

Getting to Zero

**WSDOT's Highway Safety Improvement Program
Implementation Plan 2023**

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Acknowledgements

WSDOT, together with all partner agencies and safety influencers, strives to reach zero fatal and serious injury crashes. This Highway Safety Improvement Program Implementation Plan was developed through the effort of multiple individuals and divisions across WSDOT. The Transportation Safety and Systems Analysis division is thankful for the collaborative efforts, participation, and time producing and reviewing this document. Leaders in data analysis, assembling and reviewing the document for submission (in alphabetical order):

- **John Milton**
- **Dustin Motte**
- **Amy Shaffer**
- **Ida van Schalkwyk**

The Transportation Safety Systems Analysis division would also like to thank the following individuals and their divisions for providing working documents for inclusion in the implementation plan (in alphabetical order):

- **Anissa Allen, HQ Capital Program Development**
- **Barb Chamberlain, HQ Active Transportation Division**
- **Charlotte Claybrooke, HQ Active Transportation Division**
- **Matthew Enders, HQ Local Programs**
- **Dina Swires, HQ Transportation Operation**
- **Ida van Schalkwyk, HQ Development Division**

List of Acronyms

AASHTO	American Association of State Highway and Transportation Officials
CAR	Crash Analysis Report
CPDM	Capital Program Development and Management
FARS	Fatal Analysis Reporting System
FAST	Fixing Americas Surface Transportation (FAST) Act
FHWA	Federal Highway Administration
FMCSA	Federal Motor Carrier Safety Administration
HSEC	Highway Safety Executive Committee
HFST	High Friction Surface Treatments
HSIG	Highway Safety Issues Group
HSIP	Highway Safety Improvement Program
HSP	Highway System Plan
HSM	AASHTO Highway Safety Manual
I-2	WSDOT Investment Category: Improvement Program - Safety Sub-Program
JOPS	Joint Operations Policy Statement
LCE	Low-Cost Enhancement
LRSP	Local Road Safety Plan
MAP-21	Moving Ahead for Progress in the 21st Century Act
MUTCD	Manual on Uniform Traffic Control Devices
NHTSA	National Highway Traffic Safety Administration
RCW	Revised Code of Washington
SHSP	Strategic Highway Safety Plan
SPF	Safety Performance Function
VRU	Vulnerable Road User
WA	Washington state
WSDOT	Washington State Department of Transportation
WSP	Washington State Patrol
WTSC	Washington Traffic Safety Commission

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Executive Summary

The Washington State Department of Transportation has set safety as one of the top priorities in carrying out its transportation mission. Safety is also a transportation system policy goal for WSDOT ([RCW 47.04.280\(1\)\(b\)](#)). The goal in Washington State is to achieve zero fatal and serious injury crashes by 2030. Under the [Highway Safety Improvement Program \(HSIP\) \(23 U.S.C. §148\)](#) WSDOT is required to set 5 safety performance targets. These are:

- Number of fatalities
- Rate of fatalities per 100 million vehicle miles traveled
- Number of suspected serious injuries
- Rate of suspected serious injuries per 100 million vehicle miles traveled
- Number of fatalities and serious injuries among people walking and biking (nonmotorized) in motor vehicle crashes

To set targets for 2024, WSDOT, together with the Washington Traffic Safety Commission (WTSC) and (Metropolitan Planning Organizations (MPO) used the “Target Zero method”. This method reviews safety performance measures during the previous five-year period to determine the current annual rolling average performance and then plots a trend line to zero fatal and serious injury crashes in 2030.

The resulting 2021 targets and 2022 outcomes are summarized in **Exhibit 1**. Based on the FHWA determination that WSDOT failed to make significant progress, the agency is required to develop this HSIP Implementation Plan.

Exhibit 1. Summary of Significant Progress for MAP-21 Safety Performance Measures
2018 through 2022

Performance Measure	Target: 2018-2022 rolling average	Outcome: 2018-2022 rolling average	Baseline: 2016-2020 rolling average	Target/ Baseline Met?	Significant Progress?
Number of fatalities	440	615.00	550	No/No	No
Rate of Fatalities per 100 million VMT on all public roads	0.735	1.049	0.919	No/No	
Number of serious injuries	1819	2585.8	2271.2	No/No	
Rate of serious injuries per 100 million VMT on all public roads	3.042	4.412	3.797	No/No	
Number of non-motorized fatalities and serious injuries	464.6	620.8	581.6	No/No	

[FHWA requires](#) that a state that fails to make significant progress has to:

1. Submit an annual HSIP Implementation Plan. The implementation plan describes actions WSDOT takes to make significant progress toward meeting safety targets in order to address its failure to meet targets.
2. Obligate federal HSIP funds based on previous year's allocations.

Current Trends

The most noticeable increases in fatal and serious injury crashes across emphasis areas in the Target Zero (strategic highway safety plan) are related to heavy truck-involved, bicyclist-involved, and pedestrian-involved crashes. Lane departure, intersection related, and crashes involving people who walk or bike represented the highest proportion of statewide fatal and serious injury crashes.

To reduce the potential for fatal and serious injury crashes across each of the emphasis areas, WSDOT has set up subcategories for targeted investment. The sidebar on the right summarizes the current and proposed subcategories for the WSDOT Subprogram.

Subcategory Changes

This year, WSDOT substantially completed its redirection landform removal effort and the subcategory will remain dormant. WSDOT evaluated conversion of three-to-four strand cable barriers as part of its in-service evaluation and the program subcategory will be paused as the remaining three-strand cable are performing similarly to the four-strand cable on the state highway network.

A proposed new subcategory, *Speed Management*, continues to be developed as the Speed Zone Management team is currently updating its speed setting guidelines.

A primary tenet of the safe system approach is **Speed Management**. WSDOT will begin implementation of a subcategory that emphasizes the reduction of speed to reduce crash forces.

I-2 Safety Program Subcategories

- Rumble Strips
- Lane Departure-System Curve Treatments
- Breakaway Cable Terminal Replacement
- Guardrail Infill and Retrofit
- High Friction Surface Treatment Program – Ramps
- I-2 Subprogram Field Assessments
- Active Transportation
- Safety Decision-Making and Performance Improvement
- Edge Line Visibility Pilot
- Redirectional Landforms (considered complete)

Subcategory under development:

- Speed Management

Introduction

The Washington State Department of Transportation (WSDOT) has set highway safety as one of its top priorities and is working across its capital improvement program to continue integration of the Safe System Approach within its project development process. It is believed that the Safe System will be a key component of addressing the recent increasing crash trends. While many of the capital, maintenance, and operational programs at WSDOT have safety performance improvement embedded through the policies, processes, planning, design, and operational criteria and address road safety as road modifications occur, opportunities exist to change the decision making processes for road safety.

WSDOT, together with its partner organizations developed a state strategic highway safety plan (SHSP) called "Target Zero" (www.targetzero.com). Target Zero's goal is to achieve zero fatalities and serious injuries for all roadways in Washington state by 2030. Washington was the first state in the United States to set a goal of zero fatalities and continues to actively pursue this goal. Reducing fatalities and serious injuries makes it more likely that our families, friends, and the public will arrive home safely. When one views safety this way, zero fatalities and serious injuries is the only acceptable goal. WSDOT addressed the Safe System Approach and equity considerations in 2019 and will structure its next update around the Safe System Approach.

The Highway Safety Improvement Program (HSIP) is a core federal-aid program that aims to achieve a significant reduction in fatalities and serious injuries on all public roads. If a state does not meet or make significant progress towards its annual safety performance targets, it must submit an annual HSIP Implementation Plan that describes actions it will take to meet or make significant progress toward meeting its subsequent targets. This document represents the HSIP Implementation Plan for WSDOT.

Target Setting and Special Rules

Transportation Performance Management—formerly Moving Ahead for Progress in the 21st Century (MAP-21)—and the Fixing Americas Surface Transportation (FAST) acts direct state DOTs to set five safety targets focused on fatal and serious injuries, and to report on progress towards these targets on an annual basis as part of required federal HSIP reporting. The WSDOT safety targets are: number of fatalities, fatality rate (per 100 MVMT), number of serious injuries, serious injury rate (per 100 MVMT), and number of non-motorized fatal and serious injuries. The first three targets are identical to the Washington Traffic Safety Commission (WTSC) federal Highway Safety Program reporting and are required by federal law to mirror WTSC targets. These targets are developed in

Key Takeaways

- WSDOT is required to set five targets as part of the Highway Safety Improvement Program.
- WSDOT did not make significant progress towards Target Zero goals in 2022.

coordination with WTSC and Washington's Metropolitan Planning Organizations (MPOs). The targets apply to all roads in Washington regardless of ownership.

Federal laws and regulations prescribe actions states must take when significant progress is not made toward achieving stated targets. In addition, special rules for high-risk rural roads and older road users are outlined within the federal laws and rules.

WSDOT did not meet or make significant progress in 2022 in the areas of fatalities, serious injuries, fatality rate, serious injury rate, and non-motorized fatalities and serious injuries. Thus, WSDOT is required to develop HSIP implementation plan that under 23 U.S.C. §148 must:

- Identify roadway features that constitute a hazard to road users
- Identify highway safety improvement projects on the basis of crash experience, crash potential, or other data-supported means
- Describe how HSIP funds will be allocated, including projects, activities, and strategies to be implemented
- Describe how the proposed projects, activities, and strategies funded under the HSIP will allow Washington

state to make progress toward achieving safety performance targets

- Describe the actions Washington state will undertake to achieve the performance targets

Legal Requirements

Federal and State laws have significant impact on how WSDOT develops and manages the highway safety program.

Federal Laws

[23 U.S.C. §150: National Goals and Performance Management Measures](#) HSIP is a Federal Aid program administered through the Federal Highway Administration (FHWA). The purpose of the program is to reduce fatalities and serious injuries on all public roads regardless of ownership. The HSIP requires a data-driven strategic approach to reducing fatalities and serious injuries. HSIP is legislated under [Section 148 of Title 23 and regulated under 23 CFR Part 924](#).

The main components of HSIP are:

- The [Strategic Highway Safety Plan](#) is a statewide coordinated safety plan. In our state, it is called Target Zero.
- The [State HSIP](#) or program of highway safety improvement projects.
- Railway-Highway Crossing

Program (RHCP) provides funds for elimination of hazards at railway-highway crossings under [23 U.S.C. §130](#)

- [High Risk Rural Roads](#) due to an increased fatality rate on Washington's rural roads.
- Vulnerable Road User Assessment is an assessment of the safety performance of a State with respect to vulnerable road users (pedestrians and bicyclists) and the plan of the State to improve the safety of vulnerable road users as described under [23 U.S.C. 148\(l\)](#). ([23 U.S.C. 148\(a\)\(16\)](#)).

State Laws

[RCW 47.04.280: Transportation System Policy Goals](#) establishes six transportation goals for Washington including a goal for Safety: "To provide for and improve the safety and security of transportation customers and the transportation system."

- [RCW 47.05: Priority Programming for Highway Development Target Zero](#) requires projects to be selected according to factual need and evaluation of cost and benefit.
- [RCW 43.59 Traffic Safety Commission](#) establishes the Washington Traffic Safety

Commission and designates this body to serve as the Governor's Highway Safety Representative as required by the federal Highway Safety Act of 1966 (Public Law 89-564; 80 Stat. 731).

Target Zero

[Target Zero](#), the Washington State Strategic Highway Safety Plan (SHSP), forms the basis for how Washington state measures safety performance and sets priorities and emphasis areas for safety performance investments. It is a formal statewide planning document signed by the Governor and approved by the FHWA Division Administrator.

Target Zero was created through a collaboration of traffic safety professionals and activists from many different organizations and disciplines: engineers from WSDOT and local public works; tribal and city police, county sheriffs' deputies, and troopers from Washington State Patrol (WSP); medical professionals from hospitals and public health agencies; and others from every corner of the state dedicated to reducing the fatalities and serious injuries in motor vehicle crashes.

The plan coordinates traffic safety programs across agencies, sets statewide priorities, outlines emphasis areas, and presents effective strategies. Target Zero is a data-driven strategic plan, used to identify the factors that contribute to fatalities and

serious injuries on Washington roads as well as priorities and strategies to reduce traffic fatalities and serious injuries.

Target Zero is integrated into WSDOT's safety business practices and processes. Target Zero highlights the need for a multimodal approach to identify emphasis areas to address high risk behavior, crash types, and the different road users. The Target Zero partnership delivered the first strategic highway safety plan in 2000 and it has been updated on a three-year cycle and after 2024 a five year cycle.

Safety Leadership

Washington State

The Washington Traffic Safety Commission (WTSC) is Washington's designated highway safety office and leads statewide efforts to save lives and prevent serious injuries on our roadways. The commission is led by the Governor of Washington state. Commissioners include the chief executive officers from state agencies and other organizations with an interest in and responsibility for reducing the crash potential or the frequency and severity of crashes. Members include:

- Governor of the State of Washington, Commission Chair
- Secretary of Transportation, Washington State Department of

Target Zero

- Sets statewide priorities for all traffic safety partners through a collaborative effort.
- Provides a resource for potential strategies to address each of the priority areas.
- Monitors outcomes at a statewide level for each of the priority levels.

Transportation

- Chief, Washington State Patrol
- Director, Washington State Department of Licensing
- Secretary of Health, Washington Department of Health
- Director, Health Care Authority
- Superintendent of Public Instruction
- Commissioner, Washington State Association of Counties
- Association of Washington Cities representative
- Judicial representative

The Commission works to develop plans, programs, and events that support reducing fatal and serious injury crash potential on Washington's roadways with the following organizations:

- Washington state tribes
- Tribal, Municipal, and Rural Transportation Planning Organizations
- Washington State Legislature
- Freight Mobility Strategic Investment Board
- Local law enforcement
- Community, local and regional agencies and organizations
- Private and non-profit organizations
- Federal Highway Administration
- National Highway Traffic Safety Administration
- Federal Motor Carrier Safety Administration
- Federal Railroad Administration
- Bureau of Indian Affairs
- WTSC employees

The WTSC also convenes and coordinates with:

- Cooper Jones Active Transportation Safety Council
- Washington Impaired Driving Advisory Council
- Tribal Traffic Safety Advisory Board
- Traffic Records Committee

Washington State Department of Transportation

The Secretary of Transportation represents WSDOT on the WTSC. The Secretary is supported by the Highway Safety Executive Committee (HSEC).

HSEC develops safety policies for implementing the WSDOT Capital Program Safety Subprogram (I2) and project development processes to meet Target Zero, coordinates transportation system safety within and between modes, and delivers the Washington Transportation Plan and Highway System Plan.

HSEC Executive Committee:

- Director, Transportation Safety and Systems Analysis Division
- Director, Active Transportation Division
- Director, Capital Program Development and Management Division
- Director, Development Division
- Director, Transportation Operations Division

HSEC responsibilities include:

- Providing executive support for Target Zero.
- Approving project budgets and expenditures of funds.
- Approving project scopes, objectives, and strategy.
- Resolving organizational, policy and procedural issues.
- Supporting an environment of collaboration and cooperation.
- Approving and supporting resource commitment to projects.

HSEC is supported by the Highway Safety Issues Group (HSIG). HSIG is an interdisciplinary team of transportation professionals with an interest in and responsibility for reducing fatal and serious injury crash potential on Washington's roadways. HSIG serves as a forum—including WSDOT Region representation—to discuss safety performance, implementation of the safety subprogram, and provide technical support to HSEC for solving technical safety issues. HSIG responsibilities include:

- Identifying highway safety issues.
- Developing proposed highway safety policies for HSEC consideration.
- Developing solutions within HSIG authority and proposing solutions for HSEC consideration.
- Developing and providing recommended policies to the HSEC for consideration if outside HSIG authority.
- Developing proposed project scope and requirements.
- Providing technical and engineering support to HSEC.

Through HSEC and HSI, WSDOT has developed the following documents to guide safety activities and performance on Washington's Roadways:

- [FHWA Stewardship Agreement](#) - WSDOT's agreement with FHWA for addressing safety issues on federal aid projects and safety programs.
- Safety Scoping Process Flow Chart - a chart illustrating the workflow of tasks required to understand across divisions and regions.
- [Target Zero](#) - Washington state's Strategic Highway

Safety Plan developed by the Washington Traffic Safety Commission.

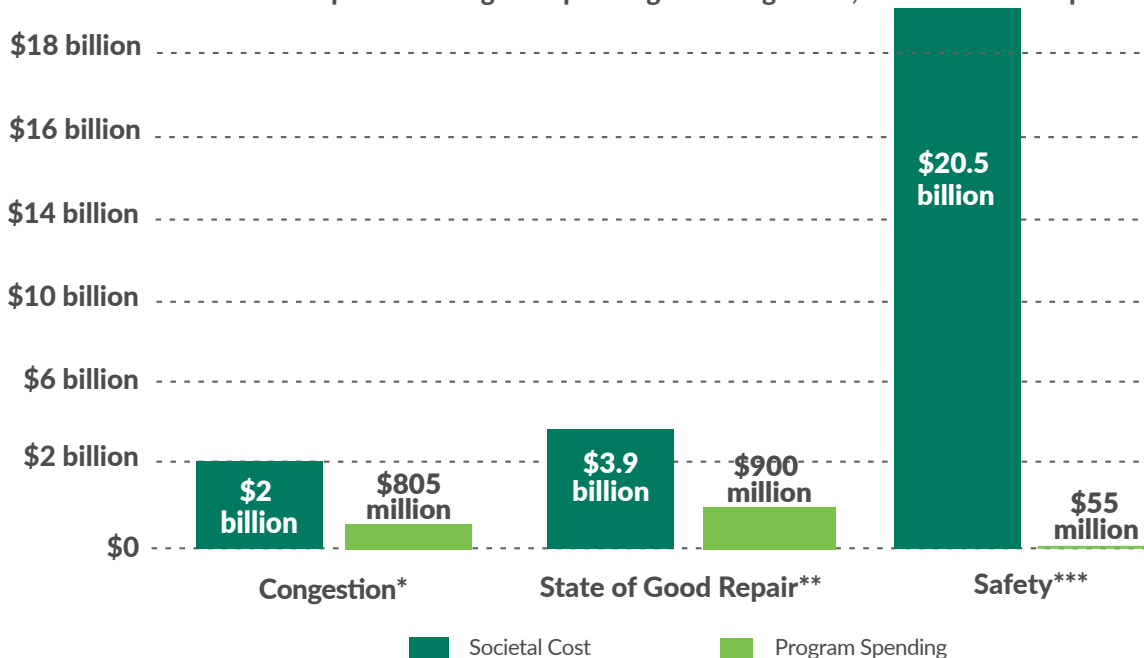
- [Washington Transportation Plan \(WTP\)](#) - Washington State Transportation Commission's recommended strategic transportation plan includes a highway safety element.
- [Sustainable Highway Safety Program](#) - Executive Order E 1085.01, establishes the Highway Safety Executive Committee and directs WSDOT resources using a scientifically based approach for safety analysis and mitigation strategies in support of Target Zero.

- [Safety Analysis Guide](#) - Provides guidance regarding expectations for safety analysis across WSDOT programs and outside of typical program areas.

Other guidance that supports WSDOT's Target Zero responsibilities include:

- The [WSDOT Design Manual](#) provides specific policies and guidance, criteria, procedures, and safety analysis documentation requirements.
- [Traffic Manual](#)
- I-2 Scoping Instructions
- [Active Transportation Plan](#)

Exhibit 2. Societal Cost Compared to Program Spending For Congestion, State of Good Repair and Safety



Notes and data sources: data from the 2022 State of Transportation Report: <https://wsdot.wa.gov/about/secretary-transportation/state-transportation>

*Congestion cost source: Texas Transportation Institute's 2015 Urban Mobility Scorecard; based on a value of travel delay and excess fuel consumption for the area from Everett to Tacoma.

**State of Good Repair cost source: ASCE 2017 Infrastructure Report Card; estimated at \$656 for every Washington driver.

***Safety cost source: Societal costs of crashes calculated using methods described in Crash Cost for Highway Safety Analysis (FHWA-SA-17-071), Chapter 6, Federal Highway Administration, Office of Safety 2018. Economic cost components include: medical care, emergency services, market productivity, household productivity, legal costs, insurance administrative costs, workplace costs, property damage and congestion.

Stakeholder Outreach

WSDOT works very closely with its safety partners, and has achieved a high level of cooperation and coordination at the federal, state and local levels. WTSC and MPOs/RTPOs meet frequently to discuss all areas of the safety program, including target setting and progress toward achieving the goal of zero fatal and serious injury crashes by 2030. WSDOT and WTSC meet quarterly with the FHWA, NHTSA, FMCSA and the WSP to discuss ongoing safety-related activities.

In 2019, WSDOT and its partners updated the state's SHSP. As part of the HSIP target setting process, WSDOT meets with MPO Technical, Coordinating and Executive Committees, as well as with MPO and RTPO boards as requested.

In his 2023 State of Transportation address to the Washington State Legislature, Washington State Secretary of Transportation Roger Millar continued to emphasize the need for additional funding to the WSDOT Safety Program by highlighting the societal cost of crashes in comparison to funding WSDOT receives in its capital program. Refer to **Exhibit 2 on page 6**. The Department made a commitment National Road Safety Strategy Call to Action.

Additional discussion on the impacts of the complete street

requirements and impacts to various programs occurred in the 2023 legislative Session.

