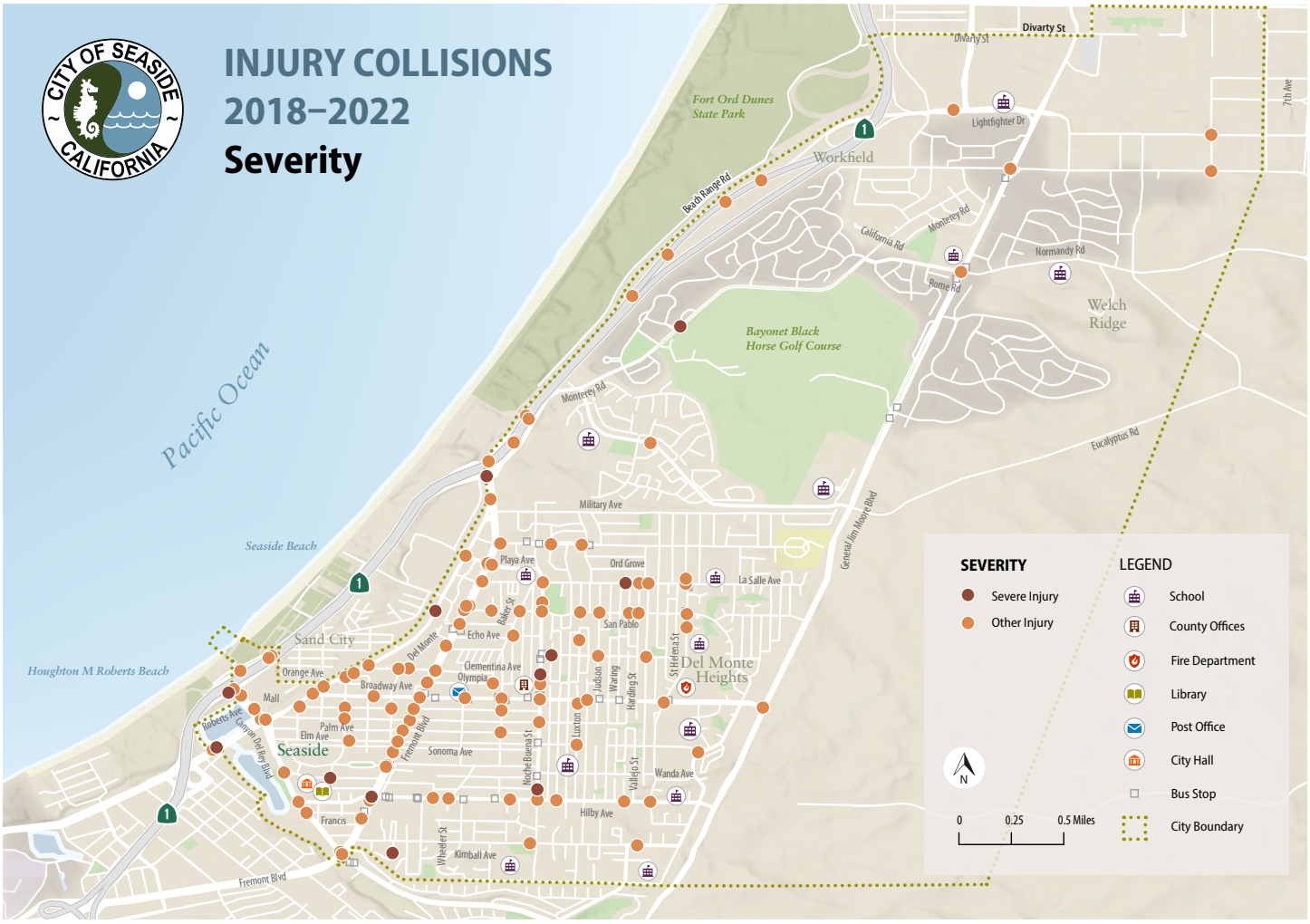


Figure 6. Injury Collisions by Severity, 2018–2022

Injury collisions occurred throughout Seaside (Figure 5); however, almost half occurred on only four roads (Table 3 and Figure 6). Nearly one quarter of all collisions during the study period occurred on Fremont Boulevard, which is the main north/south thoroughfare through the City. Del Monte Boulevard had the second highest number of collisions, followed by Broadway Avenue and Canyon Del Rey Boulevard.

Table 3. Primary Roads with the Most Collisions

Primary Road	# of Collisions	% of Total Seaside Collisions
Fremont Blvd	80	24%
Del Monte Blvd	37	11%
Broadway Ave	23	7%
Canyon Del Rey Blvd	20	6%
Total	**160**	**48%**

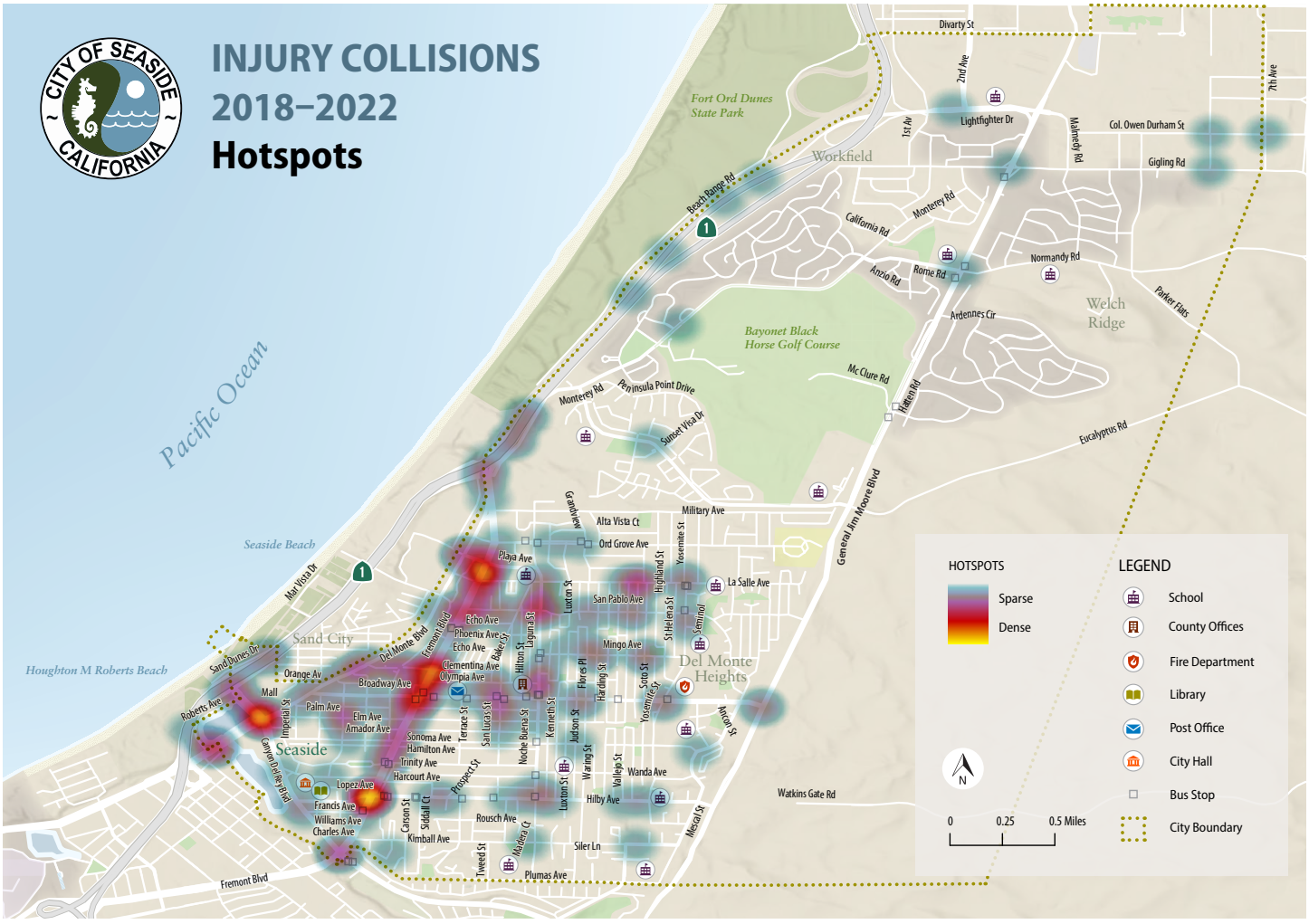


Figure 7. Collision Density, 2018–2022

Collision Injury Types and Trends Over Time

Most (90%) of the reported injury collisions in Seaside during the study period resulted in a moderate or minor injury (noted as "Other Injury" in Table 4 below). This classification denotes injuries that are apparent and observable, albeit not categorized as severe. They may include bruises, abrasions, or minor cuts. The remaining 10% of collisions resulted in severe injuries, signifying a more critical level of harm that demands immediate medical attention. There were no fatalities during the 2018–2022 period.

Table 4. Collisions by Injury Type from 2013–2017 and 2018–2022

	2013 - 2017		2018 - 2022		Difference	
Injury Type	**Count**	**Percent**	**Count**	**Percent**	**Count**	**Percent**
Other Injury	399	95%	304	90%	-95	-24%
Severe Injury	18	4%	32	10%	+14	+77%
Fatality	5	1%	0	0%	-5	-100%
Total Collisions	**422**	**100%**	**336**	**100%**	**-86**	**-20.3%**

As Table 4 shows, there were significant shifts in the count and distribution of collision injury types between the previous five-year period (2013 – 2017) and the current study period. The total count of injury collisions decreased approximately 20%, from 422 to 336 collisions between the two five-year periods. During the 2013 – 2017 period, other injuries were the most common injury type, accounting for 399 collisions (95%). From 2018 to 2022, other injury collisions decreased by 95 collisions, marking a 24% decrease from the previous period. However, the count and proportion of severe injury collisions increased by 77% (14 collisions) between the two time periods. Collisions resulting in fatalities decreased from five to zero between the two periods.

From 2018 and 2022, the data shows a consistent trend of higher monthly collision averages during the summer months of May through August, peaking at eight collisions per month (Figure 7). This period of heightened collisions could be related to increased outdoor activities and travel during the summer.

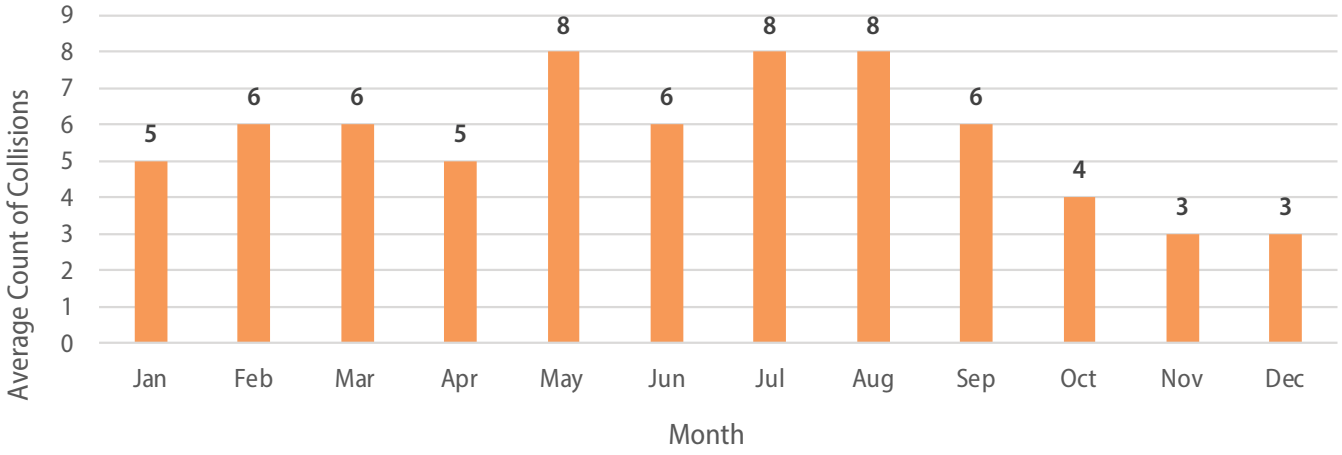


Figure **8.** *Average Collisions Per Month, 2018–2022*

Primary Collision Factors

A primary collision factor (PCF) is a behavior that best describes the main cause of a collision. While a collision may have several contributing factors, it will only have one primary collision factor. In Seaside, four primary collision factors were responsible for 60% of reported collisions (Table 5 and Figure 8). Automobile right-of-way violations – when one driver fails to yield the right-of-way to another – was the most prevalent PCF, responsible for 18% of collisions in Seaside. Unsafe speed accounted for 16% of collisions. Improper turning and violations related to traffic signals and signs each contributed to 13% of collisions.

Comparing PCF proportions between the City of Seaside and the whole of Monterey County highlights notable differences. In Seaside, automobile right of way violation was the most common PCF at 18%, but at the County level, it ranked third at 16%. Traffic signal and sign violations accounted for only 6% of collisions at the county level but 13% at the city level. Other factors that had a higher

percentage at the city level when compared to the county were pedestrian violation (7%, when the pedestrian is deemed to be at fault), pedestrian right-of-way violation (4%, where a driver or bicyclist fails to cede right-of-way to the pedestrian), following too closely (3%), and unsafe starting or backing (3%).

Driving or bicycling under the influence of drugs or alcohol was responsible for a relatively low percentage of the City's collisions: just 7%, compared to 13% countywide. Most at-fault parties (73%) were sober at the time of the collision, while 7% had been drinking and were under the influence. The impairment status of 20% of responsible parties was unknown at the time of the collision.

Of the City's 32 severe injury collisions, pedestrian violations accounted for 22% while unsafe speed and automobile right of way violations each comprised 19%. In contrast, of the "other injury" collisions, the most common factor was automobile right-of-way violation (18%) followed by unsafe speed (16%) and improper turning (13%).

Most of the automobile right-of-way violation collisions occurred on major arterial and collector roads; however, on local streets, collisions caused by this PCF tended to occur at intersections. Unsafe speed collisions occurred mostly on Fremont Boulevard.

Table 5. Top Primary Collision Factors

Primary Collision Factor	# of Collisions	% of Collisions
Automobile right-of-way violation	60	18%
Unsafe speed	54	16%
Improper turning	43	13%
Traffic signal and sign violation	42	13%
Total	**199**	**60%**

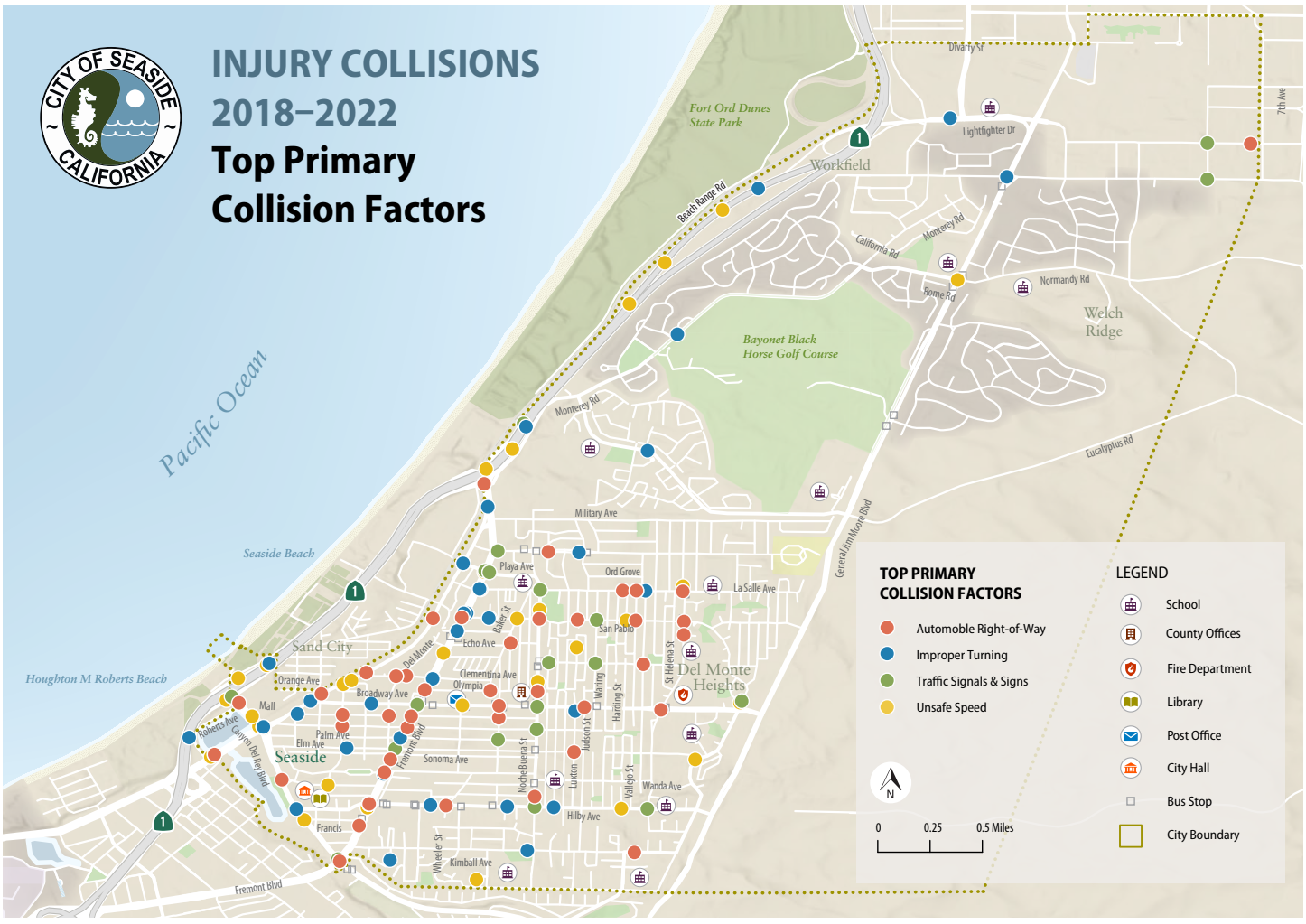


Figure 9. Collisions by Primary Collision Factor, 2018–2022

ROAD USERS

Most reported collisions in Seaside during the study period involved only motor vehicles (64%). This was followed by pedestrians (16%), bicycles (12%), and motorcycles (8%), most of which also involved motor vehicles. Figure 9 shows collision locations by transportation mode involved.

