City of Seal Beach
Local Roadway Safety Plan (LRSP)

May 2022

Prepared By:

Kimley»Horn

Executive Summary

Seal Beach has created a local roadway safety plan (LRSP), which identifies a framework to identify, analyze, and develop traffic safety enhancements on the City's roadway network. The LRSP was developed in response to local issues and needs. Through the analysis, this report has identified emphasis areas to inform and further guide safety evaluation and planning for the City's transportation network. The LRSP also analyzes collision data on an aggregate basis as well as at specific locations to identify high-crash locations, high-risk locations, and citywide trends and patterns. The analysis of collision history on the City's transportation network allows for opportunities to: 1) identify factors in the transportation network that inhibit safety for all roadway users, 2) improve safety at specific high-collision locations, and 3) develop safety measures using the 5E's of transportation safety: Engineering, Enforcement, Education, Emergency Services, and Emerging Technologies, to encourage safer roadway user behavior and better severity outcomes.

Seal Beach has been successful at taking steps to enhance traffic safety throughout the City, but can take additional steps in improving roadway safety citywide. The City is continuing these safety efforts through this plan by identifying areas of emphasis and opportunities for system improvement that can be implemented to enhance safety. This LRSP analyzes the most recent range of collision data (January 1, 2016 to December 31, 2019 and recent roadway improvements to assess historic trends, patterns, and areas of concern.

During the LRSP development process, the City has drafted a vision for traffic safety and outlined the goals that will help guide plan success. The vision is to enhance the transportation network to achieve zero traffic fatalities and serious injury related collisions. The goals were identified as:

- Identify areas with a high risk for collisions.
- Illustrate the value of a comprehensive safety program and the systemic process.
- Plan future safety improvements for near-, mid- and long-term implementation.
- Define safety projects for HSIP (Highway Safety Improvement Program) and other program funding consideration.

Seal Beach's collision history was analyzed to identify locations with elevated risk of collisions either through their collision histories or their similarities to other locations that have more general representation of network collision patterns. Using a network screening process, locations within the City that will most likely benefit from safety enhancements were identified. Using historic collision data, collision risk factors for the entire network were derived. The outcomes informed the identification and prioritization of engineering and non-infrastructure safety measures that address certain roadway characteristics and related behaviors that contribute to motor vehicle collisions with active transportation users.

(Per section 148 of Title 23, United States Code [23 U.S.C. §148(h) (4)]: REPORTS DISCOVERY AND ADMISSION INTO EVIDENCE OF CERTAIN REPORTS, SURVEYS, AND INFORMATION—Notwithstanding any other provision of law, reports, surveys, schedules, lists, or data compiled or collected for any purpose relating to this section, shall not be subject to discovery or admitted into evidence in a Federal or State court proceeding or considered for other purposes in any action for damages arising from any occurrence at a location identified or addressed in the reports, surveys, schedules, lists, or other data.)

Signature Line

By signing and stamping this Local Road Safety Plan, the engineer is attesting to this report's technical information and engineering data upon which local agency's recommendations, conclusions, and decisions are made.

Table of Contents

Table of Figures

Table of Tables

1 Introduction

Seal Beach is a coastal community that also serves as an access point to other neighboring coastal cities in Orange County. It is known for its commercial and cultural vibrancy. Similar to the surrounding communities, Seal Beach has a stable population of around 25,000 residents. Along with general tourists and beachgoers, this creates layers of tension and complexity for the transportation network.

This Local Roadway Safety Plan (LRSP) identifies emphasis areas to inform and guide further safety evaluation of the City's transportation network. The emphasis areas include type of crash, certain locations, and notable relationships between current/past efforts to address traffic collisions and crash history. The LRSP analyzes crash data on an aggregate basis as well as at specific locations to identify high-crash locations, high-risk locations, and city-wide trends and patterns. The analysis of crash history throughout the City's transportation network allows for opportunities to: 1) identify factors in the transportation network that inhibit safety for all roadway users, 2) improve safety at specific high-crash locations, and 3) develop safety measures using the five E's of safety: Engineering, Enforcement, Education, Emergency Services, and Emerging Technologies to encourage safer driver behavior and better severity outcomes.

The process and analysis performed for the City's LRSP including initial vision and goals for the LRSP development, crash history analysis, and emphasis areas is included in this Plan. The information compiled will provide a foundation for decision making and prioritization for safety countermeasures and projects that enhance safety for all modes.

Seal Beach has been successful at taking steps to enhance all modal safety throughout the City. This is supported by their California Office of Traffic Safety rankings identifying them in the top 20% tier for safety as compared to peer cities in most categories. The City continues these safety efforts in this LRSP by identifying areas of emphasis and systemic recommendations that can be implemented to enhance safety. This LRSP analyzes the most recent range of crash data (January 1, 2016 – December 31, 2019) and roadway improvements to assess historic trends, patterns, and areas of increasing concern.

The intent of the LRSP is to:

- Create greater awareness of road safety and risks
- Reduce the number of fatal and severe-injury crashes
- Develop lasting partnerships
- Support for grant/funding applications, and
- Prioritize investments in traffic safety.

2 Vision and Goals

The Seal Beach LRSP evaluates the transportation network as well as non-infrastructure programs and policies within the City. Mitigation measures are evaluated using criteria to analyze the safety of road users (drivers, bicyclist, and pedestrians), the interaction of modes, influences on the roadway network from adjacent municipalities, and the potential benefits of safety countermeasures. This effort is intended to use historical data to identify trends and develop a toolbox of countermeasures applicable to conditions in the City that can be used for proactive identification and implementation of opportunities, without relying solely on a reaction and response to crashes as they occur.

LRSPs have been effective across the country as part of the effort to reduce fatal and severe-injury crashes because they provide a locally developed and customized roadmap to directly address the most common safety challenges in the given jurisdiction. Following discussions with Seal Beach staff and a review of existing plans and policies for the area, the following Vision, Goals, and Objectives have been established for this project.

> **VISION:** To enhance the transportation network to achieve zero traffic fatalities and serious injury related crashes.

Goal #1: Identify areas with a high risk for collision.
Objectives:
- Identify intersections and segments that would most benefit from mitigation.
- Identify areas of interest with respect to safety concerns for vulnerable users (pedestrians and bicyclists).

Goal #2: Illustrate the value of a comprehensive safety program and the systemic process.
Objectives:
- Demonstrate the systemic process' ability to identify locations with higher risk for collisions based on present characteristics closely associated with severe collisions.
- Demonstrate, through the systemic process, the gaps and data collection activities that can be improved upon.

Goal #3: Plan future safety improvements for near-, mid- and long-term.
Objectives:
- Identify safety countermeasures for specific locations (case studies).
- Identify safety countermeasures that can be applied county-wide.

Goal #4: Define safety projects for future HSIP and other program funding consideration.
Objectives:
- Create the outline for a prioritization process that can be used in this and forth-coming cycles to apply for funding.
- Use the systemic process to create Project Case Studies.
- Use Case Studies to apply for HSIP funding consideration.
- Demonstrate the correlation between the proposed safety countermeasures with the Vision Zero Initiative and the California State Highway Safety Plan.

3 Process

Providing safe, sustainable, and efficient mobility choices for their residents and visitors is a primary goal for the City and their safety partners. The City will continue their collaboration with their safety partners to identify and discuss safety issues within the community through the development of the LRSP and its implementation.

Guidance on the LRSP process is provided at both the national (Federal Highway Administration) and state (California Department of Transportation) level. Both of these organizations have developed a general framework of data and recommendations to be included in an LRSP.

FHWA encourages:

- The establishment of a working group (Stakeholders) to participate in developing a LRSP.
- Review crash, traffic, and roadway data to identify areas of concern.
- Establish goals, priorities, and countermeasures to recommend improvements at spot locations, systemically, and comprehensively.

Caltrans guidance follows a similar outline with the following steps:

- Establish leadership
- Analyze the safety data
- Determine emphasis areas
- Identify strategies
- Prioritize and incorporate strategies
- Evaluate and update the LRSP

This LRSP documents the results of data and information obtained, including the preliminary vision and goals for the LRSP, existing safety efforts, initial crash analysis, and developed emphasis areas. The development of the LRSP recommendations considers the five E's of traffic safety defined by the California Strategic Highway Safety Plan (SHSP): Engineering, Enforcement, Education, Emergency Response, and Emerging Technologies throughout its process.

3.1 Guiding Manuals

The following section describes the analysis process undertaken to evaluate safety within Seal Beach at a systemic level. Using a network screening process, locations within the City that will most likely benefit from safety enhancements will be identified. Using historic crash data, crash risk factors for the entire network are derived. The outcomes will inform the identification and prioritization of engineering and non-infrastructure safety measures that address certain roadway characteristics and related behaviors that contribute to motor vehicle crashes with active transportation users.

This process uses the latest National and State best practices for statistical roadway analysis described as follows.

3.1.1 Local Roads Safety Manual

The *Local Roadway Safety Manual: A Manual for California's Local Road Owners* (Version 1.5, April 2020) purpose is to encourage local agencies to pursue a proactive approach to identifying and analyzing safety issues, while preparing to compete for project funding opportunities. A proactive approach is defined as analyzing the safety of the entire roadway network through either a one-time, network wide analysis, or by routine analyses of the roadway network.[1]

According to the *Local Roadway Safety Manual* (LRSM), "The California Department of Transportation (Caltrans) – Division of Local Assistance is responsible for administering California's federal safety funding intended for local safety improvements."

To provide the most benefit and to be competitive for funding, the analysis leading to countermeasure selection should focus on both intersections and roadway segments and be considerate of roadway characteristics, traffic volumes and surrounding land uses. The result should be a list of locations that are most likely to benefit from cost-effective countermeasures, preferably prioritized by benefit/cost ratio. The manual suggests using a mixture of quantitative and qualitative measures to identify and rank locations that considers both crash frequency and crash rates. These findings should then be screened for patterns such as crash types and severity to aid in the determination of issues causing higher numbers of crashes and the potential countermeasures that could be most effective. Qualitative analysis should include field visits and a review of existing roadway characteristics and devices. The specific roadway context can then be used to assess what conditions may increase safety risk at the site and systematic level.

Countermeasure selection should be supported using Crash Modification Factors (CMFs). These factors are the peer reviewed product of before and after research that quantifies the expected rate of crash reduction that can be expected from a given countermeasure. If more than one countermeasure is under consideration, the LRSM provides guidance on how to apply CMFs appropriately.

3.1.2 Highway Safety Manual

"The AASHTO *Highway Safety Manual* (HSM), published in 2010, presents a variety of methods for quantitatively estimating crash frequency or severity at a variety of locations."[2] This four-part manual is divided into Parts: A) Introduction, Human Factors, and Fundamentals, B) Roadway Safety Management Process, C) Predictive Method, D) Crash Modification Factors.

Chapter 4 of Part B of the HSM discusses the Network Screening process. The Network Screening Process is a tool for an agency to analyze their entire network and identify/rank locations that (based on the implementation of a countermeasure) are most likely to least likely to realize a reduction in the frequency of crashes.

The HSM identifies five steps in this process:[3]

---

[1] Local Roadway Safety Manual (Version 1.5) 2020. Page 5.
[2] AASHTO, Highway Safety Manual, 2010, Washington D.C.,
http://www.highwaysafetymanual.org/Pages/About.aspx
[3] AASHTO. *Highway Safety Manual.* 2010. Washington, DC. Page 4-2.

1. **Establish Focus:** Identify the purpose or intended outcome of the network screening analysis. This decision will influence data needs, the selection of performance measures and the screening method that can be applied.

2. **Identify Network and Establish Reference Populations:** Specify the types of sites or facilities being screened (i.e., segments, intersections, geometrics) and identify groupings of similar sites or facilities.

3. **Select Performance Measures:** There are a variety of performance measures available to evaluate the potential to reduce crash frequency at a site. In this step, the performance measure is selected as a function of the screening focus and the data and analytical tools available.

4. **Select Screening Method:** There are three principle screening methods. Each method has advantages and disadvantages; the most appropriate method for a given situation should be selected.

5. **Screen and Evaluate Results:** The final step in the process is to conduct the screening and analysis and evaluate the results.

The HSM provides several statistical methods for screening roadway networks to identify high risk locations based on overall crash histories. In addition to identifying the total number of crashes, this study uses a method referred to as Critical Crash Rate to analyze the data.

3.2 Analysis Techniques

3.2.1 Crash and Network Screening Analysis

Intersections and roadways were analyzed using four crash metrics:

- Number of Crashes
- Critical Crash Rate (HSM Ch. 4)
- Probability of Specific Crash Types Exceeding Threshold Proportion (HSM Ch. 4)
- Equivalent Property Damage Only (HSM Ch. 4)

The initial steps of the crash analysis established sub-populations of roadway segments and intersections that have similar characteristics. For this study, intersections were grouped by their control type (Signalized, Unsignalized, Roundabout) and segments by their roadway category (Arterial, Collector, Minor Collector, Local). Individual crash rates were calculated for each sub-population. The population level crash rates were then used to assess whether a specific location has more or fewer crashes than expected. These sub-populations were also used to determine typical crash patterns to help identify locations where unusual numbers of specific crash types are seen.