The Washington State *Active Transportation Plan 2020 and Beyond* is complete. The Active Transportation Division and other offices with Safety responsibilities will work on an action plan for safety, prioritizing measures to address the ongoing trend of disproportionate serious/fatal crashes involving pedestrians and bicyclists. This work will be ongoing through 2023.

Decision Framework

To focus efforts on eliminating fatal and serious injuries on state's roadways, the HSIP uses the emphasis areas within the SHSP, Target Zero, to develop subcategories. The subcategories use a 10-year horizon for planning purposes.

Using the subcategories and 10-year plan, ranked lists are developed within each of the subcategories; the methods and process are described in the Safety Subcategories Methods Section. Each emphasis area has associated strategies for fatality and serious injury reduction and will focus on incorporation of the Safe System principles (Refer to **sidebar on page 36**). It also recognizes the need for leadership in achieving safety goals and the appropriate safety culture within an organization. **Exhibit 3** shows the connections between the

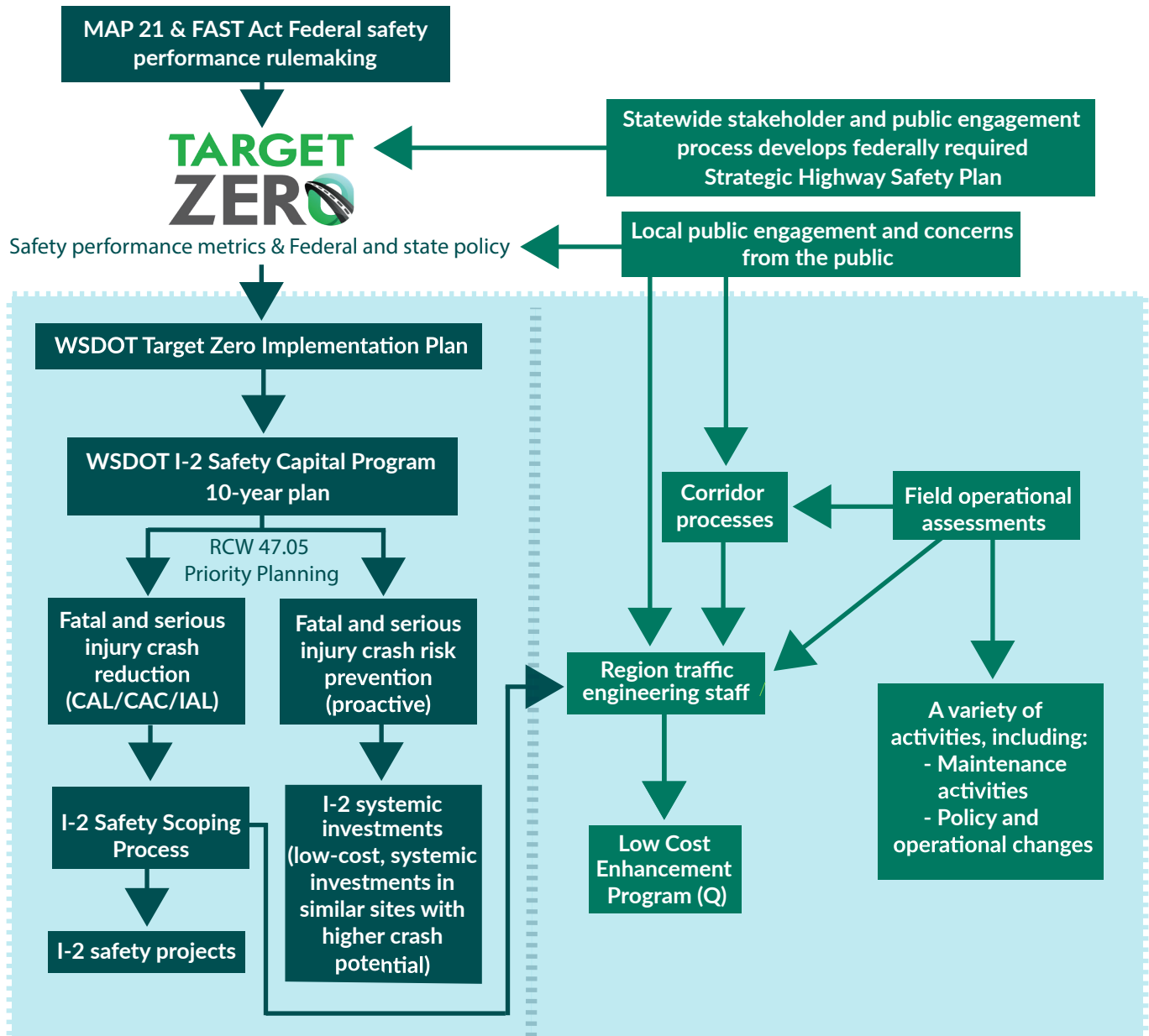
various safety management activities which support Target Zero. On publication of WSDOT executive Order 1085.01, WSDOT will review the entirety of its highway safety program to better align with Safe System Approach, and equity-based principles. A review of the status of each subcategory will occur.

Complete Streets Implementation at WSDOT

In the 2022 Move Ahead Washington transportation investment package (ESSB 5974), the legislature expressed an intent to improve the safety, mobility, and accessibility of state highways. They directed the department to incorporate the principles of complete streets with facilities that provide street access with all users in mind, including pedestrians, bicyclists, and public transportation users. This directive applies on all projects with an estimated cost of \$500,000 or more, where the design phase of the project begins on or after July 1, 2022, to be constructed on state highways routed over city streets. Since this date, WSDOT has been implementing Complete Streets Considerations as part of project development.

As part of the work for the Washington State Active Transportation Plan, state routes within the boundaries of population centers (defined as

Exhibit 3. Safety Management Activities Supporting Target Zero



incorporated cities and towns and census designated places), were assessed for level of traffic stress. Level of traffic stress provides a quantitative measure of roadway characteristics including posted speed, number of lanes, and traffic volumes; higher LTS corresponds to locations with higher crash potential. In 2022, 22.6% (359 out of 1,585) active transportation user-involved crashes occurred on state facilities within population centers (excluding ramps and limited access freeways, and including ramp terminals), making these facilities an ideal focus for further investment that improves active transportation facilities and access to transit. Most of these facilities also have higher levels of traffic stress.

Safety Priorities

Target Zero 2019 evaluated data for 2015–2017 to identify statewide priority areas related to fatalities and serious injuries. The team categorized priorities as either level one or level two based on the percentage of fatalities and serious injuries associated with each factor.

- **Priority level 1** includes the contributing factors and crash types associated with the largest number of fatalities and serious injuries and constitute at least 25% of fatalities or serious injuries. This level also includes supporting systems and technologies that are

essential for development and management of the I-2 and local safety programs.

- **Priority level 2** factors include those factors and crash types that are less than 25% of fatalities or serious injuries.

Exhibit 4 on page 10 summarizes the Target Zero emphasis areas. The approaches used for these subcategories are outlined in the Implementation Section of this report.

Exhibit 5 on page 11 presents the Target Zero 2019 Emphasis Areas as presented in the Washington State Strategic Highway Safety Plan. The table provides the priority level, and number and percent of fatalities and serious injuries that occurred during the three-year period from 2015 to 2017. WSDOT's emphasis areas are consistent with the priorities of Target Zero.

Though not identified as safety subcategories, investments in the monitored areas of Target Zero may occur for vehicle-train crashes by the HQ Development Division, school active transportation by the HQ Active Transportation Division, and work zone safety by the HQ Transportation Operations Division and regions.

The emphasis areas identified in Target Zero provide the basis for subcategory development in the I-2 safety subprogram. Each of these emphasis areas

represent broad categories of crash types. Subcategories focus on specific individual crash types and contributing factors. The expectation is that investments will likely reduce fatal and serious injury crash severity for individual or groups of crash types.

Appendix B on page 79 summarizes the statewide safety performance and safety performance for state routes distinguishes between facilities under WSDOT jurisdiction and those under local jurisdiction. Note that state routes in cities with populations over 27,500 are under local jurisdiction and do not receive Safety Subprogram investment from WSDOT. Summaries for the latter do not include any limited access facilities or crashes related to ramp terminals or crossroads at interchanges within these city boundaries. Per RCW 47.24.020(13) these state routes are local jurisdiction.

The strategies used to address specific crash types or groups of crash types are commonly known as crash countermeasures. The countermeasures become the subcategories for investment. WSDOT uses the subcategories to develop a method for ranking, prioritizing, and implementing projects.

Appendix A on page 72 provides updated performance

Exhibit 4. Summary of WSDOT's I-2 Investment Types, Emphasis Areas, and Strategies/Subcategories

Target Zero emphasis areas; Washington state; 2015-2019

Type of Investment	Emphasis area	Strategies/Subcategories
Reactive Safety Investments	Intersection-related	Intersection Analysis Locations
	Lane departure	Crash Analysis Locations/Crash Analysis Corridors
Proactive Safety Investments	Intersection Systemic Safety	Compact roundabouts
	Lane departure	Rumble Strips
		High Friction Surface Treatment Program
		Systemic Curve Treatments
		Redirectional Landforms (Dormant)
		Breakaway Cable Terminal Replacement
		Guardrail Infill and Retrofit
		Field Assessments
		Edge Line Visibility Pilot
	Active Transportation	Pedestrians and Bicyclists
		Motorcyclists
	Safety Decision-making and Performance Improvement	MIRE FDE
		AASHTO HSM Predictive Method Tools
AASHTO SafetyAnalyst IHSDM Crash Prediction Module		
MPO/WTSC Planning/Target Setting		
Safe System	Speed Management	

Notes: The emphasis areas identified in Target Zero provide the direction for subcategory development in the I-2 safety program. Each of these emphasis areas represent broad categories of crash types. Subcategories focus on specific individual crash types and contributing factors. The expectation is that investments will reduce fatal and serious injury crash severity for individual or groups of crash types.

information and presents the top seven emphasis areas by jurisdiction across crash types and road users.

Exhibit 6 on page 12 shows the emphasis areas with associated fatal and serious injuries, fatal

and serious crashes, total crashes and total 2022 societal costs associated with each of the crash types and user groups. The chart shows that lane departure and intersection crashes are the top crash types, and for user groups, crashes

involving younger drivers, and crashes involving people walking and biking predominate.

Exhibit 5. Strategic Highway Safety Plan, Target Zero 2019 Emphasis Areas

Source: Target Zero 2019

Priority Level and Emphasis Area		Fatalities ¹		Serious Injuries ²	
		Number	%	Number	%
		1,650	100%	6,537	100%
High Risk Behavior					
1	Impairment	958	58.1%	1,215	18.6%
1	Distraction	502	30.4%	1,933	29.6%
1	Speeding	485	29.4%	1,579	24.2%
2	Unrestrained Occupants	312	18.9%	701	10.7%
Crash Type					
1	Lane Departure	796	48.2%	2,458	37.6%
1	Intersection Related	377	22.8%	2,256	34.5%
Road Users					
1	Young Drivers 16-25	512	31.0%	2,243	34.3%
2	Pedestrians and Bicyclists	329	19.9%	1,333	20.4%
2	Motorcyclists	236	14.3%	1,209	18.5%
2	Older Drivers 70+	223	13.5%	599	9.2%
2	Heavy Trucks	178	10.8%	442	6.8%
Decision and Performance Improvement					
1	Traffic Data Systems				
1	EMS and Trauma Care Systems				
1	Evaluation and Diagnostics				
1	Safe Systems				
1	Cooperative Automated Transportation, including Autonomous Vehicles				
Other Monitored Emphasis Areas					
Drowsy Drivers		44	2.7%	236	3.6%
Work Zones		18	1.1%	70	1.1%
Vehicle-Train		12	0.7%	4	0.1%
Wildlife		8	0.5%	53	0.8%
School Buses		4	0.2%	17	0.3%

Notes: Percentages may not add to 100 due to crashes involving more than one factor.

1. Fatality data is from the preliminary 2019 Q4 release of the WA-FARS Analytical File, and the final 2018 WA-FARS, the best available data (final NHTSA FARS data is only available up to 2017).

2. Serious injury data is from the WSDOT Engineering Crash Datamart and represents reported crashes involving at least one motor vehicle and meeting the requirements of RCW 46.52.070, RCW 46.52.030 and WAC 446-85-010.

Source: 2019 Target Zero report, www.targetzero.com.

Exhibit 6. Fatal and Serious Injury Crashes and Societal Cost Across Emphasis Areas

Target Zero emphasis areas; Washington state; 2022

Emphasis Areas	Fatal and Serious Injuries ¹	Fatal and Serious Injury Crashes ²	Total Crashes	2022 Societal Crash Cost ³
Crash Types				
Lane departure	1,538	1,272	26,216	\$6,764,038,300
Run off the road	1,177	1,038	24,142	\$5,629,532,600
Opposite direction	361	234	2,074	\$1,134,505,700
Intersection related	1,242	1,095	39,519	\$7,456,772,600
User Groups⁴				
Crashes involving people walking and biking ⁵	713	686	2,763	\$3,240,461,900
Crashes involving people walking	558	534	1,800	\$2,445,220,700
Crashes involving people biking	156	153	964	\$799,272,600
Crashes involving motorcyclists	668	639	1,954	\$2,824,030,800
Crashes involving heavy trucks	278	236	6,282	\$1,305,113,100
Crashes involving younger drivers (ages 16 to 25)	1,171	954	35,976	\$6,338,112,200
Crashes involving older drivers (ages 70 and over)	395	348	10,102	\$2,163,099,900
All crashes	3,835	3,333	103,136	\$20,476,488,800

Source: WSDOT Engineering Crash Data Mart, 2022 year end snapshot (05/06/2023).

Notes: 1. Fatalities represent fatal crashes reported in the WSDOT Engineering Crash Data Mart. There are slight differences between the WSDOT Engineering Crash Data Mart and the NHTSA FARS data. For the purpose of this Implementation Plan the data presented are from the WSDOT Engineering Crash Data Mart (2020 year end snapshot).

2. The fatal crashes reported in the WSDOT Engineering Crash Data Mart. There are slight differences between the WSDOT Engineering Crash Data Mart and the NHTSA FARS data. For the purpose of this Implementation Plan the data presented are from the WSDOT Engineering Crash Data Mart unless otherwise noted.

3. The societal cost values were estimated using WSDOT specific crash costs derived using the methodology outlined in the FHWA Guide, Crash Costs for Highway Safety Analysis, 2018. Costs used are as follows:

- Fatal Crash - \$4,031,400
- Serious Injury Crash - \$4,031,400
- Evident Injury Crash - \$283,000
- Possible Injury Crash - \$168,300
- Property Damage Only Crash (PDO) - \$ 17,300

4. Totals represent crashes involving the specific user groups. It does not imply that these users are at fault in these crashes or that these users were involved in the first or second collision types.

5. The crashes involving people walking and people cycling will not individually add up to the total crashes involving people walking and biking because there are crashes where both people walking and biking are involved (not mutually exclusive).

Safety Investment Strategy

WSDOT's funding for reducing fatal and serious injury crash potential is managed primarily through the Improvement (I) Program's Safety Subprogram (I-2). Other funding programs and subprograms may also address crash potential if there is a positive benefit/cost opportunity within the boundaries of the project (e.g., a preservation project might include a guardrail improvement). A brief overview of WSDOT's safety investment strategy is provided below.

Integration of HSIP and Target Zero

Federal safety funds from the Highway Safety Improvement Program (HSIP) are split between state highways and local roads in a data-driven process following the Target Zero framework. The funds are split according to the proportion of fatal and serious injury crashes for Target Zero priority level 1 engineering emphasis areas that occurred on local roadways versus roadways under WSDOT jurisdiction. Allocation of funding is based on the most recent five-year period.

Available Funds and Allocation Goals

For the FFY 2022 reporting period, it is anticipated that the State of Washington will receive approximately \$49.8 million for the HSIP program. Of this, approximately \$14.9 million will be allocated to state roadways and \$34.9 million to local roadways. **Exhibit 7** shows the federal funding allocation for federal fiscal years 2021 and 2022. **Exhibit 8** shows the percentage distribution with 70% to local roads, and 30% to state highways.

The effects of the COVID-19 pandemic will not likely reduce the current expenditure. COVID-19 recovery plans are being discussed by Congress and have included some infrastructure funding, and additional investments may occur. However, Washington has experienced loss of revenue within the funding provided by the legislature and the impacts of these shortfalls are still uncertain. WSDOT and its local partners will work together as more becomes known.

Exhibit 7. Allocation of HSIP funding

Federal Fiscal Years 2021 and 2022

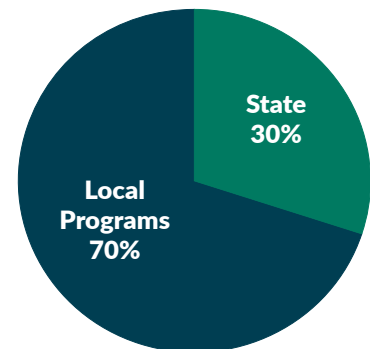
	Total	State	Local Programs
FFY 2021	\$40,194,531	\$13,406,425	\$26,788,106
FFY 2022	\$49,811,957	\$14,943,587	\$34,868,370

Key Takeaways

- HSIP funds are allocated to local roadways and state roadways based on the proportion of fatal and serious injury crashes for Target Zero priority level 1 infrastructure emphasis areas.
- Current split is 70% to local roadways to 30% state roadways.

Exhibit 8. HSIP Funding Split

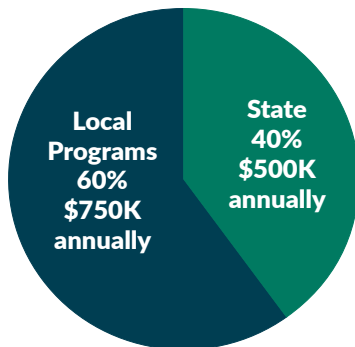
Federal Fiscal Year 2022



Local Roadways

The state Legislature established \$20 million fund over a 16-year period. New funding will allow to expand Target Zero safety efforts for priority one that is lane departure emphasis area. **Exhibit 9** shows Lane Departure fund distribution.

Exhibit 9. Lane Departure Funding Split



The funding for local roadways is divided into two programs, the County Safety Program and the City Safety Program, per guidance received from both cities and counties via a local agency safety program review panel. All safety projects must address fatal or serious injury crashes per HSIP funding requirements.

County Safety Program

The County Safety Program methodology has remained consistent since 2010, requiring counties to apply only for systemic safety projects. Systemic safety involves a data-driven, prioritized approach

to address crash potential (typically lower-cost and widespread improvements). With the widely dispersed nature of fatal and serious injury crashes across 39,200 centerline miles, WSDOT and counties have agreed a systemic approach is the best way to advance Target Zero.

Since 2014, WSDOT has required counties to submit a Local Road Safety Plan (LRSP) as part of their application to be eligible for HSIP funds. This plan describes the data-driven prioritization process for the county, including identification of common roadway characteristics associated with fatal and serious injury crashes. This is a national best practice, receiving a 2015 National Roadway Safety Award from the Federal Highway Administration and the Roadway Safety Foundation.

The County Safety Program has a call for projects every two years. Once counties submit their funding applications and Local Road Safety Plans, WSDOT Local Programs staff identify projects for funding based on fatal and serious injury crash history, common roadway characteristics associated with fatal and serious injury crashes, cost effectiveness of the countermeasures proposed, and agency delivery record based upon prior project selections. Funding for selected projects is then awarded to the counties for delivery.

City Safety Program

The City Safety Program methodology has remained consistent since 2012 and addresses safety on 17,639 centerline miles of city roadways. That methodology requires cities to apply for spot location projects or systemic safety projects. Since 2012, about half of the City Safety Program funds have been awarded to spot location projects and about half to systemic safety projects. In 2018, WSDOT began requiring cities to submit a LRSP as part of their application to be eligible to apply for the systemic safety part of the program. Starting in 2020, all cities were required to submit a LRSP as part of their application to be eligible for HSIP funds.

The City Safety Program has a call for projects every two years. Once cities submit their funding applications and LRSPs, WSDOT Local Programs staff identify projects for funding. For systemic safety projects, funding is based on fatal and serious injury crash history, common roadway characteristics associated with fatal and serious injury crashes, cost effectiveness of the countermeasures proposed, and agency delivery record based upon prior project selections.

For spot location projects, funding is based on the benefit/cost ratio of the project (expected safety benefits are based on CMFs and crash

history and are compared to total project cost). All benefit/cost ratios are calculated by WSDOT Local Programs for statewide consistency. Agency eligibility is also affected by the delivery record of that agency based upon prior project selections. Funding for selected projects is then awarded to the cities for delivery.

WSDOT Local Safety Grant Program: Strategies and Implementation

Local agency strategies follow the guidance found in Target Zero, primarily in the areas of Lane Departure, Intersections, Pedestrians and Bicyclists, and Data Improvement. Refer to **Exhibit 10** for recent Target Zero emphasis areas and primary strategies addressed by cities and counties. Refer to **Exhibit 11** for safety fund distribution in FFY 2024. Regarding local safety implementation for FFY 2024, the changes most likely to reduce potential crashes related to the contributing factors and crash types on local roads:

- The requirement for all agencies to develop a LRSP when applying for safety projects (65 cities and 37 counties have now developed a LRSP). **Appendix E on page 101** demonstrates the growth of development of Local Road Safety Plans within the state over the past decade.