MOTOR VEHICLE ONLY COLLISIONS

A total of 216 motor vehicle only collisions was reported, accounting of 64% of all collisions in the City. Among these, 93% involved multiple motor vehicles and 7% involved a solo motor vehicle. Collisions involving multiple motor vehicles primarily occurred among motor vehicles in motion (77%), while 11% involved collisions with parked motor vehicles.

Ninety-one percent (91%) of collisions involving multiple motor vehicles resulted in a non-severe injury. Severe injuries occurred in the remaining 9% of the collisions, and there were no fatalities. Of the fifteen solo motor vehicle collisions, 75% resulted in a non-severe injury while 25% resulted in a severe injury.

Tables 6 and 7 show the PCFs for motor vehicle only collisions. Automobile right-of-way violations accounted for 21% of the collisions involving multiple motor vehicles, signifying instances where one driver failed to yield to another. Improper turning was another prevalent factor in these multi-vehicle collisions, resulting in 18% of the collisions. Unsafe speed and unsafe lane changes also played significant roles, contributing to 14% and 7% of the incidents, respectively. Among solo motor vehicle collisions, the most prevalent PCFs were improper turning (40%), driving under the influence of drugs or alcohol (20%), and unsafe speed (15%). Arterial and collector streets were the major sites of motor vehicle only collisions, with Fremont Boulevard being the street with the highest number.

Table 6 – Multiple Motor Vehicle Collision Top Primary Collision Factors

Primary Collision Factor	# of Collisions	% of Multiple Motor Vehicle Collisions
Automobile right-of-way	42	21%
Improper turning	36	18%
Unsafe speed	28	14%
Unsafe lane change	14	7%
Total	**120**	**60%**

Table 7– Solo Motor Vehicle Collision Top Primary Collision Factors

Primary Collision Factor	# of Collisions	% of Multiple Motor Vehicle Collisions
Improper passing	8	40%
Driving or bicycling under the influence of alcohol or drugs	4	20%
Unsafe speed	3	15%
Total	**15**	**75**

Long crossings, like the one at Fremont Boulevard and Sonoma Avenue, can be challenging for pedestrians.

BICYCLE COLLISIONS

A total of 39 bicycle-related collisions were reported during the study period. Among these, the highest proportion (26%) resulted from automobile right of way violations (Table 8). The next most frequent cause, at 15%, was attributed to a bicyclist operating on on the wrong side of the road. Traffic signal and sign violations contributed to 13% of collisions involving bicyclists. Most of the collisions involving bicyclists (90%) resulted in non-severe injuries, while four collisions (10%) led to severe injuries. One incident involved a parked motor vehicle, while one involved a solo bicyclist; the rest of the collisions involved motor vehicles. A large majority of the bicycle collisions occurred on the east side of Fremont Boulevard, with multiple collisions on Canyon Del Rey Boulevard.

Table 8 – Bicyclist Collision Top Primary Collision Factors

Primary Collision Factor	# of Collisions	% of Multiple Motor Vehicle Collisions
Automobile right of way	10	26%
Wrong side of road	6	15%
Traffic signal and sign violation	5	13%
Total	**21**	**54%**

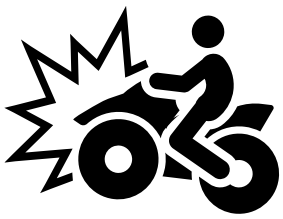
PEDESTRIAN COLLISIONS

There was a total of 52 pedestrian collisions reported during the study period. A large share of collisions (38%) took place when pedestrians were crossing within a crosswalk at an intersection (Table 9). An equal number of collisions, 20, involved pedestrians crossing outside of marked crosswalks, emphasizing a potential need for more crosswalks. There was a single case of a pedestrian crossing in a crosswalk but not at an intersection, suggesting the importance of safety at midblock crossings. Six collisions occurred when the pedestrian was not in the road, indicating collisions in non-roadway locations such as sidewalks or parking lots, while four incidents took place on the road, including the shoulder.

Among the total collisions, approximately 79% resulted in "other injuries" while 21% resulted in severe injuries. There were no fatalities. Pedestrian collisions occurred mostly on Fremont Boulevard, followed by Broadway Avenue and Canyon Del Rey Boulevard.

Table 9 – Pedestrian Action

Pedestrian Action	# of Collisions	% of Pedestrian Collisions
Crossing in crosswalk at intersection	20	38%
Crossing not in crosswalk	20	38%
Not in road	6	11%
In road, including shoulder	4	8%
Unknown	2	3%
Crossing in crosswalk not at intersection	1	2%
Total	**53**	**100%**



MOTORCYCLE COLLISIONS

A total of 28 motorcycle collisions was reported during the study period. Among these, 79% of collisions involved a motor vehicle, including 10% involving a parked motor vehicle. Seven percent (7%) of motorcycle collisions were categorized as "non-collision," suggesting circumstances where the vehicle may have experienced an incident without directly colliding with another object or vehicle. Two collisions involved other objects, while one involved an animal.

Approximately 78% of motorcycle collisions resulted in other injuries while 21% reported severe injuries; there were no fatalities.

The top PCFs contributing to motorcycle collisions were automobile right-of-way violations and improper turning, each accounting for 21% of the incidents (Table 10). Unsafe speed was also a significant factor, contributing to 18% of the collisions. Motorcycle collisions were mostly located on arterial and collector streets, with very few on local roads.

Table 10 – Motorcycle Collision Top Primary Collision Factors

Primary Collision Factor	# of Collisions	% of Multiple Motor Vehicle Collisions
Automobile right of way	6	21%
Improper turning	6	21%
Unsafe speed	5	18%
Total	**17**	**60%**

Collision Types and Road Conditions

Figure 10 shows the various collision types that occurred during the study period. Broadside collisions were the most prevalent for motor vehicle only collisions, accounting for 42% of these collisions; 34% of motor vehicle only collisions were rear-end collisions. A high percentage of bicycle collisions (58%) also experienced broadside impacts. Seventeen percent (17%) of bicycle collisions were sideswipes. Rear-end collisions were predominantly associated with motor vehicle only collisions, representing 34% of these collisions. Sideswipe collisions were observed across all road user types, with the highest prevalence among motor vehicle only collisions. Overturned collisions were reported for both motor vehicles and motorcycles.

Broadside collisions resulted in a higher number of injuries compared to other collision types. This collision type included 116 non-severe injury collisions (38% of all non-severe injuries) and 8 severe injury collisions (25% of all severe injury collisions). Rear-end collisions, while frequent, tended to cause less severe injury: 76 resulted in a non-severe injury (25%), while only four resulted in a severe injury (13%). Sideswipe collisions led to 34 non-severe injuries (11%) and four severe injury reports (13%). Vehicle/pedestrian collisions resulted in 30 non-severe injuries (10%) and eight severe injuries (25%). This was the second highest collision type that caused severe injuries.

Lighting and weather conditions may have played a role in some of Seaside's collisions. Approximately 23% of collisions occurred in the dark on streets with streetlights, while the remainder occurred in the daylight. Approximately 88% of collisions occurred under clear conditions and 8% occurred during cloudy weather conditions. This trend is consistent for all road user types.

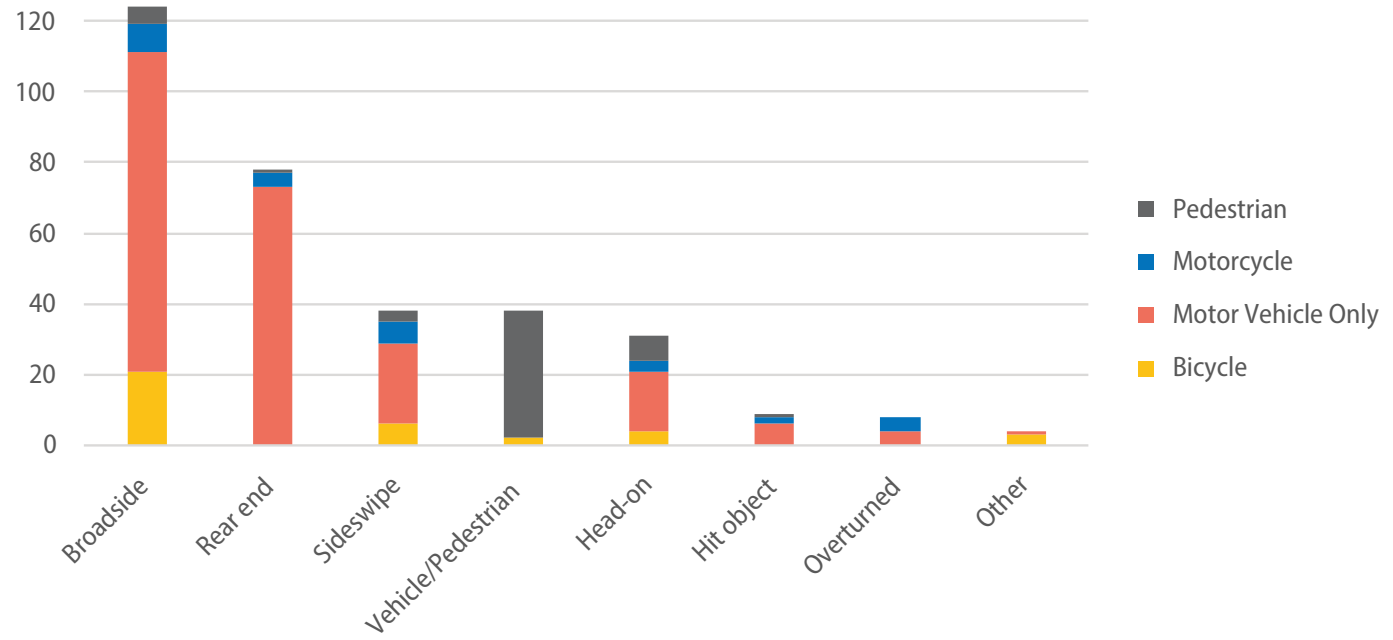
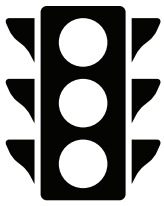


Figure 10. Collision Type for Each Road User Type



Collisions at Signalized Intersections

A total of 108 collisions – almost one-third of all collisions in Seaside – occurred within a 250-foot radius of a signalized intersection, including five resulting in a severe injury. Of these, approximately 61% involved motor vehicles only, 18% involved pedestrians, 16% involved bicyclists, and 6% involved motorcyclists.
Traffic signal and signs violations were the main cause of collisions at signalized intersections, accounting for 21%. This was followed by unsafe speed collisions (19%) and pedestrian violations (11%).

Nineteen (19) pedestrian crashes occurred at signalized intersections. Over half (53%) of these were caused by pedestrian violations (for example, a pedestrian crossing outside a crosswalk or when they did not have the right-of-way). Approximately 32% of these collisions were caused by a driver violating a pedestrians' right-of-way. Of the pedestrian collisions at signalized intersections, 52% occurred when the pedestrian was crossing in a crosswalk.

See Section 6.2 for more information on the signalized intersections with the highest numbers of collisions.

Equity

Seaside is a diverse city. Approximately 43% of the population identify as Hispanic or Latino ethnicity.[3] Approximately 91% of residents identify as having one race: primary among these are White (53%) followed by Some Other Race (19%), Asian (9%), Black or African American (7%), Native Hawaiian and Other Pacific Islander (2%), and American Indian or Alaska Native (less than 1%).

Hispanics and Latinos were involved as drivers, bicyclists, or pedestrians in almost half (49%) of the reported collisions during the study period, consistent with this group's representation among Seaside residents. African Americans were involved in these roles in 10% of collisions, higher than their proportion within the community. A significant proportion (51%) of bicyclists and pedestrians (63%) involved in collisions were Hispanic or Latino. This highlights a notable disparity in road safety outcomes within this demographic group, especially considering active transportation users.

Approximately 13% of pedestrian collisions took place within 100 feet of transit stops, emphasizing the relevance of transit-related safety measures. Several of these stops were along Broadway Avenue.

Youth and older adults made up significant percentages of pedestrians involved in collisions during the study period. Approximately 19% of pedestrians involved in collisions were youths under the age of 18; this age group makes up approximately 17% of the City's population.

Adults 65 years and older made up 20% of pedestrians involved in collisions, while they comprise approximately 13% of the City's population.

3 U.S. Census Bureau. 2017-2021 American Community Survey 5-Year Estimates Table B02001

6.2 HIGH COLLISION NETWORK

The City of Seaside's HCN was developed for the city of Seaside, focusing on collision counts at both intersections and along road segments. This effort was undertaken to identify and address areas with high incidences of traffic collisions, particularly those involving vulnerable road users such as bicyclists, pedestrians, and motorcyclists. The chosen intersections and segments were identified based on their high number of collisions, ensuring that the HCN encompasses areas with the most significant safety concerns. The selection of these HCN locations was also a collaborative process involving city officials and the TAC members, who provided critical insights and confirmation.

The HCN in Seaside includes 14 intersections and 15 road segments, as shown in Figure 11 and presented in Table 11 and Table 12.

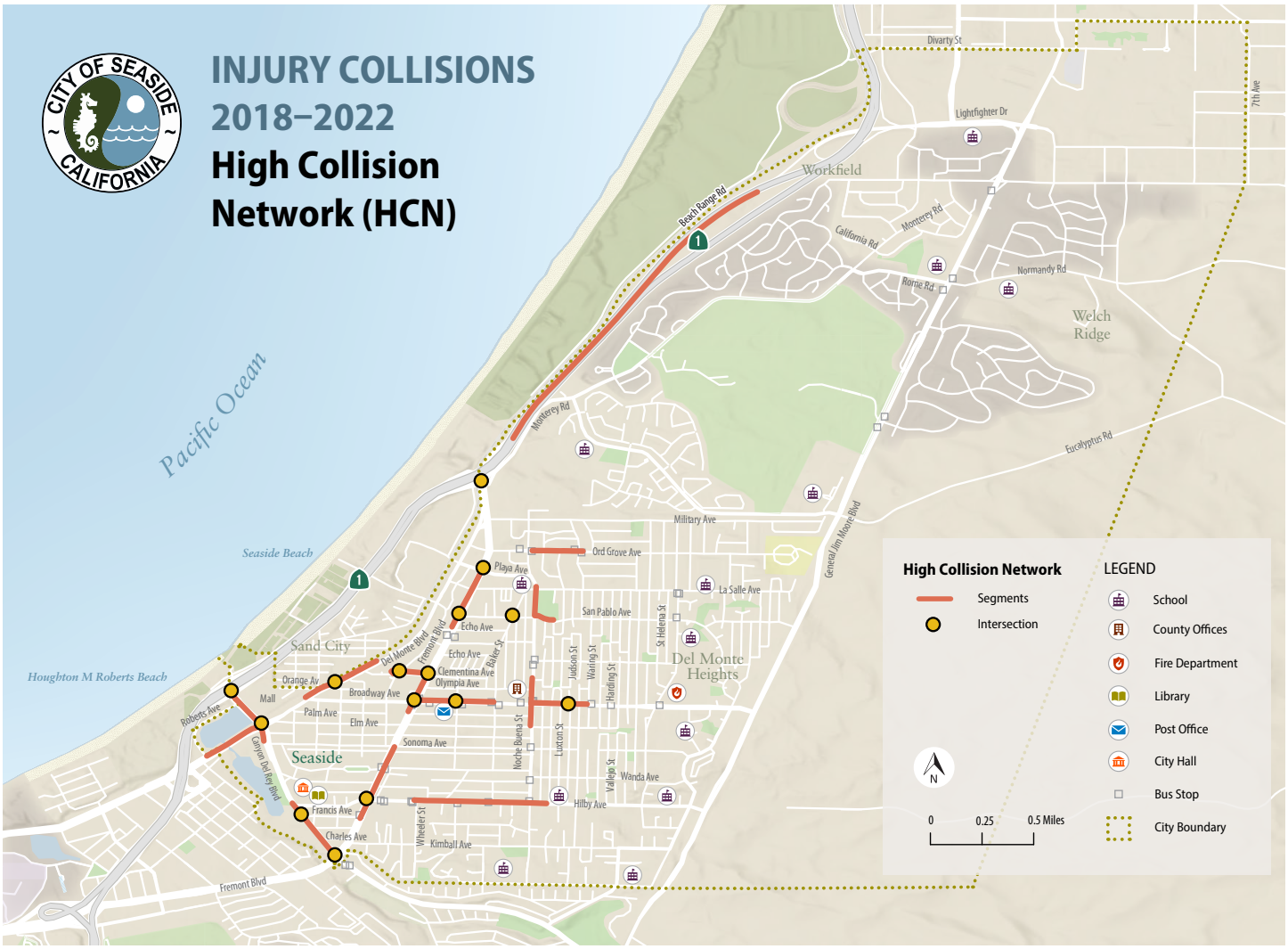


Figure 11. Seaside High Collision Network Segments

Table 11. Seaside High Collision Network Segments

Segment		Number of Collisions					
		Pedestrian	Bicycle	Motorcycle	Motor Vehicle Only	Total	Segment Length in Miles
1	Fremont Boulevard from Francis Avenue to Sonoma Avenue	8	3	0	14	26	0.35
2	Fremont Boulevard from Echo Avenue to Playa Avenue	7	2	0	12	21	0.3
3	Canyon Del Rey Boulevard from Sonoma Avenue to Highway 1	1	4	3	11	19	0.27
4	Fremont Boulevard from Palm Avenue to Clementina Avenue	2	1	0	16	19	0.2
5	Del Monte Boulevard from Roberts Avenue to Canyon Del Rey Boulevard	0	5	0	12	17	0.25
6	Broadway Avenue from Fremont Boulevard to San Lucas Street	3	3	1	9	16	0.3
7	Canyon Del Rey Boulevard from Fremont Avenue to Hilby Avenue	4	4	0	4	12	0.3
8	Noche Buena Street from Noche Bunea Place to Elm Avenue	4	0	1	7	12	0.22
9	Broadway Avenue from Noche Buena Street to Flores Street	5	0	0	6	11	0.21
10	Highway 1 Segment	1	1	3	5	10	1.5
11	Noche Buena Stret from La Salle Avenue to Lowell Street	2	0	0	8	10	0.17
12	Del Monte Boulevard from Broadway Avenue to Clementina Avenue	1	1	1	6	9	0.32
13	Hilby Avenue from Wheeler Street to Lowell Street	0	0	0	5	5	0.5
14	Ord Grove Avenue from Noche Buena Street to Waring Street	1	0	1	2	4	0.19
15	Heitzinger Plaza from Fremont to Auto Mall Parkway	0	3	0	1	4	0.15

Table 12. Seaside High Collision Network Intersections

	Intersection	Number of Collisions				
		Pedestrian	Bicycle	Motorcycle	Motor Vehicle Only	Total
1	Canyon Del Rey Boulevard and Del Monte Boulevard	1	1	1	8	11
2	Broadway Avenue and Fremont Avenue	1	1	1	5	8
3	Fremont Boulevard and Clementina Avenue	0	0	0	8	8
4	Hilby Avenue and Fremont Boulevard	1	0	0	4	5
5	Monterey Road and Fremont Boulevard	0	0	0	5	5
6	Fremont Boulevard and Playa Avenue	2	0	0	2	4
7	Canyon Del Rey Boulevard and Fremont Boulevard	1	3	0	0	4
8	Heitzinger Plaza and Auto Mall Parkway	0	4	0	0	4
9	Canyon Del Rey Boulevard and Highway 1	0	2	0	2	4
10	Canyon Del Rey Boulevard and Francis Avenue	2	0	0	2	4
11	Fremont Boulevard and San Pablo Avenue	0	0	0	3	3
12	Broadway Avenue and Judson Street	3	0	0	0	3
13	Del Monte Boulevard and Olympia Avenue	0	0	0	3	3
14	San Pablo Avenue and Baker Street	1	0	1	1	3

The identified road segments within the HCN capture 57% of these collisions in Seaside. Similarly, the intersections account for approximately 23% of the total severe injury collisions in the City. This targeted approach allows for focused interventions and resource allocation to improve safety and reduce collision rates in the most impacted areas.