The network screening process ranks intersections and roadway segments by the number of crashes that occurred at each one over the analysis period, and then identifies areas that had more of a given type of crash than would be expected for that type of location. These crash type factors were 1) crash injury (fatal, serious injury, other visible injury, complaint of pain, property damage only), 2) crash type (broadside, rear-end, sideswipe, head-on, hit object, overturned, bicycle, pedestrian, other), 3) environmental factors (lighting, wet roads), and 4) driver behavior (impaired, aggressive, and distracted driving). With these additional factors, the locations were further analyzed and assigned a new rank.

10

From the results of the network screening analyses, a short-list of locations was chosen based on crash activity, crash severity, crash patterns, location type, and area of the City of Seal Beach to provide the greatest variety of locations covering the widest range of safety opportunities for toolbox development. The intent is to populate the safety toolbox with mitigation measures that will be applicable to most of the crash activity in the county. Ten locations will ultimately be selected for mitigation analysis.

3.2.2 Critical Crash Rate (CCR) Analysis

Reviewing the number of collisions at a location is a good way to understand the cost to society incurred at the local level but does not give a complete indication of the level of risk for those who use that intersection or roadway segment on a daily basis. The Highway Safety Manual describes the Critical Crash Rate method, which provides a statistical review of locations to determine where risk is higher than that experienced by other similar locations. It is also the first step in analyzing for patterns that may suggest systemic issues that can be addressed at that location, and proactively at others to prevent new safety challenges from emerging.

The Critical Crash Rate compares the observed crash rate to the expected crash rate at a particular location based on facility type and volume using a locally calculated average crash rate for the specific type of intersection or roadway segment being analyzed. Based on traffic volumes and a weighted citywide crash rate for each facility type, a critical crash rate threshold is established at the 95% confidence level to determine locations with higher crash rates that are unlikely to be random. The threshold is calculated for each location individually based on its traffic volume and the crash profile of similar facilities.

Figure 1: Critical Crash Rate Formula

$$R_{c,i} = R_a + \left[P \times \sqrt{\frac{R_a}{MEV_i}} \right] + \left[\frac{1}{(2 \times (MEV_i))} \right]$$

Where,

$R_{c,i}$ = Critical crash rate for intersection i

R_a = Weighted average crash rate for reference population

P = P-value for corresponding confidence level

MEV_i = Million entering vehicles for intersection i

Source: Highway Safety Manual

Data Needs

CCR can be calculated using:

- Daily entering volume for intersections, or vehicle miles traveled (VMT) for roadway segments,
- Intersection control types to separate them into like populations,
- Roadway functional classification to separate them into like populations,
- Collision records in GIS or tabular form including coordinates or linear measures.

Strengths

- Reduces low volume exaggeration
- Considers variance
- Establishes comparison threshold

3.2.3 Equivalent Property Damage Only (EPDO)

The equivalent property damage only (EPDO) method is described in the Highway Safety Manual. This method assigns weighting factors to crashes based on injury level (severe, injury, property damage only) to develop a property damage only score. In this analysis, the injury crash costs were calculated for each location (based on the latest Caltrans injury costs). This figure is then divided by the injury cost for a property damage only crash. The resulting number is the equivalent number of property damage only crashes at each site. This figure allows all locations to be compared based on injury crash costs. (Highway Safety Manual, Chapter 4).

4 Safety Partners

As part of the LRSP, local stakeholders were included in the process to ensure the local perspective was kept at the forefront of this planning effort. In addition to the Project Team which included City Staff from the Public Works Department, a stakeholder group was organized. This group consisted of members from Seal Beach Police Department, Orange County Fire Department, Seal Beach Naval Weapons Station, Orange County Bike Coalition, Golden Rain Foundation, and Los Alamitos Unified School District

These leaders in the City and community were called together to offer insight on the safety issues present in the city's transportation network. After the initial network screening and safety analysis, the stakeholder group met to discuss potential countermeasures and challenge areas. The summary of the stakeholder meeting(s) are outlined below.

4.1 Stakeholder Meeting #1

The first stakeholder meeting was conducted virtually using the Zoom platform on September 28, 2021. At the meeting, stakeholders were introduced to the project and provided an overview of the data used, the required outputs, and the potential outcomes of the study.

In addition to the overview, Stakeholders were asked to provide local insight and knowledge at 10 "case study" locations that were identified after the initial network screening and crash analysis process. Potential countermeasures were recommended and discussed. Additionally, potential emphasis/challenge areas were proposed during the meeting to include vulnerable users (pedestrians and bicyclists), aging drivers, speeders and school zones.

Stakeholder feedback regarding the plan and recommendations were reviewed and incorporated into the study process for the development of the LRSP. Most of the feedback received expressed a strong desire to prioritize bicycle safety throughout the City.

5 Existing Efforts

Existing plans, policies, and projects that were recently completed, planned, or are on-going within the City of Seal Beach were compiled at the start of the LRSP process in order to gain perspective on the existing efforts for transportation-related improvements within the City. High-level key points regarding transportation improvements and safety-related topics were identified to inform decision making in this LRSP. Information reviewed included the following:

- **Seal Beach General Plan-Circulation Element (2003 – Seal Beach)**: A long-range plan that incorporates existing traffic conditions, future traffic impacts, and future circulation recommendations.

- **Main Street Specific Plan (1996 – Seal Beach):** A strategic plan that focuses on moving people by multiple transportation modes.

- **Specific Plan for the Development of Pacific Electric Right of Way(1974):** A specific plan for the development of a portion of the abandoned Pacific Electric right-of-way.

13

6 Data Summary

As a data driven process, utilizing the most recent and accurate data is crucial. The following section describes the data inputs used for the analysis process of this LRSP.

6.1 Roadway Network

The collision analysis is built upon the existing roadway network. The base network was derived from the Caltrans California Road System (CRS). **Figure 2** illustrates Seal Beach's roadway network categorized using Caltrans' Classification System. This classification assigned to each corridor roadway segment as either Other Principal Arterial, Minor Arterial, Major Collector, or Local road is used in the analysis process. Ultimately, corridors will be compared to roadway segments with similar designations.

6.2 Intersections

The collision analysis requires each intersection be classified by type: Signalized, Unsignalized, or Roundabouts. The safety analysis compares intersection safety performance to locations with similar control types. This information is also displayed in **Figure 2**.

6.3 Count Data

Vehicular count data is used as part of the analysis process to evaluate the impact of traffic and understand the natural hierarchy of the roadway network. Traffic volume data utilized for this project was pulled from the Master Plan of Arterial Highways volume model data from OCTA. For locations without volume, other resources were utilized to identify a reasonable assumption for individual corridors and classification types.

6.4 Crash Data

Collision data was collected from Transportation Injury Mapping System Software (TIMS) and Statewide Integrated Traffic Record System (SWITRS) for the period from January 1, 2016 through December 31, 2019 to have a complete set of collision data for analysis. We utilize four-years of data instead of the standard three to provide more history to evaluate trends or patterns. Analysis of the raw collision data is the first step in understanding the specific and systemic challenges faced throughout the City. Analyzing the four years of data provided insight on the following collision trends and patterns. The locations and amount of fatal and severe injury collisions are displayed in **Figure 3**. The density of collisions at intersections and along roadway segments is shown in **Figure 4**.

Figure 2: Functional Classification (CRS) and Intersection Type as of 2020

Legend
- Signalized Intersection
- Roundabout
- Other Principal Arterial
- Minor Arterial
- Major Collector
- Local
- Seal Beach Boundary
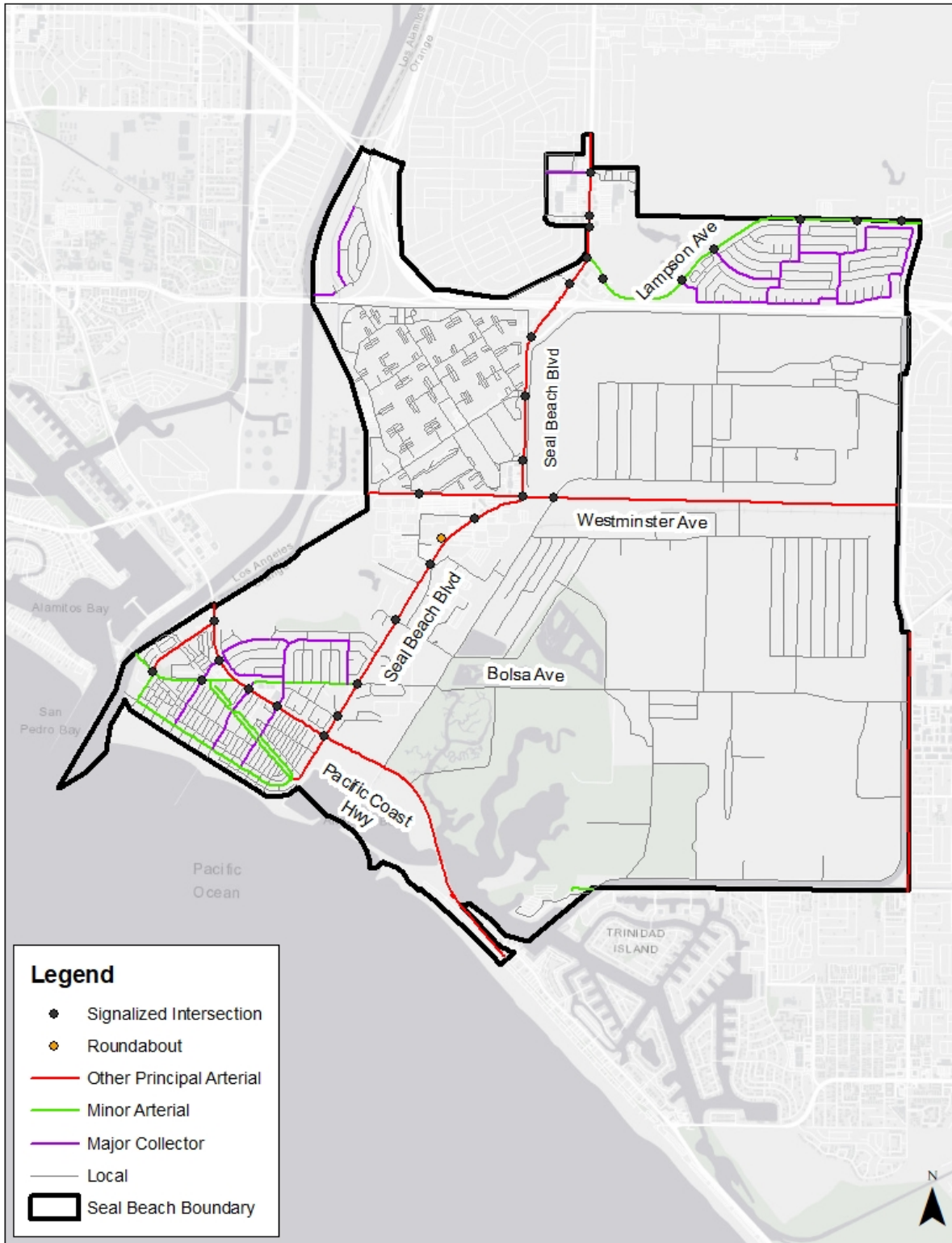
Figure 3: Fatal and Severe Injury Collisions (2016-2019)