Exhibit 10. WSDOT Local Safety Countermeasures for 2013-2023

City	County
Lane Departure (11%)	Lane Departure (69%)
Guardrail	Guardrail
High Friction Surface Treatments	High Friction Surface Treatments
Signing	Signing
	Slope flattening
	Shoulders
Intersections (56%)	Intersections (27%)
Signal Operations/Visibility	Signal Operations/Visibility
Roundabouts	Roundabouts
Traffic Signals	Traffic Signals
Signing	Signing
Pedestrians and Bicycles (33%)	Pedestrians and Bicycles (2%)
Road Diets	
Rapid Flashing Beacons	Data Improvement (1%)
Pedestrian Hybrid Beacons	
Refuge Islands	Speeding (1%)
Leading Pedestrian Intervals	
Data Improvement (1%)	
Speeding (1%)	

Exhibit 11. Planned FFY 2024 Local Safety Project Obligations

City	County
Intersections (17%)	Intersections (11%)
Roundabouts	Roundabouts
Signal Operations/Visibility	Signing
Lane Departure (6%)	Lane Departure (41%)
Clear Zone Improvement	Guardrail
Pedestrians and Bicycles (25%)	Signing
Road Diets	Slope Flattening
Rapid Flashing Beacons	Shoulders
Pedestrian Hybrid Beacons	Pavement Markings
Refuge Islands	Realignment
Bike Lanes	Delineation

Exhibit 12. 2019-2027 I-2 Safety Strategies

Subcategory: Crash Reduction (ID)
CAL/CAC
IAL
Subcategory: Crash Prevention (IE)
Intersections – 15%
Intersection Systemic Safety (angle/high speed) (Compact Roundabouts)
Lane Departure- (run-off-the-road + opposite direction) – 15%
Rumble Strips
High Friction Surface Treatments
Horizontal Curves
Roadside Safety Hardware – 15%
Redirectional landforms (dormant)
BCT - Interstate
BCT - Non Interstate
Guardrail infill
Corridors – 5%
Field Assessment
High Visibility Markings
Vulnerable Users – 15%
Pedestrian and Bike (active transportation)
Motorcycle
Decision Making & Performance Improvement – 5%
MIRE FDE
AASHTO Highway Safety Manual Predictive Method Tools
AASHTOWare SafetyAnalyst™
ISHDM Crash Prediction Module
MPO/WTSC Planning/Target Setting

- The roundabouts-first approach to major intersection improvements (rather than traffic signals). This policy is about making a culture change to utilize this significant safety improvement as part of the engineering toolbox for local agency public works departments. This requirement has led to roundabouts being the single most requested countermeasure (by funds requested) in the 2021 County Safety Program, for example.

- Getting more local agencies to develop LRSPs and apply for HSIP funds. For example, in the 2022 City Safety Program, 51 cities applied for funding (most ever in a single call), including 11 cities that had never previously applied (since the HSIP has existed). This increase in agencies directly relates to the increase in LRSPs across the state, now totaling 102 agencies with a safety plan.

State Highways Under WSDOT Jurisdiction

Ten-Year Implementation Plan

Having defined subcategories, a recommended level of funding within each of the subcategories is developed. WSDOT uses a 10-year planning horizon for the safety subprogram, as it is difficult to assess safety performance effectively

beyond the 10-year time frame. This implementation plan is incorporated into the Highway System Plan.

The Highway System Plan contains programmatic levels of funding and identifies how particular strategies might provide benefits for given levels of investment using planning level estimate of benefits.

WSDOT does not include specific projects in the plan as changes within the system occur based on numerous factors. Instead, WSDOT uses the programmatic levels to guide the selection of projects for one or two years. This flexibility helps WSDOT target the highest value projects for each funding period.

WSDOT reviews, assesses, and ranks the respective subcategories within investment categories. This subcategory ranking helps WSDOT determine relative priority and potential budget levels in the Safety subprogram shown in **Exhibit 12**.

For instance, in the Lane departure subcategories addressing BCTs on the interstate would be considered a higher priority than guardrail infill. The percentages shown indicate the respective target amount for a given year's funding.

It is important to note that in programming projects, it is typical for WSDOT to do so over a six-year period, or three

consecutive two-year biennial cycles. Because projects are previously programmed, implementation of projects within a new subcategory is not immediate. Therefore, implementation of new subcategories will typically span more than one biennium.

Priority Programming for Highway Development

In [RCW 47.05](#), the Washington State Legislature recognized that the complexity and diversity of transportation needs were becoming increasingly challenging. The legislature also recognized that the needs of the transportation system outweighed the ability to fund every location. The RCW requires that projects be selected based on a policy of priority programming where objectives are defined within available resources, and that the selection of projects be based on factual need and evaluation of the life-cycle costs and benefits.

WSDOT reviews and selects various strategies for further development into a program of potential safety-related investments that include both fatal and serious injury crash prevention and crash reduction elements. These are strategies that reduce the potential for crashes on the state highway system. This step of the process uses several different screening methods to identify a set of locations within all

highways that would appear to have potential for fatal and serious injury crash reduction when addressed with a given engineering countermeasure.

Target Zero requires that WSDOT use a data-driven approach to evaluating, analyzing, and diagnosing crashes and their contributing factors (5th E of Safety Management) to determine how best to modify the road system to reduce fatal and serious injury crashes to the greatest extent possible within available resources.

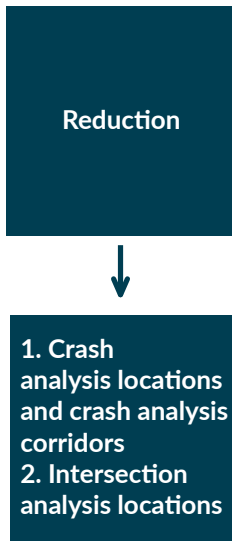
A countermeasure is a roadway or roadside modification that addresses contributing factors, crash types and injury levels in a manner that reduces potential for specific groups of crashes or injuries. However, there are crash locations at which an infrastructure change may have little or no effect on crash or injury reduction. While such a location may show up on a ranked list during the priority programming process, it does not necessarily mean that location will be modified with an infrastructure strategy for a valid reason, like in a situation when no infrastructure or operational strategies are practically available to reduce the fatal and/or serious injury crash potential.

Exhibit 13 shows the general process flow in subcategory development.

Exhibit 13. I-2 Safety Program General Process Flow



**Exhibit 14. I-2 Safety Program
Crash Reduction Category
Subcategories**



**Exhibit 15. Subcategories for
Decision Making and Performance
Improvement**



Using this process, WSDOT developed targets for each category. **Exhibit 14** lists the reduction categories identified. Federal HSIP funds can also be used to support data and decision-making tools, and WSDOT has added an emphasis area for decision-making and performance improvement. **Exhibit 15** lists the subcategories for this emphasis area. **Exhibit 16 on page 19** provides the prevention subcategories for the 2021-2023 biennium.

WSDOT I-2 Safety Subprogram

Safety projects within WSDOT’s scope of responsibility are programmed through the WSDOT Safety Subprogram (I-2) using a ranking and prioritization process.

Countermeasures

WSDOT’s approach to investments in highway safety is data-driven and science based. The approach focuses on proven infrastructure countermeasures expected to reduce the potential for crashes and allows for piloting new technology or application to test performance. These countermeasures have several common characteristics:

- Target fatal and serious injury crashes.
- Have been evaluated and shown to have a proven benefit in net overall reduction in the societal

cost of fatal and serious injury crashes.

- Are the result of a statewide approach that requires analysis of benefit-cost.
- The countermeasures in the WSDOT safety program are distinguished as being either reduction or prevention.
- Crash reduction countermeasures focus on fatal and serious injury crash reduction. Countermeasures are selected based on historic crash performance compared to similar facilities, crash type, and contributing factor analysis.
- Crash prevention (systemic) countermeasures focus on fatal and serious injury crash prevention.

Crash Reduction

Reduction countermeasures are selected based on the historic safety performance of segments and intersections. The process selection steps:

- Screen the statewide network using respective methods of each subcategory
- Assess of a subset of sites selected during the screening for infrastructure investment based of cost- effectiveness
- Identify potential countermeasures to reduce crash outcome(s)

- Complete a crash analysis report (CAR). WSDOT regional staff analyze locations and complete, which is used in the priority programming process to develop a benefit/cost ratio.
- Program project as appropriate

The potential projects are considered for funding based on a rigorous review of:

- Effectiveness of countermeasure(s) in addressing factors contributing to crash types typical of the location

- Location context
- The cost effectiveness of the proposed investment using the anticipated societal crash reduction benefits

The network screening is based on the excess fatal and serious injury crashes and is performed using the AASHTOWare SafetyAnalyst™ software.

Region staff conduct the assessment of sites identified during network screening. If they find that contributing factors at a site include risky behaviors, they notify Washington State Patrol

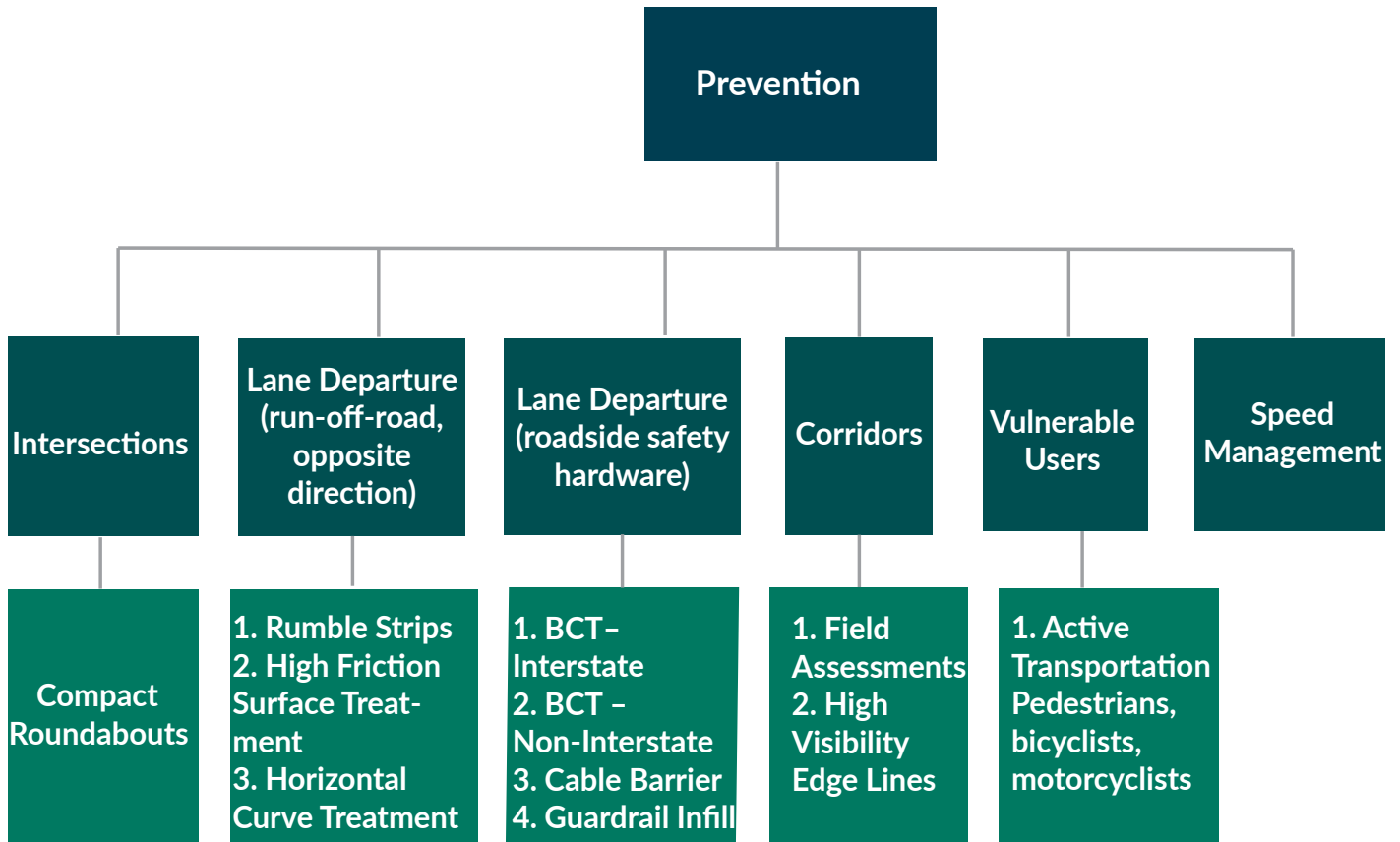
and the local Target Zero Teams. These organizations are responsible for enforcement and educational countermeasures focused on risky behavior.

The reduction flow chart in **Exhibit 17 on page 20** illustrates the general process for screening and developing a ranked list of potential locations for investment.

Crash Prevention

Crash prevention subcategories are associated with the emphasis areas in Target Zero.

Exhibit 16. Safety Program Crash Prevention Category Subcategories



Under the current plan, the subcategories are:

- Lane departure crashes includes two subcategories: run off the road crashes and opposite direction crashes
- Intersection related crashes focusing on compact roundabouts
- Speed management focusing on reducing crash forces
- User types: people that walk and bike; motorcyclists;

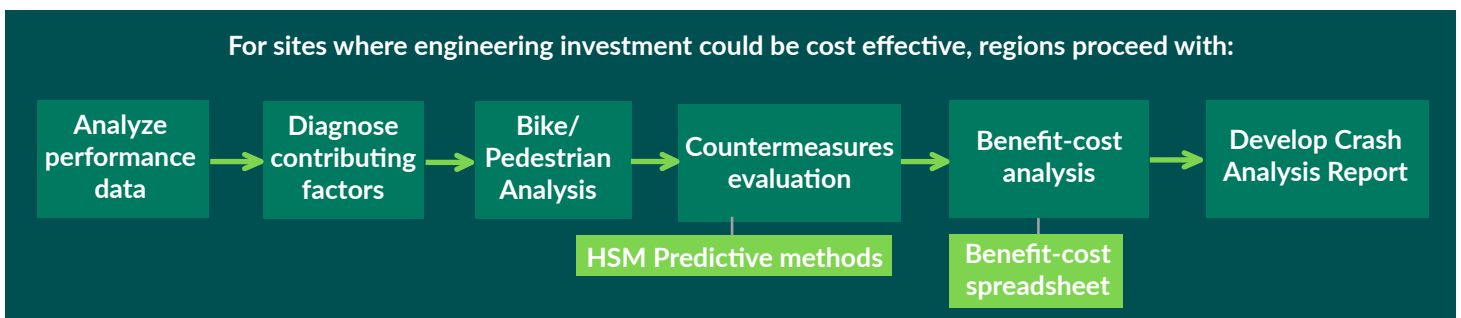
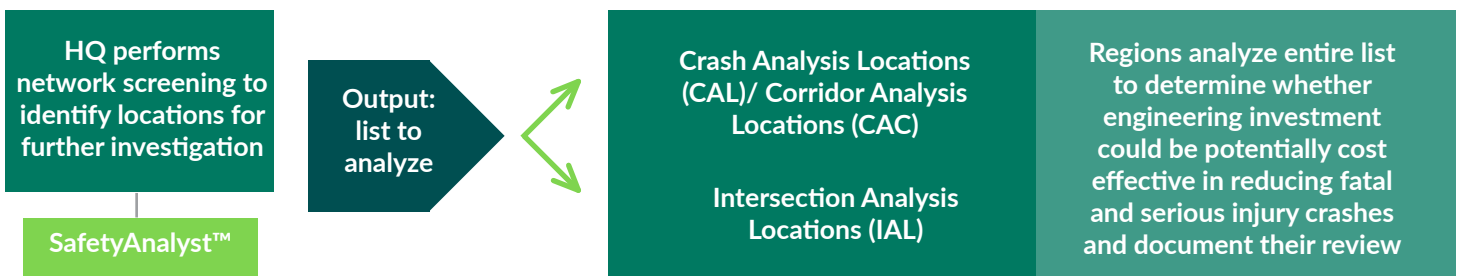
heavy truck drivers; older drivers (65+); and younger drivers (16-25); This category includes two I-2 subcategories: motorcyclists and pedestrians and bicyclists.

Discussion papers are developed for each subcategory and approved by the Highway Safety Executive Committee.

The proactive measures generally represent low cost per mile or per location

investments with high returns on investment. In recent years WSDOT has found that the cost of some of these countermeasures can vary greatly. In those cases, a benefit-cost analysis is still performed to confirm that the investment will, as a corridor or group of locations, still meet the minimum benefit-cost thresholds. The section on Implementation provides additional information about each subcategory.

Exhibit 17. Process flow for the WSDOT I-2 Safety Subprogram Crash Reduction Category



CAR review, I-2 panel review, official HSEC approval → successful projects are programmed, scoped, designed and built

Each of prevention subcategories has a different method for ranking a location for potential project consideration. The subcategory benefit/cost may either be for a location or as a system benefit/cost. A systemic approach recognizes that crashes are scattered across the system, and may occur at different locations because of different factors, such as weather, driver behavior or errors. In other words, selection is based on an evaluation of the countermeasures relevant to the subcategory. **Exhibit 18** illustrates this process.

The I-2 safety subprogram funding is distributed between the reduction and prevention categories based on the Target Zero emphasis

Exhibit 19. Distribution of I-2 Safety Funding to Target Zero Emphasis areas
Federal Fiscal Year 2021

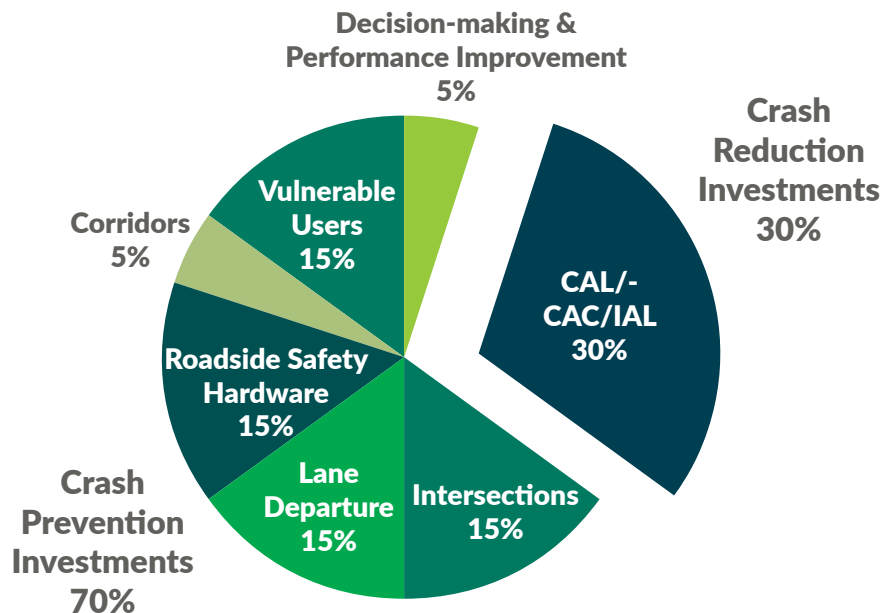
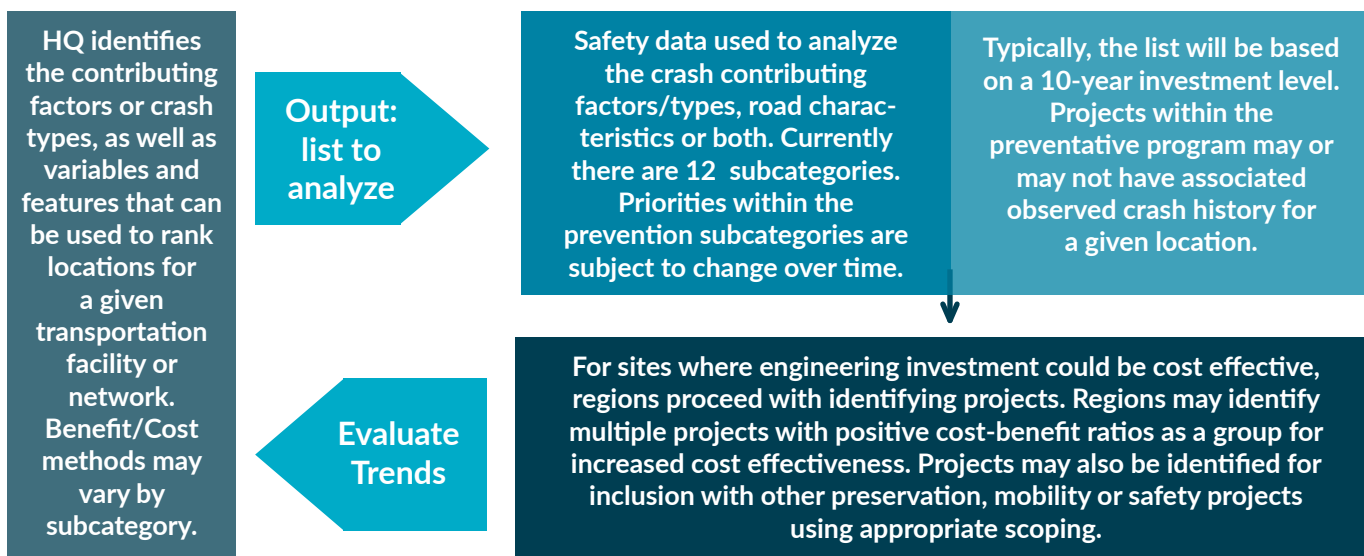


Exhibit 18. Process flow for the WSDOT I-2 Safety Subprogram Crash Prevention Category



areas and the frequency of crashes on the state and local roadways associated with them. Starting in the 2019-2021 biennium, WSDOT has continued to move towards a 70% of the I-2 funding targeted toward preventive systemic subcategories and 30% toward reduction. **Exhibit 19** summarizes the distribution of funding.