Fremont Boulevard from Francis Avenue to Sonoma Avenue had the highest number of collisions of any road segment in the City, 26. This included approximately the highest number of collisions involving pedestrians (8); 42% of all collisions on this road segment involved a bicyclist or pedestrian. Del Monte Boulevard from Roberts Avenue to Canyon Del Rey Boulevard had the highest number of bicyclist collisions (5), while Canyon Del Rey Boulevard from Sonoma Avenue to Highway 1 and Highway 1 both had the highest number of collisions involving motorcycles (3 each).

The Canyon Del Rey Boulevard and Del Monte Boulevard intersection had the most collisions of any intersection in the City (11). Broadway Avenue and Judson Street had the most pedestrian collisions (3); Heitzinger Plaza and Auto Mall Parkway had the most bicycle collisions (4); and intersections generally had low numbers of collisions involving motorcycles.

By prioritizing these high-collision locations, Seaside aims to enhance overall road safety, particularly for the most vulnerable users. The development and implementation of the HCN are crucial steps in the city's broader traffic safety strategy.

CHAPTER SEVEN: EMPHASIS AREAS

Emphasis areas form a framework with which to devise and execute strategies aimed at enhancing road user safety throughout the City of Seaside. Emphasis areas are collision characteristics – road users, collision factors, types, or other factors – that are present at higher rates within the City of Seaside compared to the broader county.

To gauge the effectiveness of the plan in reducing collisions, particularly those resulting in severe injuries or fatalities, each emphasis area is accompanied by a quantifiable goal in line with the Plan's overall vision and goals. Strategies were devised to attain the goals associated with each emphasis area and are grouped in alignment with the Caltrans Strategic Highway Safety Plan's Five E's: education, enforcement, engineering, emergency response, and emerging technology. This structured approach ensures a comprehensive and multifaceted strategy to create a safer road environment for all residents and visitors of the City of Seaside.

Strategies encompass both infrastructure and non-infrastructure elements. Infrastructure-based strategies are capital improvements that enhance the roadway environment and generally have an associated collision reduction factor identified through comparative studies (see Appendix A). Most infrastructure-based strategies identified in this Plan come from the *Caltrans Local Roadway Safety Manual.* Non-infrastructure strategies ncorporate programs and policies that aim to improve awareness and safe behaviors through strategies that don't directly impact the built environment. These can include education, enforcement measures, emergency services, and emerging technology. Many non-infrastructure-based strategies identified in this Plan come from the *National Highway Traffic Safety Administration (NHTSA) Countermeasures That Work: A Highway Safety Countermeasure Guide.*

7.1 METHODOLOGY

To develop the emphasis areas, collision trends were analyzed within both the City of Seaside and Monterey County. The rates of various collision types, factors, and behaviors were compared at both city and county levels to identify areas that were overrepresented at the city level compared to the county. Stratifying the data by specific road user groups, including pedestrians, cyclists, and motorists, allowed for the identification of specific areas of concern within each overrepresented emphasis area. The study prioritized high-impact issues, guiding the formulation of targeted recommendations for intervention. Results and recommendations were validated by the City of Seaside and the TAC, ensuring robustness and practical applicability. This methodology provides a comprehensive framework for understanding and addressing road safety challenges in the City of Seaside and Monterey County.

7.2 BROADSIDE COLLISIONS

Broadside collisions occur when the front of one vehicle collides with the side of another. These incidents are often a result of failure to yield or disregarding traffic signals. Common causes include running red lights, making improper turns, or failing to yield at intersections. In Seaside, 37% of collisions were broadside collisions, exceeding the county rate of 24%. The hot spots for these collisions were primarily located on Fremont Boulevard, particularly near key intersections such as the Fremont Boulevard and Hilby Avenue intersection, as well as Fremont Boulevard and Broadway Avenue intersection.

GOAL: Eliminate fatal and severe injury broadside collisions by 2040.

Table 13. Broadside Collision Strategies

EDUCATION	• Launch public awareness campaigns to educate drivers about the dangers of broadside collisions, emphasizing the significance of yielding the right of way and obeying traffic signals. • Develop targeted educational programs for drivers on safe intersection navigation, highlighting high-risk areas prone to broadside collisions. • Implement community workshops, seminars, and high school assemblies to raise awareness among all road users about the risks associated with side-impact collisions and promote defensive driving practices.
ENFORCEMENT	• Utilize technology such as red-light cameras and intersection surveillance to monitor and penalize violations that contribute to broadside collisions. • Implement targeted enforcement strategies during peak traffic hours to address common risky behaviors leading to side-impact collisions.
ENGINEERING	• In conjunction with other strategies, implement countermeasures focused on designing and improving intersections to encourage drivers to make safe turns (e.g., roundabouts, protected intersections, and daylighting). • Conduct comprehensive intersection safety assessments to identify characteristics contributing to broadside collisions and implement corrective engineering measures. • Consider modifying traffic signal timing with longer clearance intervals such as with advanced dilemma zone detection and/or all-red periods.
EMERGENCY RESPONSE	• Train emergency responders on specialized techniques for extrication and medical care required in side-impact collision scenarios. • Consider targeted training for responding to specific high incident locations and treatment of predominant injury types at those locations.
EMERGING TECHNOLOGY	• Advocate for the implementation of automated intersection management systems that prioritize safety by preventing conflicting traffic movements. • Utilize technologies such as video data and crowdsourcing to track and address near misses. • Integrate and/or update traffic signal technologies that optimize intersection efficiency and reduce the likelihood of conflicting movements.

7.3 SIDESWIPE COLLISIONS

Sideswipe collisions occur when the sides of two vehicles traveling in the same or opposite directions make contact with each other. Causes of sideswipe collisions include distracted driving, improper lane changes, and merging without proper signaling. In Seaside, 11% of collisions were sideswipe collisions, exceeding the county rate of 8%. This suggests a potential area for focused efforts to reduce such incidents and enhance overall traffic safety. These collisions were spread out throughout the city and no hot spot location is evident.

GOAL: Eliminate fatal and severe injury sideswipe collisions by 2040.

Table 14. Sideswipe Collision Strategies

EDUCATION	• Enhance the reach and impact of existing educational programs, by incorporating interactive workshops, webinars, and community events. • Develop specialized educational modules within driver training programs to address the specific challenges and risks associated with sideswipe collisions.
ENFORCEMENT	• Utilize data-driven approaches to identify patterns of sideswipe collisions, allowing law enforcement to focus efforts on times and areas with heightened risk. • Equitably implement targeted enforcement at high injury locations where sideswipe collisions are more common.
ENGINEERING	• Assess roadways and implement tailored countermeasures to prevent sideswipe collisions, such as improved road markings, signage, and lane configurations. • Prioritize the implementation of turn lanes and other design elements proven to reduce the likelihood of sideswipe collisions, particularly at high-risk intersections.
EMERGENCY RESPONSE	• Allocate resources to enhance emergency response capabilities, including specialized training for responding to sideswipe collisions and the deployment of efficient triage and treatment protocols. • Establish clear and well-defined emergency routes, ensuring unobstructed access to collision sites and facilitating timely response.
EMERGING TECHNOLOGY	• Harness advanced technologies, including video data analytics and crowdsourcing, to proactively identify and address potential sideswipe collision hotspots. • Integrate smart infrastructure technologies, including signal optimization and lane channelization, to enhance the predictability and safety of roadway maneuvers.

7.4 HEAD-ON COLLISIONS

Head-on collisions occur when the front ends of two vehicles traveling in opposite directions collide with each other. These types of collisions often result in severe injuries and fatalities due to the combined force of the vehicles traveling towards each other at high speeds. Behaviors such as speeding, impaired driving, or distracted driving are common contributors to head-on collisions. Approximately 9% of collisions in Seaside were head-on, surpassing the county rate of 7%. These collisions tended to concentrate along Fremont Boulevard, with one notable hotspot occurring at the intersection of Fremont Boulevard and Sonoma Avenue.

GOAL: Eliminate fatal and severe injury head-on collisions by 2040.

Table 15. *Head-On Collision Strategies*

EDUCATION	• Integrate specialized driver education modules within school curricula and driver training programs to comprehensively tackle the risks associated with head-on collisions. • Forge partnerships with local community organizations to organize workshops and events focused on promoting defensive driving techniques, underscoring the paramount importance of averting head-on collisions.
ENFORCEMENT	• Roll out focused enforcement initiatives on roads with a history of head-on collisions, concentrating efforts on curbing traffic violations that frequently lead to such incidents, including improper passing and reckless driving. • Deploy cutting-edge enforcement technologies, such as speed cameras and sobriety checkpoints, to discourage behaviors contributing to head-on collisions. • Heighten police presence during peak travel times on roadways susceptible to head-on collisions, acting as a deterrent against aggressive driving and ensuring strict adherence to traffic laws.
ENGINEERING	• Implement targeted engineering solutions such as centerline rumble strips and enhanced high-visibility signage at locational with high numbers of head-on collisions. • Prioritize the installation of median barriers on undivided highways and roads to prevent crossover collisions and diminish the severity of head-on collisions. • Execute road design enhancements, such as well-defined lane markings and improved sightlines, to augment driver awareness and diminish the likelihood of unintentional lane departure.
EMERGENCY RESPONSE	• Implement swift response strategies to expedite medical aid, extraction, and transportation of injured individuals involved in head-on collisions. • Foster collaboration with emergency services to establish precise communication protocols, ensuring seamless coordination in responding to head-on collisions.
EMERGING TECHNOLOGY	• Leverage advanced traffic management technologies to implement proactive measures at sites with elevated numbers of head-on collisions.

7.5 AUTOMOBILE RIGHT-OF-WAY VIOLATIONS

Automobile right-of-way violations occur when a vehicle fails to yield to another vehicle as required by traffic laws. These violations can lead to collisions, particularly at intersections or when merging. In Seaside, automobile right-of-way violations occurred at a rate of approximately 18%, exceeding the county rate of 16%. Most of these collisions occurred near intersections, particularly along Fremont Boulevard.

GOAL: Eliminate fatal and severe injury collisions resulting from automobile right-of-way violations by 2040.

Table 16. Automobile Right-of-Way Violation Strategies

EDUCATION	• Conduct comprehensive public information and education campaigns aimed at promoting intersection safety laws, covering areas such as traffic light regulations, stop sign procedures, proper left and right turns, the dangers of distracted driving, and pedestrian right-of-way. • Develop engaging materials for dissemination through various channels, including social media, community events, and local educational institutions, to increase awareness and understanding of right-of-way rules.
ENFORCEMENT	• Equitably implement targeted enforcement at high injury locations where automobile right-of-way violations are high. • Consider use of technology to support automated enforcement at key locations; consider supporting legislation to allow automated enforcement.
ENGINEERING	• Install engineering countermeasures strategically designed to reduce behaviors leading to automobile right-of-way violations such as signal head improvements, advanced dilemma zone technology, all-red signal phases, and the implementation of roundabouts where applicable. • Collaborate with engineering experts to assess and enhance the safety features of critical intersections, ensuring they are designed to minimize right-of-way conflicts and promote safer traffic flow.
EMERGENCY RESPONSE	• Install emergency vehicle preemption systems. • Improve resources for deploying emergency responses to collision sites. • Ensure that emergency routes are clear and well defined. • Consider targeted training for responding to specific high incident locations and treatment of predominant injury types at those locations.
EMERGING TECHNOLOGY	• Deploy collision-prevention technology at signalized intersections. • Utilize technologies such as video data and crowdsourcing to track and address near misses. • Engage in legislative advocacy to seek state law change allowing automated speed cameras and allowing the resulting citations to be handled as local municipal code violations rather than vehicle code violations.

7.6 TRAFFIC SIGNAL AND SIGN VIOLATIONS

Traffic signal and sign violations occur when drivers disregard the instructions and regulations provided by signals and signs, disrupting the safe and orderly flow of traffic. This includes actions such as running red lights, disobeying stop signs, failing to yield, ignoring speed limit signs, and improper lane usage. In Seaside, approximately 13% of all collisions resulted from traffic signal and sign violations, significantly exceeding the county rate of approximately 6%. Key locations for this type of collision included Fremont Boulevard, Hilby Avenue, and Canyon Del Rey Avenue.

GOAL: Eliminate fatal and severe injury collisions resulting from traffic signal and sign violations by 2040.

Table 17. Traffic Signal and Sign Violation Strategies

EDUCATION	• Collaborate with local schools, driving schools, and community organizations to integrate traffic signal and sign education into curricula and driver training programs. Develop interactive educational programs, including online modules and community workshops, to reinforce proper interpretation and compliance with traffic signals and signs.
ENFORCEMENT	• Implement targeted enforcement at intersections and road segments with a high incidence of signal and sign violations, employing both traditional methods and advanced technologies like surveillance cameras. • Increase police presence during peak traffic hours to deter violations and ensure adherence to traffic regulations. • Explore legislative support for stricter penalties and automated enforcement technologies to enhance compliance with signal and sign regulations.
ENGINEERING	• Enhance the visibility and clarity of traffic signals and signs through regular maintenance and updates, ensuring they remain effective in conveying information to drivers. • Implement engineering solutions such as road diets, lane narrowing, and lane reductions at critical intersections to naturally slow traffic and reduce the likelihood of violations. • Integrate traffic calming measures, such as speed bumps and raised crosswalks, where applicable to enhance safety and encourage compliance with signals and signs. • Collaborate with urban planners and engineers to design roadways with features that naturally encourage compliance with traffic signals and signs.
EMERGENCY RESPONSE	• Integrate information about common signal and sign violations into emergency responder training programs to enhance situational awareness during responses to incidents. • Collaborate with emergency services to identify intersections prone to violations and prioritize strategic placement of emergency vehicles to deter reckless behavior.
EMERGING TECHNOLOGY	• Implement smart traffic management systems utilizing technologies such as sensors and real-time analytics to monitor and promptly address signal and sign violations. • Advocate for the continued development and integration of cutting-edge technologies that enhance the effectiveness of traffic signals and signs in promoting safe and efficient traffic flow.

7.7 COLLISIONS INVOLVING PEDESTRIANS

Collisions involving pedestrians, which often occur at intersections or crosswalks, pose significant risks to both pedestrians and drivers. In Seaside, approximately 16% of collisions involved pedestrians, notably exceeding the county rate of approximately 8%. Additionally, collisions involving older pedestrians aged 60-90 accounted for approximately 15% of pedestrian collisions in Seaside, compared to 10% of pedestrian collisions in the county. While drivers were at fault in most pedestrian-related collisions in Seaside, specific pedestrian behaviors were seen at higher rates in the City compared to the county. Pedestrian violations – when the pedestrian is deemed at fault – accounted for approximately 7% of total pedestrian collisions in Seaside, compared to just 2% of total pedestrian collisions in the county. Moreover, pedestrians crossing outside of a crosswalk represented approximately 6% of collisions in Seaside, compared to 2% in the county.

Pedestrian collisions were notable along Fremont Boulevard, spanning from Hilby Avenue to Harcourt Avenue, as well as from Hamilton Avenue to Sonoma Avenue. Broadway Avenue, from Fremont Avenue to Noche Buena Street, also registered significant pedestrian-related collisions. Across various locations, pedestrian collisions were often influenced by primary contributing factors such as pedestrian violations, driver failure to yield the right-of-way to pedestrians, and unsafe starting or backing maneuvers.

GOAL: Eliminate fatal and severe injury collisions involving pedestrians by 2040.