Lampson Ave

Seal Beach Blvd

Westminster Ave

2 fatalities

Seal Beach Blvd

Bolsa Ave

Pacific Coast Hwy

Pacific Ocean

Alamitos Bay

San Pedro Bay

Los Angeles

Los Al Orange

TRINIDAD ISLAND

Legend

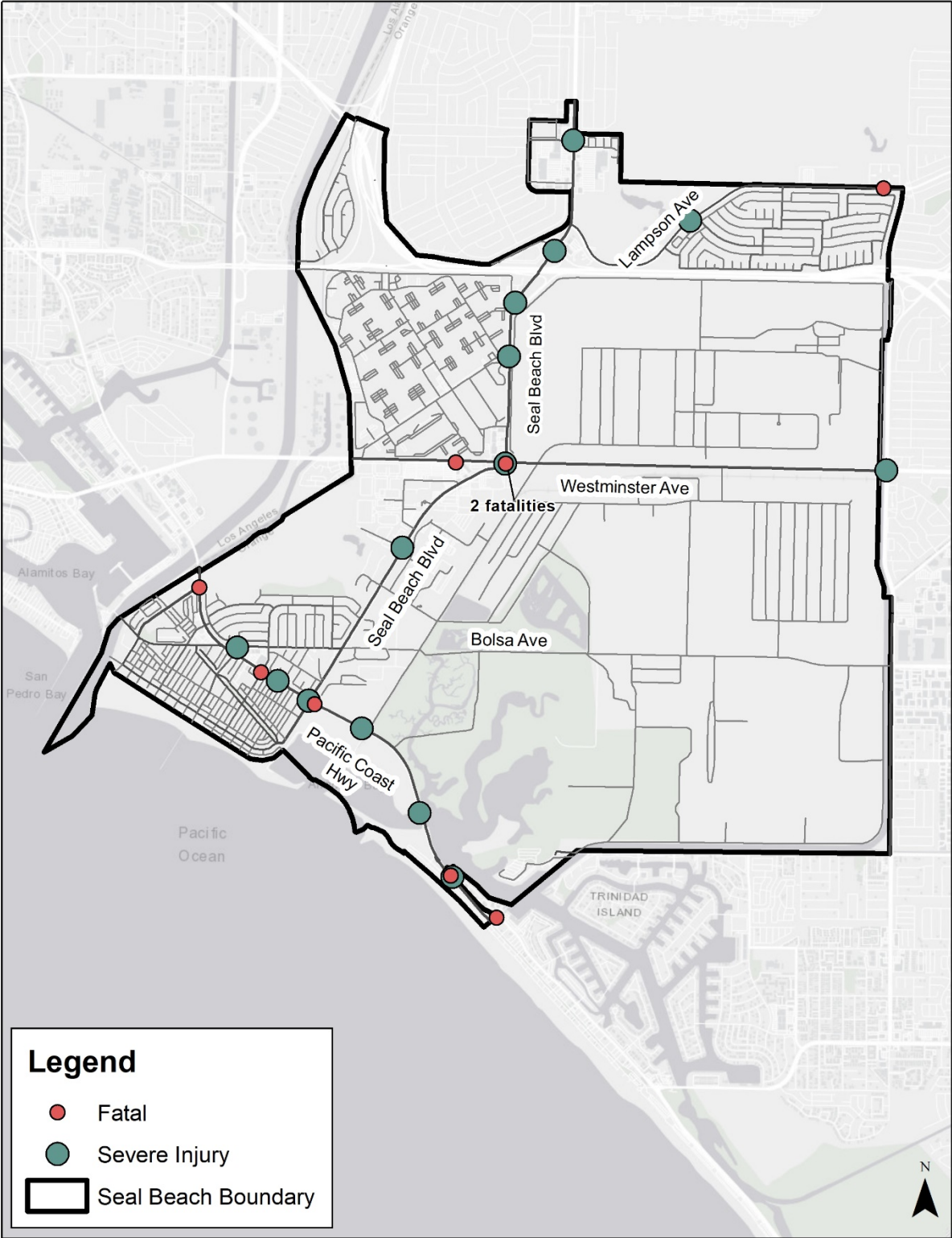● Fatal

● Severe Injury

▭ Seal Beach Boundary

N

Figure 4: Density of all Crashes at Intersections and Segments (2016-2019)
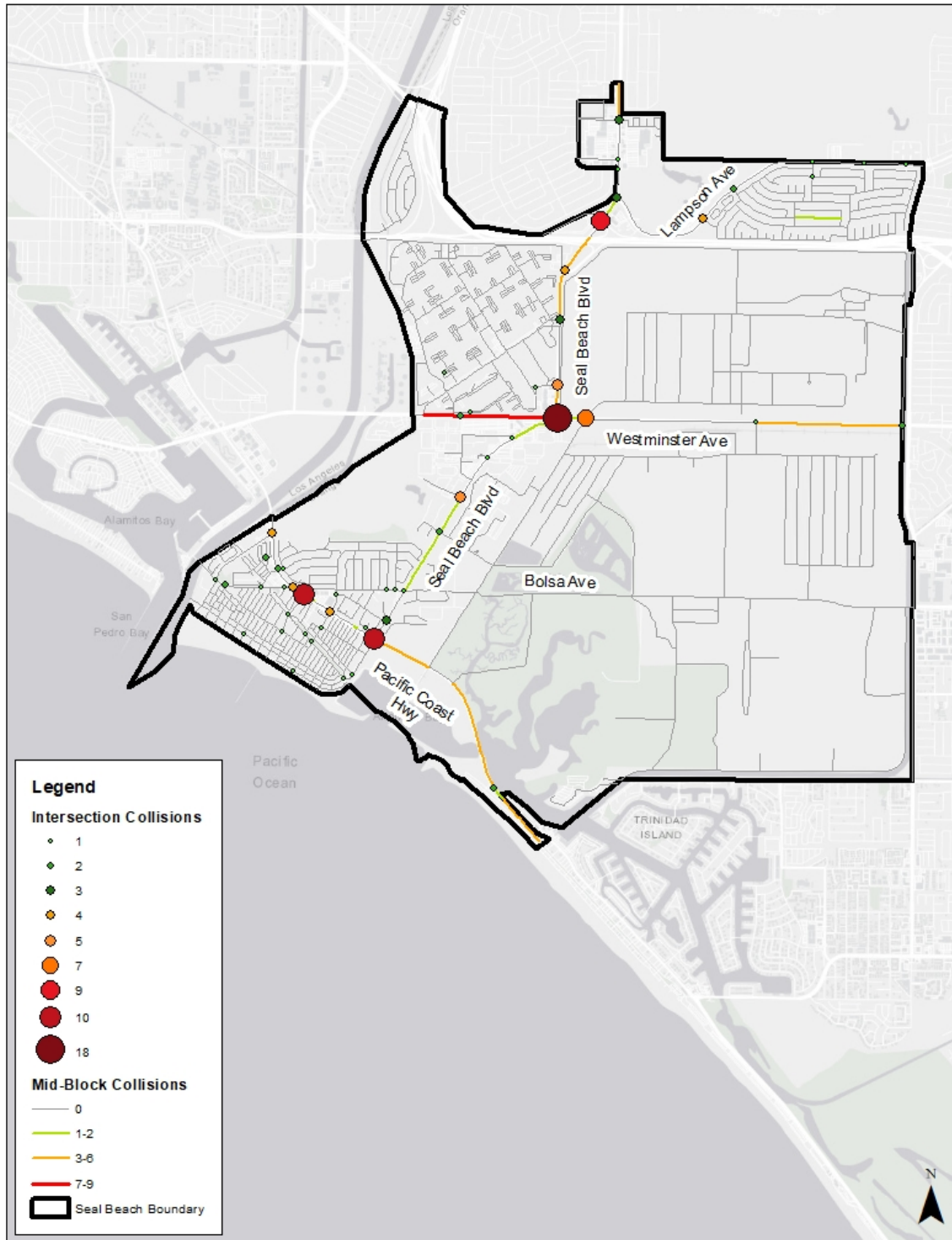
7 Crash Safety Trends

The following section breaks down the crash data for the period from January 1, 2016 through December 31, 2019 by a variety of input factors and user types. This information will be used to highlight areas of concern for the City.

7.1 All Crashes

This report utilized collision data for a four-year period to provide a better understanding of trends and to reflect the patterns in crashes that have occurred on City streets. New data is added to the system in an ongoing basis which means that each time the City updates the analysis, a full 4-year draw from the database, rather than just adding records from the last query should be standard practice. Data used for this report were extracted from Transportation Injury Mapping System (TIMS) and Statewide Integrated Traffic Records System (SWITRS) on July 9, 2021 and was current as of that date. Collision data from January 1, 2016 through December 31, 2019 as reported to TIMS from the local enforcement indicated that during this time there were 512 collisions recorded within Seal Beach. At the time of data collection, data for 2020 was not available on the TIMS database.

During this time, the most common occurring collision types were Rear-End (33%) and Broadside (21%). The total number of collisions have been trending downward since 2016, with a significant 24% drop from 2016 to 2019.

Figure 5: Crash Type by Year (2016-2019)
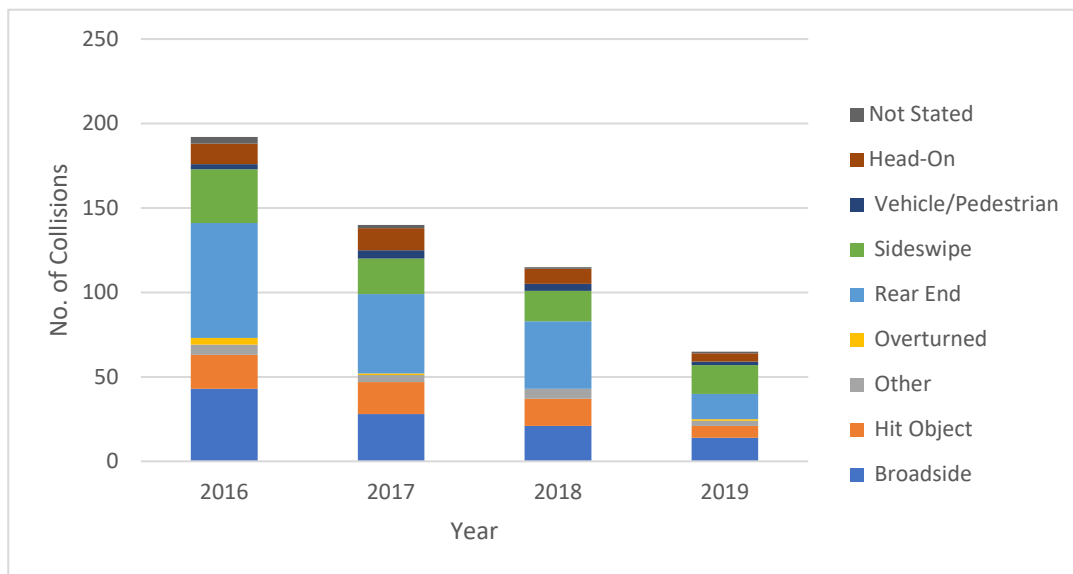
7.2 Fatalities

During the study period, 9 fatal crashes occurred, as seen in **Figure 3**. One of the bicycle fatal crashes occurred at night in an area without streetlights. The remaining three took place during daytime.

Table 1: Injury Crashes Categorized by Modes Involved (2016-2019)

Involved With	# of Fatal Collisions	# of Severe Injury Collisions	# of Other Visible Injury Collisions	# of Complaint of Pain Collisions	# of Property Damage Only Collisions	TOTAL
Vehicle	4	13	50	129	275	470
Bicycle	2	1	9	12	0	24
Pedestrian	3	0	4	11	1	18
TOTAL	9	14	63	152	276	**514**

The cause of the fatal & severe injury collisions is shown in **Table 2** below. The most common cause for fatal and severe injury collisions is driving or bicycling under the influence (33%), followed by unknown causes, automobile right of way violations, and unsafe speed.

Table 2: Fatal & Severe Injury Collisions by Cause (2016-2019)

Collision Cause	# of Fatal Collisions	# of Severe Injury Collisions
Driving or Bicycling Under the Influence of Alcohol or Drug	3	5
Unknown	2	2
Automobile Right of Way	1	1
Pedestrian Violation	2	-
Pedestrian Right of Way	1	-
Unsafe Speed	-	3
Improper Turning	-	1
Traffic Signals and Signs	-	1
Unsafe Lane Change	-	1

7.3 Injury Levels

Two-thirds (66%) of the crashes reported during the time-period resulted in property damage only. Fatalities and severe injuries totaled less than 4% of all crashes.

Figure 6: Crashes by Injury Levels (2016-2019)

Legend:
- Property Damage Only (PDO) (PDO collisions not included on TIMS)
- Injury (Complaint of Pain)
- Injury (Other Visible)
- Injury (Severe)
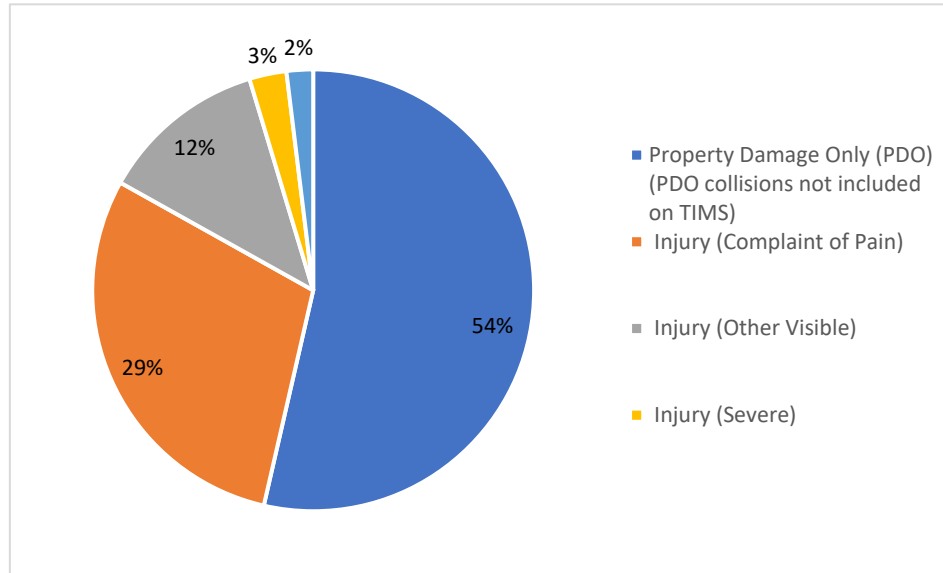
7.4 Cause of Crash

The highest cause of collision in Seal Beach is unsafe speed at 35%, followed by improper turning at 13% and driving or bicycling under the influence at 12%. Issues with automobile right of way also had a substantial impact on the City, comprising 9% of the collisions. Drivers ignoring traffic signals and signs compromised 6% of the collisions.

Figure 7: Cause of Crashes (2016-2019)

35%	Unsafe Speed
13%	Improper Turning
12%	Driving or Bicycling Under the Influence of Alcohol or Drug
10%	Unknown
9%	Automobile Right of Way
6%	Traffic Signals and Signs
5%	Unsafe Starting or Backing
2%	Other Than Driver (or Pedestrian)
2%	Pedestrian Right of Way
1%	Other Improper Driving
1%	Unsafe Lane Change
1%	Wrong Side of Road
1%	Following Too Closely
1%	Other Hazardous Violation
0.39%	Pedestrian Violation
0.39%	Fell Asleep

7.5 Vulnerable Users

7.5.1 Pedestrians
18 pedestrian involved collisions occurred during the study period, resulting in 3 fatal collisions and 15 resulting in some level of injury. About half of the pedestrian collisions occurred at night and roughly 75% of them occurred in a crosswalk.