Corridor Subcategories

In addition to the I-2 Safety subprogram, other funding subprograms may develop projects that might influence fatal and serious injury crash potential. For instance, maintenance and operational program modifications to the roadway or roadside contribute to change. When a safety activity is triggered, safety subject matter experts are consulted.

The crash prevention category also includes two subcategories that address corridors and are commonly associated with preservation and maintenance activities, respectively.

- Field assessments conducted by regional Transportation Operations staff.
- High Visibility Marking Pilot projects managed through Transportation Operations.

While these subcategories are listed as corridor approaches, treatments in other subcategories, such

as rumble strips, are also deployed at the corridor level as part of considerations during pavement preservation. These investments are, however, addressed under other funding subprograms.

Decision-making and performance improvement

Target Zero also includes an emphasis area for decision-making and performance improvement. WSDOT has responsibility for data systems essential to support WSDOT's Target Zero activities and data are also necessary for work conducted in support of Target Zero by other partners.

WSDOT developed a Safety Data Business Plan with the support of FHWA. This plan identifies priority activities for improvement and will help guide them. Activities may include examining roles and responsibilities related to safety within WSDOT, improving the availability, access, and/or quality of data needed to support analysis and performance management, and/or tools to improve the consistency and quality of safety management and project development and delivery.

Work conducted in support of decision-making and performance improvement is funded through the agency operating budget provided for agency staff and programs.

With the Safe System approach, WSDOT is considering a speed management subcategory for future programming.

Projects

Priority programming for state and local roads results in a prioritized list of potential projects. Adjustments may be made to align with other programmed work (e.g., pavement or mobility improvements) and workforce capacity. For the federal fiscal year 2023, \$15.7 million (30%) on roadways under WSDOT jurisdiction, \$36.6 million (70%) of available funding is expected to be obligated on local roadways under city and county jurisdiction. Refer to **Exhibit 20**.

For the federal fiscal year 2023, \$47.3 million (61%) of available funding is expected to be obligated for intersection investments, \$20.2 million (26%) for lane departure investments, \$9.8 million (13%) for pedestrian and bicyclist investments. Refer to **Exhibit 21**.

The list of programmed projects identified for the FFY 2024 is provided in **Appendix C: Detailed Project List on page 86**. Benefit - Cost effectiveness of programmed projects in Prevention/Reduction categories is demonstrated in **Exhibits 48 and 49 on page 66 and 99**, respectively.

Exhibit 20. Safety Subprogram Funding Distribution by Jurisdiction Type

Anticipated obligations for Federal Fiscal Year 2023

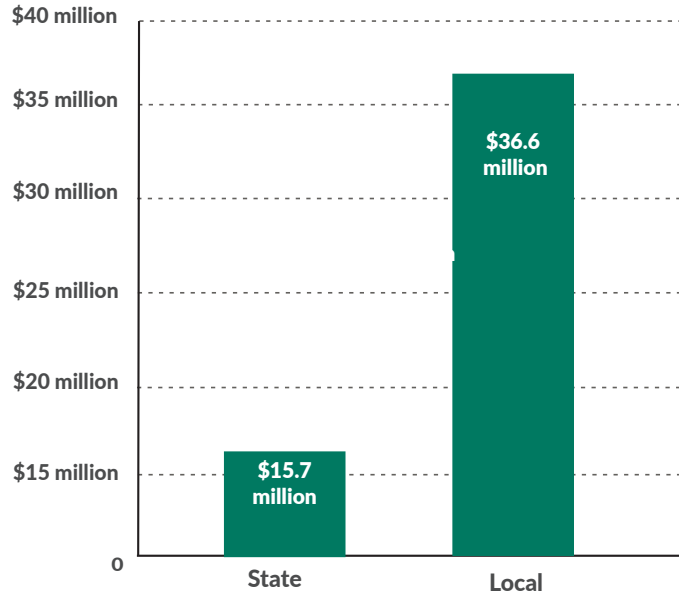
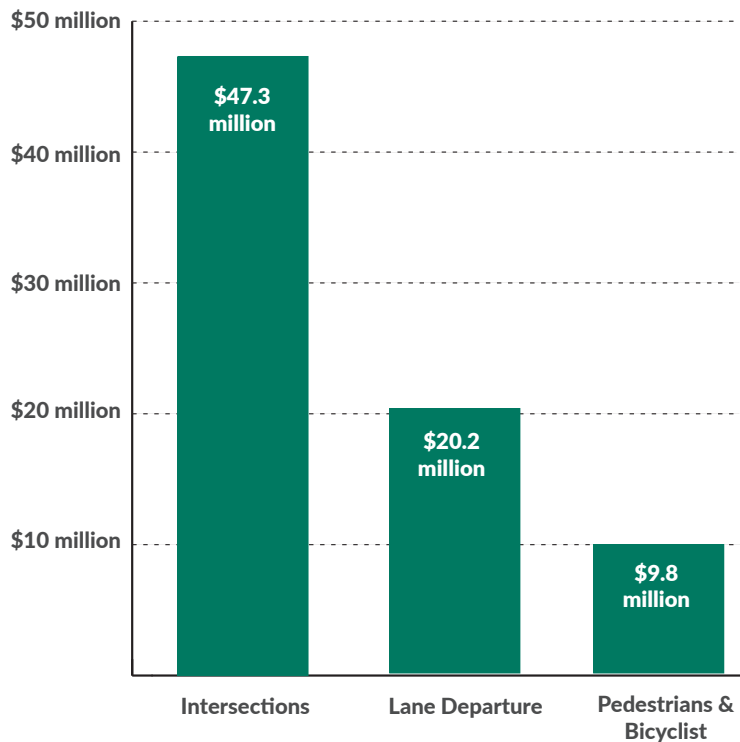


Exhibit 21. Expected Safety Subprogram Funding Obligations by Emphasis Area

Anticipated obligations for Federal Fiscal Year 2023



Performance Trends

Project Review points

Review effectiveness of previously implemented projects, countermeasures, and programs to determine needs for further considerations elaborating on:

- What countermeasures were implemented?
- Where were those countermeasures implemented?
- What crash types or severities were those countermeasures addressing?
- Were those crash types and pertinent countermeasures identified as a priority in the SHSP?
- Were those countermeasures effective in reducing fatal and serious injury crashes?

Washington State Performance Trends

The 2019 Target Zero Plan is the seventh version of this safety road map and it is more important now than ever given the increasing crash trends.

Data from 2013–2022 show that Washington’s traffic fatalities and serious injuries are increasing.

Safety performance management through analysis, evaluation, and diagnosis is critical for understanding and reducing fatal and serious injury crashes. Washington is required by FHWA to set performance targets for the following metrics:

- Number of fatalities - The total number of persons dying in a motor vehicle crash during a calendar year
- Rate of fatalities per 100 million vehicle miles travelled (VMT) - the ratio of total number of fatalities to the number of vehicle miles travelled (VMT expressed in 100 million VMT) in a calendar year
- Number of serious injuries - The total number of persons suffering a serious injury in a motor vehicle crash during a calendar year
- Rate of serious injuries per 100 million VMT - The ratio of total number of serious injuries to the number of VMT (VMT expressed in 100 million VMT) in a calendar year
- Number of non-motorized fatalities and number of non-motorized serious injuries combined - The combined total number of fatalities and serious injuries among pedestrians and bicyclists during a calendar year

WSDOT and WTSC elected to report consistent targets for the first three metrics as part of the Highway Safety Plan.

WSDOT sets targets and monitors performance for highway safety by a yearly assessment of safety data. Safety performance is reported in WSDOT’s Gray Notebook, the agency’s quarterly accountability report and, in accordance with the Safe System Executive Order, on a formal basis to the Washington State Secretary of Transportation.

WSDOT's Approach to MAP-21 Target Setting

WSDOT and WTSC work together to determine how best to set MAP-21 highway safety targets for Washington state. Target setting does not need to follow the same method each year and WSDOT has used two approaches in the past—the Target Zero method and the maintenance method.

The Target Zero method was used in FY 2022. Targets were set using the last five-year rolling average (baseline) and projecting to zero fatal and serious injury crashes in 2030.

The FHWA rules state that a state is considered to have

made significant progress when at least four out of the five MAP-21 safety performance targets are met or the actual outcome is lower than the baseline values. **Exhibit 22** summarizes the trend in the number of highway fatalities and serious injuries, the rate of occurrence per 100 million vehicle miles traveled (VMT), and the number of fatal and serious injuries among people walking or biking (combined in MAP-21 as non-motorist). **Exhibits 23 through 27** shows the five safety performance metrics. **Exhibit 28** lists trends for fatalities and serious injuries for older active transportation users and drivers.

Exhibit 22. Washington State Performance Across Five Required Safety Performance Metrics

Rolling five-year averages; 2012 through 2022

Performance Measure	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Number of Fatalities	473.0	456.0	450.0	468.2	484.6	509.6	530.2	545.4	550	575.2	615
Rate of Fatalities	0.837	0.802	0.787	0.811	0.827	0.856	0.876	0.889	0.919	0.954	1.049
Number of Serious Injuries	2402.8	2275.6	2146.8	2071.4	2088.0	2092.0	2156.0	2206.2	2273.8	2415.6	2585.8
Rate of Serious Injuries	4.252	4.002	3.754	3.592	3.571	3.517	3.564	3.595	3.802	4.009	4.412
Number of Non-Motorized Fatalities and Serious Injuries	487.4	473.6	478.4	482.0	505.2	512.6	560.2	576.8	582.2	595.4	620.8

Note. Values represent five year rolling averages ending in the year shown in the header. For example, the 2022 rolling average (2018 through 2022) fatality count is 615.

Historical Performance

Since 2013, the safety performance across the current Target Zero Emphasis areas reduced with an increase in fatal and serious injury crashes.

[NCHRP Report 928, Identification of factors contributing to the decline of traffic fatalities in the United States from 2008-2012](#)

indicates that the post-2008 recession led to reduced travel and less economic activity, which were identified as key contributing factors to crash reduction. Strengthening of seat belt laws, graduated licensing, investments in rumble strips and cable barriers represent some of the interventions that have contributed to the reductions. Post 2013, fatal and serious injury crashes across the emphasis areas increased to present day highs/near high totals. In this case, the economic rebound increased travel and economic growth and a subsequent increase in crashes, although growth in vehicle miles travelled is not explaining all the observed increases. With reduced travel during COVID, the number of crashes reduced but the severity increased, with continued growth in the number of fatal and serious injury crashes on Washington's public roads.

Exhibit 23. Fatalities

2006 through 2030

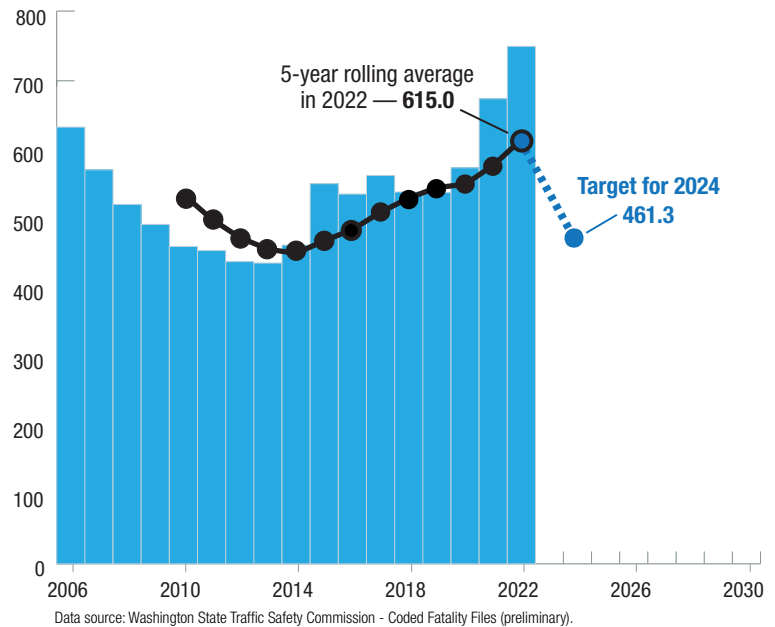
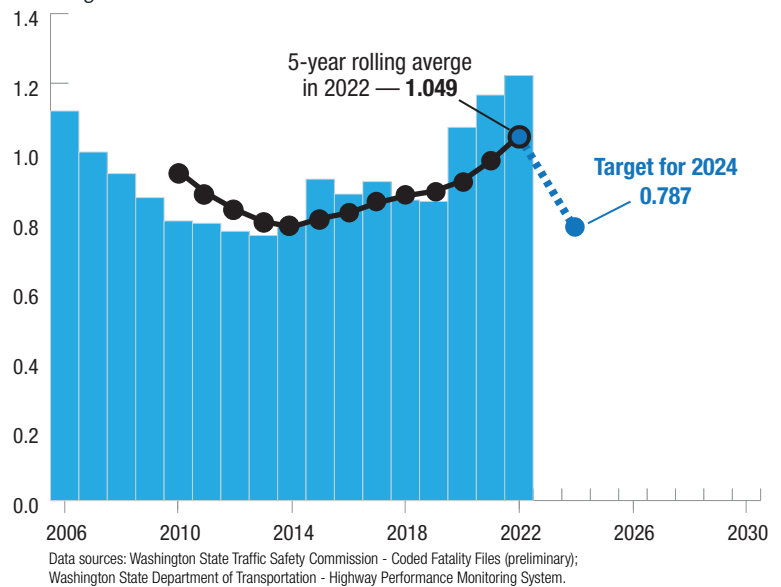


Exhibit 24. Fatality rate

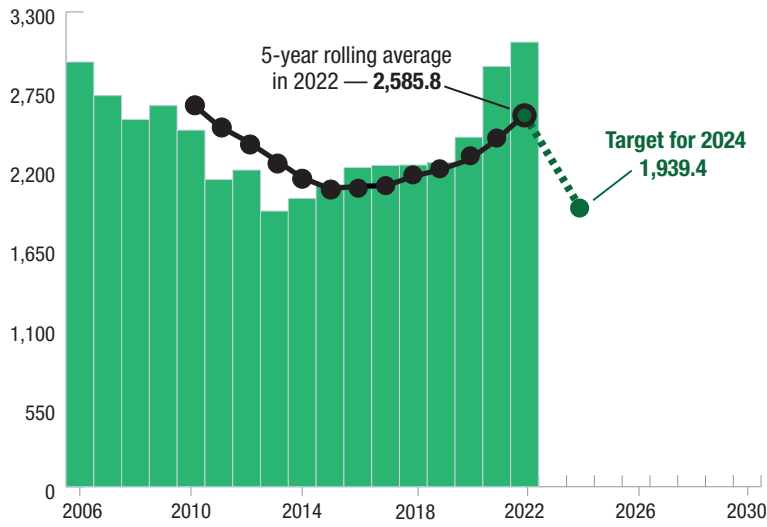
2006 through 2030



Notes: Fatality data for 2022 is finalized as of January 2024, serious injury count for 2022 is as of June 2023. All data for 2022 is preliminary as of June 2023. Under 23 U.S. Code § 148 and 23 U.S. Code § 407, safety data, reports, surveys, schedules, lists compiled or collected for the purpose of identifying, evaluating, or planning the safety enhancement of potential crash sites, hazardous roadway conditions, or railway-highway crossings are not 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 mentioned or addressed in such reports, surveys, schedules, lists, or data.

Exhibit 25. Serious Injury

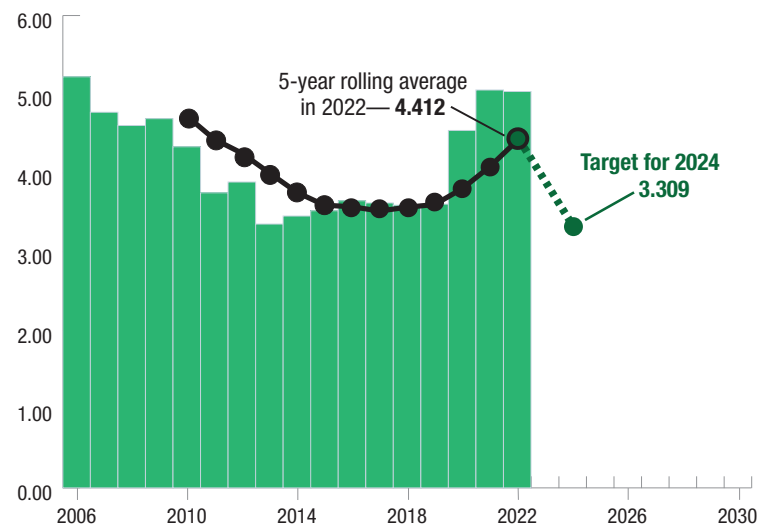
2006 through 2030



Data source: Washington State Department of Transportation - Crash Database.

Exhibit 26. Serious Injury Rate

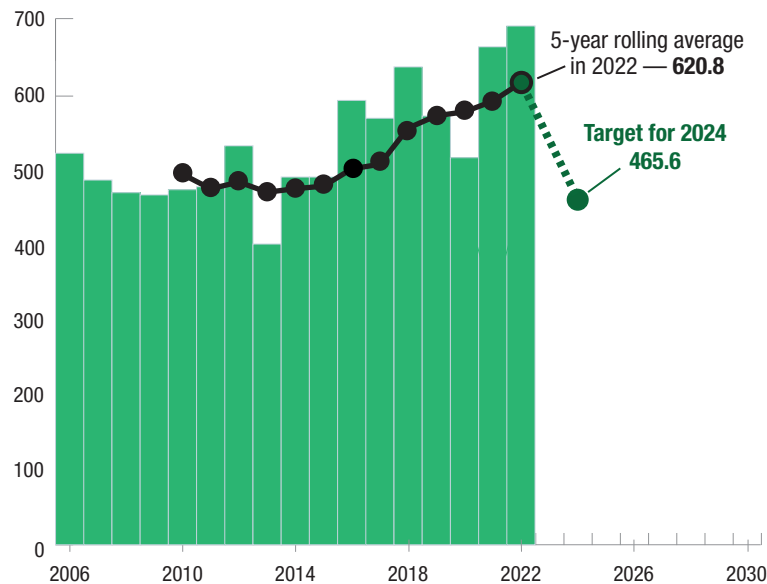
2006 through 2030



Data sources: Washington State Department of Transportation - Crash Database, Highway Performance Monitoring System.

Exhibit 27. Non-motorist Fatalities and Serious Injuries

2006 through 2030



Data sources: Washington State Traffic Safety Commission - Fatality Analysis Reporting System; Washington State Department of Transportation - Crash Database, Highway Performance Monitoring System.

A review of performance across the emphasis areas of the Washington SHSP begins with the two most recent Target Zero plans. The intent is to understand how safety performance changed across emphasis areas over time. For this Implementation Plan, WSDOT is using data from the WSDOT Engineering Data Mart, resulting in some minor differences in the total counts of fatalities and fatal crashes compared to the WTSC Coded Fatality Files data.

Using the WSDOT data, WSDOT can integrate the crash data more easily with roadway and other internal datasets that heavily rely on WSDOT specific mainframe location identifiers and their geospatial characteristics. For the most part, discussion of performance is around fatal and serious injury crashes rather than individual fatalities and serious injuries.

Exhibit 28. Trends for fatalities and serious injuries, including older active transportation users

The rate of occurrence per 100 million vehicle miles traveled (VMT)

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
65 plus Pedestrian Fatalities	20	16	21	23	24	28	18	28	27	31	27
65 plus Pedestrian Suspected Serious Injuries	30	34	38	36	45	51	54	54	44	53	48
65 plus Bicyclist Fatalities	0	2	1	2	2	3	5	3	4	3	4
65 plus Bicyclist Suspected Serious Injuries	4	3	5	3	9	5	14	8	4	5	7
Motor vehicle driver 65 plus fatalities	67	73	88	115	117	109	101	121	98	120	87
65 plus Motor Vehicle Driver Suspected Serious Injuries	119	116	122	132	144	135	136	157	173	187	209

Data from the most recent three years (2020–2022) show that Washington’s traffic fatal and serious injury crashes are increasing. Refer to **Exhibit 22 on page 25**.

Exhibit 34 on page 31 portrays graphically the percentage change between the 2018 and 2022 Target Zero plan emphasis areas. Lane departures, run-off-the-road, intersections, young drivers, and older drivers involved fatal and serious injury crashes have increased by the highest percentages.

Exhibit 35 on page 34 portrays the emphasis area as a portion of the total fatal and suspected serious injury crashes for 2018–2022. The data show lane departure, run-off-the-road, intersections, and young drivers involved make up the highest

percentage of the total fatal and serious injuries.

Other notable trends

- The 2019 Target Zero update combines pedestrian and bicyclist involved crashes. Previous reports recorded them separately. For 2022, the combined pedestrian and cyclist involved crashes remains high and account for 22.1% of total fatal and serious injury crashes.
- Intersection-related fatal and serious injury crashes increased by 22% between 2008 and 2022. It was notable that both pedestrian and bicyclist involved fatal and serious injury crashes as well as younger drivers were

the most represented road user types in these crashes.