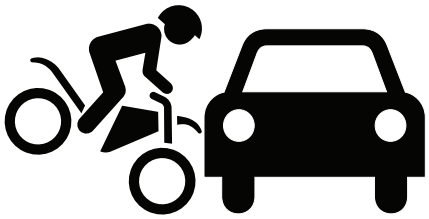
Table 18. Pedestrian Collision Strategies

EDUCATION	• Expand Safe Routes to Schools education programming, fostering a culture of pedestrian safety among students. • Collaborate with local schools, driving schools, and community organizations to integrate pedestrian safety into curricula and driver training programs. • Engage in public awareness campaigns highlighting the consequences of pedestrian-related traffic violations. • Implement a driver safety behavior campaign utilizing social media, physical signs, and other mediums to promote responsible driving practices, including pedestrian awareness and yielding right-of-way.
ENFORCEMENT	• Implement targeted enforcement in key collision areas with a history of pedestrian injuries. • Prioritize enforcement of traffic laws, focusing on behaviors most likely to cause pedestrian collisions. • Conduct regular pedestrian-focused enforcement operations, especially during peak times and in areas prone to violations. • Collaborate with schools to enforce school zone speed limits and ensure safe pedestrian conditions during school hours. • Advocate for increased fines and penalties for traffic violations related to pedestrian safety.

ENGINEERING	• In conjunction with other strategies, install countermeasures focused on reducing the likelihood and severity of collisions between automobiles and pedestrians and increasing driver awareness of pedestrians. • Provide low stress, all ages and abilities infrastructure connectivity for pedestrians, particularly within one mile of schools and along key active transportation routes. • Implement pedestrian safety countermeasures in all improvement and maintenance projects. • Conduct an assessment of sites with high numbers of collisions resulting from pedestrian violations and consider adding high-visibility crosswalks and/or adjusting pedestrian signal timing as appropriate. • Implement engineering countermeasures tailored to the needs of older pedestrians, such as leading pedestrian intervals (LPIs) and median refuge islands, aimed at enhancing safety at key crossing points.
EMERGENCY RESPONSE	• Install emergency vehicle preemption systems to expedite responses to pedestrian collision sites. • Enhance resources for prompt emergency responses to pedestrian incidents. • Define clear emergency routes and consider targeted training for responders in high-incident locations and predominant injury types.
EMERGING TECHNOLOGY	• Implement new technologies to make pedestrian crossings safer and more comfortable (e.g., automated pedestrian detection at signalized intersections, etc.). • Deploy collision-prevention technology at signalized intersections. • Utilize technologies such as video data and crowdsourcing to track and address near misses.

Calming traffic on wide streets such as Hilby Avenue can improve safety for all road users.

7.8 COLLISIONS INVOLVING BICYCLISTS



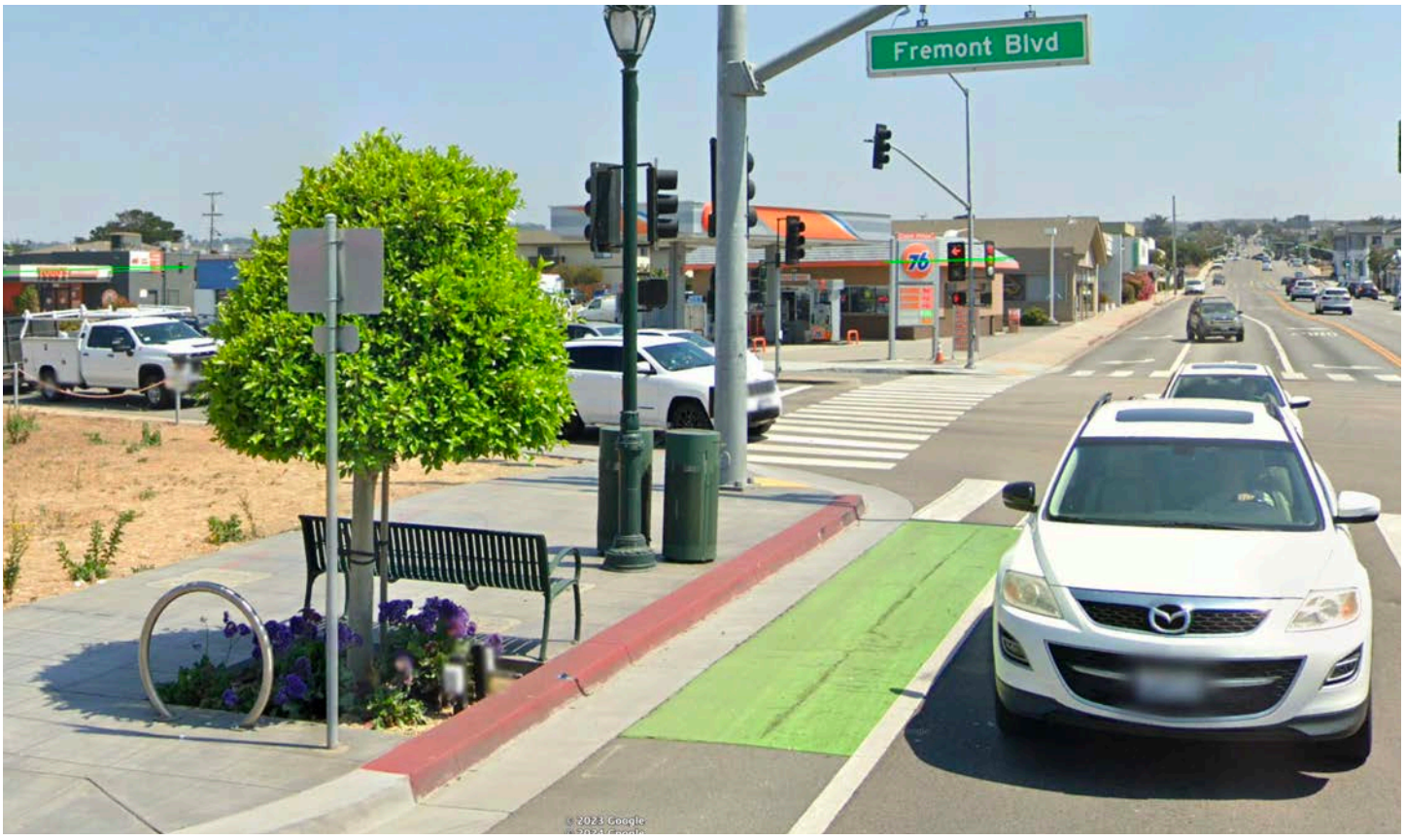
Collisions involving bicyclists are a significant concern, particularly in areas where bicycle lanes intersect with vehicular traffic. In Seaside, 12% of collisions involved bicyclists, markedly surpassing the county rate of approximately 5%. Moreover, collisions involving younger bicycle users under the age of 25 accounted for approximately 8% of incidents in Seaside, compared to 4% in the county. The primary contributing factors for bicycle collisions commonly involved automobile right-of-way violations, riding on the wrong side of the road, and disregarding traffic signals and signs. Bicycle collisions are prevalent at Heitzinger Plaza and Auto Mall Parkway intersection, as well as at the junction of Broadway Avenue and Fremont Boulevard. Additionally, Canyon Del Rey Boulevard and Fremont Avenue witness frequent incidents involving bicycles.

GOAL: Eliminate fatal and severe injury collisions involving bicyclists by 2040.

Table **19.** *Bicyclist Collision Strategies*

EDUCATION	• Expand Safe Routes to Schools education programming, fostering a culture of bicycle safety among students. Include instruction on e-bicycle safety. • Develop educational materials specifically addressing e-bicycle safety, including guidelines for proper usage, speed management, and age restrictions. • Collaborate with local e-bicycle retailers and manufacturers to disseminate safety information and encourage responsible e-bicycle ownership. • Integrate bicycle safety modules into driver education programs to enhance awareness and understanding among motorists. • Establish partnerships with community organizations to host workshops and events promoting safe bicycling practices. • Launch a comprehensive driver safety behavior campaign targeting collisions involving bicyclists, utilizing social media platforms, physical signage, and community outreach events to raise awareness and promote responsible driving practices.
ENFORCEMENT	• Equitably implement targeted enforcement in key collision areas that have seen injuries from bicycle collisions. • Prioritize enforcement of traffic laws based on the likelihood of behavior causing bicycle-related injury collisions. • Implement targeted enforcement for bicyclists driving under the influence of alcohol or drugs, ensuring fair and consistent application of the law.
ENGINEERING	• Install countermeasures focused on reducing the likelihood and severity of collisions between automobiles and bicyclists, emphasizing increased driver awareness. • Develop low-stress, all-ages infrastructure connectivity for bicyclists, especially within one mile of schools and along key active transportation routes. Refer to Caltrans and FHWA guidance on the preferred method of separation based on automobile speeds and roadway volumes. • Implement technology, such as bicycle-activated signal detection and bicycle signal heads, to enhance bicyclist safety.

EMERGENCY RESPONSE	• Install emergency vehicle preemption systems to expedite responses to bicycle collision sites. • Enhance resources for efficient emergency responses to bicycle incidents, including specialized training for responders. • Consider targeted training for responding to specific high-incident locations and treating predominant bicyclist injury types. • Define and maintain clear emergency routes for unobstructed access to bicycle collision sites. • Develop standardized protocols for emergency responders to effectively handle bicycle-related incidents, including immediate medical response and transportation. • Establish partnerships with local bicycle advocacy groups to ensure a collaborative approach to emergency response planning and implementation. • Provide ongoing training for emergency responders on the unique challenges and injuries associated with bicycle collisions.
EMERGING TECHNOLOGY	• Implement new technologies to make bicycle crossings safer and more comfortable (e.g., automated detection at signalized intersections, dynamic intersection lighting, etc.). • Deploy collision-prevention technology at signalized intersections. • Utilize technologies such as video data and crowdsourcing to track and address near misses. • Collaborate with technology companies to develop and implement innovative solutions to improve bicycle safety, considering input from the bicycling community.

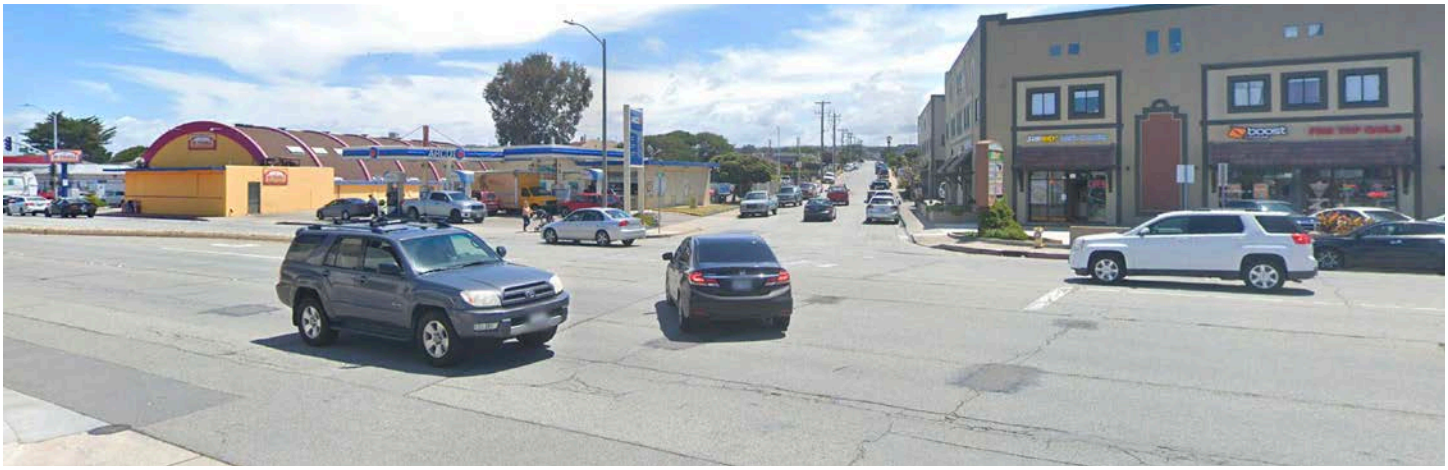


The addition of bicycle lanes can improve bicyclist safety on Seaside's streets.

CHAPTER EIGHT: PRIORITY PROJECTS

Following the identification of Seaside's HCN and emphasis areas, collision patterns at the selected intersections and segments were analyzed to determine potential countermeasures. In collaboration with City officials, a subset of priority project locations was selected to recommend specific improvements based on collision trends and potential impact. These locations were chosen based on their high number of collisions per road mile; the involvement of vulnerable road users (bicyclists, pedestrians, motorcyclists); and the presence of areas in disadvantaged communities as identified by the US Department of Transportation's Equitable Transportation Community Explorer. Figure 12 shows the priority project locations identified across Seaside. The analysis revealed that targeted site-specific engineering improvements at these priority locations could significantly enhance road safety and help achieve the LRSP's goals. The priority project locations and their recommended improvements are described below.

Figure 12. Priority Project Locations in Seaside.



Traffic signal and sign violations were the top cause of collisions on this segment, particularly at intersections.

8.1 FREMONT BOULEVARD FROM PALM AVENUE TO CLEMENTINA AVENUE

The segment of Fremont Boulevard from Palm Avenue to Clementina Avenue experienced 19 total collisions, including 3 involving bicyclists and pedestrians, over a length of 0.2 miles, resulting in 95 collisions per mile. Top PCFs included traffic signals and signs (37%), unsafe speed (16%), and wrong-side driving (11%). The most common crash types were broadside (47%) and rear-end collisions (21%). This segment includes the High Collision Network intersections at Fremont Boulevard and Clementina Avenue, and Fremont Boulevard and Broadway Avenue.

Signalized Intersection Improvements: Improvements for signalized intersections include updating signal timing, implementing advanced detection zones, and adding protected left turn phasing to reduce road user conflicts and enhance traffic efficiency. Given that a significant portion of collisions were related to traffic signals and signs, these improvements are expected to substantially reduce these types of incidents. Additional improvements can be made to enhance the visibility of the signals, such as adding reflective tape to the signal heads. A number of engineering countermeasures would improve the safety of people walking and bicycling along the segment: implementing leading pedestrian and bicycle intervals, adding pedestrian countdowns, enlarging existing medians, and upgrading existing crosswalks to high-visibility designs would enhance safety for people crossing the street. The addition of directional ADA curb ramps and accessible pedestrian signals would enhance safety and comfort for people with disabilities. Protected intersections could further improve the safety of cyclists navigating these intersections. Transit pre-emption and priority could also be considered when upgrading traffic signals to facilitate transit service.

Segment-Wide Improvements: Segment-wide improvements include traffic calming measures such as tightening curb radii to slow turning vehicles, upgrading paint to thermoplastic to visually narrow lanes, and physically narrowing lanes, which could provide additional right-of-way for bicycle facilities or transit lanes. Daylighting intersections and installing painted bulb-outs would improve visibility at intersections. Implementing corridor access management would enhance traffic flow and safety across the segment by reducing conflict points. Signage should be refreshed as necessary to improve legibility.

Fremont Boulevard's wide roads and lack of bicycling infrastructure make this segment challenging for active transportation users.

8.2 FREMONT BOULEVARD FROM FRANCIS AVENUE TO SONOMA AVENUE

The segment of Fremont Boulevard from Francis Avenue to Sonoma Avenue experienced 26 total collisions, including 11 involving bicyclists and pedestrians, over a length of 0.35 miles, resulting in 74.3 collisions per mile. PCFs included automobile right-of-way violations (19%), pedestrian violations (15%), and issues related to traffic signals and signs (15%). The most common crash types were broadside (35%) and head-on (19%) collisions. This segment includes the high collision intersection at Fremont Boulevard and Hilby Avenue.

Signalized Intersection Improvements: Traffic signal improvements would reduce collisions at intersections, including broadside and head-on collisions. Updating signal timing and implementing advanced detection zones would reduce vehicle conflicts, while lower-tech improvements such as adding reflective tape to signal heads and upgrading 8" signal heads to 12" heads would make traffic signals more visible to drivers. Considering that a notable portion of collisions were related to traffic signals and signs (15%), these enhancements are crucial for improving safety. Other improvements enhance safety and comfort for bicyclists and pedestrians. These include adding pedestrian signals and countdowns where they are not already present, adding bicycle signals, and implementing leading pedestrian intervals. Implementing protected intersections at signalized intersections would also help bicyclists safely cross the street. Transit pre-emption and priority could also be considered when upgrading traffic signals to facilitate transit service.

Signalized and Non-Signalized Intersection Improvements: A number of improvements could be made to improve safety at both signalized and non-signalized intersections. Adding or upgrading existing crosswalks to high-visibility crosswalks, adding painted bulb-outs, and enlarging existing pedestrian refuge islands make pedestrians more visible and shorten their crossing distances. Adding directional curb ramps compliant with the Americans with Disabilities Act (ADA) would also improve safety for pedestrians with disabilities. Tightening curb radii slows turning vehicles, increasing safety for all road users.

Specific Intersection Improvements for Fremont Boulevard and Hilby Avenue: For the intersection of Fremont Boulevard and Hilby Avenue, specific improvements include considering protected left turn phasing on Hilby Avenue; this is already being implemented on Fremont Boulevard. Upgrading the signal head size to 12", and adding a near-side traffic signal on Hilby Avenue would improve signal visibility.

Segment-Wide Improvements: Segment-wide improvements include daylighting intersections to increase visibility. Upgrading paint to thermoplastic visually narrows lanes, helping to calm traffic, while narrowing lanes has a similar effect while allowing excess right-of-way to be repurposed for bicycle lanes or transit lanes. Implementing corridor access management should also be considered to consolidate driveways and reduce conflict zones. Signage should be refreshed as necessary to improve legibility.

Almost one-third of collisions on this road segment were caused by unsafe speeds.

8.3 CANYON DEL REY BOULEVARD FROM SONOMA AVENUE TO HIGHWAY 1

The segment of Canyon Del Rey Boulevard from Sonoma Avenue to Highway 1 recorded 19 total collisions, including 5 involving bicyclists and pedestrians, over a length of 0.27 miles, resulting in 70.4 collisions per mile. Top PCFs included unsafe speed (32%), driving or bicycling under the influence of alcohol or drugs (21%), and unknown factors (21%). The most common crash types were rear-end (42%) and broadside (26%) collisions. This segment includes the high-collision intersections at Canyon Del Rey and Francis Avenue, Canyon Del Rey and Fremont Avenue.