7.5.2 Bicycle
During the study period, twenty-four (24) collisions involving bicycles were reported. Of these, two (2) were fatal, and one (1) resulted in severe injuries. The remaining collisions resulted in 21 with some form of reported injury or pain. 80% of the collisions occurred during daylight. Most of these collisions were attributed to improper turning and automobile right-of-way violations.

Figure 8: Pedestrian and Bicycle Crashes (2016-2019)
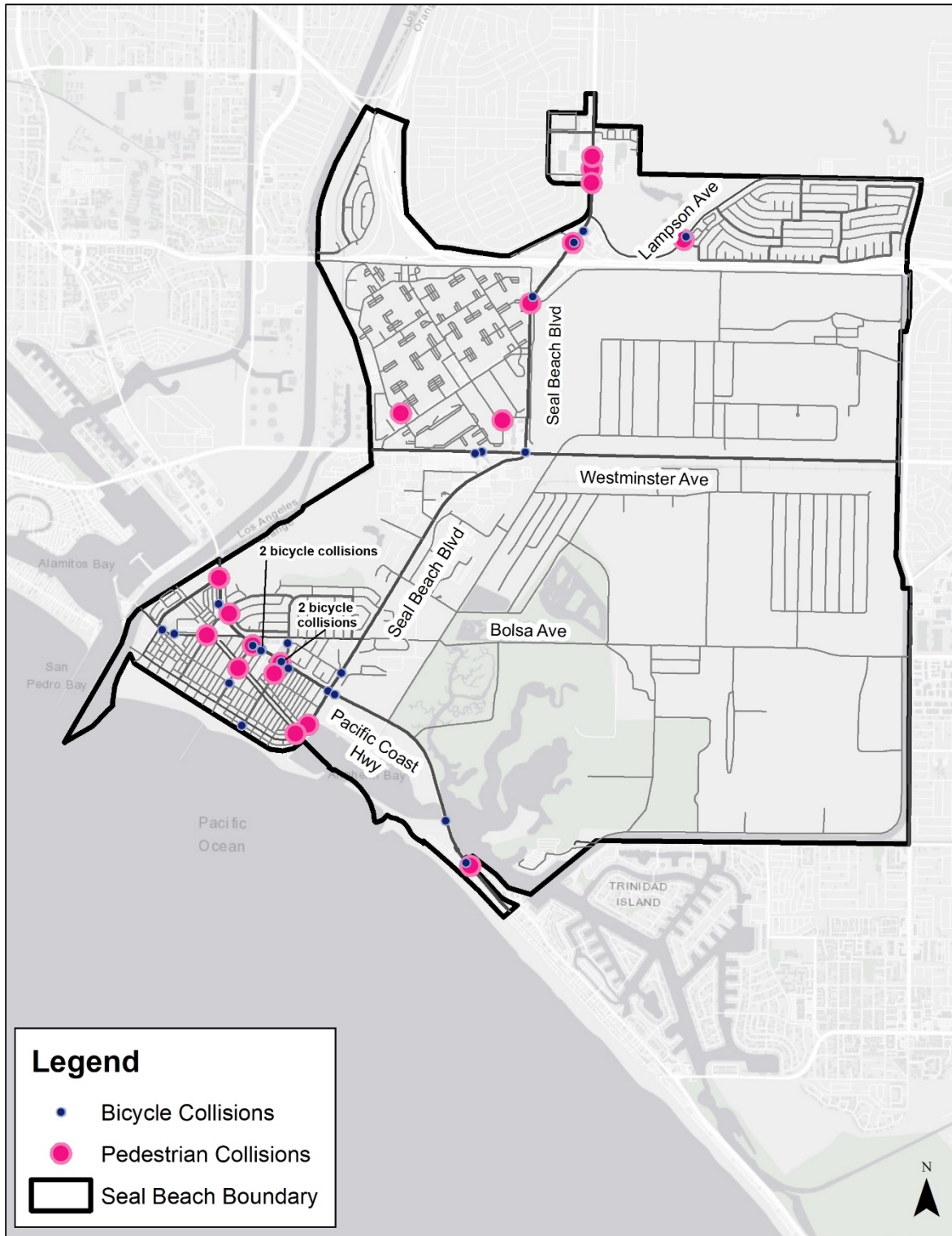
7.6 Significant Trends for Passenger Vehicles

- 62 percent of collisions (322) occurred during the day. Many of these collisions still occurred at or near intersections.
- Only eight percent of collisions (45) occurred at night without streetlights, streetlights not functioning (streetlights are owned and maintained by SCE), or during dusk/dawn. Many streetlights in the city operate on ambient light. Many of these collisions still occurred at or near intersections.
- 25 percent of drivers at fault were aged 16 through 25.
- 21 percent of the drivers at fault were aged 65 and older. 30% of drivers at fault were aged 55 and older.

7.7 Behavioral

7.7.1 Driving Under the Influence
17% of all collisions (85), were reported as the driver being under the influence of drugs or alcohol. More than half of collisions took place on arterial roads. 2 of these collisions resulted in fatalities, 5 resulted in severe injuries, and 31 resulted in other types of injuries. These collisions were concentrated on Seal Beach Bl, Westminster Ave, and in the downtown Seal Beach area.

7.7.2 Aggressive Driving
Thirty-five (35) percent of the collisions were primarily caused by drivers traveling at unsafe speed or following too closely. These types of collisions are located primarily on major arterials.

7.8 Statewide Comparison

Due to the availability of data, a comparison of crash data to the State averages could only be conducted for data from 2015-2018. **These numbers may vary slightly from those mentioned previously, due to the differences in the years of the study period.** The following are areas where Seal Beach's crash rates are higher than those of the State.

Table 3: Comparison of Statewide and Seal Beach Crashes (2015-2018)

Challenge Area	Statewide %	Seal Beach %	Difference
Seal Beach has a Higher Percentage of Collisions			
Aggressive Driving	33.2%	53.7%	20.5%
Impaired Driving	23.5%	34.1%	10.6%
Improper Use of Occupant Protection	13.8%	22%	8.2%
Distracted Driving	4.7%	9.8%	5.1%
Motorcyclists	21.7%	26.8%	5.1%
Aging Drivers	13.2%	17.1%	3.9%
Work Zones	1.3%	4.9%	3.6%
Lane Departure	42%	43.9%	1.9%

Challenge Area	Statewide %	Seal Beach %	Difference
Seal Beach has a Low Percentage of Collisions			
Commercial Vehicles	6.5%	4.9%	-1.6%
Bicyclists	7.2%	2.4%	-4.8%
Pedestrians	19.3%	9.8%	-9.5%
Young Drivers	12.2%	2.4%	-9.8%
Intersections	23.8%	9.8%	-14%

8 Emphasis Areas

Emphasis Areas are places where the City of Seal Beach can strategically focus efforts to have a large impact on transportation safety. Emphasis areas were developed by revisiting the Vision and Goals developed at the onset of this planning process and comparing them with the trends and patterns identified in the crash analysis. Where these areas aligned, or major challenges were observed, Emphasis Areas and strategies were developed. While the statewide comparison in Section 7.8 was used to identify potential emphasis areas, not all challenge areas where Seal Beach experienced higher rates than the statewide average resulted in an emphasis area focus.

Emphasis Area #1: Aggressive Driving

Description: Aggressive driving, as defined by the Caltrans SHSP, includes several behaviors including speeding, tailgating, and ignoring traffic signals and signs. Aggressive driving accounted for 53.7% of the City's crashes resulting in severe injuries or fatalities, versus 33.2% statewide.

Goal for Emphasis Area #1:

- Reduce the number of crashes due to aggressive driving in the City
- Identify hot spots and priority corridors for aggressive driving
- Apply for funding and implement countermeasures to address aggressive driving

Strategies for Emphasis Area #1:

- Educational campaign to target aggressive drivers
- Increased law enforcement presence near aggressive driving hotspots
- Increased coordination with law enforcement and other community organizations

These strategies will be implemented by the City, law enforcement, and community organizations. Funding sources for these strategies may include OTS, NHTSA, ATP and SB1 grant programs.

Emphasis Area #2: Impaired Driving

Description: Impaired driving crashes are a high priority challenge area within the Caltrans SHSP. Caltrans defines these as crashes where any evidence of drug or alcohol use by the driver is present, even if the driver was not over the legal limit. 34.1% of impaired driving collisions resulted in severe injuries or death compared to 23.5% for the state average.

Goal for Emphasis Area #2

- Reduce the number of crashes attributed to impaired driving
- Identify hot spots and priority corridors for countermeasures to reduce impaired driving
- Apply for funding to implement countermeasures to reduce impaired driving crashes

Strategies for Emphasis Area #2:

- Authorize, publicize, and conduct sobriety checkpoints programs
- Implement an impaired driving education campaign
- Develop educational programs targeting specific audiences based on age group
- Additional enforcement presence

- Create effective media campaigns in both visual and print media

Emphasis Area #3: Improper Use of Occupant Protection

Description: Caltrans defined Improper Use of Occupant Protection as any collision involving victims who did not use or improperly used a safety belt or child restraint. 22% of fatal and severe injury collisions in Seal Beach involved improper use of occupant protection, compared to 13.8% statewide.

Goal for Emphasis Area #3:
- Reduce the number of collisions involving improper use of occupant protection
- Identify high areas of collisions involving improper use of occupant protection
- Apply for funding and implement countermeasures at these collision hotspots

Strategies for Emphasis Area #3:
- Strategic enforcement of existing seat belt laws at hotspot locations
- Strategic messaging campaign about seat belt laws and seat belt safety
- Establish education and training program to improve occupant protection compliance

These strategies will be implemented by the City, law enforcement, and local community organizations. Funding sources for these strategies may include, HSIP, OTS, and SB1 grant programs.

Emphasis Area #4: Distracted Driving

Description: Caltrans defined Distracted Driving as any collisions where the driver of a motor vehicle was not paying attention or using an electronic device. 9.8% of fatal and severe injury collisions in Seal Beach involved improper use of occupant protection, compared to 5.1% statewide.

Goal for Emphasis Area #4:
- Reduce the number of collisions involving distracted driving
- Identify high areas of collisions involving distracted driving
- Apply for funding and implement countermeasures at these collision hotspots

Strategies for Emphasis Area #4:
- Strategic enforcement of cell phone use laws at hotspot locations
- Strategic messaging campaign about cell phone laws and driver safety
- Establish education and training program to reduce distracted driving and increase compliance of cell phone use laws

These strategies will be implemented by the City, law enforcement, and local community organizations. Funding sources for these strategies may include, HSIP, OTS, and SB1 grant programs.

Emphasis Area #5:Aging Drivers (65+)

Description: Collisions involving aging drivers, as defined by the Caltrans SHSP, includes instances where the driver of the motor vehicles is 65 years or older. During the study period,

17.1% of collisions resulting in fatalities or severe injuries were attributed to drivers 65+, versus a state average of 13.2%.

Goal for Emphasis Area #5:

- Reduce the number of crashes involving aging drivers
- Identify hot spots and priority corridors for aging drivers
- Apply for funding and implement countermeasures to address collisions involving aging drivers

Strategies for Emphasis Area #5:

- Educational campaign to target aging drivers with messaging about traffic safety either through city programs or programming provided at Leisure World
- Increased coordination with law enforcement and other community organizations

Emphasis Area #6:Lane Departure Collisions

Description: Lane departure collisions, as defined by the SHSP, includes head-on, hit object, and overturned collisions. It includes instances where a vehicle runs off the road and crosses into the opposing lane prior to the collision. These collisions account for 43.9% of the fatal and sever crashes in the city, versus 42.0% statewide.

Goal for Emphasis Area #6:
• Reduce the number of lane departure collisions
• Identify hot spots for lane departure collisions
• Apply for funding and implement countermeasures on City roads

Strategies for Emphasis Area #6:
• Address lane departure collisions by implementing proven countermeasures
• Identify priority corridors for lane departure collisions and implement countermeasures on these corridors

These strategies will be implemented by the City, law enforcement, and local community organizations. Funding sources for these strategies may include, HSIP, OTS, and SB1 grant programs.

Emphasis Area #7:Bicyclists

Description: Any instance where a motor vehicle is involved in a collision with a bicyclist is defined as a high priority challenge area by the SHSP. Despite bicycle collisions accounting for 2.4% of fatal & severe injuries compared to 7.2% statewide (based on 2016-2018 SHSP data), this area was emphasized to account for the severity of the bicycle collisions that occurred and the overall safety of bicyclists.

Goal for Emphasis Area #7:
• Reduce the number of collisions involving bicyclists
• Identify high areas of bicycle collisions
• Apply for funding and implement countermeasures at bicycle collision hotspots

Strategies for Emphasis Area #7:
• Implement bicycle priority detection at certain key locations
• Implement bicycle infrastructure at key locations

• Install bicycle counters to determine where high bicycle volume locations are
• Establish education and training program to improve bicyclist safety in the City

These strategies can be implemented by the City with assistance from emergency services and community organizations.