Further review of the yearly data shows that fatal and serious injury crashes have increased since 2013, particularly in the following categories: intersections, lane departure, bicycle-involved, pedestrian-involved, heavy trucks, younger drivers, and older drivers. The number of fatalities for bicyclists has remained steady.

VMT and both fatal and serious injury crashes increased in 2022. The following section presents the distribution of fatal and serious injury crashes across jurisdictions.

Fatal and Serious Injury Crashes Across All Public Roadways in WA State

There was 13,866 fatal and serious injury crashes in Washington state between 2018 and 2022. Refer to **Appendix B on page 79**.

The total societal cost for crashes in Washington state in 2022 was \$20.5 billion, of which \$13.4 billion represents fatal and serious injury crashes. **Exhibit 29** presents the largest portions of fatal and serious injury crashes for all public roadways across the Target

Zero emphasis areas. Note in subsequent subsections how these percentages are different across the emphasis areas when considering specific jurisdictions.

Exhibit 29. Emphasis areas for all public roadways in Washington State by percentage fatal and serious injury crashes (Source: WSDOT Data 2018-2022)

Top Emphasis Areas	% Fatal and Serious Injury Crashes
Lane departure	39.1%
Intersection related	32.2%
Involving people walking or biking	22.1%
Involving motorcyclists	18.7%
Involving heavy trucks	6.8%

Note. Statewide centerline miles from the 2019 Miles and Daily Vehicle Miles Travelled (DVMT) Information web page at <https://wsdot.wa.gov/mapsdata/travel/hpms/annualmileage.htm>.

Fatal and Serious Injury Crashes Across Jurisdictions

The distribution of fatal and serious injury crashes along with the societal cost of these crashes across jurisdictions provide valuable insight as to the safety performance of the different parts of

the system and identifies jurisdiction specific priorities for the Target Zero emphasis areas. This is valuable input into decisions regarding the relative investment levels likely to support effective overall reductions in fatal and serious injury crashes.

Between 2018 and 2022, 66% of the fatal and serious

injury crashes occurred under local jurisdiction on public roadways in Washington state on roadways under local jurisdiction. These roadways include city streets, county roads, and state routes within cities with a population over 27,500. Refer to **Exhibit 30**.

Exhibit 30. Distribution of fatal and serious injury crashes across jurisdiction (Source: WSDOT Data 2018-2022)

Jurisdiction	% Fatal and Serious Injury Crashes
WSDOT	34%
Local	66%
All	100%

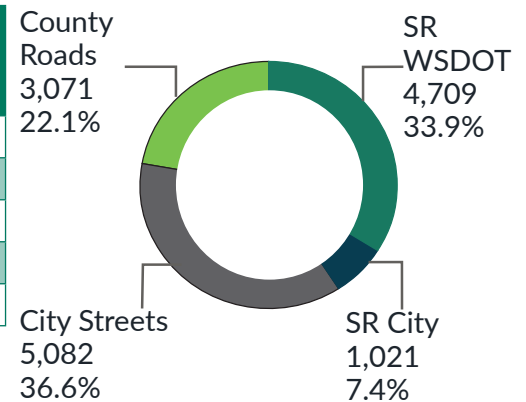


The pie chart in **Exhibit 31** demonstrates the distribution of fatal and serious injury crashes from 2018 through 2022 across the state of Washington: 4,709 crashes (33.9%) occurred on state routes under WSDOT jurisdiction, 5,082 crashes

(36.6%) occurred on city streets, 3,071 crashes (22.1%) occurred on county roads, and 1,021 crashes (7.4%) occurred on state routes within cities with a population of over 27,500.

Exhibit 31. Distribution of fatal and serious injury crashes across WSDOT jurisdiction
(Source: WSDOT Data 2018-2022)

Jurisdiction	Fatal and Serious Injury Crashes	% Fatal and Serious Injury Crashes
SR WSDOT	4,709	33.9%
City Streets	5,082	36.6%
SR City	1,021	7.4%
County Roads	3,071	22.1%
All	13,883	100.0%



Local Jurisdiction

Local jurisdiction fatal and serious injury crashes represent 66% of statewide fatal and serious injury crashes.

Exhibit 32 presents the largest portions of fatal and serious injury crashes for roadways in Washington state under local jurisdictions across the Target Zero emphasis areas. For local jurisdictions intersection related

fatal and serious injury crashes are the most predominant emphasis area.

Exhibit 32. Emphasis areas under local jurisdiction in Washington State by percentage fatal and serious injury crashes
(Source: WSDOT Data 2018-2022)

Top Emphasis Areas	% Fatal and Serious Injury Crashes
Intersection related	38.0%
Lane departure	36.1%
Involving people walking or biking	27.4%
Involving motorcyclists	18.2%
Involving heavy trucks	4.1%

WSDOT Jurisdiction

Between 2018 and 2022, 34% of the fatal and serious injury crashes in the state occurred on roadways under WSDOT jurisdiction. **Exhibit 33**

presents the largest portions of fatal and serious injury crashes for roadways under WSDOT jurisdiction across the Target Zero emphasis areas. For state routes under WSDOT jurisdiction, there are

almost twice as many fatal and serious injury crashes in the lane departure emphasis area compared to the intersection related area.

Exhibit 33. Emphasis areas under WSDOT jurisdiction in Washington State by percentage fatal and serious injury crashes (Source: WSDOT Data 2018-2022)

Top Emphasis Areas	% Fatal and Serious Injury Crashes
Lane departure	45.0%
Intersection related	21.0%
Involving motorcyclists	19.6%
Involving heavy trucks	12.0%
Involving people walking or biking	11.6%

City Streets (excluding state routes within cities with a population over 27,500)

Between 2018 and 2022, 36.6% of the fatal and serious injury crashes in the state occurred on city streets (excluding state

routes within cities with a population over 27,500). 44.9% of the crashes on city streets are intersection related fatal and serious injury crashes and 35.9% of the fatal and serious injury crashes involves people walking or biking. **Exhibit 34**

presents the largest portions of fatal and serious injury crashes for city streets in Washington State across the Target Zero emphasis areas.

Exhibit 34. Emphasis areas for city streets, excluding state routes within cities with a population over 27,500, in Washington State by percentage fatal and serious injury crashes (Source: WSDOT Data 2018-2022)

Top Emphasis Areas	% Fatal and Serious Injury Crashes
Intersection related	44.9%
Involving people walking or biking	35.9%
Lane departure	27.5%
Involving motorcyclists	17.2%
Involving heavy trucks	3.6%

Note. Statewide centerline miles from the 2019 Miles and Daily Vehicle Miles Travelled (DVMT) Information web page at <https://wsdot.wa.gov/mapsdata/travel/hpms/annualmileage.htm>.

State Routes within cities with a population over 27,500 (local jurisdiction)

Between 2018 and 2022, 7.4% of the fatal and serious injury crashes in the state occurred on state routes within cities with a population over 27,500, i.e. local jurisdiction.

There were 2.88 fatal and serious injury crashes per mile on state routes under city jurisdiction. This is much higher than any other parts of the system. The main contributors to this high density are intersection related crashes and crashes involving people walking and biking.

50.0% of the fatal and serious injury crashes on state routes under local jurisdiction are intersection related crashes. **Exhibit 35** presents the largest portions of fatal and serious injury crashes for state routes under local jurisdiction across the Target Zero emphasis areas.

Exhibit 35. Emphasis areas for state routes within cities with a population over 27,500 (local jurisdiction) in Washington State by percentage fatal and serious injury crashes (Source: WSDOT Data 2018-2022)

Top Emphasis Areas	% Fatal and Serious Injury Crashes
Intersection related	50.0%
Involving people walking or biking	35.2%
Involving motorcyclists	18.1%
Lane departure	16.7%
Involving heavy trucks	5.7%

City Jurisdiction (city streets and state routes within cities with a population over 27,500)

Between 2018 and 2022, 44% of the fatal and serious injury

crashes in the state occurred on city streets and state routes within cities with a population over 27,500, under city jurisdiction. **Exhibit 36** presents the largest portions of fatal and serious

injury crashes for roads under city jurisdiction across the Target Zero emphasis areas.

Exhibit 36. Emphasis areas for city jurisdiction (city streets and state routes within cities with a population over 27,500) in Washington State by percentage fatal and serious injury crashes (Source: WSDOT Data 2018-2022)

Top Emphasis Areas	% Fatal and Serious Injury Crashes
Intersection related	45.8%
Involving people walking or biking	35.8%
Lane departure	25.7%
Involving motorcyclists	17.3%
Involving heavy trucks	4.0%

County Roads

Between 2018 and 2022, 22.1% of the fatal and serious injury crashes in the state occurred on county roads. 56.8% of the fatal and serious injury crashes

on county roads are lane departure crashes. **Exhibit 37** presents the largest portions of fatal and serious injury crashes for county roads across the Target Zero emphasis areas in descending order.

Exhibit 37. Emphasis areas for county roads jurisdiction (city streets and state routes within cities with a population over 27,500) in Washington State by percentage fatal and serious injury crashes (Source: WSDOT Data 2018-2022)

Top Emphasis Areas	% Fatal and Serious Injury Crashes
Lane departure	56.8%
Intersection related	22.4%
Involving motorcyclists	20.0%
Involving people walking or biking	10.9%
Involving heavy trucks	4.3%

WSDOT I-2 Subprogram Implementation

The previous section discussed how Target Zero priority levels are examined to identify emphasis areas and how WSDOT develops safety subcategories for the emphasis areas within its scope of responsibility. One or more potential strategies (countermeasures) are identified for each subcategory. The next section provides information about each strategy, the anticipated benefits, how potential projects will be prioritized for implementation, and the anticipated costs and benefits.

Local Road Safety Strategy

WSDOT's local road safety process is implemented based on each local agency's fatal and serious injury crash history, its Local Road Safety Plan, and countermeasure selection. Because of the varying nature and context of each location, whether it be within a county or city, a wide array of crash countermeasures are used that are specific to that location's characteristics. These characteristics are identified and evaluated within each Local Road Safety Plan. The Local Road Safety Plans provide detail on each local agency's need.

The most common countermeasures implemented by counties relate to lane departure crashes, such as guardrail, HFST, and signing improvements. Counties also implement many intersection safety countermeasures such as signal visibility and operations upgrades, roundabouts, and signage upgrades. Cities also implement many pedestrian safety countermeasures, including road diets, rectangular rapid flashing beacons and pedestrian hybrid beacons. Summary and comparison data for developing Local Road Safety Plans are made available to local agencies through the Local Programs Division of WSDOT. Detailed crash data are also provided to agencies through WSDOT's Crash Data and Reporting office. Other data resources include the Research and Data section of the Washington Traffic Safety Commission's website and the [WSDOT Crash Data Portal](#). Community-specific data help local and regional agencies prioritize their traffic safety projects and programs, and also assists in developing localized Target Zero efforts. A data-driven approach to problem identification and prioritization can provide local-level justification for allocating funds and resources.

WSDOT's Safety Strategies

The I-2 safety subprogram funding is distributed between the reduction and prevention categories based on the Target Zero emphasis areas.

Crash Reduction Safety Emphasis Areas:

- Crash Analysis Location/ Crash Analysis Corridor
- Intersection Analysis Location

State Crash Prevention Safety Emphasis Areas:

Lane Departure

The lane departure emphasis area consists of run-off-the-road crashes and opposite direction crashes. The opposite direction crashes do not include any wrong way crashes. The most common crash types among lane departure crashes are fixed object crashes and head-on crashes. Emphasis area and crash type information are primary inputs to subcategory development.

Several countermeasures are considered to address these crash types, depending on the context, and contributing factors of these crashes. For example:

- Rumble Strips
- High Friction Surface Treatment Program

- Lane Departure-System Curve Treatments
- Breakaway Cable Terminal Replacement
- Cable Median Barrier (Paused)
- Guardrail Infill and Retrofit
- I-2 Subprogram Field Assessments
- Edge Line Visibility Pilot

Intersection Related

Analysis of intersection related fatal and serious injury crashes shows that vehicles entering an intersection at an angle are the most common type of crash. One of the most effective countermeasures to target this type of crash is a roundabout if the context and site-specific conditions are appropriate for such an installation. If the site is not appropriate for a roundabout, other countermeasures can be considered, particularly those dealing with temporary reductions in operating speed and increasing driver awareness of expectations related to conflicts at the intersection. Information about roundabouts is provided in the section on Intersection Systemic Safety on **page 46**. In 2023, WSDOT will emphasize and install roundabouts.

Other Proactive Safety Investments

Two other subcategories have been established: *Active Transportation* and *Safety Decision-making and Performance Improvement*. Another subcategory, *Speed Management*, is under development. The *Active Transportation* subcategory was created to recognize and address the increase in people walking, biking, and using other forms of active transportation (mobility assisting devices). In crashes involving people walking or biking the vehicle driver may strike the person biking or walking first or after striking another vehicle/object, then the person walking or biking. In 2018, crash coding requirements changed to include events where the person biking may have struck the vehicle as a separate crash type. The work and methods planned for this reporting period are described in the section on *Active Transportation* on **page 64** as this method will be used to develop a short rank list for consideration in the 2023 funding cycle.

The *Safety Decision-Making and Performance Improvement* subcategory focuses on improving efficiency through better understanding of the resources used in highway target setting and safety management. *Speed Management* to achieve the

Exhibit 38. Percent change in number of Fatal and Suspected Serious Injury Crashes

Washington state; 2017-2019 to 2020-2022; Percentages rounded up

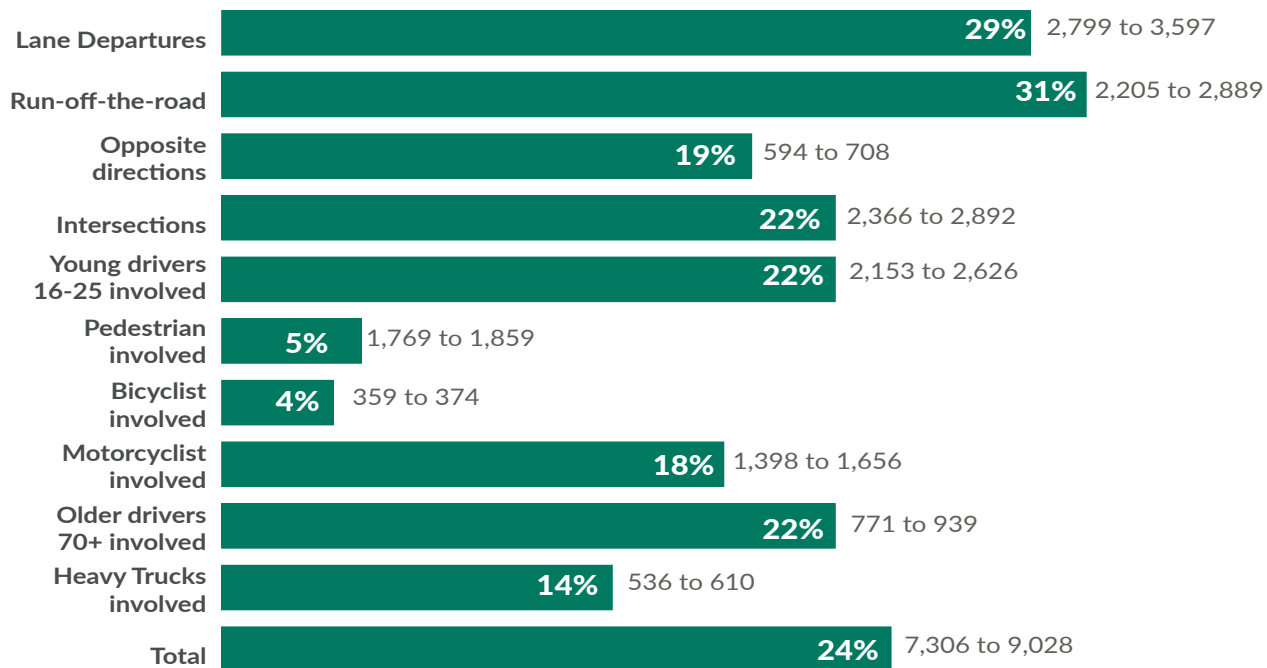
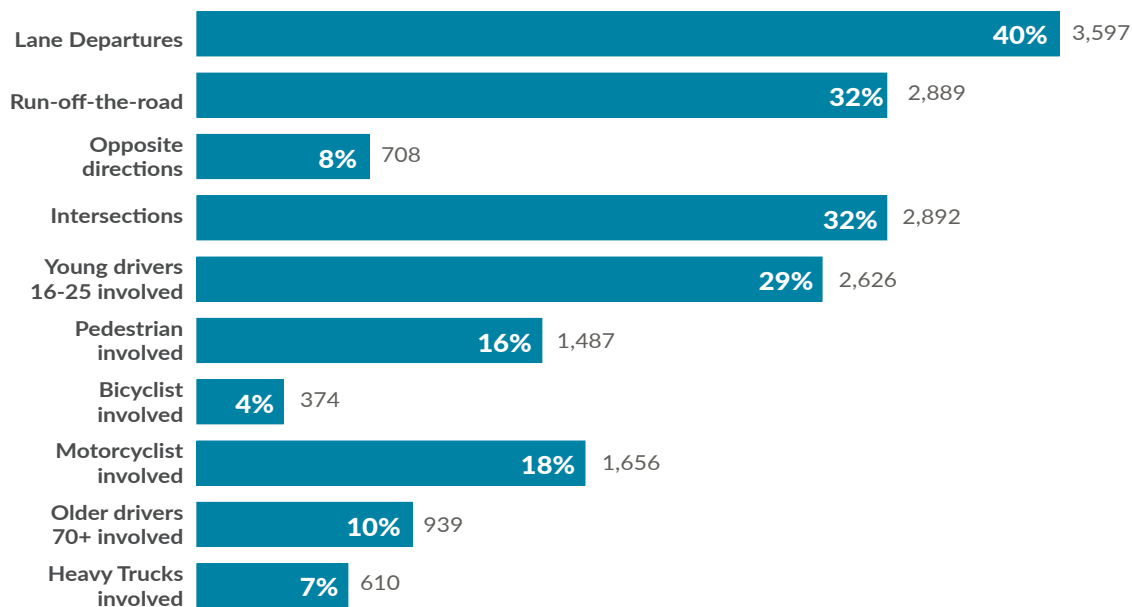


Exhibit 39. Target Zero Emphasis Areas as a Percentage of Fatal and Suspected Serious Injury Crashes

Washington state: Percentage fatal and serious injury crashes for each emphasis areas within Target Zero (2018-2022)



principles of the Safe System will be developed in 2023. Additional information on this subcategory is provided on **page 38**.

WSDOT is currently performing a Vulnerable Road User (VRU) Safety Assessment. This assessment is required by FHWA and will be an appendix to the updated Strategic Highway Safety Plan in 2024. There are several requirements for the assessment, including incorporating equity and sociodemographic information. The analysis thus far found strong correlation between VRU fatal and serious injury crashes and some equity and sociodemographic characteristics of communities, indicating strong evidence for incorporating these factors into the way that WSDOT identifies and ranks projects.

Countermeasure Performance

WSDOT continues to track a CMF Inventory based on Washington State data and project installation. Refer to **Appendix D on page 100**. This inventory is intended to aid in the assessment of the effectiveness of the countermeasures applied and their success in decreasing fatal and serious injury crashes, as well as guide

WSDOT's limited resources on future investments. This year updates were made to the roundabout CMF. **Appendix D** presents a table on CMF analysis. Washington is using the Empirical Bayes Method to assess its CMFs for LED Stop Signs, HFST, Curve Signage, Rectangular Rapid Flashing Beacons, Intersection Conflict Warning Systems (ICWS) and Prepare to Stop When Flashing PTSWF sign countermeasure. WSDOT's before-after study on HFST has shown significant reductions in wet weather crashes that occurred at installation locations as outlined on **page 48**.

Performance of some HFST treatments on state highways has been limited because of installation practices and damage from studded tires. These issues have raised concerns about HFST installation within the context of pavement asset management. WSDOT will continue to evaluate HFST investments at spot locations. There has been significant HFST investments made on larger projects on local roads in multiple counties and over a number of years. These investments have been primarily to address horizontal curves. WSDOT is also recommending specific funding for data and performance improvement activities to bring resources toward these types of activities.

Evaluation of Countermeasures

If an observational before/after evaluation is conducted without any consideration of non-treatment sites (i.e., with no safety performance frameworks and no comparison group), this is referred to as a simple or naive before/after evaluation. Such evaluations do not compensate for regression-to-the-mean bias or compensate for general time trends in the crash data. For more information, Refer to the Highway Safety Manual, 1st Edition. 2010, AASHTO.