Signalized Intersection Improvements: Updating signal timing and implementing advanced detection zones would reduce vehicle conflicts, while lower-tech improvements such as adding reflective tape to signal heads would make traffic signals more visible to drivers. Other improvements enhance safety and comfort for bicyclists and pedestrians. These include adding pedestrian signals and countdowns where they are not already present, adding bicycle signals, and implementing leading pedestrian intervals. Implementing protected intersections at signalized intersections would also help bicyclists safely cross the street. Given that traffic signals and signs were a factor in 11% of collisions and rear-end (42%) and broadside (26%) collisions were prevalent, these improvements are expected to address these high-incidence crash types effectively.

Signalized and Non-Signalized Intersection Improvements: Upgrading existing crosswalks to high visibility types and adding painted bulb-outs would improve visibility for people crossing the street on foot. Adding directional ADA curb ramps would also improve safety for pedestrians with disabilities. Tightening curb radii slows turning vehicles, increasing safety for all road users.

Specific Intersections Improvements at Highway 1 Ramps: Traffic signals at the Highway 1 ramp intersections would reduce conflicts between vehicles entering and exiting the highway and traffic on Fremont Boulevard.

Segment-Wide Improvements: Upgrading paint to thermoplastic visually narrows lanes, helping to calm traffic, while narrowing lanes has a similar effect while allowing excess right-of-way to be repurposed for bicycle lanes. Consideration should be given to installing new bicycle facilities, particularly a separated bikeway connecting to the Monterey Bay Coastal Trail. Signage should be refreshed as necessary to improve legibility.

One-third of collisions on this segment were broadsides, usually occurring at intersections.

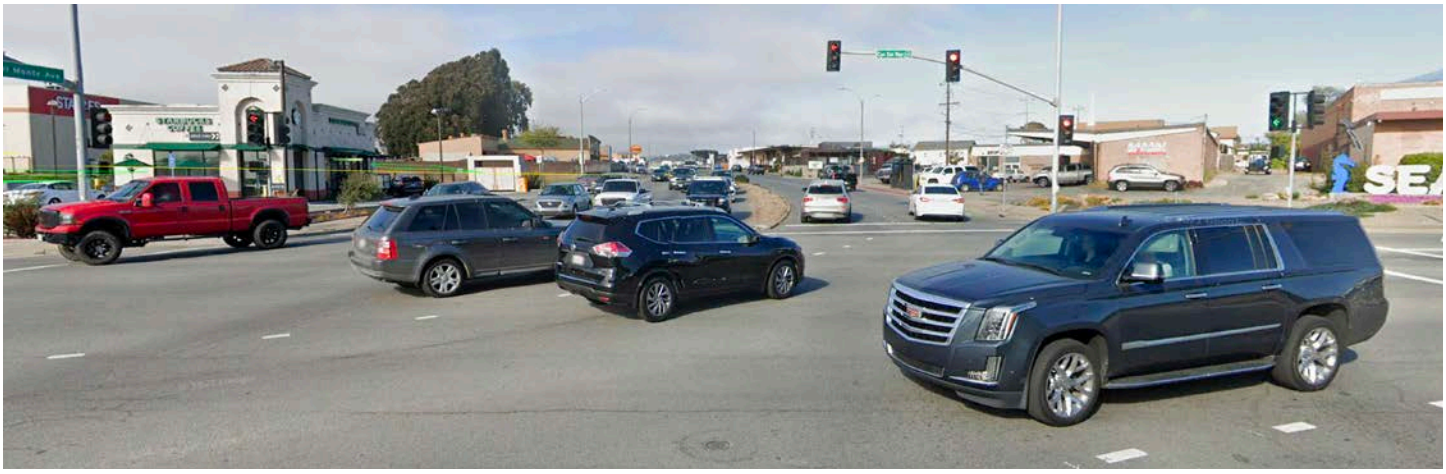
8.4 FREMONT BOULEVARD FROM ECHO AVENUE TO PLAYA AVENUE

The segment of Fremont Boulevard from Echo Avenue to Playa Avenue experienced 21 total collisions, including 9 involving bicyclists and pedestrians, over a length of 0.3 miles, resulting in 70.0 collisions per mile. Top PCFs included improper turning (29%), traffic signal and sign violations (24%), and pedestrian violations (19%). The most common crash types were broadside (33%) and vehicle/pedestrian (24%) collisions. Older individuals, particularly those aged 50-64 years (23.8%), were notably involved in crashes at this location. This segment includes the high-collision intersections at Fremont Boulevard and San Pablo Avenue, as well as Fremont Boulevard and Playa Avenue.

Signalized Intersection Improvements: Updating signal timing, adding left-turn phasing, and implementing advanced detection zones would reduce vehicle conflicts, while lower-tech improvements such as adding reflective tape to signal heads and upgrading 8" signal heads to 12" heads would make traffic signals more visible to drivers. Other improvements enhance safety and comfort for bicyclists and pedestrians. These include adding pedestrian signals and countdowns where they are not already present, adding bicycle signals, and implementing leading pedestrian intervals. These changes will also benefit older individuals by making signals more visible and improving crossing times. Implementing protected intersections at signalized intersections would also help bicyclists safely cross the street. Transit pre-emption and priority could also be considered when upgrading traffic signals to facilitate transit service.

Signalized and Non-Signalized Intersection Improvements: At all intersections, installing or upgrading crosswalks to high-visibility types on both the major and minor streets would increase pedestrian visibility. Tightening curb radii would help slow turning vehicles, increasing safety for all road users. These improvements will enhance safety for older pedestrians by reducing crossing distances and improving visibility.

Segment-Wide Improvements: Segment-wide enhancements include daylighting intersections to increase visibility. Upgrading paint to thermoplastic visually narrows lanes, helping to calm traffic, while narrowing lanes has a similar effect while allowing excess right-of-way to be repurposed for bicycle lanes or transit lanes. Implementing corridor access management should also be considered to consolidate driveways and reduce conflict zones. Signage should be refreshed as necessary to improve legibility.



Almost one-third of collisions on this road segment were caused by unsafe speeds.

8.5 DEL MONTE BOULEVARD FROM ROBERTS AVENUE TO CANYON DEL REY BOULEVARD

The segment of Del Monte Boulevard from Roberts Avenue to Canyon Del Rey Boulevard reported 17 total collisions, including 5 involving bicyclists, over a length of 0.25 miles, resulting in 68 collisions per mile. Top PCFs included unsafe speed (29.4%), driving or bicycling under the influence (17.6%), and unknown (17.6%). The most common crash types were rear-end (29.4%) and broadside (35.3%). This segment includes the High Collision Network intersection at Del Monte Boulevard and Canyon Del Rey Boulevard.

Signalized Intersection Improvements: Improvements for signalized intersections include updating signal timing to include all red phases, implementing advanced detection zones, and adding protected left turn phasing to reduce road user conflicts. The addition of reflective tape on the signal heads would make them more visible to road users, improving compliance. The addition of directional ADA curb ramps and accessible pedestrian signals would improve the safety and comfort of people with disabilities who walk and roll on the corridor. Other countermeasures, such as implementing leading pedestrian and bicycle intervals, adding pedestrian countdowns, enlarging median refuge islands, and upgrading crosswalks to high-visibility designs would benefit all non-motorized users crossing the street. Daylighting intersections and installing painted bulb-outs would further improve visibility at intersections. Tightened curb radii and protected intersections would further reduce the risk of collisions at signalized intersections.

Segment-Wide Improvements: Segment-wide improvements include traffic calming measures such as upgrading paint to thermoplastic to visually narrow lanes and physically narrowing lanes, which could provide additional right-of-way for bicycle facilities or transit lanes. Signage should be refreshed as necessary to improve visibility. Segment-wide and signalized intersection improvements will specifically help address issues related to unsafe speed and driving or biking under the influence by enhancing visibility and reducing vehicle conflicts.

Almost 30% of collisions at this intersection resulted from a traffic signal or sign violation.

8.6 MONTEREY ROAD AND FREMONT BOULEVARD/HIGHWAY 1 RAMPS

The intersection at Monterey Road and Fremont Boulevard /Highway 1 Ramps reported 7 total collisions, with no incidents involving bicyclists or pedestrians. Given that this location is an intersection, collisions per road mile was not calculated. Top PCFs included traffic signals or signs (28.6%), unknown (14.3%), driving or bicycling under the influence (14.3%), unsafe speed (14.3%), automobile right of way (14.3%), and unsafe starting or backing (14.3%). The most common crash types were broadside (71.4%) and rear-end (28.6%. This location includes the intersection of Monterey Road and Fremont Boulevard/Highway 1 Ramps.

Signalized Intersection Improvements: Improvements at this signalized intersection include updating signal timing and implementing advanced detection zones to reduce vehicle conflicts. Adding reflective tape on the signal heads would make them more visible to road users, increasing compliance. Additionally, upgrading the existing crosswalks to high-visibility designs and adding directional ADA curb ramps would improve safety for pedestrians at this location.

CHAPTER NINE: IMPLEMENTATION AND MONITORING

Several considerations must be proactively managed to successfully implement the strategies presented in this LRSP. Successful implementation requires adequate funding, coordination, and partnerships, and can be supported by citywide policies.

7.1 IMPLEMENTATION

Next Steps and Timeline for Implementation

Next steps for implementation should focus on developing specific programs and projects from the recommendations provided in this LRSP. This process includes:

- Identify an "agency champion" to advance each LRSP priority recommendation. This agency generally would assume the primary role in program/project development.
- Coordinate with TAMC to achieve synergies in regional Vision Zero planning, education campaigns, and other potential areas of overlap.
- Further define each priority recommendation (or if appropriate, bundle several recommendations together) into a discrete program or project with a specific scope of improvements.
- Allocate initial funding to complete basic program/project development tasks, such as conceptual planning, feasibility assessments, cost estimation, and agency coordination.

These initial development steps will allow lead agencies to define specific programs and projects and prepare them for inclusion in competitive funding applications, regional transportation plans, and local capital improvement plans (CIPs).

The strategies introduced in this document may be implemented in different phases.

Short-term implementation (less than five years from LRSP completion): These actions include low-cost engineering treatments that can be constructed relatively quickly, such as striping projects, signal optimizations, and quick-build infrastructure. Additional short-term strategies could include scaling up existing programs and implementing enforcement activities.

Medium-term implementation (five to ten from LRSP completion): This may include progressive and scaled-up safety elements as well as larger projects that require more resources to design and construct. Policy changes also could be implemented in this timeframe.

Long term (10 years or more): Implementation may focus on further emphasizing safety in future planning and design efforts.

Funding Sources and Strategies

Obtaining funding is critical for plan implementation. The City of Seaside can pursue funding at various levels depending on its needs. Identification of funding sources and opportunities can be focused on the following:

- Federal and state grant opportunities, including the Highway Safety Improvement Program, Safe Streets and Roads for All, and the Active Transportation Program
- Regional funding opportunities, including funding opportunities resulting from the Transportation Agency for Monterey County's Measure X
- Capital improvement projects, such as repaving efforts into which safety upgrades could be bundled

The following strategies can help to increase the likelihood of success in competitive funding applications:

- Pursue the highest-priority, highest-benefit projects and programs. These tend to be the most competitive in grant programs, driven by strong results in the benefit-cost analyses that are often required. In addition, showing funding partners that the City has thought carefully about the highest-value ways to direct resources can inspire confidence from these federal and state entities.
- Leverage local funding for projects and aim to provide close to 50 percent of total project costs from these local funds. This type of commitment will increase competitiveness when applying for discretionary funds at the federal and state levels.
- Partner across jurisdictions to greatly strengthen applications for competitive funding. Some potential partners for local jurisdictions include the County, Transportation Agency of Monterey County, or relevant community-based organizations. Beyond grant applications, these jurisdictional partnerships also could include more formalized memoranda of understanding to share the costs of planning, design, construction, or operations.
- Pursue multiple funding sources. Infrastructure programs and projects often require agencies to leverage many sources to meet project budgets, especially given the uncertainty of competitive funding programs.

Coordination and Partnership

Coordination and partnership among diverse stakeholders are essential for the success of the LRSP. Collaboration and partnership between public works, law enforcement, bicycle/pedestrian advisory committees, and others can ensure that road user safety is systematically addressed.

Countywide partnerships should also be considered to coordinate on countywide programming efforts and to track funding and project implementation. These partnerships could take the following forms:

- Coordination with TAMC's Vision Zero Action Plan efforts on regional issues and strategies
- Countywide bicycle working committee including representatives from existing groups from various jurisdictions to further develop program/project concepts, track funding opportunities, and monitor overall progress toward LRSP goals
- Task force to audit countywide projects and programs related to bicycle safety, review collision trend data, and make recommendations on preventing future collisions
- Jurisdictional partnerships to prepare joint grant applications and potentially share program/project costs

Policy Support

The LRSP strategy implementation can be facilitated by supportive policies. Policies to consider include establishing clear goals for connectivity through an updated bicycle master planning process, parking policies, and other supportive policies. Having clear policies can pave the way for related safety improvements.

7.2 MONITORING

It will be important to monitor and evaluate progress towards meeting the LRSP's goals. Ongoing monitoring allows the City to assess safety conditions over time and make strategy adjustments as necessary.

To understand progress and safety conditions, specific outcome metrics should be used when evaluating the LRSP's progress. Foremost among these should be the number of collisions that result in a severe injury or a fatality, commonly referred to as KSI collisions (collisions in which people were Killed or Severely Injured), as this corresponds directly to the LRSP goals. Additional metrics could be the number of non-KSI injury collisions and collisions related to each emphasis area. Metrics should be tracked every two years and summarized in a memo or scorecard. This data will also be helpful when applying for funding. Coordination with TAMC can allow the City to realize efficiencies in its monitoring strategy..Coordination with TAMC can allow the City to realize efficiencies in its monitoring strategy.

Regularly updating the LRSP will allow the plan and its strategies to be revised based on the evaluation results. The LRSP should be updated every four years or as needed.

Parametrix

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City of Seaside
Local Road Safety Plan
APPENDIX

NOVEMBER 2024

Prepared for the City of Seaside by Parametrix

2024 CITY OF SEASIDE LOCAL ROAD SAFETY PLAN

APPENDIX

Prepared for the City of Seaside by Parametrix

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APPENDIX A. COUNTERMEASURE TOOLKIT

INTRODUCTION

The Countermeasure Toolkit provided within the following pages summarizes the measures found in the 2022 Caltrans Local Roadway Safety Manual (CA-LRSM). The CA-LRSM is a tool intended to provide focused roadway safety information in a single document. This data uses information from the Crash Modification Factor Clearinghouse and three other Federal Highway Administration (FHWA) published safety manuals — Roadway Departure Safety, Intersection Safety, and Roadways Safety Information Analysis — in conjunction with its own research with the Safe Transportation Research and Education Center (SafeTREC) to develop the CA-LRSM.

SUMMARY OF CONTENT

The toolkit lists Highway Safety Improvements Program (HSIP) countermeasures and non-HSIP countermeasures as well as crash type, crash reduction factors (CRF), federal funding eligibility for HSIP projects and the systemic opportunity. The countermeasures listed in this toolkit have been divided into four groups: signalized intersections, unsignalized intersection, roadway segments and countermeasure that do not currently apply for HSIP funding (not included in the CA-LRSM).

The information included in the countermeasure toolkit are:

- **CRASH TYPES – "All", "P & B" (Pedestrian and Bicycle), "Night", "Emergency Vehicle", or "Animal"**
- **CRF - Crash Reduction Factor used for HSIP calls-for-projects**
- **EXPECTED LIFE – 10 years or 20 years**
- **FEDERAL FUNDING ELIGIBILITY – The maximum federal reimbursement ratio**
- **SYSTEMIC APPROACH OPPORTUNITY – Opportunity to implement using a systemic approach: "Very High", "High", "Medium" or "Low"**

For countermeasures that are not eligible in Caltrans' local HSIP call for projects, "N/A" is placed in the above fields.

The toolkit refers to each countermeasure with an identification letter and number. The letters refer to the following:

- **'S' countermeasures apply to signalized intersections.**
- **'NS' countermeasures apply to unsignalized intersections.**
- **'R' countermeasures apply to roadway segments.**
- **'NH' countermeasures do not qualify for HSIP funding.**

The list of countermeasures in the following section is not all-inclusive and only consists of thoroughly researched countermeasures. The mix of countermeasure and CRFs included is intended to meet Caltrans' goal of a data-driven process for local agencies to follow. Where possible and appropriate, the CRF value listed in this toolkit is based on research studies that specifically established the CRF to be used for 'all' project areas, roadway types and traffic volumes. Where not all applicability factors have already been established by prior research, Caltrans worked closely with FHWA to approximate CRFs for countermeasures often utilized by local agencies.

SIGNALIZED INTERSECTIONS COUNTERMEASURES

S1. Add intersection lighting

Applicable at signalized intersections that have a disproportionate number of nighttime crashes and do not currently provide lighting at the intersection or at its approaches. Intersection lighting is of particular benefit to non-motorized users. Lighting not only helps them navigate the intersection, but also helps drivers see them better.

Crash Type	Night
CRF	40%
Expected Life (Years)	20
Federal Funding Eligibility	100%
Systemic Approach Opportunity	Medium

S2. Improve signal hardware: lenses, back-plates, mounting, size, and number

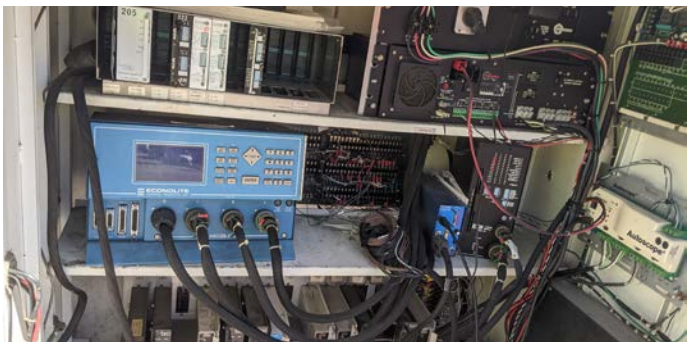
Install at signalized intersections with a high frequency of right-angle and rear-end crashes occurring because drivers may be unable to see traffic signals sufficiently in advance of the intersection. Signalized intersection improvements include new LED lighting, signal back plates, retro-reflective tape outlining the back plates, or visors to increase signal visibility, larger signal heads, relocation of the signal heads, or additional signal heads.