9 Recommendations

The following provides more information on general identified issues, crash modification factors, improvements, and countermeasures identified for the City of Seal Beach, as well as for specific project locations identified as part of this analysis.

9.1 Infrastructure Improvements

9.1.1 Countermeasure Selection Process

Part D of the HSM provides information on Crash Modification Factors (CMF) for roadway segments, intersections, interchanges, special facilities, and road networks. CMFs are used to estimate the safety effects of highway improvements and apply CMFs to compare and select highway safety improvements. A CMF less than 1.0 indicates that a treatment has the potential to reduce collisions. A CMF greater than 1.0 indicates that a treatment has the potential to increase collisions. The application of an appropriate CMF can influence the decision to implement a particular project, and the misapplication of CMFs can lead to misinformed decisions. Key factors to consider when applying CMFs include:

1. Selection of an appropriate CMF,
2. Estimation of collisions without treatment,
3. Application of CMFs by type and severity, and
4. Estimation of the combined effect for multiple treatments

Examples of Safety Countermeasures can be found through several sources. This Report utilizes the countermeasures found in the California LRSM (https://dot.ca.gov/-/media/dot-media/programs/local-assistance/documents/hsip/2020/lrsm2020.pdf) and the CMF Clearinghouse (CMF CH) website (http://www.cmfclearinghouse.org/).

Countermeasures for each of the Safety Project Case Studies are based on the data analysis and site visits. Additional countermeasures were identified for the high-level issues on a city-wide level and are discussed in Section 9.3 of this Report.

9.1.2 Safety Project Case Studies

From the city-wide analysis, ten project case study locations were selected for further analysis and recommendation. For each of these locations, Safety Project Case Studies were developed to provide a case study to organize projects when applying for funding. These locations were identified through the analysis process based on their collision histories, the observed crash patterns, and their differing characteristics to provide the most insight into potential systemic safety countermeasures that the City can employ to achieve the most cost-effective safety benefits.

A Safety Project Case Study was developed for these locations:

1. Segment: Westminster Ave (City Limits to Seal Beach Blvd)

2. Segment: Seal Beach Blvd (Bradbury to Rossmoor Center Way)
3. Segment: Candleberry Ave (Fuchsia St to Marigold St)
4. Signalized Intersection: Seal Beach Blvd & Westminster Ave
5. Signalized Intersection: Seal Beach Blvd & Golden Rain Rd
6. Signalized Intersection: Seal Beach Blvd & Bolsa Ave
7. Signalized Intersection: Tulip St & Lampson Ave
8. Unsignalized Intersection: Seal Beach Blvd & Electric Ave
9. Unsignalized Intersection: Central Avenue & Marina Dr
10. Unsignalized Intersection: Marina Dr & Pacific Coast Highway

Appendix A contains the Case Study pages which summarize conditions at each location, and potentially beneficial countermeasures. Countermeasures were subjected to a benefit/cost assessment and scored according to their potential return on investment. These case studies can be used to select the most appropriate countermeasure, and to potentially phase improvements over the longer-term. The potential benefit of these countermeasures at locations with similar design characteristics can then be extrapolated regardless of crash history. These case study sheets can also be used to position the City for future grant funding opportunities.

9.2 Non-Infrastructure Improvements

Non-Infrastructure recommendations have also been proven to impact safety conditions of the transportation network. These education and enforcement measure recommendations are developed to target specific behavior types and populations. Based on a review of the existing plans, policies, and programs within the City, the following topics have been reviewed to identify areas where the City can implement or enhance safety efforts.

Table 4: Summary of Programs, Policies, and Practices for the City of Seal Beach

Summary of Programs, Policies, and Practices for City of Seal Beach		
Topic	Current Status	Implement or Enhance
COMMITTEES / ROLES		
Active Transportation Coordinator	None currently	Consider adding role, especially if active transportation master plan is adopted
Safety or Active Advisory Committee	None currently	Consider Implementing Safety/Active Advisory Committee
Active Transportation Safety Education Program	Currently offering traffic safety bicycle safety awareness	Monitor current impacts, modify and expand current efforts as need be

Summary of Programs, Policies, and Practices for City of Seal Beach		
Topic	Current Status	Implement or Enhance
POLICY / PLANS		
Complete Streets	No current plans, regulations or policies implemented	Consider implementing plan or developer requirements for sidewalks
Traffic Impact Fees	Currently implementing	Monitor roll out of current fees, modify if necessary
Safe Routes to School	No current plans, regulations or policies implemented	Identify areas of concern and seek funding opportunities to enhance safety.
Traffic Calming Policies	No current traffic calming policies before raising speed limits.	Implement traffic calming measures throughout city where feasible
Speed Surveys	Conducts regular speed surveys. Speed limits are current.	Continue to update as required by California Vehicle Code; review new guidance from Assembly Bill 43
Warrants for Stop Signs and Signals	City policy based on CA MUTCD	Continue to use CA MUTCD warrants; identify areas where additional warrants can be used (such as flashing stop signs)
Planning for Density and Walkable Areas	No current plans, regulations or policies implemented	Implement localized plans for transit-oriented development
Transportation Demand Management (TDM)/Vehicle Miles Travelled (VMT) Reduction	TDM: Goals, Objectives, and Policies are addressed in City's Circulation element. VMT: Addressed in Circulation Element, and Traffic Impact Guidelines address VMTs to follow CEQA.	Continue to support TDM plans; monitor VMT reduction strategies in conjunction with traffic impact guidelines.
Traffic Crash Monitoring	Collision data is kept with the Seal Beach Police Department Records.	Continue monitoring crash data; Digitize collision data in GIS database
Active Transportation Master Plan	No current plans or policies implemented	Consider implementing active transportation

Summary of Programs, Policies, and Practices for City of Seal Beach		
Topic	Current Status	Implement or Enhance
		master plan to improve bike/pedestrian safety and reduce conflicts with vehicles.
Pedestrian Signal Timing	No current plans, regulations or policies implemented	Implement priority signaling at key intersections; review current timings for accuracy and appropriateness
Crosswalks/Pedestrian Infrastructure	High visibility crosswalks are standard. School zone crosswalks implemented. Pedestrian countdown heads are being updated as part of routine maintenance. Town Ctr Drive, Seal Beach Bl near McGaugh Elementary School, Adolfo Lopez has restricted ped movements due to vehicle turning movements.	Continue to implement countdown heads; evaluate interventions at locations with restricted peds movements; continue to close gaps in pedestrian network
Enforcement	Coordination with Westminster, Los Alamitos, Cypress, OCSD, Fountain valley, and any other agency who request assistance. At least one check point a year and five saturation patrols yearly, run by the Police Department. Enforced ordinances for helmet use/riding on sidewalks, and jaywalking.	Continue with current enforcement programs and continually monitor the effectiveness of these programs.
Bicycle Policy	Maintenance of city streets and Cal trans is responsible for PCH. No current regulations implemented.	Develop bicycle-friendly policies that encourage bicycling for leisure and as an alternative transportation mode.
Transit	Transit vehicles currently accommodate bicycles. No current plans, regulations or policies implemented to ensure safe and equitable access to transit stops.	Implement policies to integrate bicycle infrastructure with transit, such as bike racks, safety improvements near popular stops.

Summary of Programs, Policies, and Practices for City of Seal Beach		
Topic	Current Status	Implement or Enhance
Wayfinding	Main St Revitalization project planned to implement wayfinding along Main St (in progress)	Monitor effectiveness of wayfinding, expand to popular locations.
DATA COLLECTION / INVENTORY		
Inventory of Pedestrian Signs and Signals	Inventory is kept with the Police Department and with Public Works	Continue to maintain and update inventory; digitize in GIS database if not done so already.
Inventory/Mapping of Active Transportation Routes	No current plans, regulations or policies implemented. Inventory is based on request.	Complete inventory of existing infrastructure, digitize in GIS and possibly include on wayfinding infrastructure.
Crossroad Database	City does not use	Implement regular updates of collision data into database.
Active Transportation Volume Counting	Based on Coastal Commission's request. Only applies to the beach lots and Main Street	Continue traffic & active transportation volume collection; utilize this data in collision analysis
COORDINATION / FEEDBACK		
Citizen Feedback	Police Department does take citizen feedback for roadway safety. No way for City to track this feedback. 'Ask City Hall' website allows to give feedback.	Continue to seek out resident feedback and incorporate into policies and implementations; expand opportunities for easy feedback from citizens.
Institutional Coordination	Interdepartmental coordination between City departments in City Hall. Leisure World and Naval Weapons Station coordination as well. City liaison for Seal Beach Chamber of Commerce.	Maintain formal coordination between city departments; involve in collision analysis and planning process.
School Engagement	City coordinates with Los Alamitos USD.	Continue to coordinate with schools and district,

Summary of Programs, Policies, and Practices for City of Seal Beach		
Topic	Current Status	Implement or Enhance
		involve in collision analysis and planning process
Law Enforcement/Emergency Service Engagement	Currently active in City transportation planning. Local health agencies are not engaged in City transportation planning.	Continue to coordinate with City police and County Fire; involve in collision analysis and planning process. Engage health agencies as stakeholder.

9.3 General City-wide Countermeasure Toolbox

This evaluation considered city-wide trends to identify countermeasures that would likely provide the most benefit with widespread implementation. Countermeasures for each of the 5E Safety Strategies (Engineering, Enforcement, Education, Emergency Services, and Emerging Technologies) were identified. These include both infrastructure recommendations, non-infrastructure recommendations. **Table 5** outlines the city-wide safety project recommendations, which is also referred to as the "Countermeasure Toolbox". Within the toolbox, the description of the countermeasure along with its LRSM ID number is listed. The next column, Crash Reduction Factor (CRF) also known as Crash Modification Factor (CMF), are "multiplicative factors used to estimate the expected number of crashes after implementing a given countermeasure at a specific site (the lower the CMF, the greater the expected reduction in crashes)[4]."

For each of these countermeasures, a planning level benefit/cost analysis was completed. Applying the benefit/cost at the city-wide level was estimated assuming some randomness in crash distribution. The location characteristics, such as whether there is a traffic signal, and the type of crashes, were used at the city-wide level to calculate an average cost of crashes that the countermeasure might reduce. The benefit per location was then factored out to a 20-year life-cycle savings, with an Opinion of Project Probable Cost (OPCC) for the initial installation costs and a per-year maintenance cost estimate. The cost shown in **Table 5** should be considered initial planning costs using 2022 dollars and not assumed final. **Table 6** describes additional recommendations for the remaining categories of traffic safety which includes Enforcement, Education, Emergency Services, and Emerging Technology.

---

[4] LRSM Version 1.5 (2020), Page 27

Table 5: City-wide Recommended Safety Projects (Countermeasure Toolbox)

COUNTERMEASURES	LRSM/CMF ID	CRF	PER UNIT COST	UNIT
Convert intersection to roundabout (from 2-way stop or yield control)	NS05	35%	$80,000	Per Intersection
Install/upgrade larger or additional stop signs/other intersections warning/regulatory signs (stop signs with LED borders)	NS06	15%	$1,500	Per Sign
Install raised median	R08	25%	$75,000	Per Mile
Install edge-lines and centerlines	R28	25%	$8,000	Per Mile
Install curve advance warning	R25	30%	$80,000	Per sign
Install dynamic speed warning signs	R26	30%	$100,000	Per sign
Install green paint in bicycle lanes	R32PB	35%	$15,000	Per Intersection
Install retroreflective backplates	S02	15%	$12,000	Per Intersection
Improve signal timing (coordination, phasing, red, yellow, operation)	S03	15%	$8,000	Per Intersection
Install advanced dilemma zone detection	S04	40%	$34,000	Per Intersection
Install protected left-turn phasing	S06	45%	$75,000	Per intersection
Install raised pavement markers and striping (Through Intersection)	S09	10%	$22,000	Per Intersection
Install raised medians (refuge islands)	NS19PB	45%	$25,000	Per Intersection
Install/upgrade pedestrian crossing at uncontrolled locations	NS21PB	35%	$10,000	Per Intersection
Add segment lighting	R01	35%	$50,000	Per Mile
Convert to all-way stop control (from 2-way or Yield Control)	NS02	50%	$10,000	Per Location
Install High-Visibility Crosswalk	4124	19%	$25,000	Per Crosswalk
Increase turning radii of driveways	-	5%	$50,000	Per Location
Install bus bay	-	5%	$150,000	Per Location

COUNTERMEASURES	LRSM/CMF ID	CRF	PER UNIT COST	UNIT
Reconfigure bicycle lanes	-	5%	$60,000	Per Location
Retrofit ADA ramps	-	5%	$100,000	Per Location
Install shutter on signal heads to prevent speeding	-	5%	$100,000	Per Location
Install no right-turn-on-red restriction	-	5%	$50,000	Per Approach
Install additional movement signal heads	-	5%	$100,000	Per Location
Intersection control evaluation	-	5%	$100,000	Per Location

Non-Engineering 5E Safety Strategy Countermeasures:

These recommended countermeasures were derived from the collision analysis and build on the actions identified in Section 9.2. These relate to the additional Es of Traffic Safety outside of Engineering. This includes Enforcement, Education, Emergency Services and Emerging Technologies.