Exhibit 40. Summary of WSDOT's I-2 Subprogram Strategies, Emphasis Areas and Subcategories

Target Zero emphasis areas; Washington state; 2022

Type of Investment	Emphasis area	Strategies/Subcategories
Crash Reduction Safety Investments	Intersection-related	Intersection Analysis Locations
	Lane departure	Crash Analysis Locations/Crash Analysis Corridors
Crash Prevention Safety Investments	Intersections	Compact roundabouts
	Lane departure	Rumble Strips
		High Friction Surface Treatment Program
		Systemic Curve Treatments
		Breakaway Cable Terminal Replacement
		Cable Median Barriers Conversion (paused for evaluation)
		Guardrail Infill and Retrofit
		Field Assessments
	Edge Line Visibility Pilot	
	Active Transportation	
Motorcyclists		
Safety Decision-making and Performance Improvement	Safe System - Speed Management	

Opportunities

Target Zero emphasis areas are used to determine the subcategories within the I-2 Safety Program. These subcategories are outlined through discussion papers that are used in developing an implementation plan, and a two-year plan. Changes are made to the program based on evaluation results. The

subcategories are typically reviewed and updated on an annual basis. Refer to **Exhibit 4 on page 10** for the current emphasis areas. The increasing number of fatal and serious injury crashes involving vulnerable road users has led to the development of a method for active transportation investment considerations. A ranked list was developed in early 2023 and will be revised

by findings from the vulnerable road user safety assessment that is currently underway. Additional detail about each subcategory is described in the Implementation section.

Safe System



WSDOT began its journey towards the Safe System Approach, with its early implementation of Vision Zero and Sustainable Safety, from Sweden and the Netherlands respectively. Together with WSDOT's Practical Solutions approach, it focused on proactive approaches to address the contributing factors and crash types that lead to fatal and serious injury crashes, the installation of systems to reduce potential crash forces (such as roadside safety systems, roundabouts, and target speeds), and changes in design practices to consider context and modal priority on the state highway system. These practices align with what is now more commonly known as the Safe System Approach.

In addition, WSDOT, together with its partners and consistent with the Cooper Jones Active

Transportation Safety Council, incorporated the Safe System Approach into the Washington State Target Zero plan in 2019. The Active Transportation Plan in 2021 provided additional analysis concerning the disproportionate crashes for vulnerable road users, particularly in locations affected by decisions that created wide, fast, and busy roadways lacking walking/biking facilities in certain neighborhoods while insulating others from these contributors to crash exposure.

In the 2022 Legislative Session in Washington, a budget proviso now requires WSDOT, to incorporate Complete Streets design using the Safe System for all projects greater than \$500,000. Since that time significant modification in planning, programming, design, and operations has taken place and that process continues.

Within the Safe System Approach to road safety, WSDOT has a primary responsibility of road infrastructure design and operations. This includes speed management, multimodal context-sensitive geometric design and land use decisions, roadside features and road user actions affected by road infrastructure design and operations (such as signage, lighting, and striping), and the safety management systems that support analysis and decision making. In the following year, WSDOT will review the safety subcategories to align towards the Safe System Approach, the complete streets policies and WSDOT active transportation Plan.

WSDOT is also in the process of completing the vulnerable road user assessment, and will incorporate socio-economic

components into the active transportation and speed management subcategories. During review of crash reduction safety projects WSDOT is considering the Safe System Principles both in evaluation of projects and the subcategories of the program.

WSDOT’s updated Executive Order 1085, Road Safety – Advancing the Safe System Approach for All Road Users was published in April 2023. In this update, WSDOT varies from FHWA in describing the Safe System Principles to be more in alignment with the international approach as it provides a more active description of the Safe System Approach.

- **Eliminate death and serious injuries:** While no crashes are desirable, the Safe System approach prioritizes elimination of crashes that result in death and serious injuries.
- **Support safe road use:** Road users will inevitably make mistakes that can

lead to crashes, and the transportation system and vehicles can be designed and operated to reduce that injury outcomes from those errors. A forgiving system accommodates reasonable and predictable human limitations and behavior (such as diligence, perception, and attention). Roads that are developed in this manner as “self-enforcing and self-explaining roads” make it more difficult for errors to occur, and when the errors do occur, they result in fewer fatal and serious injuries.

- **Reduce large crash forces:** Road users have limits for tolerating crash forces before death or serious injury occurs. Therefore, it is important within the Safe System approach to manage the transfer of kinetic energy through adoption of design and operational elements that account for and reduce crash speeds and impact angles to be within survivable limits.

- **Responsibility is shared:** All stakeholders (transportation system designers, managers, road users, vehicle manufacturers, policy makers, etc.) commit to reducing fatal and serious injury crashes and to working together. The focus is placed on the larger context and network of contributing factors and characteristics from which traffic death and serious injury arise, instead of the individual road users.
- **Strengthen all parts:** All parts of the transportation system are strengthened to reinforce each other so that if one part fails, the other parts still protect road users. In this way redundancy is provided for the elements that make up the safe system.
- **Safety is proactive:** Proactive (systemic safety) approaches address context, contributing factors, and crash types to help to reduce the potential for fatal and

Exhibit 41. WSDOT Safe System Approach Elements and Principles

Safe System Elements	Safe System Principles
A. Safe Roads B. Safe Speeds C. Safe Road Users D. Safety Management Systems	1. Death and Serious Injury are unacceptable 2. Support Safe Road Use 3. Prevent exposure to large crash forces 4. Safety is proactive 5. Shared Responsibility 6. Strengthen All Parts

Exhibit 42. Safe System Alignment

Type of Investment	Strategy Subcategories	Safe System Approach		
		Exposure	Likelihood	Severity
Reactive Safety Category	Intersection Analysis Locations	✓	✓	✓
	Crash Analysis Locations/Crash Analysis Corridors	✓	✓	✓
Proactive Safety Category	Intersection Systemic Safety	✓	✓	✓
	Rumble Strips		✓	
	High Friction Surface Treatment		✓	✓
	Systemic Curve Treatments		✓	
	Breakaway Cable Terminal Replacement			✓
	Cable Median Barriers			✓
	Guardrail Infill and Retrofit			✓
	Field Assessments			
	High Visibility Edge Line		✓	
	Active Transportation	✓	✓	✓
	Speed Management			✓
	Decision Making and Performance Improvement	✓	✓	✓

serious injury crashes. These approaches complement traditional, reactive crash reduction programs that focus on individual sites and segments with a history of observed crashes using the methods outlined by the American Association of State Highway and Transportation Officials (AASHTO) Highway Safety Manual.

WSDOT is in the process of updating Target Zero with its partner the WTSC. The Strategic Highway Safety Plan around the principles and elements of the updated WSDOT Safe System Approach as outlined by **Exhibit 41**.

WSDOT recognizes the value of implementation of the Safe System through updates to its authoritative documents, such as the Design Manual, and safety analysis documents to be inclusive of active transportation by explicitly requiring consideration of all road user when changes are made to improve vehicle operations.

To reduce large crash forces the Department is in the process of developing two working groups, the first to consider making roundabouts the preferred intersection alternative and the second to further the concept of injury minimization through target speed setting.

Exhibit 42 shows that the WSDOT program is developed to address the Safe System holistically and comprehensively. The chart shows that the principles of *Death and Serious Injuries, Shared Responsibilities and Strengthen All Parts* are identified in all subcategories. The Safety Improvement Subprogram has been developed to reduce fatal and serious injury crashes across all subcategories.

WSDOT reviews the contributing factors to crashes. Commonly human behaviors are apparent in the factors that have led to a crash or are known to increase the potential for a crash. While in the traditional approach road safety might lead

other agencies to determine that behavioral interventions should occur at that location as the sole countermeasure, WSDOT analyzes whether a crash reduction or crash prevention infrastructure countermeasure could be put in place to reduce the frequency of fatal and serious injury crash outcomes. These considerations are in recognition of the *Shared Responsibility and Strengthen All Parts* Elements in the Safe System Approach. Approximately 70% of WSDOT Safety Program addresses *Proactive Safety*.

Intersection Analysis Locations, Crash Analysis Locations/Corridors

The IAL, CAL/CAC subcategories are focused on crash reduction. The elements addressed in these subcategories are safe roads, safe speeds, and road users. A common treatment for these locations is to reduce angle and higher speed rear end crashes to prevent large crash forces. Countermeasures often include roundabouts and addition of turn lanes.

Lighting, signing, striping, and channelization consistent with crash contributing factors are provided to increase awareness and understanding within the given context of the road and

these support safe road user behaviors. The subcategory allows for projects that separate users in space and time, reduce speeds, and remove signals.

Intersection Systemic Safety

This subcategory commonly installs compact roundabouts. This leads to reduction of large crash forces and supports safe road user behaviors through speed management. At WSDOT these intersections are designed to reduce speeds to approximately 25 mph in the roundabout, greatly benefiting crossing treatments for those walking and biking and higher yielding rates by drivers.

Rumble Strips, High Friction Surface Treatments, Systemic Curve Treatments and High Visibility Edge Lines

This group of proactive treatments are directed towards reduction of crashes related to a specific crash types such as lane departure, wet weather, and run off road crashes. WSDOT's goal within these subcategories is to reduce crash potential by supporting safe road use. Rumble strips help alert drivers to errors and lane departure; HFST helps maintain traction that is beneficial to sudden stopping at intersections and control issues in curves; systemic curve treatments provide driver information and

warning; and High Visibility Edge Lines are used to provide information related to lane departure and provide information in lower visibility conditions.

Breakaway Cable Terminal Replacement, Cable Median Barrier, Guardrail infill and Retrofit

When drivers run off the road these roadside system are placed to reduce fatal and serious injury outcomes by reducing the occupant forces in the crash. It is recognized by safety professionals that roadside crashes are often the result of behavioral factors, but roadside safety barrier is placed recognizing that should a crash occur, these systems can provide reduced injury outcomes. Roadside safety hardware provides redundancy in the system and are provided in addition to other road safety components such lane striping, rumble strips, signage.

Active Transportation and Speed Management

The Active Transportation subcategory is provided to reduce potential crashes to those walking, biking, and rolling. The intent is to provide systems to reduce exposure to large crash forces by reducing speeds; to increase the alertness and attentiveness for those in

vehicles by providing crossings; or separation or facilities at appropriate locations. In doing so the subcategory intends to support safe road user behaviors and reduce exposure to large crash forces.

Field Assessments and Decision Making and Performance Improvement

This subcategory recognizes the importance of the 5th E of Safety (Evaluation, Analysis and Diagnosis). In the Safe System Approach the 5th E is a critical component of Safety Management. Safety decisions are made based on the understanding of the road systems contexts, priorities, and needs. These subcategories are used to assess potential opportunities where safety investment would be beneficial, as well as to evaluate, analyze, and diagnose what modifications could occur at a project, subcategory, or at the statewide level. Providing important planning steps improves program formulation.

Crash Analysis Location/Crash Analysis Corridor/Intersection Analysis Location



The Crash Reduction subcategory intends to reduce the number of fatal and serious injury crashes consistent with the goals outlined in Target Zero. There are two methods of analysis used to identify locations for further investigation: Crash Analysis Locations/Crash Analysis Corridors (CAL/CAC) and Intersection Analysis Locations (IAL) on the state highway system.

Introduction

In 2011, WSDOT's Highway Safety Executive Committee formally adopted the Highway Safety Manual (HSM) for statewide implementation. The HSM provides information and tools to evaluate roadway sites and select those that have a high potential for countermeasures to reduce crash severity and frequency. The HSM helps assess potential

countermeasures to mitigate the factors contributing to crashes.

Each biennium, WSDOT uses AASHTOWare SafetyAnalyst® to create ranked CAL/CAC & IAL lists for review by WSDOT's regional offices as a part of the capital project safety programming process for the I-2 program.

The CAL/CAC and IAL on state highway system strategies address crashes that fall within all Target Zero monitored emphasis areas: high risk behavior, crash type, road users, and other monitored emphasis areas.

In 2024, WSDOT is transitioning from AASHTOWare SafetyAnalyst® to the SPF tool. In addition in Accordance with EO 1085, WSDOT will be reviewing and updating as necessary its practices related to network screening

Key Takeaways

- CAL/CAC and IAL on state highway system are methods to screen corridors and intersections for project sites where crash severity and frequency could potentially be reduced.
- WSDOT estimates that constrained needs for this program are approximately \$84 million, or 12.8% of the entire 10-year safety plan.

for the Crash CAL/CAC, IAL processes. In this transition, the Department will begin using the new SPF tool. WSDOT may also include quantitative tools related to the Safe System. Because of this the current CAL/CAC and IAL ranked lists will be retired and replaced as

the Department reviews and updates the overall I2 safety subprogram.

Methodology

- Identify sites where average fatal and injury crash frequency and severity could potentially be reduced.
- Perform network screening using a sliding window and peak searching to establish reference populations. Managed access highways within cities with a population over 27,500 are not included, as these rights of way are managed by the cities in which they are located.
- Rank sites from high to low based on the expected average crash frequency using Empirical Bayes (EB) adjustment—a type of statistical estimation that addresses randomness and provides increased statistical reliability compared to using a crash history for safety performance estimations.
- Screen locations using a cutoff criterion of 0.5 expected (CAL/CAC) or 0.3 excess (IAL) crashes per year. Refer to **Exhibit 43 on page 44**.

The CAL/CAC and IAL lists are created and distributed (CAL/CAC in odd years, IAL in

even years) to regions for the following actions:

- Review the lists and confirm the Safety Analyst crash data is accurate.
 - Determine if modifications are appropriate based on the context, type and contributing factors for the crashes. Consistent with the Safe System analyze the sites to determine whether education, enforcement or engineering countermeasures alone or together would be appropriate to address crashes at individual locations.
 - If countermeasure(s) are determined to be appropriate, identify locations that can be addressed with Low Cost Enhancement (LCE) funding.
- If the action needed exceeds the LCE funding limit, analyze the location for possible inclusion in the I-2 program.
- Use the Crash Analysis Report (CAR) template to document an evaluation of the site and the benefit/cost analysis results for selected alternatives. This benefit/cost data will be considered in the priority ranking of projects. Document all proposed actions or reasons for no actions taken in the CAR report.
 - Present the crash analysis report for proposed I-2 projects to the selected I-2 safety panel of senior and executive level traffic engineers, designers and safety experts from across the state. This group recommends modifications

Exhibit 43. CAL/CAC/IAL Methodology

CAL/CAC 2017 Methodology	
Tool	AASHTOWare SafetyAnalyst 4.5.2 (will transition to SPF in 2024)
Datasets	2012-2016 crash data from the WSDOT Engineering Crash Datamart, 2016 geometry data
Performance measure	Expected crash frequency
Site types	Segments
Number of sites screened	4,255
Crash Severity Level	Fatal and serious injury crashes
Roadway Segments	Sliding window screening
Window Length	0.5 mile
Window Increment	0.1 mile

or acceptance of each project, emphasizing countermeasures that are both lower cost and cost-effective for CPDM's programming consideration.

Benefits

The implementation of a science-based, technical approach for selecting countermeasures with the highest benefit-cost ratio is in line with the agency's Safe Systems Safety Program. Additional benefits of the program include:

- Reducing the potential for and severity of crashes occurring on roadways.
- Providing a reliable assessment of crash potential before and after modifications.
- Considering how modifications might change crash potential for all types of road users.
- Improving the skills and developing the abilities of WSDOT's workforce in

crash analysis and in-field reviews, achieving increased consistency in crash analysis reporting across the state.

Costs and Benefit/Cost Ratios

Cost and benefit/cost ratios are developed after the regions develop Crash Analysis Reports that are endorsed by the I-2 Panel and programmed by CPDM.

Ten-Year Constrained Budget Outlook for the I-2 program

The current estimated 10-year needs for the I-2 program under the \$657 million revenue available is approximately \$84 million. This would account for 12.8% of the 10-year safety plan.

Note: Refer to **Appendix C** for FFY 2024 projects

Intersection Systemic Safety



Intersection systemic modifications can result in substantial increases to intersection safety performance where investigation of speed, approach skew angle, crash history, traffic volumes, and other criteria indicate potential for improvement.

Introduction

The Strategic Highway Safety Plan (SHSP) identifies intersection related crash types as a Target Zero “level one” priority, and further identifies the most common type of fatal and serious injury crashes at intersections as enter-at-angle. According to the 2019 update of the SHSP, there were 377 fatalities and 2,256 suspected serious injuries at intersections in Washington State. The SHSP states, “Some of the most effective

strategies to reduce the likelihood or severity of crashes at intersections for all users include converting intersections to roundabouts”. Similar to the SHSP, one of FHWA’s Every Day Counts Initiatives (EDC-2) recommends roundabouts and compact roundabouts for these crash types as well as other intersection related crashes so this is the focus of the Intersection Systemic Safety Compact Roundabout Improvement effort. This effort is part of the I2 Safety Program, Crash Prevention, intersection modifications (with compact roundabouts being a strategy).

WSDOT has recently constructed several compact roundabouts (inscribed circle diameter of approximately 90 feet) as a practical solution that minimized costs while reducing fatal and serious injury

Key Takeaways

- From 2015 through 2017, there were 377 fatalities and 2,256 suspected serious injuries at intersections in Washington state.
- Recently installed compact roundabouts have benefit/cost ratios ranging from 15:1 to 50:1.

crash potential at locations with enter-at-angle crash type. This effort continues that successful approach under the I2 Safety, Crash Prevention program. The statewide intersection list of potential act roundabout locations has been developed, ranked, and screened for feasibility. Locations that are feasible for

a compact roundabout will be programmed within the safety program according to rank and other considerations, such as AADT, posted speed limit, biennial funding available, and other projects being delivered. Once these locations have been fully programmed and there is identified capacity within the crash prevention program, the intent is to re-evaluate statewide intersection performance and update the list, as needed.

Methodology

Intersection systemic safety modifications are intended to reduce crash potential by reducing operating speeds and conflict points. The screening criteria targeted intersections that:

- Had a recent five-year crash history of an annual excess crash frequency of 0.5 or more for fatal and all injury crashes per the Highway Safety Manual methodology
- Had space for an approximately 90-foot inscribed circle diameter center island
- Categorized as a stop-controlled intersections
- Intersections within cities having a population over 27,500 are excluded per [RCW 47.24](#).

Using the screening criteria, a statewide un-signalized

intersection list was developed. The list was ranked based upon excess crash frequency. This list was provided to region engineers in the fall of 2020. Region engineers screened out locations that were considered not feasible for a compact roundabout; such as in cases where the intersection could not accommodate a 90' inscribed circle diameter, had too high of traffic levels, or if other recent countermeasures had been applied that should be monitored prior to additional countermeasure application. The remaining locations formed the I2 Crash Prevention – Compact Roundabout List.

Benefits

When a high-speed stop-sign intersection is converted to a single-lane roundabout, the intersection may see up to a 90% reduction in fatal and serious injury crashes. Using the excess crash frequency from the ranked list and a Crash Modification Factor (CMF) of 0.22, twenty-year present worth of benefits were calculated and ranged from \$2.7 M to \$15 M, with an average of \$6.3 M. Using the estimated range of project costs (\$600,000 to \$1,000,000), implementation of the program translates to a benefit-cost ratio ranging between 6 and 10.

Costs

Compact roundabouts are low cost, with total costs

ranging from \$2,000,000 to \$3,000,000. Preliminary engineering costs are low since all work is done in existing right-of-way. In addition, environmental permitting is minimal, the risk of cost escalation during construction is low, and construction working days are few so the impact to the public is minor. Because there are no moving parts to this intersection control type, maintenance costs are negligible so adding this asset to WSDOT's inventory is essentially cost neutral.

Ten-Year Constrained Budget Outlook for the I-2 program

Without projects the legislature classifies as I2, which may or may not align with Target Zero, it averages \$93.5 M per biennium. The current estimated 10-year revenue available would be \$468 million. Finally, we are not targeting a specific amount of roundabouts at this point.

Note: Refer to **Appendix C** for FFY 2024 projects

High Friction Surface Treatment



High Friction Surface Treatment is a widely applied countermeasure that addresses run-off-the-road crashes and wet weather crashes. The higher pavement friction helps drivers maintain better vehicle control in both dry and wet driving conditions.

Introduction

High Friction Surface Treatment (HFST) has proven to be a valuable, low-cost tool for mitigating crashes at specific locations. This countermeasure is most often used at locations with a higher friction demand (i.e. ramps, horizontal curves) and is effective at sites with a history of wet weather crashes. The potential crash reduction benefits of HFST align with the Washington State Strategic Highway Safety Plan - Target Zero, as this treatment

addresses two separate priority level 1 emphasis areas: Lane Departure and Speeding Involved crashes.

There has been significant debate over the potential for HFST to reduce pavement surface life due to the concerns about HFST epoxy and surface texture deterioration. Because of the potential for reduced service life, additional pavement treatment may be needed. Approximately 100 HFST had been completed by local agencies, with about half in King County.

WSDOT has applied HFST to several ramps in its Northwest and Southwest regions over the past five years. As a result, wet weather condition crashes at these locations were reduced by 85% to 95%.

Key Takeaways

- High Friction Surface Treatment has reduced wet weather condition crashes by 85% to 95% in locations where WSDOT has used it.
- Benefit/cost estimates for WSDOT's 13 identified potential HFST locations range from 3.7:1 to 13.4:1.
- Implementing HFST at all 13 locations would provide an estimated annual reduction of 3.2 fatalities and serious injuries.

HFST Applications and Advancements

The cost of applying HFST in 2015 and 2016 was approximately \$150,000 per ramp, but the HFST industry and technology is dynamic. Recent advances in the application method are lowering project costs. WSDOT has updated its construction specifications to keep up with these industry changes. The intent of this proposal is to install HFST on more ramps, monitor HFST applications, keep pace with industry changes, and expand HFST application locations.

Methodology

I-2 Program

The following criteria are proposed for screening potential locations to implement HFST on the Washington state highway system:

- Locations are limited to horizontal curves located along freeway ramps. Other installations may be considered on a case-by-case basis (i.e. locations identified by CAL/CAC/IAL analysis).
- Locations have been paved within the last five years, with no upcoming paving scheduled within the next five years.
- Other countermeasures have been attempted at

these locations prior to installing HFST (e.g. signing, delineation, etc.).