Crash Type	All
CRF	15%
Expected Life (Years)	20
Federal Funding Eligibility	100%
Systemic Approach Opportunity	Medium

S3. Improve signal timing (coordination, phases, red, yellow, or operation)

Install at locations that have a crash history at multiple signalized intersections along a corridor. Signalization improvements may include adding phases, lengthening clearance intervals, eliminating or restricting higher-risk movements, and coordinating signals at multiple locations.

Crash Type	All
CRF	15%
Expected Life (Years)	10
Federal Funding Eligibility	50%
Systemic Approach Opportunity	Very High



S5. Install emergency vehicle pre-emption systems

The target of this strategy is signalized intersections where normal traffic operations impede emergency vehicles and where traffic conditions create a potential for conflicts between emergency and nonemergency vehicles. These conflicts could lead to almost any type of crash, due to the potential for erratic maneuvers of vehicles moving out of the paths of emergency vehicles.

Crash Type	Emergency Vehicle
CRF	70%
Expected Life (Years)	10
Federal Funding Eligibility	100%
Systemic Approach Opportunity	High

S6. Install left-turn lane & add turn phase (signal has no left-turn lane or phase before)

Many intersection safety problems can be traced to difficulties accommodating left-turning vehicles, in particular where there is currently no accommodation for left turning traffic. A key strategy for minimizing collisions related to left-turning vehicles (angle, rearend, sideswipe) is to provide exclusive left-turn lanes and the appropriate signal phasing, particularly on high-volume and high-speed major-road approaches.

Crash Type	All
CRF	55%
Expected Life (Years)	20
Federal Funding Eligibility	90%
Systemic Approach Opportunity	Low

S7. Provide protected left turn phase (left turn lane already exists)

Applicable at signalized intersections with existing left turn pockets that currently have a permissive left-turn or no left-turn protection and have a high frequency of angle crashes involving left turning, opposing through vehicles, and non-motorized road users. A properly timed protected left-turn phase can also help reduce rear-end and sideswipe crashes between left-turning vehicles and the through vehicles as well as vehicles behind them.

Crash Type	All
CRF	30%
Expected Life (Years)	20
Federal Funding Eligibility	100%
Systemic Approach Opportunity	Very High

S8. Convert signal to mast arm (from pedestal-mounted)

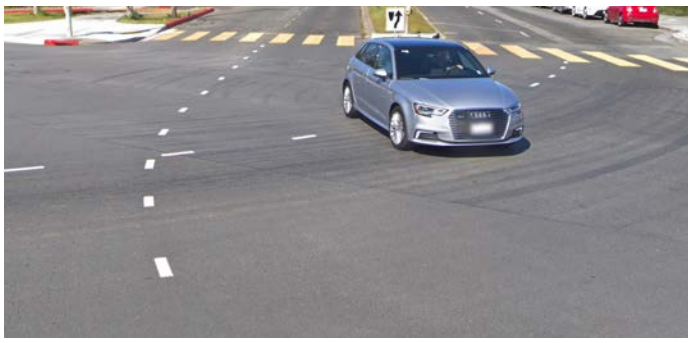
Install at intersections that are currently controlled by pedestal-mounted traffic signals (in medians and/or on outside shoulder) and that have a high frequency of right-angle and rear-end crashes occurring because drivers may be unable to see traffic signal in advance to safely negotiate the intersection. Intersections that have pedestal-mounted signals may have poor visibility and can result in vehicles not being able to stop in time for a signal change.

Crash Type	All
CRF	30%
Expected Life (Years)	20
Federal Funding Eligibility	100%
Systemic Approach Opportunity	Medium

S9. Install raised pavement markers and striping (through intersection)

Install at intersections that are currently controlled by pedestal-mounted traffic signals (in medians and/or on outside shoulder) and that have a high frequency of right-angle and rear-end crashes occurring because drivers may be unable to see traffic signal in advance to safely negotiate the intersection. Intersections that have pedestal-mounted signals may have poor visibility and can result in vehicles not being able to stop in time for a signal change.

Crash Type	All
CRF	10%
Expected Life (Years)	10
Federal Funding Eligibility	100%
Systemic Approach Opportunity	Very High



S10. Install flashing beacons as advance warning

Applicable in advance of signalized intersections with crashes that are a result of drivers being unaware of the intersection or being unable to see the traffic control device in time to comply.

Crash Type	All
CRF	30%
Expected Life (Years)	10
Federal Funding Eligibility	100%
Systemic Approach Opportunity	Medium

S11. Improve pavement friction (High Friction Surface Treatments)

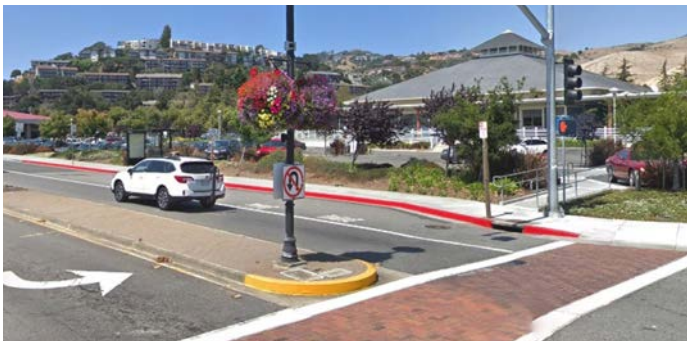
Install at signalized Intersections noted as having crashes on wet pavements or under dry conditions when the pavement friction available is significantly less than needed for the actual roadway approach speeds. This treatment is intended to target locations where skidding and failure to stop are determined to be problems in wet or dry conditions and the target vehicle is unable to stop due to insufficient skid resistance.

Crash Type	All
CRF	40%
Expected Life (Years)	10
Federal Funding Eligibility	100%
Systemic Approach Opportunity	Medium

S12. Install raised median on approaches

Effective at intersections noted as having turning movement crashes near the intersection as a result of insufficient access control. Raised medians must comply with Americans with Disabilities Act guidelines.

Crash Type	All
CRF	25%
Expected Life (Years)	20
Federal Funding Eligibility	90%
Systemic Approach Opportunity	Medium



S13PB. Install pedestrian median fencing on approaches

Applicable at signalized Intersections with high pedestrian-generators nearby (e.g., transit stops) that may experience high volumes of pedestrians jaywalking across the travel lanes at mid-block locations instead of walking to the intersection and waiting to cross during the walk-phase. When this safety issue cannot be mitigated with signal timing and shoulder/sidewalk treatments and a midblock crossing isn't viable, installing a continuous pedestrian barrier in the median may be a solution.

Crash Type	P&B
CRF	35%
Expected Life (Years)	20
Federal Funding Eligibility	90%
Systemic Approach Opportunity	High

S14. Create directional median openings to allow (and restrict) left-turns and U-turns

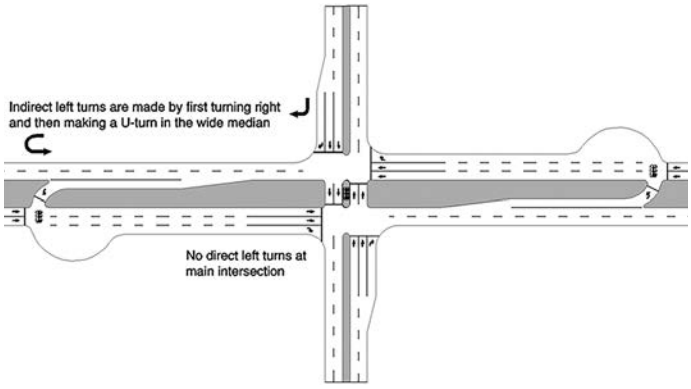
Install at locations where crashes related to turning maneuvers include angle, rear-end, pedestrian, and sideswipe (involving opposing left turns) crashes. If any of these crash types are an issue at an intersection, restriction or elimination of the turning maneuver may be the best way to improve the safety of the intersection.

Crash Type	All
CRF	50%
Expected Life (Years)	20
Federal Funding Eligibility	90%
Systemic Approach Opportunity	Medium

S15. Reduced left-turn conflict intersections

Reduced left-turn conflict intersections are geometric designs that alter how left-turn movements occur to simplify decisions and minimize the potential for related crashes. Two highly effective designs that rely on U-turns to complete certain left-turn movements are known as the restricted crossing U-turn and the median U-turn.

Crash Type	All
CRF	50%
Expected Life (Years)	20
Federal Funding Eligibility	90%
Systemic Approach Opportunity	Medium



S16. Convert intersection to roundabout (from signal)

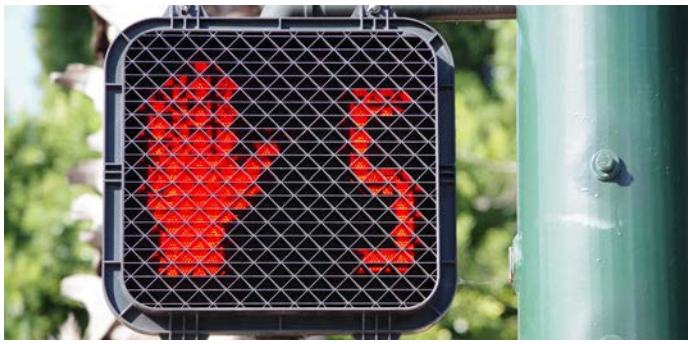
Install at signalized intersections that have a significant crash problem and the only alternative is to change the nature of the intersection itself. Roundabouts can also be very effective at intersections with complex geometries and intersections with frequent left-turn movements.

Crash Type	All
CRF	Varies
Expected Life (Years)	20
Federal Funding Eligibility	100%
Systemic Approach Opportunity	Low

S17PB. Install pedestrian countdown signal heads

Install at signals that have signalized pedestrian crossings with walk/don't walk indicators and where there have been pedestrian/vehicle crashes. Countdown signals can reassure pedestrians who are in the crosswalk when the flashing "DON'T WALK" interval appears that they still have time to finish crossing.

Crash Type	P & B
CRF	25%
Expected Life (Years)	20
Federal Funding Eligibility	100%
Systemic Approach Opportunity	Very High



S18PB. Install pedestrian crossing

Install at signalized Intersections with no marked crossings and pedestrian signal heads, where pedestrians are known to be crossing intersections that involve significant turning movements. Pedestrian crossings are especially important at intersections with multiphase traffic signals, school crossings, and double-right or double-left turns.

Crash Type	P & B
CRF	25%
Expected Life (Years)	20
Federal Funding Eligibility	100%
Systemic Approach Opportunity	High

S19PB. Pedestrian Scramble

A pedestrian scramble is a form of pedestrian "walk" phase at a signalized intersection in which all vehicular traffic is required to stop, allowing pedestrians and bicyclists to safely cross through the intersection in any direction, including diagonally. A pedestrian scramble may be considered at signalized intersections with very high pedestrian/bicycle volumes, e.g. in an urban business district.

Crash Type	P & B
CRF	25%
Expected Life (Years)	20
Federal Funding Eligibility	100%
Systemic Approach Opportunity	High

S20PB. Install advance stop bar before crosswalk (Bicycle Box)

Install at signalized Intersections with a marked crossing and where significant bicycle and/or pedestrians volumes are known to occur. Adding an advance stop bar before the striped crosswalk has the opportunity to enhance both pedestrian and bicycle safety. Stopping cars well before the crosswalk provides a buffer between the vehicles and the crossing pedestrians. It also allows for a dedicated space for cyclists, making them more visible to drivers.

Crash Type	P & B
CRF	15%
Expected Life (Years)	10
Federal Funding Eligibility	100%
Systemic Approach Opportunity	Very High

S21PB. Modify signal phasing to implement a Leading Pedestrian Interval (LPI)

Install at signalized intersection locations noted as having high turning vehicle volumes and that have had pedestrian/vehicle crashes. An LPI gives pedestrians the opportunity to enter an intersection about 3–7 seconds before vehicles are given a green indication.

Crash Type	P & B
CRF	60%
Expected Life (Years)	10
Federal Funding Eligibility	100%
Systemic Approach Opportunity	Very High

UNSIGNALIZED INTERSECTIONS COUNTERMEASURES

NS1. Add intersection lighting

Install at non-signalized intersections that have a disproportionate number of nighttime crashes and do not currently provide lighting at the intersection or at its approaches. Crash data should be studied to ensure that safety at the intersection could be improved by providing lighting. This strategy would be supported by a significant number of crashes that occur at night.

Crash Type	Night
CRF	40%
Expected Life (Years)	20
Federal Funding Eligibility	100%
Systemic Approach Opportunity	Medium

NS2. Convert to all-way STOP control (from two-way or Yield control)

Applicable at unsignalized intersection locations that have a crash history and have no controls on the major roadway approaches. However, all-way stop sign control is suitable only at intersections with moderate and relatively balanced volume levels on the intersection approaches. Under other conditions, the use of all-way stop control may create unnecessary delays and aggressive driver behavior. CA MUTCD warrants should always be followed.

Crash Type	All
CRF	50%
Expected Life (Years)	10
Federal Funding Eligibility	100%
Systemic Approach Opportunity	High

NS3. Install signals

Traffic signals can be used to prevent the most severe type crashes (right-angle, left-turn). Consideration to signalize an unsignalized intersection should only be given after (1) less restrictive forms of traffic control have been utilized as the installation of a traffic signal often leads to an increased frequency of crashes (rear-end) on major roadways and introduces congestion; and (2) signal warrants have been met.

Crash Type	All
CRF	Varies
Expected Life (Years)	20
Federal Funding Eligibility	100%
Systemic Approach Opportunity	Low

NS4. Convert intersection to roundabout (from all way stop)

Applicable at intersections that have a high frequency of right-angle and left-turn type crashes. Whether such intersections have existing crash patterns or not, a roundabout provides an alternative to signalization. The primary target locations for roundabouts should be moderate-volume unsignalized intersections. Roundabouts may not be a viable alternative in suburban and urban settings where right-of-way is limited.

Crash Type	All
CRF	Varies
Expected Life (Years)	20
Federal Funding Eligibility	100%
Systemic Approach Opportunity	Low

NS5. Convert intersection to roundabout (from 2-way stop or yield control)

Applicable at intersections that have a high frequency of right-angle and left-turn type crashes. Whether such intersections have existing crash patterns or not, a roundabout provides an alternative to signalization. The primary target locations for roundabouts should be moderate-volume unsignalized intersections, or retrofitting existing moderate volume signalized intersections. Roundabouts may not be a viable alternative in suburban and urban settings where right-of-way is limited.

Crash Type	All
CRF	Varies
Expected Life (Years)	20
Federal Funding Eligibility	100%
Systemic Approach Opportunity	Low

NS5mr. Convert intersection to mini roundabout

Mini roundabouts generally have a diameter of 45-90 feet with traversable islands. They provide the benefits of a roundabout with a smaller footprint, ideal for areas that already have low speeds but also a constrained right-of-way.

Crash Type	All
CRF	30%
Expected Life (Years)	20
Federal Funding Eligibility	90%
Systemic Approach Opportunity	

NS6. Install/upgrade larger or additional stop signs or other intersection warning/regulatory signs

The target for this strategy should be approaches to unsignalized intersections with paerns of rear-end, right-angle, or turning collisions related to lack of driver awareness of the presence of the intersection.

Crash Type	All
CRF	15%
Expected Life (Years)	10
Federal Funding Eligibility	100%
Systemic Approach Opportunity	Very High

NS7. Upgrade intersection pavement markings

Install at unsignalized intersections that are not clearly visible to approaching motorists, particularly approaching motorists on the major road. The strategy is appropriate for intersections with patterns of rear-end, right-angle, or turning crashes related to lack of driver awareness of the presence of the intersection, also at minor road approaches where conditions allow the stop bar to be seen by an approaching driver at a significant distance from the intersection. Typical improvements include "Stop Ahead" markings and the addition of centerlines and stop bars.

Crash Type	All
CRF	25%
Expected Life (Years)	10
Federal Funding Eligibility	100%
Systemic Approach Opportunity	Very High

NS8. Install flashing beacons at stop-controlled intersections

Flashing beacons can reinforce driver awareness of the non-signalized intersection control and can help mitigate patterns of right-angle crashes related to stop sign violations. Post-mounted advanced flashing beacons or overhead flashing beacons can be used at stop-controlled intersections to supplement and call driver attention to stop signs.

Crash Type	All
CRF	15%
Expected Life (Years)	10
Federal Funding Eligibility	100%
Systemic Approach Opportunity	High

NS9. Install flashing beacons as advance warning

Install in advance of non-signalized intersections with patterns of crashes that could be related to lack of a driver's awareness of the approaching intersection or controls at a downstream intersection.

Crash Type	All
CRF	30%
Expected Life (Years)	10
Federal Funding Eligibility	100%
Systemic Approach Opportunity	High

NS10. Install transverse rumble strips on approaches

Transverse rumble strips are installed in the travel lane to provide an auditory and tactile sensation for each motorist approaching the intersection. They can be used at any stop or yield approach intersection, often in combination with advance signing to warn of the intersection ahead. Due to the noise generated by vehicles driving over the rumble strips, care must be taken to minimize disruption to nearby residences and businesses.

Crash Type	All
CRF	N/A
Expected Life (Years)	10
Federal Funding Eligibility	90%
Systemic Approach Opportunity	N/A

NS11. Improve sight distance to intersection (clear sight triangles)

Install at unsignalized intersections with restricted sight distance and patterns of crashes related to lack of sight distance where sight distance can be improved by clearing roadside obstructions without major reconstruction of the roadway.