Table 6: Non-Engineering 5E Safety Strategy Countermeasures

PROPOSED COUNTERMEASURE	POTENTIAL PARTNERS	EXAMPLES OF COUNTERMEASURE
ENFORCEMENT		
Establish enforcement and visibility program for aggressive driving	Local law enforcement; CHP	CHP's Regulate Aggressive Driving and Reduce Speed (RADARS) Program
Continued enforcement in school zones	Local law enforcement; CHP; school districts; OCTA; SCAG	Obtain grant funding for additional personnel in school zones
Increased enforcement of safe driving & active transportation behaviors near busy crosswalk locations	Local law enforcement; CHP	Obtain grant funding for additional enforcement near high pedestrian activity locations
EDUCATION		
Campaign to target aggressive driving and DUIs	Local law enforcement; CHP; California Office of Traffic Safety (OTS)	CHP's Regulate Aggressive Driving and Reduce Speed (RADARS) Program
Bicycle and pedestrian safety campaign	Local law enforcement; OCTA; SCAG	SCAG's 'Go Human' Campaign; ' OTS' 'Ride With Traffic' campaign Planned educational events at high activity locations
Explore safe routes to school education grants to expand program	Local school districts; local law enforcement; OCTA; SCAG	Safe Routes to School Program, funded by Caltrans
Coordinate safety education campaigns with SCAG	SCAG; local law enforcement	Roadway safety fairs at schools Education campaign for aging drivers
EMERGENCY SERVICES		
Continue to work on interdepartmental communication between City staff and City police department and County fire department	Local law enforcement & county fire department	Incorporate law enforcement/fire department as stakeholders on transportation improvement projects

PROPOSED COUNTERMEASURE	POTENTIAL PARTNERS	EXAMPLES OF COUNTERMEASURE
Incorporate public health agencies and fire departments as stakeholders in safety projects	Local public health agencies and county fire departments	Adjust safety project development processes to include public health and fire department feedback
EMERGING TECHNOLOGY		
Continue to use best practices for pedestrian crossings at high pedestrian traffic areas	City Public Works; OCTA; Caltrans	Continuously update pedestrian crossing design standards in accordance with latest best practices
Utilize new data sources to monitor traffic conditions and inform County safety plans	City Public Works; OCTA; Caltrans	Utilization of data from OCTA traffic management center

10 Evaluation & Implementation

10.1 Evaluation

The success of the LRSP will be evaluated using the preliminary process outlined below. This process will be useful to ensure proper implementation of goals and to determine when updates are needed.

- Regular progress meetings will be conducted to track the implementation of the plan. In addition, the success of the plan will be evaluated on an annual basis.
- An update to the plan should be considered after no more than five years.
- Continued monitoring and recording of traffic incidents on local roadways by law enforcement.
- Maintain a list of focus areas where there are transportation safety concerns.

10.2 Implementation

Implementation of the LRSP can be accomplished through several avenues including development of projects, the establishment of new policies and programs, and development/strengthening of relationships with stakeholders.

With regard to projects, the following identifies potential focus areas for the City in the near-to-mid-term.

Near- & Mid-Term Focus Areas

The opportunities identified in this report provide more of the systemic countermeasures that can be applied within the City. Over the next three to five years, it is recommended that the City concentrate its efforts on the emphasis areas:

1. Aging Drivers

2. Impaired Driving

3. Improper Use of Occupant Protection

4. Distracted Driving

5. Aggressive Driving

6. Lane Departure Collisions

7. Bicyclists

Analysis conducted at the citywide level indicated that these factors were some of the most frequent influences contributing to collisions within the City. The countermeasure opportunities previously discussed in this report for both systemic and project-specific improvements can be used as a basis for developing projects at locations where addressing these focus areas would be of the most benefit. Projects that address these focused areas can be developed with a high benefit-to-cost ratio (by applying City-wide collision rates), allowing projects to be developed even at sites with little to no direct collision history, but with conditions that might contribute to future collisions.

10.3 Funding

Competitive funding resources are available to assist in the development and implementation of safety projects in Seal Beach. The City should continue to seek available funding and grant opportunities from local, state, and federal resources to accelerate their ability to implement safety improvements throughout Seal Beach. The following is a high-level introduction into some of the main funding programs and grants for which the City can apply. The City should also work with regional agencies such as OCTA and SCAG to identify and apply for safety improvement funding.

10.3.1 Highway Safety Improvement Program

The Highway Safety Improvement Program (HSIP) is a Federal program housed under Fixing America's Surface Transportation (FAST) Act. This program apportions funding as a lump sum for each state, which is then divided among apportioned programs. These flexible funds can be used for projects to preserve or improve safety conditions and performance on any Federal-aid highway, bridge projects on any public road, facilities for non-motorized transportation, and other project types. Example safety improvement projects eligible for this funding include:

- New or upgraded traffic signals
- Upgraded guard rails
- Pedestrian warning flashing beacons
- Marked crosswalks

California's local HSIP focuses on infrastructure projects with national recognized crash reduction factors. Normally HSIP call-for-projects is made at an interval of one to two years. The applicant must be a city, a county, or a tribal government federally recognized within the State of California.

Additional information regarding this program at the Federal level can be found online at: https://safety.fhwa.dot.gov/hsip/. California specific HSIP information – including dates for upcoming call for projects - can be found at: http://www.dot.ca.gov/hq/LocalPrograms/hsip.html.

10.3.2 Caltrans Active Transportation Program

Caltrans Active Transportation Program (ATP) is a statewide funding program, created in 2013, consolidating several federal and state programs. The ATP funds projects that encourage increased mode share for walking and bicycling, improve mobility and safety for non-motorized users, enhance public health, and decrease greenhouse gas emissions. Projects eligible for this funding include:

- Bicycle and pedestrian infrastructure projects
- Bicycle and pedestrian planning projects (e.g. safe routes to school)
- Non-infrastructure programs (education and enforcement)

This program funding is provided annually. The ATP call for projects typically comes out in the spring. Information on this program and cycles can be found online at: http://www.dot.ca.gov/hq/LocalPrograms/atp/

10.3.3 State Transportation Improvement Program

The State Transportation Improvement Program (STIP) provides state and federal gas tax money for improvements both on and off the state highway system. STIP programming occurs every two years. The programming cycle begins with the release of a proposed fund estimate, followed by California Transportation Commission (CTC) adoption of the fund estimate. The fund estimate serves to identify the amount of new funds available for the programming of transportation projects. Once the fund estimate is adopted, Caltrans and the regional planning agencies prepare transportation improvement plans for submittal. Caltrans prepares the Interregional Transportation Improvement Program (ITIP) using Interregional Improvement Program (IIP) funds, and regional agencies prepare Regional Transportation Improvement Programs (RTIPs) using Regional Improvement Program (RIP) funds. The STIP is then adopted by the CTC.

10.3.4 California Senate Bill 1 (SB 1)

SB 1 is a landmark transportation investment to rebuild California by fixing neighborhood streets, freeways and bridges in communities across California and targeting funds toward transit and congested trade and commute corridor improvements.

California's state-maintained transportation infrastructure will receive roughly half of SB 1 revenue: $26 billion. The other half will go to local roads, transit agencies and an expansion of the state's growing network of pedestrian and cycle routes. Each year, this new funding will be used to tackle deferred maintenance needs both on the state highway system and the local road system, including:

- Bike and Pedestrian Projects: $100 million
    - This will go to cities, counties and regional transportation agencies to build or convert more bike paths, crosswalks and sidewalks. It is a significant increase in funding for these projects through the Active Transportation Program (ATP).
- Local Planning Grants: $25 million

10.3.5 California Office of Traffic Safety (OTS) Grants

This program has funding for projects related to traffic safety, including transportation safety education and encouragement activities. Grants applications must be supported by local crash data (such as the data analyzed in this report) and must relate to the following priority program areas:

- Alcohol Impaired Driving
- Distracted Driving
- Drug-Impaired Emergency Medical Services
- Motorcycle Safety
- Occupant Protection
- Pedestrian and Bicycle Safety
- Police Traffic Services
- Public Relations, Advertising, and Marketing Program
- Roadway Safety and Traffic Records

10.3.6 SCAG Sustainable Communities Program (SCP)

This program is an innovative vehicle for promoting local jurisdictional efforts to test local planning tools. The SCP provides direct technical assistance to SCAG member jurisdictions to complete planning and policy efforts to implement the regional Sustainable Communities Strategies (SCS). Grants are available in the following three categories:

- Integrated Land Use
    - Sustainable Land Use Planning
    - Transit Oriented Development (TOD)
    - Land Use & Transportation Integration
- Active Transportation
    - Bicycle Planning
    - Pedestrian Planning
    - Safe Routes to School Plans
- Green Region
    - Natural Resource Plans
    - Climate Action Plans (CAPs)
    - Green House Gas (GHG) Reduction programs

10.4 Next Steps

The City of Seal Beach has completed this LRSP to guide the process of future transportation safety improvements for years to come. The data-driven analysis process identified collision types, related primary collision factors, and locations of many collisions. Based on this process, Emphasis Areas were developed. These Emphasis Areas will guide corridor improvements, education programs, and capital improvements for the City.

Using the analyzed data and outputs from this LRSP, the City has also completed, or plans to complete, the following tasks:

- Actively seek other funding opportunities to improve safety for all modal users
- Collaborate with established safety partners & neighboring municipalities as improvements are made to create a cohesive transportation network
- Iteratively evaluate existing and proposed transportation safety programs and capital improvements to design a safer transportation network in Seal Beach.
- Begin designing safety improvements identified in the Case Study sheets contained in this report.

The City also plans to have the City Council formally approve and adopt the Local Road Safety Plan (LRSP) in 2022 Based on current Caltrans guidelines, the City will plan to update the LRSP in five years in 2027.

Appendix A: Case Study Sheets
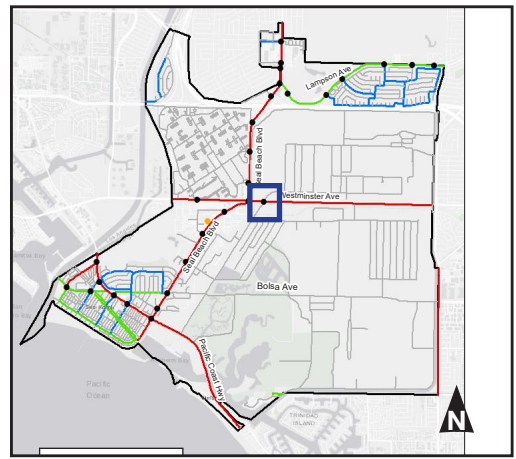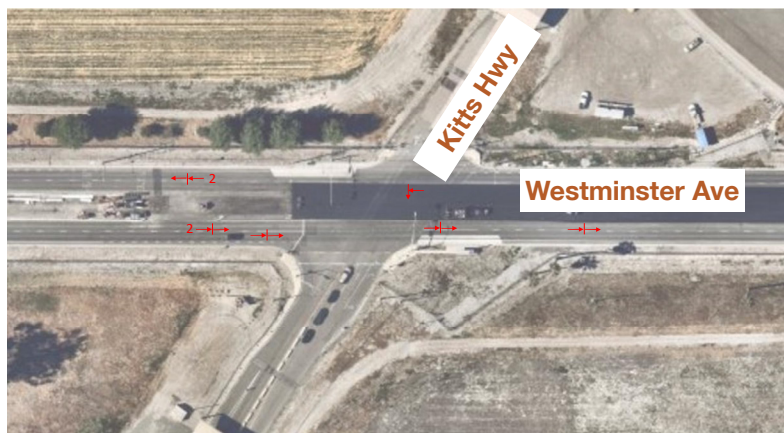
Case Study Sheet: Location #1

Project Name: Seal Beach LRSP
Agency Name: Seal Beach
Contact Name: Iris Lee
Email: ilee@sealbeachca.gov

Prepared by: Kimley-Horn
Checked by: Jason Melchor
Date: April 2022

Project Location Description & Maps:

Intersection: Westminster Ave & Kitts Hwy
Examples of Similar Intersections: Seal Beach Blvd & Apollo Dr

Traffic and Geometric Data:

Collision Data	
Total Collisions	10
Fatal and Injury Collisions	Fatal Injury - 0 Severe Injury - 0 Visible Injury - 3
Top 3 Collision Types	Rear-End (80%) Broadside (10%) Other (10%)
Total Nighttime Collisions	2
Wet Surface Collisions	1
Drug and Alcohol Related Collisions	1

Traffic Data	
Number of Approaches	4
Total Entering Vehicles	38,000
Crosswalk Condition	3 Legs with Pedestrian Timing
Control Type	Signalized
Lighting	Yes
Highest Posted Speed Limit	50 MPH
Median	Yes

Collision Breakdown		
Veh vs. Veh	**Veh vs. Ped**	**Veh vs. Bike**
10	0	0

Additional Notes:

- High concentration of rear-ends
- Construction on Westminster Ave
- Westminster Blvd is a large arterial
- 60% of crashes happened in 2016 before the start of the constrution
- Bicyclists constrained on this roadway
- Entrance to Naval Weapons Station Seal Beach - Security Gate 9 (south leg of intersection) & Security Gate 30 (north leg of intersection)

Countermeasure Evaluation

| Primary Issues	Potential Counter-measures	Crash Modification Factor (LRSM/CMF ID)	20 Year Safety Benefit	Total 20-Year Costs	Safety Related B/C
Bike & Pedestrian	Install green paint in bicycle lanes	0.65 (R32PB)	$1,390,480	-*	-*
All	Install retroflective backplates on signal heads	0.85 (S02)	$595,920	$12,000	49.66
All	Install advanced dilemma zone detection system at signals	0.60 (S04)	$1,589,120	$60,000	26.48