Locations that meet the above criteria will be further screened using the following parameters:

- Five or more wet weather injury crashes within a five-year period
- A minimum of 50% of crashes at this location are wet weather injury crashes.

Locations will then be ranked by total number of fatal and serious injury crashes. Seven years after implementing HFST, locations will be assessed to determine if HFST should be replaced. If not, HFST may be implemented at a new location.

Benefits

WSDOT applied HFST on four ramps with average annual daily traffic between 11,000 and 24,000 vehicles in 2015 and 2016. These ramps showed an 85%-95% reduction in wet run-off-the-road crashes and coefficient of friction numbers above 70. WSDOT defines an acceptable coefficient of friction on the roadway surface as 30 to 35.

Using the methodology and ranking criteria described above, WSDOT's initial screening identified 13 potential locations for implementing HFST on ramps. Implementing HFST at all 13 locations would provide an estimated annual reduction of 3.2 fatalities

and serious injuries. For the purposes of calculating benefit/cost ratios, the benefit is the estimated reduction in societal cost due to avoiding these fatalities and serious injuries.

Costs

Based on construction costs from Northwest Region projects, initial HFST applications at each location will cost \$50,000 to design and \$150,000 to construct. If HFST is implemented at all 13 of the locations WSDOT has identified, the total cost will be approximately \$2.6 million.

Benefit/Cost Ratios

Benefit/cost ratios will be developed on a location-by-location basis, and construction will be prioritized based on the individual benefit/cost values. Benefit/cost estimates for WSDOT's 13 identified potential HFST locations range from 3.7 to 13.4.

Ten-Year Constrained Budget Outlook for the I-2 program

The current estimated 10-year needs for state highways excluding those in cities a population over 27,500 people under the \$657 million revenue available would be approximately \$84 million. This would account for 12.8% of the 10-year safety plan.

Note: Refer to **Appendix C** for FFY 2024 projects

Systemic Curve Treatment



Lane Departure crashes are a Target Zero priority. Half of all run-off-the-road crashes occur on curves. While efforts like barrier installation, high-friction surfaces and signing treatments have been implemented, more efforts are needed.

Introduction

According to the 2019 Target Zero update, there were 1,650 fatalities and 6,537 serious injuries in Washington from 2015 to 2017. Of those, 796 fatalities and 2,458 suspected serious injuries were run-off-the-road crashes. National studies estimate that run-off-the-road crashes in curves comprise 50% of all lane departure crashes. WSDOT estimates that 667 lane departure fatal and serious injury crashes occurred on 613 curves from 2014 through 2018—approximately 133 per year.

In addition, crashes involving motorcyclists—another Target Zero emphasis area—account for approximately 18% of fatal and serious injury crashes in Washington state. Many of these crashes involve run-off-the-road crashes, often in roadway sections with a series of curves.

Lane departure crashes involving curves can be categorized as head-on, sideswipe, or run-off-the-road to the inside or the outside of the curve. Efforts to address curve-related crashes have included treatments such as curve warning signs, chevrons, wide edge lines and high friction surface treatments (HFST). Curve warning and chevron modifications have been installed or are programmed for installation on curves where there is a 15-mph difference between the advisory speed and posted speed. WSDOT

Key Takeaways

- WSDOT has identified 230 locations where countermeasures for lane departure crashes could be implemented.
- WSDOT will perform an assessment of fatalities and serious injuries on curves that might be correctible by HFST and will determine the benefits from that assessment.
- The average benefit/cost ratio for these projects is estimated to be 5.4:1.

has also installed High Friction Surface Treatments (HFST) on several curves. While more costly, HFST have shown significant potential benefit in curves where there is a greater potential for wet weather friction-related crashes.

Description of Program

The goal of assessing and re-signing curves was to reduce the potential for lane departure and run-off-the-road crashes, and to comply with the Manual on Uniform Traffic Control Devices (MUTCD). The Statewide Curve Data Collection & Analysis Project is designed to meet this goal. Data collected helps to identify the next locations for curve warning signs or chevron installation and allow WSDOT to correlate curve crashes, curve-banking data and signage.

Having addressed the curve warning signs, and currently assessing high visibility markings in a pilot project, WSDOT will begin to review HFST at curves as a potential additional countermeasure. From this, assessment, further discussion will occur with the HSEC to determine a method and approach to developing a HFST curve treatment applications approach. This approach will consider crash and asset elements in the decision-making process.

Methodology

After assessing crash data from 2014 through 2018 and the statewide geometric database, WSDOT set the screening parameter at curves with a radius of 1,250 feet or less—which tend to have a crash history—and a minimum of one fatal or one serious injury lane departure crash. This resulted in the identification of 230 curves with 252 total fatal and serious injury lane departure crashes, or approximately 50 fatal and serious injury crashes per year.

Curve crash data will be evaluated every five years to rank sites from high to low based on the expected average crash frequency. In 2023, locations will be reviewed to determine whether to apply the following countermeasure for HFST.

Benefits

Implementation of the following countermeasures will potentially contribute to the reduction of curve-related lane departure and run-off-the-road serious and fatal related crashes:

- Application of high friction surface treatments

WSDOT will perform an assessment of fatalities and serious injuries on curves that might be correctible by HFST and will determine the benefits from that assessment.

Costs

A cost estimate of \$100,000 per curve is assumed. If all 230 identified locations are addressed, the cost would be \$23 million.

Benefit/Cost Ratio

If all 230 locations are addressed, their average benefit/cost ratio would be 5.4.

Ten-Year Constrained Budget Outlook for the I-2 program

The current estimated 10-year needs under the \$657 million revenue available would be approximately \$8 million. This would account for 1.3% of the 10-year safety plan.

Note: Refer to **Appendix C** for FFY 2024 projects

Rumble Strips



WSDOT installs rumble strips on state highways to reduce the potential of lane departure. The benefits of both centerline and shoulder rumble strips have been well-established in retrospective studies, including those by WSDOT and FHWA. Research by the Federal Highway Administration (FHWA) shows rumble strips reduce the risk of crossover crashes by 30% and single-vehicle run-off-the-road crashes by 16%.

Introduction

WSDOT began installing rumble strips in the early 2000s because of their proven record of success in studies by FHWA. As of 2022, WSDOT had installed rumble strips on all multilane state highways and most rural highways in Washington. About 3,400 miles of centerline rumble strips and

710 miles of shoulder rumble strips have been installed on non-freeway rural highways in Washington state.

In 2022, 353 miles of centerline rumble strips were installed on the state highway network along with 240 miles of shoulder rumble strips as part of pavement preservation projects.

Methodology

When considering two lane rural highways, there are approximately 1,700 miles of locations that are likely suitable for centerline rumble strip installation, and 2,400 miles potentially eligible for shoulder line rumble strip installations.

Using the HSM predictive method WSDOT determines segments' eligibility for rumble strip installation by estimating the potential benefit to society and then dividing it by the

Key Takeaways

- WSDOT has identified approximately 1,500 centerline miles of state highways that are eligible for rumble strip installation.
- Installing centerline rumble strips in the identified locations is projected to provide \$435 million in societal benefit over the next 16 years and cost \$54.6 million.

projected costs of installation and maintenance over the rumble strips' 16-year estimated life span.

The costs of rumble strip installation and maintenance are affected by the type of pavement at the locations where the rumble strips are installed. A recent estimate indicated that the cost of rumble strip installation and maintenance on typical hot mix asphalt pavement is approximately \$2,000 per mile, while the same work on roads with bituminous surface treatments (BST, also known as chip seal) costs approximately \$35,000. Therefore, the type of pavement must be considered during location ranking and calculation of benefit/cost ratios.

Benefits

The agency performed predictive analysis on the two-lane rural state highway system to estimate societal benefits for existing and potential installation sites. This analysis found 335 miles of centerline rumble strips and 1,568 miles of shoulder rumble strips that were eligible candidates for treatment. Statewide benefits were calculated by estimating the societal benefits of installing rumble strips at each eligible highway segments over ten years. Societal benefit for centerline rumble strips is

estimated at \$259 million, and total benefits for shoulder rumble strips is estimated at \$1,208 million.

Costs

To develop a preliminary benefit-cost ratio, WSDOT assumed a cost of \$35,000 per mile to install rumble strips, based on the higher costs required for BST roads.

Including 335 miles of centerline rumble strips and 1,568 miles of shoulder rumble strips, the overall cost of this program is estimated to be \$66.6 million, with anticipated overall benefits of \$1,467 million, resulting in an overall programmatic benefit/cost ratio of 22:1.

Ten-Year Constrained Budget Outlook for the I-2 program

A proposal to program new centerline rumble strips and associated shoulder rumble strips where the benefit/cost ratio is currently estimated at 22:1 will cost \$83.5 million over 10 years, incorporating assumptions associated with the high cost of installing rumble strips in BST pavement. The cost of maintaining rumble strips in BST pavements is estimated to add \$40.5 million to this 10-year cost, although the benefits of doing so have not yet been determined.

Note: Refer to **Appendix C** for FFY 2024 projects

Breakaway Cable Terminal



Key Takeaways

- WSDOT maintains an inventory to identify the locations of remaining breakaway cable terminals on the state system that would be eligible for replacement.
- The expected benefit/cost ratio for WSDOT's proposed approach to removing BCTs is 2:1.

Replacing breakaway cable terminals (BCTs) with modern terminals provides a positive benefit/cost ratio by reducing the potential for fatal and suspected serious injury crashes. It also brings WSDOT in line with long-standing agency policy and Federal Highway Administration (FHWA) guidance.

WSDOT has completed the conversion of known inventory of Interstate mainline and on/off ramps. It is in the process of completing other freeways and freeway on/off ramps. WSDOT anticipates to make additional progress on the remaining BCTs as a part of its Preservation program and supplemented by stand-alone projects for high priority BCT locations that do not have a Preservation project over the next six years.

Introduction

WSDOT installed breakaway cable terminals at the end of guardrails in the 1970s and 1980s to reduce the severity of crashes. Later research by the Federal Highway Administration determined that the terminals did not reduce crash severity as well as originally expected. WSDOT is following FHWA's direction to replace BCTs with terminals that meet Manual for

Assessing Safety Hardware (MASH) standards.

Methodology

New MASH-standard terminals have been found to reduce the number of fatal and serious injury crashes in comparison to BCTs. Starting in 1997, WSDOT began replacing BCTs during pavement preservation activities (for more details on changes in BCT policy over time, refer to **Exhibit 44**). However, hundreds remain on both interstate and non-interstate routes.

Benefits and Costs

The agency analyzed the benefits of replacing all BCTs with MASH terminals over the next three years. Replacing all BCTs would reduce societal costs by \$21 million over the next 20 years. Based on the agency's experience, it would

be conservative to estimate that the agency would also experience four risk-related events during the same 20 year period, assuming a cost of \$5 million each for a total of \$20 million. This brings the total benefits to \$41 million. Replacement of BCTs is estimated at \$20 million.

Benefit/Cost Ratio

Based on a benefits and costs listed above, the benefit/cost ratio for the proposed approach to removing BCTs is estimated at 2:1.

Progress

As part of its ongoing effort to remove BCTs and replace them with MASH-standard terminals, WSDOT removed 119 BCTs as part of dedicated BCT replacement contracts. Note that other BCTs were replaced as part of basic safety on other contracts but that these replacements cannot be tracked with existing construction data.

Ten-Year Constrained Budget Outlook for the I-2 program

WSDOT continues to update its inventory to account for BCT replacements already completed or in progress.

As of December 2022, WSDOT had replaced or awarded contracts to update approximately 800 breakaway cable terminals. WSDOT identified BCTs in its inventory for future replacement, prioritizing locations with high annual average daily traffic on the interstate highway system, which will require approximately \$5.7 million.

Note: Refer to **Appendix C** for FFY 2024 projects

Exhibit 44. State & Federal Breakaway Cable Terminal Policies
1994 through 2018

Year	Policy change
1994	FHWA directs states to stop installing BCTs on National Highway System routes one year after learning BCTs were not effective in reducing fatal and serious injury crashes.
1997	WSDOT issues its first policy on BCT removal, providing for their removal where the flare rate did not meet the initial design criteria (minimum 3-foot offset)
1998	FHWA directs states replace BCTs when they are within the boundaries of any resurfacing, restoration, or rehabilitation work.
2005	WSDOT policy is updated to require the removal of BCTs on all interstate routes.
2017	WSDOT policy is updated to require the removal of BCTs on all state highway routes.
2018	FHWA requires installation of guardrail terminals that meet MASH standards in all new installations and full repairs on the NHS.

Cable Median Barriers



Key Takeaways

- WSDOT completed an in-service performance evaluation (ISPE) and compared performance of the three and four strand high tension cable.
- WSDOT is pausing conversions from three to four strand cable systems given that the ISPE indicated that the three and four strand cables performed similarly.

No expansion of the cable median barriers countermeasure is proposed at this time. Three to four strand high tension cable conversions were halted given that these systems perform similarly.

WSDOT has completed a detailed inventory of median locations that fit existing criteria (50 feet wide and less). The agency reviewed the median inventory and associated crash data. The agency will continue to monitor national research on this topic and the safety performance of medians greater than 50 feet wide. If WSDOT finds sufficient evidence that a change in policy and/or additional treatments appear to be appropriate, then the agency will prepare a proposal for a programmatic response.

Introduction

WSDOT determined in 2019 that it has installed or had plans to install cable median barriers on all state roadways with speed limits of 45 miles per hour or higher and median widths of up to 50 feet. Cable median barriers—including

double sided w-beam, and pre-cast or cast-in-place concrete—reduce the potential for crashes with oncoming traffic when vehicles veer off the roadway and into the highway median. WSDOT completed a statewide inventory to verify that all appropriate locations have cable media barriers. No locations without barriers that fit the installation criteria (medians 50 feet wide or less, speeds of 45 mph or higher) were identified.

WSDOT conducted an in-service performance evaluation (ISPE) on all cable barrier systems installed on state highways, using the NCHRP 22-33 methodology. Using this analysis, WSDOT determined that three and four strand high tension cable performs similarly. Based on this finding WSDOT halted any conversions from three to four

strand systems that would have totaled over \$70 million.

Methodology

Installing cable median barriers on medians 50 feet wide or less is WSDOT's current policy and is accepted as a best practice in Washington and other states. In 2017, WSDOT reviewed this policy and analyzed crash statistics to determine whether installing barriers on medians greater than 50 feet wide was needed. The agency determined there were no crossover crash fatalities at medians between 50 and 60 feet wide from October 2011 through September 2016 and concluded that installing barriers on medians wider than 50 feet was not necessary.

WSDOT will continue monitoring national research findings and considers changes to its cable median barrier policy as new research-based recommendations are made.

Benefits and Costs

No further work is proposed given that the inventory did not identify any additional locations for installation.

Ten-Year Constrained Budget Outlook for the I-2 program

No fundamental change in policy or programming is proposed at this time.

Note: Refer to **Appendix C** for FFY 2024 projects

Guardrail Infill and Retrofit



Work continues on a quantitative approach to identifying locations for potential new barrier or treatments, including the cost and benefit of such treatments.

Introduction

WSDOT uses clear zones to provide drivers as much space as possible to regain control of their vehicles if they depart the roadway. Some clear zones contain objects that can be

struck by drivers or features such as ditches or slopes that could increase the potential for fatal or serious injuries. Guardrail is one mitigation option WSDOT uses to shield drivers from objects or areas in clear zones where fatal or serious injury crashes have occurred (refer to box below for more details on mitigation options). Guardrail infill was the original context of clear zone mitigation, and retrofit has

Key Takeaway

- WSDOT estimates that 73% of weathering steel guardrail installed on highways is showing accelerated deterioration.

WSDOT's options for reducing the potential for crashes in clear zones:

- Remove objects in the clear zone
- Redesign fixed objects to be traversable
- Relocate objects
- Use breakaway features to reduce impact severity
- Shield the area with traffic barriers
- Delineate by placing barrier, guardrail or cable barrier

been added in order to address accelerated deterioration identified in some weathering steel guardrail.

Methodology

WSDOT estimates that 73% of weathering steel guardrail installed on state highways is showing accelerated deterioration. Locations with deterioration have been prioritized for replacement based on crash and traffic history.

The agency completed an updated inventory of guardrail on state highways in 2019 and is applying the Highway Safety Manual (HSM) predictive method to select cost-effective safety investments, instead of relying solely on previous crash data. The new tools acquired in 2019 include improved incident

coding and a predictive analysis method from the Federal Highway Administration’s new Interactive Highway Safety Design Model (HSDM) tool.

Benefits and Costs

WSDOT will create a list of prioritized projects that includes locations for new guardrails, and locations with existing guardrails that need retrofitting or replacing. After the list is compiled the cost/benefit estimate will be calculated to establish a ranking order based on the cost-effectiveness of the project.

Ten-Year Constrained Budget Outlook for the I-2 program

Using previously available data, the agency has created plans to address all weathering steel guardrail locations of concern. Replacement cost is estimated at \$34 million over 10 years in the five biennia for state highways excluding those in cities with a population over 27,500. Refer to **Exhibit 45**.

Note: Refer to Appendix C for FFY 2024 projects

Exhibit 45. Estimated Cost For Replacing Weathering Steel Guardrail

Estimated cost in 2019; 2017-2019 through 2025-2027

Biennium	Estimated biennial cost
2017-2019	\$5 million
2019-2021	\$6 million
2021-2023	\$7 million
2023-2025	\$8 million
2025-2027	\$8 million
Total	\$34 million

High Visibility Edge Lines



Edge lines are the solid white longitudinal markings at the outside edge of roadways. High visibility edge lines increase the driver's ability to see the markings, helping reduce lane departure crashes. The Edge Line Visibility Pilot will potentially reduce run-off-the-road crashes by installing high visibility edge lines on rural highways and freeways in Western Washington.

Introduction

The Edge Line Visibility pilot attempts to reduce lane departure crashes, which is one of the Target Zero focus areas. WSDOT will establish high visibility edge lines in three Western Washington regions. The pilot will focus on rural routes and freeways on the west side of Washington state. Studies have shown that increasing edge line visibility by having wider or thicker lines

with high visibility beads can reduce run-off-the-road crashes by up to 35%. This pilot will install high build, or thicker than average, 4-inch-wide edge lines on target roadways.

In Spring 2023, WSDOT's Transportation Operations and Maintenance Divisions coordinated efforts with NWR and OR Maintenance to install wet reflective striping on SR 9 and SR 101. WSDOT found that the application of the wet reflective beads were creating clogging of application systems in the trucks.

WSDOT will collect after crash, speed and maintenance data at the locations to assess performance and longevity.

Funding and striping trucks (to accommodate the wet reflective beads) remain concerns. Currently, WSDOT is using state

Key Takeaway

- Assuming a 20% reduction in crashes following edge line visibility treatments, the expected benefit/cost ratio is 30:1, with some estimates as high as 78:1.

funds for this effort, not Federal HSIP. WSDOT may not have other applications in 2024 due to a limited paving program.

Methodology

Crash Modification Factors (CMF) are used to compute the expected number of crashes after implementing a strategy intended to reduce crash frequency or severity on a road or intersection CMF No. 4792 in the Federal Highway Administration's clearinghouse for crash modification factors

Exhibit 46. All Injury Crashes in Western Washington¹

Annual average, 2014-2018

Severity	Annual Lane Departure ² Crashes	Annual Societal Costs	Annual 20% Crash Reduction	Annual Societal Benefits with 20% Reduction
Possible	952	\$130,916,000	184.0	\$26,1863,200
Evident	519	\$123,115,640	103.7	\$24,623,128
Serious	129	\$442,987,960	25.9	\$88,597,592
Fatal	56	\$191,710,400	11.2	\$38,342,080
All	1,624	\$888,730,000	324.8	\$177,746,000

Notes: 1. Includes three WSDOT regions: Southwest Region, Olympic Region and Northwest Region. 2. Lane Departure includes all run-off-the-road crashes, plus any crash resulting from leaving the traveled lane.

increases the edge lines from 4 inches to 6 inches and has a value of 0.78, or a 22% reduction in crashes. The CMF has a rating of 4/5 and used a before/after study with empirical Bayes methodology, a type of statistical estimation that addresses randomness and increases precision compared to using a crash history.

WSDOT will examine the three Western Washington regions in this pilot, with a focus on rural highways and freeways. Urban highways were excluded as many have curbing and no edge line, and potentially have lower travel speeds. All injury lane departure crashes were included in the screening and a 20% crash reduction is assumed.

Using the proposed high build 4-inch edge lines will provide benefits for all conditions, according to the research cited in the introduction. Other benefits may include improved readability by smart vehicle

technology and road stripes maintaining visibility over longer periods of time. Based on the available research and CMFs cited above, a 20% reduction in lane departure crashes is a reasonable estimate.

Benefits

The implementation of high visibility edge lines in Western Washington could potentially result in 37 fewer fatal and serious injury lane departure crashes and \$177 million in societal benefit annually. Refer to **Exhibit 46**.