Crash Type	All
CRF	20%
Expected Life (Years)	10
Federal Funding Eligibility	90%
Systemic Approach Opportunity	High

NS12. Improve pavement friction (high friction surface treatments)

Install at non-signalized intersections noted as having crashes on wet pavements or under dry conditions when the pavement friction available is significantly less than needed for the actual roadway approach speeds. This treatment is intended to target locations where skidding and failure to stop are determined to be a problem in wet or dry conditions and the target vehicle is unable to stop due to insufficient skid resistance.

Crash Type	All
CRF	40%
Expected Life (Years)	10
Federal Funding Eligibility	100%
Systemic Approach Opportunity	Medium

NS13. Install splitter-islands on the minor road approaches

Applicable at minor road approaches to unsignalized intersections where the presence of the intersection or the stop sign is not readily visible to approaching motorists. The strategy is particularly appropriate for intersections where the speeds on the minor road are high. Creation of a splitter island allows for an additional stop sign to be placed in the median for the minor approach.

Crash Type	All
CRF	40%
Expected Life (Years)	20
Federal Funding Eligibility	90%
Systemic Approach Opportunity	Medium

NS14. Install raised median on approaches

Install at locations where turning movements affect the safety of an intersection. This countermeasure only applies to crashes occurring on the approaches or in the influence area of the new raised median. All new raised medians funded with federal HSIP funding must not include the removal of the existing roadway structural section and must be doweled into the existing roadway surface.

Crash Type	All
CRF	25%
Expected Life (Years)	20
Federal Funding Eligibility	90%
Systemic Approach Opportunity	Medium

NS15. Create directional median openings to allow (and restrict) left-turns and u-turns

Install at locations with crashes related to turning maneuvers including angle, rear-end, pedestrian, and sideswipe (involving opposing left turns). If any of these crash types are an issue at an intersection, restriction or elimination of the turning maneuver may be the best way to improve the safety of the intersection.

Crash Type	All
CRF	50%
Expected Life (Years)	20
Federal Funding Eligibility	90%
Systemic Approach Opportunity	Medium

NS16. Reduced left-turn conflict intersections

Reduced left-turn conflict intersections are geometric designs that alter how left-turn movements occur to simplify decisions and minimize the potential for related crashes. Two highly effective designs that rely on U-turns to complete certain left-turn movements are known as the restricted crossing U-turn and the median U-turn.

Crash Type	All
CRF	50%
Expected Life (Years)	20
Federal Funding Eligibility	90%
Systemic Approach Opportunity	

NS17. Install right-turn lane

Many collisions at unsignalized intersections are related to right-turn maneuvers. A key strategy for minimizing such collisions is to provide exclusive right-turn lanes, particularly on high-volume and high-speed major-road approaches. When considering new right-turn lanes, potential impacts to non-motorized users should be considered and mitigated as appropriate.

Crash Type	All
CRF	20%
Expected Life (Years)	20
Federal Funding Eligibility	90%
Systemic Approach Opportunity	Low

NS18. Install left-turn lane (where no left-turn lane exists)

Many collisions at unsignalized intersections are related to left-turn maneuvers. A key strategy for minimizing such collisions is to provide exclusive left-turn lanes, particularly on high-volume and high-speed major-road approaches. When considering new left-turn lanes, potential impacts to non-motorized users should be considered and mitigated as appropriates.

Crash Type	All
CRF	35%
Expected Life (Years)	20
Federal Funding Eligibility	90%
Systemic Approach Opportunity	Low

NS19PB. Install raised medians / refuge islands

Applicable at intersections that have a long pedestrian crossing distance, a high number of pedestrians, or a crash history. Raised medians decrease the level of exposure for pedestrians and allow pedestrians to concentrate on (or cross) only one direction of traffic at a time.

Crash Type	P & B
CRF	45%
Expected Life (Years)	20
Federal Funding Eligibility	90%
Systemic Approach Opportunity	Medium

NS20PB. Install pedestrian crossing at uncontrolled locations (new signs and markings only)

Install at non-signalized intersections without a marked crossing, where pedestrians are known to be crossing intersections that involve significant vehicular traffic. They are especially important at school crossings and intersections with right and/or left turns pockets.

Crash Type	P & B
CRF	20%
Expected Life (Years)	10
Federal Funding Eligibilitty	100%
Systemic Approach Opportunity	High

NS21PB. Install/upgrade pedestrian crossing at uncontrolled locations (with enhanced safety features)

Install at non-signalized intersections with or without a marked crossing, where pedestrians are known to be crossing intersections with significant vehicular traffic. Rectangular rapid flashing beacons, overhead flashing beacons, curb extensions, advanced "stop" or "yield" markings, and other safety features can be added to complement standard crossing elements.

Crash Type	P & B
CRF	35%
Expected Life (Years)	20
Federal Funding Eligibility	100%
Systemic Approach Opportunity	Medium

NS22PB. Install rectangular rapid flashing beacon (RRFB)

A Rectangular Rapid Flashing Beacon (RRFB) includes pedestrian-activated flashing lights and additional signage that enhance the visibility of marked crosswalks and alert motorists to pedestrian crossings. It uses an irregular flash pattern that is similar to emergency flashers on police vehicles. RRFBs are installed at unsignalized intersections and mid-block pedestrian crossings.

Crash Type	P & B
CRF	35%
Expected Life (Years)	20
Federal Funding Eligibility	90%
Systemic Approach Opportunity	

NS23PB. Install pedestrian signal (including Pedestrian Hybrid Beacon (HAWK)

Intersections noted as having a history of pedestrian/ vehicle crashes and in areas where the likelihood of a pedestrian is significant. Corridors should also be assessed to determine if there are adequate safe opportunities for non-motorists to cross and if a pedestrian signal, high-intensity activated crosswalk, or hybrid beacons are needed to provide an active warning to motorists when a pedestrian is in the crosswalk.

Crash Type	P & B
CRF	55%
Expected Life (Years)	20
Federal Funding Eligibility	100%
Systemic Approach Opportunity	Low

ROADWAY SEGMENTS COUNTERMEASURES

R1. Add segment lighting

Install at locations with a noted substantial patterns of nighttime crashes. In particular, patterns of rear-end, right-angle, turning or roadway departure collisions on the roadways may indicate that night-time drivers can be unaware of the roadway characteristics.

Crash Type	Night
CRF	35%
Expected Life (Years)	20
Federal Funding Eligibility	100%
Systemic Approach Opportunity	Medium

R2. Remove or relocate fixed objects outside of clear recovery zone

Applicable at locations or roadway segments prone to collisions with fixed objects such as utility poles, drainage structures, trees, and other fixed objects, such as the outside of a curve, end of lane drops, and in traffic islands. A clear recovery zone should be developed on every roadway, as space is available. In situations where public right-of-way is limited, steps should be taken to request assistance from property owners, as appropriate.

Crash Type	All
CRF	35%
Expected Life (Years)	20
Federal Funding Eligibility	90%
Systemic Approach Opportunity	High

R3. Install median barrier

Applicable in areas where crash history indicates that drivers are unintentionally crossing the median and these cross-overs are resulting in high severity crashes. The installation of median barriers can increase the number of property damage only collisions and non-severe injuries. The net result in safety from this countermeasure is connected more to reducing the severity of crashes as opposed to the number of crashes.

Crash Type	All
CRF	25%
Expected Life (Years)	20
Federal Funding Eligibility	100%
Systemic Approach Opportunity	Medium

R4. Install guardrail

A guardrail is installed to reduce the severity of lane departure crashes. However, guardrails can reduce crash severity only for those conditions where striking the guardrail is less severe than going down an embankment or striking a fixed object. Guardrails should only be installed where it is clear that crash severity will be reduced, or there is a history of run-off-the-road crashes at a given location that have resulted in severe injury crashes.

Crash Type	All
CRF	25%
Expected Life (Years)	20
Federal Funding Eligibility	100%
Systemic Approach Opportunity	High

R5. Install impact attenuators

Impact attenuators are typically used to shield rigid roadside objects such as concrete barrier ends, steel guardrail ends and bridge pillars from oncoming automobiles. Attenuators should only be installed where it is impractical for the objects to be removed.

Crash Type	All
CRF	25%
Expected Life (Years)	10
Federal Funding Eligibility	100%
Systemic Approach Opportunity	High

R6. Flatten side slopes

Applicable at roadways experiencing frequent lane departure crashes that result in roll-over type crashes as a result of the roadway slope being so severe as to not accommodate a reasonable degree of driver correction. This countermeasure is appropriate when there is a need to reduce the severity of lane departure crashes without installing a barrier system that could result in increased numbers of crashes.

Crash Type	All
CRF	30%
Expected Life (Years)	20
Federal Funding Eligibility	90%
Systemic Approach Opportunity	Medium

R7. Flatten side slopes and remove guardrail

Install at locations where high number of crashes originate as a lane departure and result in collision with guardrail or a fixed object located on the side slope shielded by guardrail. The guardrail may or may not meet current standards. Even though guardrails are generally installed to reduce the severity of departure crashes, they still can result in severe crashes in some locations.

Crash Type	All
CRF	40%
Expected Life (Years)	20
Federal Funding Eligibility	90%
Systemic Approach Opportunity	Medium

R8. Install raised median

Install at locations experiencing head-on collisions that may be affected by both the number of vehicles that cross the centerline and by the speed of oncoming vehicles. Installing a raised median is a more restrictive approach in that it represents a more rigid barrier between opposing traffic.

Crash Type	All
CRF	25%
Expected Life (Years)	20
Federal Funding Eligibility	90%
Systemic Approach Opportunity	Medium

R9. Install median (flush)

Applicable at locations experiencing head-on collisions that may be affected by both the number of vehicles that cross the centerline and by the speed of oncoming vehicles. Roadways with oversized lanes offer an opportunity to restripe the roadway to reduce the lanes to standard widths and use the extra width for the median.

Crash Type	All
CRF	15%
Expected Life (Years)	20
Federal Funding Eligibility	90%
Systemic Approach Opportunity	Medium

R10PB. Install pedestrian median fencing on approaches

Roadway segments with high pedestrian generators and destinations nearby (e.g. transit stops) may experience a high volume of pedestrians jaywalking across the travel lanes at mid-block locations instead of walking to the nearest intersection or designated mid-block crossing. When this safety issue cannot be mitigated with shoulder, sidewalk and/or crossing treatments, then installing a continuous pedestrian barrier in the median may be a viable solution.

Crash Type	All
CRF	15%
Expected Life (Years)	20
Federal Funding Eligibility	90%
Systemic Approach Opportunity	Medium

R11. Install acceleration/ deceleration lanes

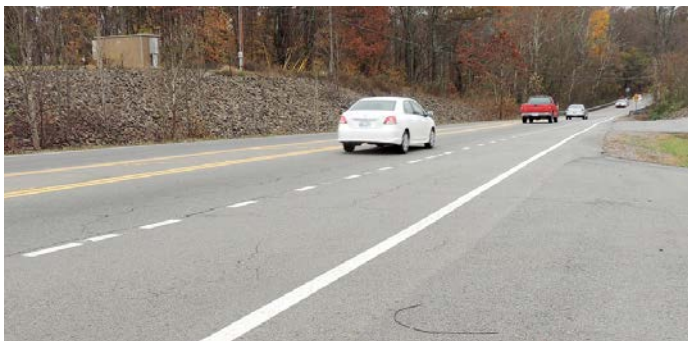
Install at locations proven to have crashes that are the result of drivers not being able to turn onto a high speed roadway to accelerate until the desired roadway speed is reached and areas that do not provide the opportunity to safety decelerate to negotiate a turning movement. This countermeasure can also be used to improve the safety of merging vehicles at a lane-drop location.

Crash Type	All
CRF	25%
Expected Life (Years)	20
Federal Funding Eligibility	90%
Systemic Approach Opportunity	Low

R12. Widen lane (initially less than 10 feet)

Install at horizontal curves or tangents and low speed or high speed roadways identified as having lane departure crashes, sideswipe or head-on crashes that can be attributed to an existing lane width less than 10 feet.

Crash Type	All
CRF	25%
Expected Life (Years)	20
Federal Funding Eligibility	90%
Systemic Approach Opportunity	Medium



R13. Add two-way left-turn lane (without reducing travel lanes)

Applicable at roadways having a high frequency of drivers being rear-ended while attempting to make a left turn across oncoming traffic. Also can be effective for drivers inadvertently crossing the centerline of an undivided multilane roadway.

Crash Type	All
CRF	30%
Expected Life (Years)	20
Federal Funding Eligibility	90%
Systemic Approach Opportunity	Medium

R14. Road Diet (reduce travel lanes from four to three and add a two-way left-turn and bicycle lanes)

Install at areas noted as having a high frequency of head-on, left-turn, and rear-end crashes with traffic volumes that can be handled by only two free flowing lanes. Using this strategy in locations with traffic volumes that are too high could result in diversion of traffic to routes that are less safe than the original four-lane design. It may also result in congestion levels that contribute to other crashes.

Crash Type	All
CRF	30%
Expected Life (Years)	20
Federal Funding Eligibility	90%
Systemic Approach Opportunity	Medium

R15. Widen shoulder

Applicable at roadways that have a frequent incidence of vehicles leaving the travel lane resulting in an unsuccessful attempt to reenter the roadway. The probability of a safe recovery is increased if an errant vehicle is provided with an increased paved area in which to initiate such a recovery.

Crash Type	All
CRF	30%
Expected Life (Years)	20
Federal Funding Eligibility	90%
Systemic Approach Opportunity	Medium

R16. Curve shoulder widening (outside only)

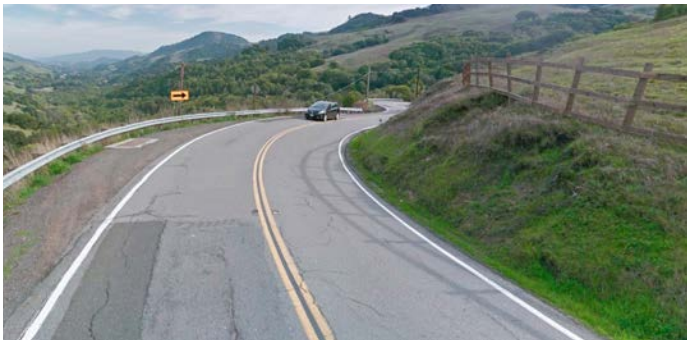
Install at roadway curves noted as having frequent lane departure crashes due to inadequate or no shoulders, resulting in an unsuccessful attempt to reenter the roadway. Curve shoulder widening creates a recovery area in which a driver can regain control of a vehicle, as well as lateral clearance to roadside objects.

Crash Type	All
CRF	45%
Expected Life (Years)	20
Federal Funding Eligibility	90%
Systemic Approach Opportunity	

R17. Improve horizontal alignment (flatten curves)

Applicable at roadways with horizontal curves that have experienced lane departure crashes as a result of a roadway segment having compound curves or a severe radius. This strategy should generally be considered only when less expensive strategies involving clearing of specific sight obstructions or modifying traffic control devices have been tried and have failed to ameliorate the crash patterns.

Crash Type	All
CRF	50%
Expected Life (Years)	20
Federal Funding Eligibility	90%
Systemic Approach Opportunity	Low



R18. Flatten crest vertical curve

The target for this strategy is usually unsignalized intersections with restricted approach sight distance due to vertical geometry and with patterns of crashes related to that lack of sight distance that cannot be ameliorated by less expensive methods. This strategy should generally be considered only when less expensive strategies involving clearing of specific sight obstructions or modifying traffic control devices have been tried and have failed to ameliorate the crash patterns.

Crash Type	All
CRF	25%
Expected Life (Years)	20
Federal Funding Eligibility	90%
Systemic Approach Opportunity	Low

R19. Improve curve superelevation

Applicable for roadways noted as having frequent lane departure crashes and inadequate or no superelevation. Safety can be enhanced when the superelevation is improved or restored along curves where the actual superelevation is less than the optimal.

Crash Type	All
CRF	45%
Expected Life (Years)	20
Federal Funding Eligibility	90%
Systemic Approach Opportunity	Medium

R20. Convert from two-way to one-way traffic

One-way streets can offer improved signal timing and accommodate irregular-spaced signals. One-way streets can simplify crossings for pedestrians, who must look for traffic in only one direction. While studies have shown that conversion of two-way streets to one-way generally reduces pedestrian crashes and the number of conflict points, one-way streets tend to have higher speeds that can create new problems.

Crash Type	All
CRF	35%
Expected Life (Years)	20
Federal Funding Eligibility	90%
Systemic Approach Opportunity	Medium

R21. Improve pavement friction (high friction surface treatments)

Applicable at locations with a noted amount of crashes on wet pavement or under dry conditions when pavement friction is significantly less than actual roadway speeds; including but not limited to curves, intersections, and areas with short stopping or weaving distances. This treatment is intended to target locations where skidding is a problem and the target vehicle runs (skids) off the road or is unable to stop due to insufficient skid resistance.

Crash Type	All
CRF	40%
Expected Life (Years)	10
Federal Funding Eligibility	100%
Systemic Approach Opportunity	Medium

R22. Install/upgrade signs with new fluorescent sheeting (regulatory or warning)

This countermeasure only applies to crashes occurring within the influence area of the new/upgraded signs. This countermeasure is not eligible unless it is done as part of a larger sign audit project, including the study of: 1) the existing signs' locations, sizes, and information per MUTCD standards; 2) missing signs per MUTCD standards; and 3) sign retroreflectivity.

Crash Type	All
CRF	15%
Expected Life (Years)	10
Federal Funding Eligibility	100%
Systemic Approach Opportunity	Very High

R23. Install chevron signs on horizontal curves

Install at roadways that have an unacceptable level of crashes on relatively sharp curves during periods of light and darkness. Ideally this type of safety countermeasure would be combined with other sign evaluations and upgrades.

Crash Type	All
CRF	40%
Expected Life (Years)	10
Federal Funding Eligibility	100%
Systemic Approach Opportunity	Very High

R24. Install curve advance warning signs

Applicable at roadways that have an unacceptable level of crashes on relatively sharp curves during periods of light and darkness. This countermeasure may also include horizontal alignment and/or advisory speed warning signs. Ideally this type of safety countermeasure would be combined with other sign evaluations and upgrades.