* There were no bicycle or pedestrian collisions at this location, therefore a benefit could not be calculated for this countermeasure

Kimley»Horn

Project Template: Location #2

Project Name: Seal Beach LRSP
Agency Name: Seal Beach
Contact Name: Iris Lee
Email: ilee@sealbeachca.gov

Prepared by: Kimley-Horn
Checked by: Jason Melchor
Date: April 2022
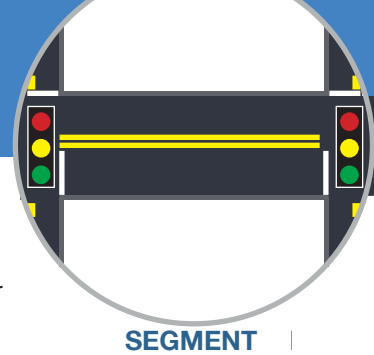
Project Location Description & Maps:

Segment: Seal Beach Bl: Bradbury Rd to Rossmoor Center Way
Examples of Similar Segments: Seal Beach Blvd: Plymouth Dr to St Cloud Dr
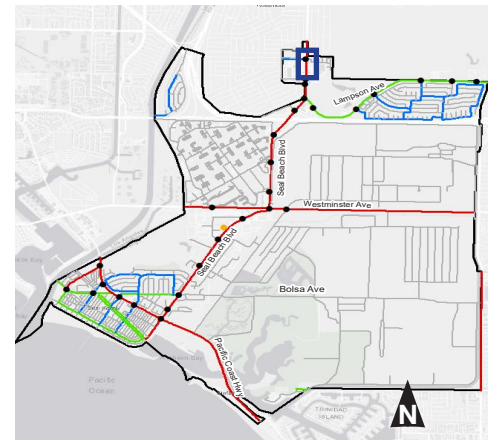
Traffic and Geometric Data:

Collision Data	
Total Collisions	3
Fatal and Injury Collisions	Fatal Injury - 0 Severe Injury - 0 Visible Injury - 1
Top 3 Collision Types (percentage)	Broadside (33.3%) Rear-End (33.3%) Hit Object (33.3%)
Total Nighttime Collisions	2
Wet Surface Collisions	0
Drug and Alcohol Related Collisions	0

Traffic Data	
Average Daily Traffic (ADT)	37,833
Lighting	Yes
Highest Posted Speed Limit	40 MPH

Collision Breakdown		
Veh vs. Veh	**Veh vs. Ped**	**Veh vs. Bike**
3	0	0

Additional Notes:

- Several driveway related crashes
- Turning radius on driveway is tight as evident by tire marks on curb
- Stop bar is far back on driveway due to pedestrian sidewalk yet reduces sight distance

Kimley»Horn
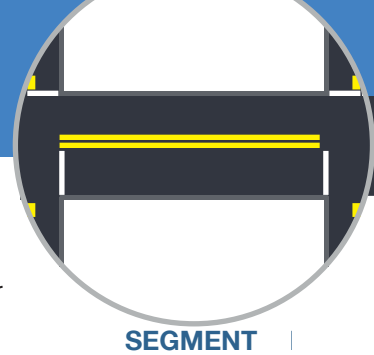
Countermeasure Evaluation

Primary Issues	Potential Countermeasures	Crash Modification Factor (LRSM/CMF ID)	20 Year Safety Benefit	Total 20-Year Costs	Safety Related B/C
Turning Radius	Increase turning radii of driveways along Seal Beach Bl	0.95	$60,820	$50,000	1.22

Kimley»Horn

Project Name: Seal Beach LRSP
Agency Name: Seal Beach
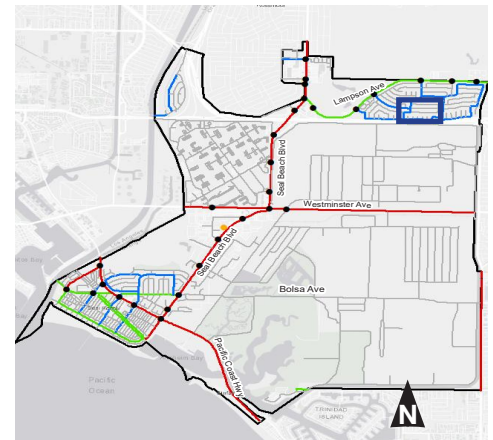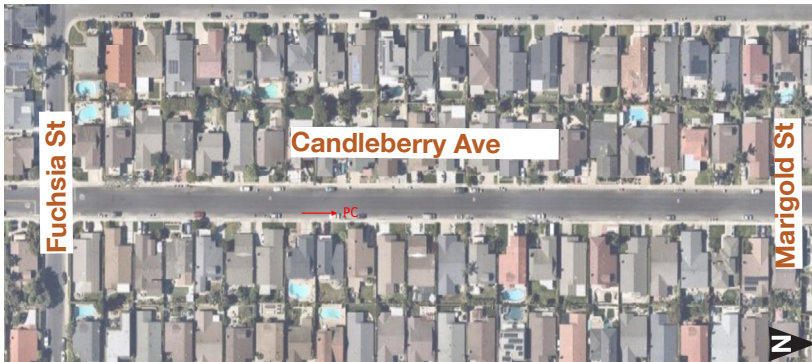**Contact Name:** Iris Lee
Email: ilee@sealbeachca.gov

Prepared by: Kimley-Horn
Checked by: Jason Melchor
Date: April 2022

Project Location Description & Maps:

Segment: Candleberry Ave: Fuschia St to Marigold St
Examples of Similar Segments: Seal Beach Blvd: Plymouth Dr to St Cloud Dr

Traffic and Geometric Data:

Collision Data	
Total Collisions	1
Fatal and Injury Collisions	Fatal Injury - 0 Severe Injury - 0 Visible Injury - 0
Collision Type	Rear-End
Total Nighttime Collisions	1
Wet Surface Collisions	0
Drug and Alcohol Related Collisions	1

Traffic Data	
Average Daily Traffic (ADT)	1,000
Lighting	Yes, south side of road
Highest Posted Speed Limit	30 MPH

Collision Breakdown		
Veh vs. Veh	**Veh vs. Ped**	**Veh vs. Bike**
1	0	0

Additional Notes:

- No striping on Candleberry Ave
- Candleberry Ave acts a neighborhood collector road to exit the College Park East neighborhood to Lampson Ave
- High pedestrian and bicycle traffic
- Residential neighborhood

Kimley»Horn

Countermeasure Evaluation

Primary Issues	Potential Countermeasures	Crash Modification Factor (LRSM/CMF ID)	20 Year Safety Benefit	Total 20-Year Costs	Safety Related B/C
All	Install centerline striping	0.75 (R28)	$80,900	$8,000	10.11
All	Install edgeline striping	0.75 (R28)	$80,900	$8,000	10.11
All	Install speed feedback signage	0.85 (NS06)	$48,540	$5,000	9.71
Ped & Bike	Install bicycle lanes	0.65 (R32PB)	$113,260	$25,000	4.53

Case Study Sheet: Location #4

Project Name: Seal Beach LRSP
Agency Name: Seal Beach
Contact Name: Iris Lee
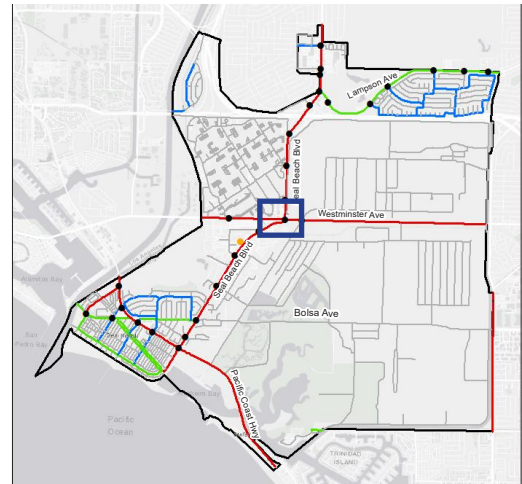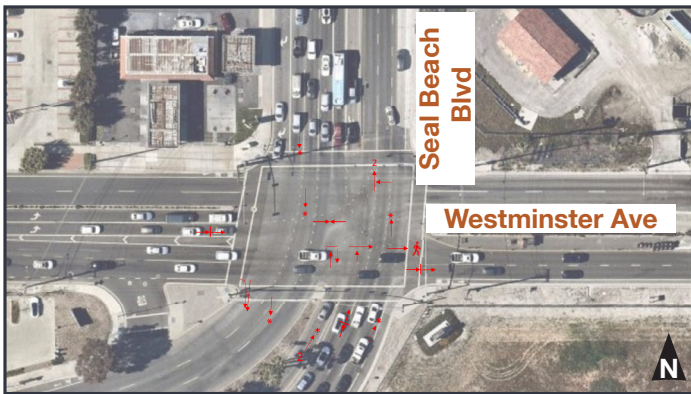**Email:** ilee@sealbeachca.gov

Prepared by: Kimley-Horn
Checked by: Jason Melchor
Date: April 2022

Project Location Description & Maps:

Intersection: Seal Beach Bl & Westminster Ave
Example of Similar Intersection: Seal Beach Blvd & Pacific Coast Highway

Seal Beach Blvd

Westminster Ave

N

Traffic and Geometric Data:

Collision Data	
Total Collisions	18
Fatal and Injury Collisions	Fatal Injury - 2 Severe Injury - 1 Visible Injury - 4
Top 3 Collision Types	Hit Object (38.9%) Broadside (27.8%) Rear-End (16.7%)
Total Nighttime Collisions	8
Wet Surface Collisions	2
Drug and Alcohol Related Collisions	5

Traffic Data	
Number of Approaches	4
Total Entering Vehicles	38,635
Crosswalk Condition	All Legs with Pedestrian Timing
Control Type	Signalized
Lighting	Yes
Highest Posted Speed Limit	50 MPH
Median	Yes

Collision Breakdown		
Veh vs. Veh	**Veh vs. Ped**	**Veh vs. Bike**
17	0	1

Additional Notes:

- High concentration of hit object crash type
- Busiest intersection in the city
- No bus bay which can block vehicles
- Curve near intersection causes congestion and sight issues
- Bicycle lanes need to be reconfigured on certain approaches
- ADA ramps on some corner do not lead to crosswalk; issues for sidewalk bicycle riders
- Speed is a large issue at this location

Kimley»Horn

Countermeasure Evaluation

Primary Issues	Potential Counter-measures	Crash Modification Factor (LRSM/CMF ID)	20 Year Safety Benefit	Total 20-Year Costs	Safety Related B/C
All	Install bus bay on southern leg of Seal Beach Bl	0.95	$527,280	$150,000	3.52
Bike & Pedestrian	Reconfigure bicycle lanes approach	0.95	$28,460	$60,000	0.47
Bike & Pedestrian	Retrofit ADA ramps to address current issues	0.95	$527,280	$100,000	5.27
All	Install retroflective backplates	0.85 (S02)	$1,581,840	$12,000	131.82
All	Install additional R3-7 sign (Left Lane Must Turn Left) on north leg median	0.85 (NS06)	$1,581,840	$1,500	1054.56
All	Install advanced dilemma zone detection system - can address curve visibility	0.60 (S04)	$4,218,240	$80,000	52.73
All	Install curve advance warning signs (flashing beacons)	0.70 (R25)	$3,163,680	$80,000	39.55
All	Install dynamic speed warning signage before curve	0.70 (R26)	$3,163,680	$100,00	31.64

Project Name: Seal Beach LRSP
Agency Name: Seal Beach
Contact Name: Iris Lee
Email: ilee@sealbeachca.gov

Prepared by: Kimley-Horn
Checked by: Jason Melchor
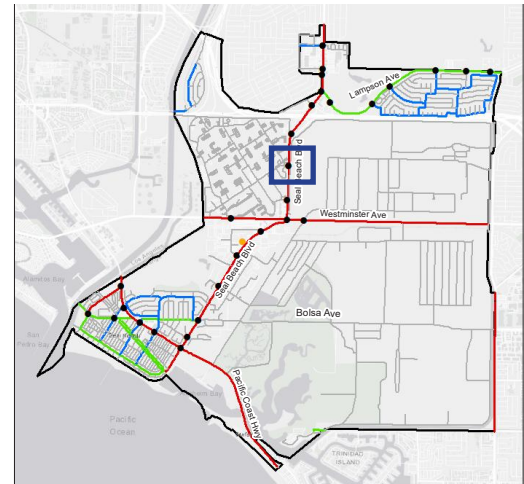**Date:** April 2022

INTERSECTION

Project Location Description & Maps:

Intersection: Seal Beach Bl & Golden Rain Rd
Examples of Similar Intersections: Seal Beach Blvd & Heron Pointe; Seal Beach Blvd & Rossmoor Way

Traffic and Geometric Data:

Collision Data	
Total Collisions	3
Fatal and Injury Collisions	Fatal Injury - 0 Severe Injury - 1 Visible Injury - 0
Top 3 Collision Types	Rear-End (66.7%) Broadside (33.3%)
Total Nighttime Collisions	2
Wet Surface Collisions	0
Drug and Alcohol Related Collisions	0

Traffic Data	
Number of Approaches	3
Total Entering Vehicles	41,690
Crosswalk Condition	West side with Pedestrian Timing
Control Type	Signalized
Lighting	Yes
Highest Posted Speed Limit	50 MPH
Median	Yes

Collision Breakdown		
Veh vs. Veh	**Veh vs. Ped**	**Veh vs. Bike**
3	0	0

Additional Notes:

- No crosswalk across Seal Beach Bl
- No sidewalk but bike lane along NB Seal Beach Bl
- Red light running has been observed here
- Confusion by intersection proximity has been observed as well

Kimley»Horn

Countermeasure Evaluation

Primary Issues	Potential Counter-measures	Crash Modification Factor (LRSM/CMF ID)	20 Year Safety Benefit	Total 20-Year Costs	Safety Related B/C
All	Install retroflective backplates on signal	0.85 (S02)	$1,411,080	$12,000	117.59
Bike & Pedestrian	Install crosswalk across Seal Beach Bl to facilitate bicycle crossings	0.65 (NS21PB)	-*	$100,000	-*
All	Install shutters on signal heads to prevent speeding	0.95	$470,360	$100,000	4.70
All	Adjust signal timing to address run throughs of signals	0.85(S03)	$1,411,080	$8,000	176.39
All	Install advanced dilemma zone detection system	0.60 (S04)	$3,762,880	$60,000	62.71

*No pedestrian or bicycle collisions occurred at this location, therefore a safety benefit cannot be calculated

Kimley»Horn

Case Study Sheet: Location #6

Project Name: Seal Beach LRSP
Agency Name: Seal Beach
Contact Name: Iris Lee
Email: ilee@sealbeachca.gov

Prepared by: Kimley-Horn
Checked by: Jason Melchor
Date: April 2022

Project Location Description & Maps:

Intersection: Seal Beach Bl & Bolsa Ave
Examples of Similar Intersections: Pacific Coast Highway & Bolsa Ave

Traffic and Geometric Data:

Collision Data	
Total Collisions	1
Fatal and Injury Collisions	Fatal Injury - 0 Severe Injury - 0 Visible Injury - 1
Collision Types	Head-On (100%)
Total Nighttime Collisions	1
Wet Surface Collisions	1
Drug and Alcohol Related Collisions	1

Traffic Data	
Number of Approaches	4
Total Entering Vehicles	24,426
Crosswalk Condition	3 yellow crosswalks with pedestrian timing for nearby school
Control Type	Signalized
Lighting	Yes
Highest Posted Speed Limit	50 MPH
Median	Yes

Collision Breakdown		
Veh vs. Veh	Veh vs. Ped	Veh vs. Bike
1	0	0

Additional Notes:

- Speeding is an issue here
- Crosswalk on Westbound leg not present
- McGaugh Elementary School is at this location
- School crossing signage is far from intersection
- Bike lane striping should be updated on Seal Beach Bl

Kimley»Horn

Countermeasure Evaluation

Primary Issues	Potential Counter-measures	Crash Modification Factor (LRSM/CMF ID)	20 Year Safety Benefit	Total 20-Year Costs	Safety Related B/C
All	Install crosswalk along Westminster leg	5% (4124)	-*	$100,000	-*
Bike & Pedestrian	Upgrade bicycle lane striping along Seal Beach Bl	0.65 (R32PB)	-*	$15,000	-*
All	Install no right-turn-on-red restriction from Bolsa Ave on WBR movement	0.95	$28,460	$50,000	0.57
All	Install lane tracking striping on left turns	0.91 (S09)	$56,920	$22,000	2.59
All	Install additional through movement signal heads on Bolsa Ave movements	0.95	$28,460	$100,000	0.28
All	Evaluate relocation of bus stop on Seal Beach Bl north of Bolsa Ave	-	varies	varies	varies

*No pedestrian or bicycle collisions occurred at this location, therefore a safety benefit cannot be calculated

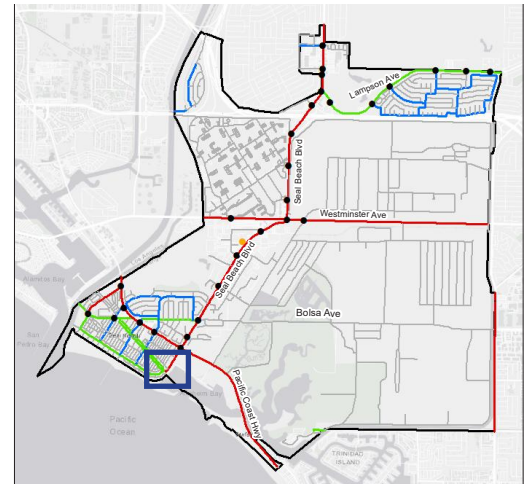Kimley»Horn

Case Study Sheet: Location #7

Project Name: Seal Beach LRSP
Agency Name: Seal Beach
Contact Name: Iris Lee
Email: ilee@sealbeachca.gov

Prepared by: Kimley-Horn
Checked by: Jason Melchor
Date: April 2022

Project Location Description & Maps:

Intersection: Ocean Ave & Electric Ave
Examples of Similar Intersections: 14th St & Electric Ave; Main St & Electric Ave

Traffic and Geometric Data:

Collision Data	
Total Collisions	2
Fatal and Injury Collisions	Fatal Injury - 0 Severe Injury - 0 Visible Injury - 0
Top 3 Collision Types	Vehicle-Pedestrian (100%)
Total Nighttime Collisions	2
Wet Surface Collisions	0
Drug and Alcohol Related Collisions	0

Traffic Data	
Number of Approaches	5
Total Entering Vehicles	3,250
Crosswalk Condition	4 Legs; none on the southern side
Control Type	Stop sign
Lighting	No
Highest Posted Speed Limit	30 MPH
Median	Yes- center refuge

Collision Breakdown		
Veh vs. Veh	**Veh vs. Ped**	**Veh vs. Bike**
0	2	0

Additional Notes:

- Two pedestrian collisions
- Class I bike lane leading into intersection, but signage and striping can be improved
- Many have observed that Class I bike lane is not used often
- Multi-leg intersection that causes confusion regarding right-of-way
- Landscaping may cause visibility issues

Countermeasure Evaluation

Primary Issues	Potential Counter-measures	Crash Modification Factor (LRSM/CMF ID)	20 Year Safety Benefit	Total 20-Year Costs	Safety Related B/C
All	Improve signage and striping along bicycle lane	0.90 (S09)	$64,720	$22,000	2.94
All	Evaluate roundabout at this location	varies	varies	varies	varies

Case Study Sheet: Location #8

Project Name: Seal Beach LRSP
Agency Name: Seal Beach
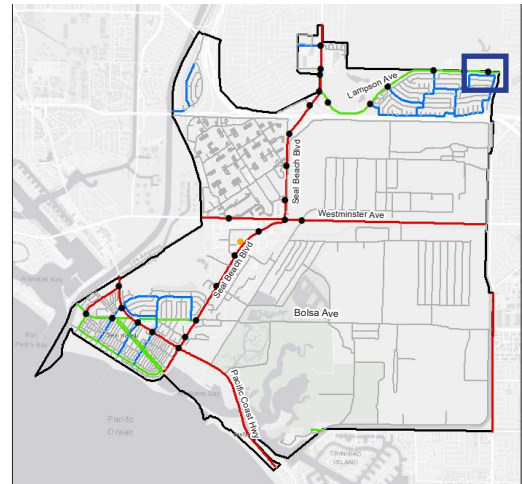**Contact Name:** Iris Lee
Email: ilee@sealbeachca.gov

Prepared by: Kimley-Horn
Checked by: Jason Melchor
Date: April 2022

Project Location Description & Maps:

Intersection: Tulip St & Lampson Ave
Examples of Similar Intersections: Healther St & Lampson Ave; Basswood St & Lampson Ave

Traffic and Geometric Data:

Collision Data	
Total Collisions	1
Fatal and Injury Collisions	Fatal Injury - 1 Severe Injury - 0 Visible Injury - 0
Top 3 Collision Types	Broadside (100%) - (0%) - (0%)
Total Nighttime Collisions	0
Wet Surface Collisions	0
Drug and Alcohol Related Collisions	0

Traffic Data	
Number of Approaches	4
Total Entering Vehicles	13,651
Crosswalk Condition	3 Crosswalks with Pedestrian Timing; none on the northern side
Control Type	Signalized
Lighting	Yes
Highest Posted Speed Limit	45 MPH
Median	No

Collision Breakdown		
Veh vs. Veh	**Veh vs. Ped**	**Veh vs. Bike**
1	0	0

Additional Notes:

- This intersection is shared with Los Alamitos
- No injury collisions within Los Alamitos jurisdiction or along frontage road
- Fatal broadside collision here
- Poor sight distance for NBR movement due to brick wall along Lampson Ave
- All-red is one second
- Right-turn-on-red allowed here

Kimley»Horn

Countermeasure Evaluation

Primary Issues	Potential Counter-measures	Crash Modification Factor (LRSM/CMF ID)	20 Year Safety Benefit	Total 20-Year Costs	Safety Related B/C
All	Install no right-turn-on-red restriction on NBR movement	0.05	$32,360	$10,000	3.24
All	Reevaluate signal timing, including all-red phases	0.85 (S03)	$97,080	$8,000	12.14
All	Install protected phasing on N/S movements	0.45 (S06)	$291,240	$75,000	3.88

Kimley »Horn

Case Study Sheet: Location #9

Project Name: Seal Beach LRSP
Agency Name: Seal Beach
Contact Name: Iris Lee
Email: ilee@sealbeachca.gov

Prepared by: Kimley-Horn
Checked by: Jason Melchor
Date: April 2022

INTERSECTION

Project Location Description & Maps:

Intersection: Caravel Way & Marina Dr
Examples of Similar Intersections: Ocean Ave & 3rd St; Ocean Ave & 14th St

Traffic and Geometric Data:

Collision Data	
Total Collisions	2
Fatal and Injury Collisions	Fatal Injury - 0 Severe Injury - 0 Visible Injury - 0
Collision Types	Broadside (50 %) Sideswipe (50 %)
Total Nighttime Collisions	1
Wet Surface Collisions	1
Drug and Alcohol Related Collisions	1

Traffic Data	
Number of Approaches	3
Total Entering Vehicles	6,130
Crosswalk Condition	Two crosswalks, west side and north side
Control Type	Unsignalized
Lighting	Yes
Highest Posted Speed Limit	30 MPH
Median	No

Collision Breakdown		
Veh vs. Veh	**Veh vs. Ped**	**Veh vs. Bike**
2	0	0

Additional Notes:

- Traffic circle like at 4th and Central may work here
- Bicycle lane is wide here and may be confusing to drivers
- Conflict between SBR and NBL merge/visibility

Kimley»Horn

Countermeasure Evaluation

Primary Issues	Potential Counter-measures	Crash Modification Factor (LRSM/CMF ID)	20 Year Safety Benefit	Total 20-Year Costs	Safety Related B/C
All	Install traffic circle	0.65 (NS05)	$226,520	$80,000	2.83
All	Install safety lighting at Marina Dr & Caravel Way intersection	0.65 (R01)	$226,520	$50,000	4.53
All	Install all-way stop	0.50 (NS02)	$323,600	$20,000	16.18
Bicycle & Pedestrian	Reconfigure bicycle lane striping and signage	0.95	-*	$75,000	-*

*No pedestrian or bicycle collisions occurred at this location, therefore a safety benefit cannot be calculated

Kimley»Horn

Project Name: Seal Beach LRSP
Agency Name: Seal Beach
Contact Name: Iris Lee
Email: ilee@sealbeachca.gov

Prepared by: Kimley-Horn
Checked by: Jason Melchor
Date: April 2022

INTERSECTION

Project Location Description & Maps:

Intersection: Marina Drive & Pacific Coast Highway
Examples of Similar Intersections: Pacific Coast Highway & 1st St

Traffic and Geometric Data:

Collision Data	
Total Collisions	4
Fatal and Injury Collisions	Fatal Injury - 0 Severe Injury - 0 Visible Injury - 0
Top 3 Collision Types	Broadside (50%) Rear-End (50%)
Total Nighttime Collisions	1
Wet Surface Collisions	0
Drug and Alcohol Related Collisions	0

Traffic Data	
Number of Approaches	3
Total Entering Vehicles	67,800
Crosswalk Condition	1 on the west side
Control Type	Unsignalized
Lighting	Yes
Highest Posted Speed Limit	40 MPH
Median	Yes

Collision Breakdown		
Veh vs. Veh	**Veh vs. Ped**	**Veh vs. Bike**
4	0	0

Additional Notes:

- Sigh distance issues due to curves
- Caltrans is planning to put bike lane on PCH
- PCH & 8th St crossing is no left-turn

Kimley》Horn

Countermeasure Evaluation

Primary Issues	Potential Counter-measures	Crash Modification Factor (LRSM/CMF ID)	20 Year Safety Benefit	Total 20-Year Costs	Safety Related B/C
All	Intersection control evaluation to determine potential changes to geometric configuration, in coordination with Caltrans	0.95	$64,720	$100,000	0.65
All	Install median or bollards to prevent left-turns from 8th St onto PCH	0.55 (NS19PB)	$582,480	$25,000	23.3