Crash Type	All
CRF	25%
Expected Life (Years)	10
Federal Funding Eligibility	100%
Systemic Approach Opportunity	High

R25. Install curve advance warning signs (flashing beacon)

Install at roadways that have an unacceptable level of crashes on relatively sharp curves. Flashing beacons in conjunction with warning signs should only be used on horizontal curves that have an established severe crash history to help maintain their effectiveness.

Crash Type	All
CRF	30%
Expected Life (Years)	10
Federal Funding Eligibility	100%
Systemic Approach Opportunity	High

R26. Install dynamic/variable speed warning signs

Dynamic speed feedback signs can reduce vehicle speeds by alerting motorists that they are operating above the speed limit. The signs include a speed measuring device and a message sign that displays feedback to drivers who exceed a predetermined speed threshold. The feedback can include displaying the driver's actual speed, showing a message such as SLOW DOWN, or activating some warning device, such as beacons or a curve warning sign.

Crash Type	All
CRF	30%
Expected Life (Years)	10
Federal Funding Eligibility	100%
Systemic Approach Opportunity	High

R27. Install delineators, reflectors and/or object markers

Applicable at roadways that have an unacceptable level of crashes on curves (relatively flat to sharp) during periods of light and darkness. Many roadways with a history of fixed object crashes can be candidates for this treatment, as can roadways with similar fixed objects along the roadside that have yet to experience crashes.

Crash Type	All
CRF	15%
Expected Life (Years)	10
Federal Funding Eligibility	100%
Systemic Approach Opportunity	Very High

R28. Install edge-lines and centerlines

Install on roadways with a history of run-off-road right, head-on, opposite-direction-sideswipe, or run-off-road left crashes. Install where the existing lane delineation is not sufficient to assist the motorist in understanding the existing limits of the roadway.

Crash Type	All
CRF	25%
Expected Life (Years)	10
Federal Funding Eligibility	100%
Systemic Approach Opportunity	Very High

R29. Install no-passing line

Applicable at roadways that have a high percentage of head-on crashes suggesting that many head-on crashes may relate to failed passing maneuvers. No-passing lines should be installed where drivers' passing sight distance is not available due to horizontal or vertical obstructions.

Crash Type	All
CRF	45%
Expected Life (Years)	10
Federal Funding Eligibility	100%
Systemic Approach Opportunity	Very High

R30. Install centerline rumble strips/stripes

Centerline rumble strips/stripes can be used on many roadways – especially those with a history of head-on crashes. It is recommended that rumble strips/stripes be applied systematically along an entire route instead of only at spot locations. For all rumble strips/stripes, pavement condition should be sufficient to accept milled rumble strips. Care should be taken when considering installing rumble strips in locations with residential land uses or in areas with high bicycle volumes.

Crash Type	All
CRF	20%
Expected Life (Years)	10
Federal Funding Eligibility	100%
Systemic Approach Opportunity	Very High

R32PB. Install bicycle lanes

Applicable along roadway segments noted as having crashes between bicycles and vehicles or crashes that may be preventable with a buffer/shoulder. Most studies suggest that bicycle lanes may provide protection against bicycle/motor vehicle collisions. Striped bicycle lanes can be incorporated into a roadway when it is desirable to delineate which available road space is for exclusive or preferential use by bicyclists.

Crash Type	P & B
CRF	35%
Expected Life (Years)	10
Federal Funding Eligibility	90%
Systemic Approach Opportunity	High

R33PB. Install separated bicycle lanes

Separated bicycleways are most appropriate on streets with high volumes of bicycle traffic and/or high bicycle-vehicle collisions. Separation types range from simple, painted buffers and flexible delineators to more substantial separation measures including raised curbs, grade separation, bollards, planters, and parking lanes. These options range in feasibility due to roadway characteristics, available space, and cost.

Crash Type	P & B
CRF	45%
Expected Life (Years)	20
Federal Funding Eligibility	90%
Systemic Approach Opportunity	

R34PB. Install sidewalk/pathway (to avoid walking along roadway)

Install at areas noted as not having adequate or no sidewalks and a history of walking along roadway pedestrian crashes. In rural areas asphalt curbs and/or separated walkways may be appropriate.

Crash Type	P & B
CRF	80%
Expected Life (Years)	10
Federal Funding Eligibility	90%
Systemic Approach Opportunity	Medium

R35PB. Install pedestrian crossing (with enhanced safety features)

Install on roadway segments with no controlled crossing for a significant distance in high-use midblock crossing areas and/or multilane roads locations. Rectangular rapid flashing beacons, overhead flashing beacons, curb extensions and other safety features can be added to complement standard crossing elements. For multi-lane roadways, advance "yield" markings can be effective in reducing the 'multiple-threat' danger to pedestrians.

Crash Type	P & B
CRF	30%
Expected Life (Years)	10
Federal Funding Eligibility	90%
Systemic Approach Opportunity	Medium

R36PB. Install raised pedestrian crossing

Applicable on lower-speed roadways where pedestrians are known to be crossing roadways that involve significant vehicular traffic. In these cases, raised crossings can be added to complement the standard crossing elements. Special requirements may apply and extra care should be taken when considering installing raised crossings to ensure unintended safety issues are not created, such as emergency vehicle access or truck route issues.

Crash Type	P & B
CRF	35%
Expected Life (Years)	10
Federal Funding Eligibility	90%
Systemic Approach Opportunity	High

R37PB. Install rectangular rapid flashing beacon (RRFB)

A Rectangular Rapid Flashing Beacon (RRFB) includes pedestrian-activated flashing lights and additional signage that enhance the visibility of marked crosswalks and alert motorists to pedestrian crossings. It uses an irregular flash pattern that is similar to emergency flashers on police vehicles. RRFBs are installed at unsignalized intersections and mid-block pedestrian crossings.

Crash Type	P & B
CRF	350%
Expected Life (Years)	20
Federal Funding Eligibility	90%
Systemic Approach Opportunity	

R38. Install animal fencing

Install at locations with high percent of vehicular/animal crashes (reactive) or where there is a known high percent of animals crossing due to migratory patterns (proactive).

Crash Type	Animal
CRF	80%
Expected Life (Years)	20
Federal Funding Eligibility	90%
Systemic Approach Opportunity	Medium

COUNTERMEASURES THAT DO NOT QUALIFY FOR HSIP FUNDING

NH1. Implement traffic safety education programs

Education programs can raise awareness and improve driver, pedestrian, and bicyclist behaviors. Aimed as "hot spot" locations, education programs can be successful in encouraging safe traffic behavior.

Crash Type	All
CRF	N/A
Expected Life (Years)	N/A
Federal Funding Eligibility	N/A
Systemic Approach Opportunity	N/A

NH2. Implement targeted enforcement programs

Enforcement programs can be effective at reducing common violation types such as speeding, failure to yield, red light running, aggressive driving, failure to wear safety belts, distracted driving, and driving while impaired. They can be especially effective when combined with education programs.

Crash Type	All
CRF	N/A
Expected Life (Years)	N/A
Federal Funding Eligibility	N/A
Systemic Approach Opportunity	N/A

NH3. Install cameras to detect red-light running

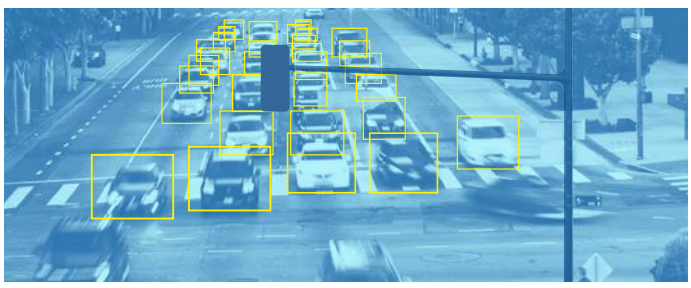
Install at signalized intersections with a high frequency of crashes attributed to drivers who intentionally disobey red signal indications. This type of automated enforcement refers to the use of photo and video camera systems connected to the signal controller. Such systems record vehicles proceeding through the intersection after the signal displays red.

Crash Type	All
CRF	N/A
Expected Life (Years)	N/A
Federal Funding Eligibility	N/A
Systemic Approach Opportunity	N/A

NH4. Provide advanced dilemma zone detection for high speed approaches

Effective in remote areas that have a high frequency of right-angle and rear-end crashes. The advanced dilemma zone detection system enhances safety at signalized intersections by modifying traffic control signal timing to reduce the number of drivers that may have difficulty deciding whether to stop or proceed during a yellow phase. This may reduce rear-end crashes associated with unsafe stopping and angle crashes due to illegally continuing into the intersection during the red phase.

Crash Type	All
CRF	N/A
Expected Life (Years)	N/A
Federal Funding Eligibility	N/A
Systemic Approach Opportunity	N/A



NH5. Fill sidewalk and pathway gaps

Filling gaps in existing sidewalk and pathway networks increases safety and comfort for active transportation users. Gaps should be filled in a way that meets specifications for best practices in terms of width, accessibility, and other attributes.

Crash Type	P & B
CRF	N/A
Expected Life (Years)	N/A
Federal Funding Eligibility	N/A
Systemic Approach Opportunity	N/A

NH6. Add pedestrian scale lighting

Pedestrian scale lighting increases the visibility of pedestrians at night, especially at intersections and when crossing the street. Lighting should be implemented in a way so as to illuminate pedestrians and reduce glare to motorists.

Crash Type	P & B
CRF	N/A
Expected Life (Years)	N/A
Federal Funding Eligibility	N/A
Systemic Approach Opportunity	N/A

NH7. Wayfinding

This treatment can reduce pedestrian and bicycle collisions. Wayfinding can be deployed to route bicycles and pedestrians to safer facilities and avoid hazardous routes.

Crash Type	P & B
CRF	N/A
Expected Life (Years)	N/A
Federal Funding Eligibility	N/A
Systemic Approach Opportunity	N/A

NH8. Install sharrows

Sharrow markings increase the visibility of bicyclists, clarifies where bicyclists are expected to ride and reminds motorists to expect bicyclists on the road.

Crash Type	P & B
CRF	N/A
Expected Life (Years)	N/A
Federal Funding Eligibility	N/A
Systemic Approach Opportunity	N/A

NH9. Install 'Bikes May Use Full Lane' sign

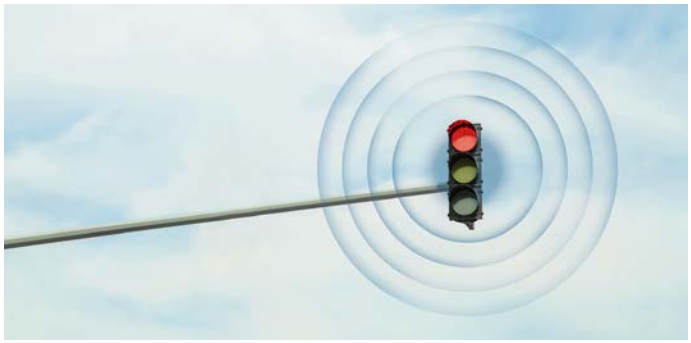
Regulatory 'Bikes May Use Full Lane' sign increases the visibility of bicyclists, clarifies where bicyclists are expected to ride, and reminds motorists to expect bicyclists on the road.

Crash Type	P & B
CRF	N/A
Expected Life (Years)	N/A
Federal Funding Eligibility	N/A
Systemic Approach Opportunity	N/A

NH10. Deploy smart signal technology

Smart traffic signals are equipped with sensing, video capture, and connectivity technologies to collect real-time data from the environment. They can improve the flow of traffic as well as detect pedestrians and bicyclists at intersections.

Crash Type	All
CRF	N/A
Expected Life (Years)	N/A
Federal Funding Eligibility	N/A
Systemic Approach Opportunity	N/A



NH11. Install protected intersection

Protected intersections separate bicyclists from vehicles at intersections, increasing safety for all users. The bicycleway is set back from vehicle traffic and bicyclists are given a dedicated path through the intersection and have right-of-way over turning vehicles.

Crash Type	P & B
CRF	N/A
Expected Life (Years)	N/A
Federal Funding Eligibility	N/A
Systemic Approach Opportunity	N/A

NH12. No right turn on red restrictions

No right turn on red (RTOR) restrictions can benefit pedestrians with minimal impacts on traffic. They should be done in locations with substantial pedestrian volume and places where children cross. Part-time RTOR prohibitions during the busiest times of day may be sufficient to address the problem. Blank out signs can be used to reinforce turn restrictions and encourage motorist compliance.

Crash Type	All
CRF	N/A
Expected Life (Years)	N/A
Federal Funding Eligibility	N/A
Systemic Approach Opportunity	N/A

NH13. Refresh signage/ striping

Refresh signage and striping that has faded with age. Faded striping and signs can lead to confusion and poor night time visibility.

Crash Type	All
CRF	N/A
Expected Life (Years)	N/A
Federal Funding Eligibility	N/A
Systemic Approach Opportunity	N/A

NH14. Back-in angle parking

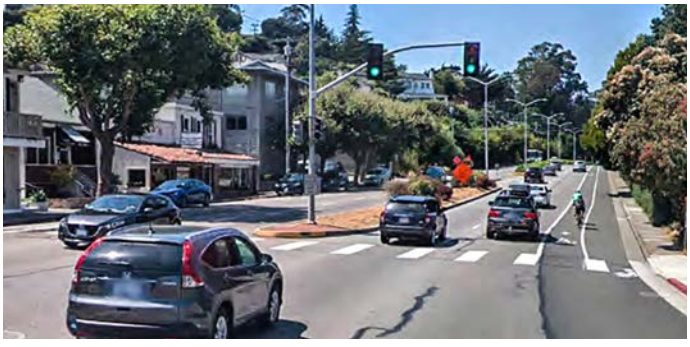
Back-in angle parking provides motorists with better visibility of bicyclists, pedestrians, cars, and trucks as they exit a parking space and enter moving traffic. Back-in angle parking also removes the difficulty that drivers, particularly older drivers, have when backing into moving traffic.

Crash Type	All
CRF	N/A
Expected Life (Years)	N/A
Federal Funding Eligibility	N/A
Systemic Approach Opportunity	N/A

NH15. Reduced lane widths

Reduced lane width encourages slower speeds and frees up additional right of way for bicycle and pedestrian facilities. Residential streets may be reduced to 10-foot lanes, arterial streets may be reduced to 11 foot lanes, and turn lanes may be reduced to 10 feet, as determined by individual jurisdictions.

Crash Type	All
CRF	N/A
Expected Life (Years)	N/A
Federal Funding Eligibility	N/A
Systemic Approach Opportunity	N/A



NH16. Square up intersection

Irregular angled intersections present safety hazards for all road users. Intersections less than 90 degrees reduce visibility for motorists, while intersections greater than 90 degrees allow for high-speed turns. These intersections also create unnecessarily long pedestrian crossings. Redesign intersections as close to 90 degrees as possible.

Crash Type	All
CRF	N/A
Expected Life (Years)	N/A
Federal Funding Eligibility	N/A
Systemic Approach Opportunity	N/A

NH17. Relocate parking

Parked vehicles can block sight distances. Relocate parking, or remove parking at the approaches to intersections and driveways to improve visibility.

Crash Type	All
CRF	N/A
Expected Life (Years)	N/A
Federal Funding Eligibility	N/A
Systemic Approach Opportunity	N/A

NH18. Mumble strip

Mumble strips are modified rumble strips. They use noise and vibrations to alert drivers who are leaving their lanes. Mumble strips generate less outside noise than rumble strips, which are less disruptive to nearby residents, through a sinusoidal wave pattern. Mumble strips should be installed on facilities where roadway departures collisions have occurred.

Crash Type	All
CRF	N/A
Expected Life (Years)	N/A
Federal Funding Eligibility	N/A
Systemic Approach Opportunity	N/A

NH19. Provide tapered edge for pavement edge drop-off

This treatment is designed to be a standard policy for any overlay project. Instead of an overlay project ending with a 90-degree asphalt or concrete face at the edge of pavement, the tapered edge provides an approximate 30-degree angle at the edge.

Crash Type	All
CRF	N/A
Expected Life (Years)	N/A
Federal Funding Eligibility	N/A
Systemic Approach Opportunity	N/A

NH20. Pave existing shoulder

Install at roadways with an unpaved existing shoulder and exhibiting a high incidence of vehicles leaving the travel lane resulting in an unsuccessful attempt to reenter the roadway. Paving the existing shoulder provides a wider recovery area with a smooth surface that has a higher friction factor.

Crash Type	All
CRF	N/A
Expected Life (Years)	N/A
Federal Funding Eligibility	N/A
Systemic Approach Opportunity	N/A

NH21. Widen shoulder (unpaved)

Consider for roadways with a high incidence of vehicles leaving the travel lane resulting in an unsuccessful attempt to reenter the roadway. The probability of a safe recovery is increased if an errant vehicle is provided with an area in which to initiate such a recovery. Unpaved shoulders usually have flatter cross sections and some structural integrity as compared to areas of "flatten side slopes".

Crash Type	All
CRF	N/A
Expected Life (Years)	N/A
Federal Funding Eligibility	N/A
Systemic Approach Opportunity	N/A

NH22. Remove slip lane

This treatment addresses pedestrian and sideswipe collisions. Slip lanes should be avoided as they allow vehicles to travel through intersections at larger speeds and allow less visibility of pedestrians waiting to cross. Removing one will result in a shorter crossing distance for pedestrians and slower speeds at the intersection.

Crash Type	All
CRF	N/A
Expected Life (Years)	N/A
Federal Funding Eligibility	N/A
Systemic Approach Opportunity	N/A

NH23. Upgrade bridge railing

Open-faced railings can present a snagging hazard, which may produce high deceleration forces leading to occupant injuries. Curbs or walkways between the driving lane and the bridge railing are another common hazard of older railing systems. Impacted vehicles may go over the railing or roll over.

Crash Type	All
CRF	N/A
Expected Life (Years)	N/A
Federal Funding Eligibility	N/A
Systemic Approach Opportunity	N/A

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