Exhibit 47. Marginal Labor, Equipment, Materials and Operations (LEMO) Costs

Western Washington 4-inch high build package

Component	Estimated annual cost
Western Washington traditional paint LEMO	\$3,205,000
Western Washington high-build pain LEMO	\$4,543,000
<i>Paint delta</i>	\$1,338,000
Traditional beads	\$397,000
High-build beads	\$1,318,000
<i>Bead delta</i>	\$921,000
<i>High-build package delta</i>	\$2,259,000

Costs

For Western Washington, the traditional paint package (paint, beads, labor and equipment) costs \$3,602,000 per year. Applying high visibility stripes and beads would cost an additional \$2,259,000 per year for state highways excluding those in cities with a population over 27,500 people. Refer to **Exhibit 47** for more details.

Note: Refer to **Appendix C** for FFY 2024 projects

Benefit/Cost Ratio

The benefit/cost ratio is based on the annual potential benefits of reduced societal costs from crashes and the annual material and labor costs of installing the high visibility edge lines. At a 20% reduction the expected benefit/cost ratio is 78:1.

Field Assessments



The Field Assessment strategy was created to replace WSDOT's previous spot safety investments, which were associated with pavement preservation. Field assessments are a programmatic approach to reviewing all state highways in order to identify opportunities, evaluate potential benefits, evaluate roadway and roadside characteristics, and develop lower-cost spot safety and operational modifications.

Introduction

The Field Assessment program provides the opportunity to address crash and operational locations across the state highway system.

By systematically reviewing all highways using a consistent statewide approach, Region Field Assessment Engineers are able to identify potential fatal and serious injury crash

reduction opportunities, address emerging crash trends, and recommend incremental solutions.

Countermeasures to reduce crashes are typically location-specific and prioritized according to the most effective and efficient use of resources.

Methodology

This program given its dual purpose of serving operational and crash related aspects is in the process of moving from the safety improvement program (I2), to the Transportation Operations program (Q).

Further discussions will take place to assess whether any elements of the Field Assessments will be considered within I2, and future funding of the field assessment personnel will be from the Transportation Operations Program.

Key Takeaway

- Region Field Assessment Engineers are able to identify potential fatal and serious injury crash reduction opportunities, address emerging crash trends and recommend incremental solutions.

Active Transportation



Fatal and serious injury crashes involving people walking and biking on the state system continue to increase. WSDOT does not currently have a specific funding program to reduce or eliminate crashes involving people walking and biking on the state system. In the Move Ahead Washington transportation investment package enacted in 2022 the legislature created the five-year \$50M Connecting Communities Pilot Program, directing WSDOT to identify projects to reweave the active transportation network where it was severed by legacy state transportation facilities. WSDOT will prioritize projects based on equity, safety, identification as a gap in the state Active Transportation Plan, and other criteria. The legislature also allocated 24% of ongoing revenues from

the Climate Commitment Act to a new Climate Active Transportation Account that will fund expansion of Safe Routes to School and Pedestrian/Bicyclist grants to local agencies. Some of the projects funded under those programs may include improvements on WSDOT right of way. All these new programs address safety; however, it remains the case that funding for the state system does not include a dedicated active transportation safety program for WSDOT projects. Project identification for all new programs begins with equity criteria. The State Active Transportation Plan 2020 and Beyond includes data and analysis of state right-of-way that can inform safety program investments.

Key Takeaways

- From 2018 through 2022, more than 14,700 crashes on the Washington state route system involved people walking or biking.
- Projects that address safety outcomes for pedestrians and bicyclists also provide crash reduction benefits for other road users.

Introduction

Walking and biking are essential parts of an integrated, sustainable, multimodal transportation system. According to the 2017 National Household Travel Survey, an

Infrastructure life cycles affect program costs

Investments in infrastructure for people who walk and bike need to account for the life cycle of the installations. The agency needs to take a complete inventory of bicyclist and pedestrian facilities on the state system. To make a reliable estimate of maintenance costs for these installations, the agency will also need to establish the expected service life of the various components:

- Pedestrian electronic systems operate like traffic systems with replacement often occurring on a 10-year basis.
- Paved surfaces and dedicated structures used by pedestrians and bicyclists will have longer life cycles than those used primarily by vehicles due to the limited wear and tear caused by walking and biking.

WSDOT estimates a need of \$163.25 million for preservation and maintenance of pedestrian and bicyclist infrastructure for 2021-2031. WSDOT needs to develop better data and refine its calculation methodology to understand lifecycle costs.

estimated 11.5% of all trips are conducted by walking or biking. More than 14,700 traffic crashes involved people walking and biking on the Washington state route system from 2018 through 2022. About 22% of these crashes resulted in a serious injury or fatality.

In 2021, 22% of all traffic fatalities were people walking and biking, which represents a disproportionately high number of deaths considering the walk/bike mode share. Pedestrian and bicyclist fatalities have increased 46% over the last 10 years, and continue to rise.

Significantly, an equity analysis indicates that these serious and fatal crashes occur disproportionately in locations with high percentages of Black, indigenous, and people of color, or people in low-income households. These same neighborhoods have more people who rely on active transportation and transit.

In WSDOT's previous 10-year plans, funding for pedestrian and bicyclist improvements came from the now defunct Pedestrian Risk and Pedestrian Accident Locations programs. WSDOT currently administers the Safe Routes to School and Pedestrian and Bicyclist Programs, providing funding for local agency needs. Projects under these programs occasionally include improvements to the state system in partnership with

local agency plans, but the primary legislative intent in establishing these programs was to fund local system improvements. Funding for these programs is projected to increase significantly under the new Move Ahead Washington package.

It is recognized that the WSDOT State Active Transportation Plan 2020 and Beyond and the programs listed above will contribute to achieving a more walkable and bikeable system.

The Active Transportation subcategory is intended to address the increasing trend of fatal and serious injury crashes involving those who walk and bike by identifying factors associated with crash potential, equity and demand.

The majority, 86%, of bicyclist and pedestrian related fatal and serious injury crashes in 2010-2019 occurred on roads with a posted speed over 25 mph. The majority of pedestrian fatalities and serious injuries, 62%, occurred when the pedestrian was crossing the street. WSDOT will continue to focus on reducing driving speeds in contexts with a mix of users, modes, and destinations; providing a connected network of facilities for pedestrians and bicyclists; and appropriately designing crossing treatments with pedestrian-scale lighting, sited at the right frequency

to serve the needs of people walking and biking. The Active Transportation Plan incorporates specific recommendations from WSDOT's Safe Transportation for Every Pedestrian action plan developed under EDC-4

The Cooper Jones Active Transportation Safety Council studies specific issues and makes annual recommendations to the legislature. In 2020 and 2021 they emphasized speed management to reduce serious and fatal crashes and use of automated safety cameras. In 2022 they are examining sidewalks and crossings, among other topics.

Methodology

The Washington State Active Transportation Plan 2020 and Beyond is complete. It includes a systematic analysis of the level of traffic stress (LTS) for vulnerable road users was developed into spatial data for use in active transportation project assessment and is available in WSDOT's GIS workbench. LTS defines and ranks traffic stress based on existing facility and associated road characteristics, posted speed, and vehicle volumes. Another result of the analysis was the creation of spatial data that includes locations on the state system that are identified as active transportation gaps. These gaps may reflect complete lack of facilities,

limited or non- ADA-compliant facilities, or lack of data to determine whether they meet WSDOT's guidance and criteria. A concurrent analysis provided spatial data identifying active transportation route directness. This route directness index identifies locations at which a active transportation user has no direct route to common destinations and must travel out of their way to safely bypass vehicle traffic.

To develop a ranked list of locations as recommended in the HSIP Implementation Plan 2022, WSDOT conducted

a systemic GIS analysis identifying locations on state jurisdiction roads:

- Where crash data (2010-2019) showed the locations of fatal and serious injury collisions involving active transportation,
- Within 200 feet of locations where high route directness index paths for active transportation road users intersect with high level of traffic scores,
- Within 200 feet of transit stops, as these are known active transportation user-generators.

Exhibit 48. Criteria for Evaluating Locations for Pedestrian and Bicyclist Infrastructure

Criterion	Relevant to Gap Location	Score
Safety	Crash history	0 - 5
	Systemic safety issues	5 or 10
	Connectivity (conflict reduction infrastructure)	0 - 10
	Destination proximity	0 or 10
	Trail proximity	0 - 10
Equity	Intermodal proximity	0 - 10
	Concentration of low-income households	1 - 10
	Concentration of people with a disability	1 - 10
Demand	Concentration of people of color	1 - 10
	Potential for walking/cycling	0 - 10

WSDOT concatenated the resulting list of analysis locations with:

- Census tract data identifying percent minority, percent in poverty, percent English speaking, percent disabled,
- Distance to the nearest school,
- Posted speed limit (for reference only, as speed was already analyzed through the level of traffic stress data).

The intent was to use these variables to further refine the analysis and increase understanding of potential correlations. Second, this analysis resulted in a dataset that includes locations—where fatal and serious injury collisions involving active transportation road users occurred—that can be used to help inform where to invest project funds to best facilitate active transportation road user safety. The information will be shared with region staff for validation of costs and locations. Region scoping activities will include Active Transportation considerations in field reviews, and the reviews will be used as the basis for scoping.

Modifications at these locations may include proven treatments such as traffic safety cameras in school zones, road reconfigurations,

raised pedestrian crossings, curb extensions, rectangular rapid flashing beacons, HAWK signals, separated/protected bicycle lanes, protected intersections, leading pedestrian intervals for traffic signals, roundabouts, sidewalks, shared use paths, etc (refer to **Appendix C**).

Benefits

The benefits of projects that address safety outcomes for people who walk and bike can be measured by estimating the societal value of the deaths and serious injuries avoided by implementing the projects. WSDOT follows the USDOT guidance for calculating the value of lives saved and injuries prevented, available at [Departmental Guidance on Valuation of a Statistical Life in Economic Analysis](#).

From 2019 through 2021 the societal cost of the 351 pedestrian and bicyclist fatalities that occurred on state routes in Washington state was approximately \$3.73 billion. Additionally, the 1,385 pedestrian and bicyclist serious injuries that occurred during that same time period had a societal value of approximately \$1.4 billion.

The total value to society of the lives affected during the three-year period was \$5.13 billion, which averages to an annual cost of \$1.71 billion. Projects that address safety outcomes for pedestrians and bicyclists provide crash reduction benefits for all road users; all people are pedestrians at some point in every trip. Refer to **Appendix C** for FFY 2024 projects.

Ten-Year Constrained Budget Outlook for the I-2 program

The current estimated 10-year needs under the current revenue projections the safety sub-program would be approximately \$85 million for state highways excluding those in cities with a population over 27,500 people. This would account for 12.9% of the 10-year safety plan.

Decision-Making and Performance Improvement

The Decision-Making and Performance Improvement subcategory helps meet Target Zero goals by improving efficiency and enabling:

1. Safety performance-based planning, design, maintenance, operations, and asset management;
2. Timely and quality crash diagnosis, analysis, and evaluation;
3. Compliance with federal requirements.

Introduction

WSDOT's approach to transportation safety continues to evolve from a standards-based to a quantitative, data-driven, and science-based approach. The transition to Sustainable Safety in 2013, Performance-Based Practical Solutions in 2015, Complete Streets in 2022 and finalizing the Safety System Approach Executive Order update in 2023 are indicative of this evolution. WSDOT recognizes the value of data collection and analysis goes beyond safety and is vital to asset and performance management, which highlights a need for the integration of safety data into these efforts. Safety data evaluation, modeling, analysis, and diagnosis are a focus because the evolution of WSDOT's approach to the Safe System Approach creates a greater need for integrated safety data throughout the

planning, programming, and project development processes.

The intent of this subcategory is provide for a) timely data-driven decision-making, and b) the ability to capture and use feedback for continual performance improvement. Work will focus on safety planning and target setting; collection and use of integrated safety data, including the fundamental [Model Inventory of Roadway Elements \(MIRE-FDE\)](#), using [LIDAR data collection](#); the tools necessary to support data analysis and other uses; and consistency in policy implementation across divisions and regions will continue to occur.

WSDOT has developed a scalable approach to safety analysis that ranges from a detailed safety performance analysis of contributing factors, crash types, and development of targeted solutions to a simple estimation of the societal benefit for crash reduction and prevention due to implementation or changes to existing conditions. These are outlined in two documents for safety analysis, one with planning, the other in project development. Without such analysis, decisions are based on perceptions or past practice, limiting reliability in decision making and the effectiveness of safety investments.

These activities require integrated, high quality, timely, integrated, accessible and

Key Takeaways

- The benefit/cost ratio of investing in safety data and decision-making is 1.83:1.
- The data needed for safety diagnostics, analysis, and evaluation are also needed across WSDOT to support data-driven, performance-based approaches.

complete safety data that includes multimodal crashes, roadway and asset inventory, and traffic volume data.

When data drives the making of safety decisions that affect the lives and health of the traveling public, data quality is of the utmost importance. Quality data provides a level of certainty that the crashes are properly located, and the location characteristics are correct. Quality, well designed data promotes the ability integrate and reuse data effectively and efficiently.

Both MAP-21 and the FAST Act increased federal requirements for safety data at state DOTs. These federal mandates require States to collect a minimum level of safety data, establish performance measurement targets and use data-driven safety analysis for projects using federal funding provided in the Highway Safety Improvement Program.

As part of the support state agency compliance and understanding of state-specific needs, several different types of national assessments related to safety data were carried out at WSDOT:

- 2010 Crash Data Improvement Program.
- 2012 Roadway Safety Data Capability Assessment.
- 2014 NHTSA Traffic Records Assessment.
- 2015 Feasibility Study for GIS Based Roadway Data Integration.
- 2018 Roadway Data Improvement Program (RDIP)

In 2017, WSDOT piloted the [FHWA Guide for State DOT Safety Data Business Planning](#). This process involved engaging stakeholders that are essential for safety data collection, access, use and management to develop a WSDOT Safety Data Business Plan. The business plan provides a road map for improvement that will support this safety subcategory.

The specific needs identified by these assessments, such as concerns around the linear referencing system (location information system), roadway data, the difficulty and level of effort needed for data integration, are amplified. The Safety Program advocated for making the linear referencing updates a top priority within

M2D2 and IT project priority within the Division. The agency is well underway with roadside safety asset lifecycles and performance outcomes as part of asset management program and has made request to pause or revise roadside based safety subcategories. This will require changes that support a greater ability to manage safety assets across programs and to optimize investment and decision making related to those assets, and these wins show the value of the Decision-Making and Performance Improvement subcategory.

Examples of decision and performance improvement include:

- Mobile LIDAR (intended to address linear reference system concerns, data quality and MIRE FDE).
- Minimum Inventory Roadway Environment Functional Data Elements (MIRE-FDE) - (FHWA required data collection).
- Retire SafetyAnalyst and implement new network screening software, IHSDM, and predictive safety tools (planning, design and operational decision making).
- Evaluate vulnerable road users crash, roadway, and facility data collection and analysis.
- Addressing outdated mainframe systems.

The data needed for safety diagnostics, analysis, and evaluation are also needed across the agency to support data-driven performance-based approaches. Therefore, the needs described in these assessments and plans represent what is adversely affecting WSDOT across divisions and regions as the agency plan, scope, design, and operate the system this will be particularly true of understanding road user needs that have less data, such as active transportation.

Since 2019 WSDOT made significant progress in the area of asset management of roadside barriers. The department developed an inventory of all barrier installations: cable barrier systems, concrete barriers, guardrails, end treatments, and impact attenuators. In-service performance evaluations (ISPEs) were also completed on the cable systems, concrete barriers, end treatments, and impact attenuators. Findings from the ISPEs have been instrumental in guiding decisions regarding three to four strand conversions of cable barrier systems, and potential areas for further study and investment.

Mobile LIDAR data collection of the state highway system started in June 2023 and will be completed by September 2023. This data will be used, among others, to extract information

for MIRE-FDE, roadside barrier and clear zones, and active transportation facilities.

Methodology

The WSDOT Safety Data Business Plan, as well as previous and future assessments will be used to identify needs.

Benefits

The implementation of a coordinated enterprise approach to technology and data management provides the safety program with the ability to:

- Identify locations most likely to reduce fatal and serious injury crashes.
- Scale investments appropriately in order to balance cost and societal benefit.
- Optimize trade-offs during planning, design, and operations to provide for the Safe System Approach.
- Evaluate how and if investments were successful in reducing fatal and serious injury crashes.
- Provide feedback to refine policy, decision making and implementation practices.

This is necessary for a strategic and coordinate performance and decision-making framework for the agency as a whole.

Benefit/Cost Ratios

According to [FHWA](#) the benefit/cost ratio of investing in safety data and decision-making is 1.83:1.

Ten-Year Constrained Budget Outlook for the I-2 program

WSDOT has estimated the need in the area of decision-making and performance improvement subcategory at 5% of the I-2 budget, or approximately \$25 million over a 10-year period. This effort will include MIRE FDE and LIDAR Data Collection.

Note: Refer to **Appendix C** for FFY 2024 projects

Conclusion

Noteworthy Practices

In 2022, WSDOT continued to advance road safety with changes throughout its design and operational process to incorporate Complete Streets legislation as outlined in WSDOT Legislative Budgets. Consistent with WSDOT Sustainable Safety and Practical Solutions Executive Orders WSDOT has been incorporating the Safe System Approach into its design and operational policies and procedures. With specific funding and direction within the legislation the rate of implementation and institutionalization will be increased.

WSDOT updated the Safe System Executive Order 1085.01. The EO directs its safety suprogram to be consistent with the Safe System. Together with its partners WSDOT will do the same for the SHSP.

WSDOT intends to update its [Safety Analysis Guide](#) to provide guidance regarding expectations for safety analysis across WSDOT programs within each program area and consistent with the Safe System Approach.

Moving Forward

The goal of zero fatal and serious injuries is a daunting task that requires a commitment and understanding from the highest levels of the Department to staff level

implementation. WSDOT continues to emphasize that “Target Zero” is our guide and directive for our safety program.

The trend in fatal and serious injury crashes is troubling and the trend has been upward over many years. While investment in the Safety Program remains near the lower end of all programs, with the implementation of Complete Streets and associated funding for the safe system approach, as well as more federal and state safety grants to local agencies reductions in fatal and serious injury crashes will occur over time. In addition, WSDOT is challenged by growth in vehicle travel, population growth, the increases in driving while intoxicated by drugs and alcohol, and increasing speeds, and will investigate how self-explaining and enforcing roads can lead to reductions in fatal and serious injury crashes. WSDOT current performance to achieve our zero goals, we must be able to sustain progress in both the near-term and long-term but reversal of trends may not be immediate.

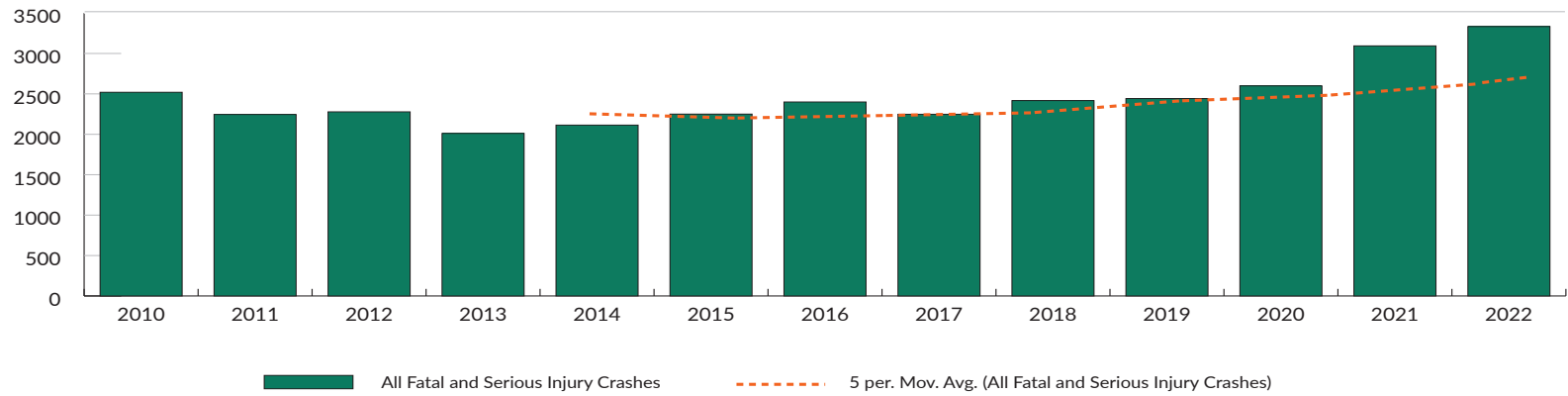
WSDOT’s “Safe System Approach” is intended to focus on the principles of the Safe System: that deaths and serious injuries are unacceptable, we support safe road use, reduce large crash forces, that responsibility is shared, safety is proactive, and that we strengthen all parts.

WSDOT continues to encourage safety assessments, in service performance evaluations, and performance assessments across organizational boundaries and at all levels of the project development process as outlined in the new Safe System EO. These reviews are critical in reducing rework, aligning objectives, and improving the overall flow of information and knowledge as projects make their way through the development process. Therefore, WSDOT’s success is contingent on our ability to work collaboratively within WSDOT and with our external partners and stakeholders. The ultimate goal of WSDOT’s Safe System Approach is to reduce fatal and serious injury crashes and to do so in a matter that optimizes project planning, prioritization, design, and operation relationships to fatal and serious injury crash reduction and prevention. Through our continued commitment to learning and improvement, we will achieve Target Zero. It means that our families, friends, and the public will arrive home safely.

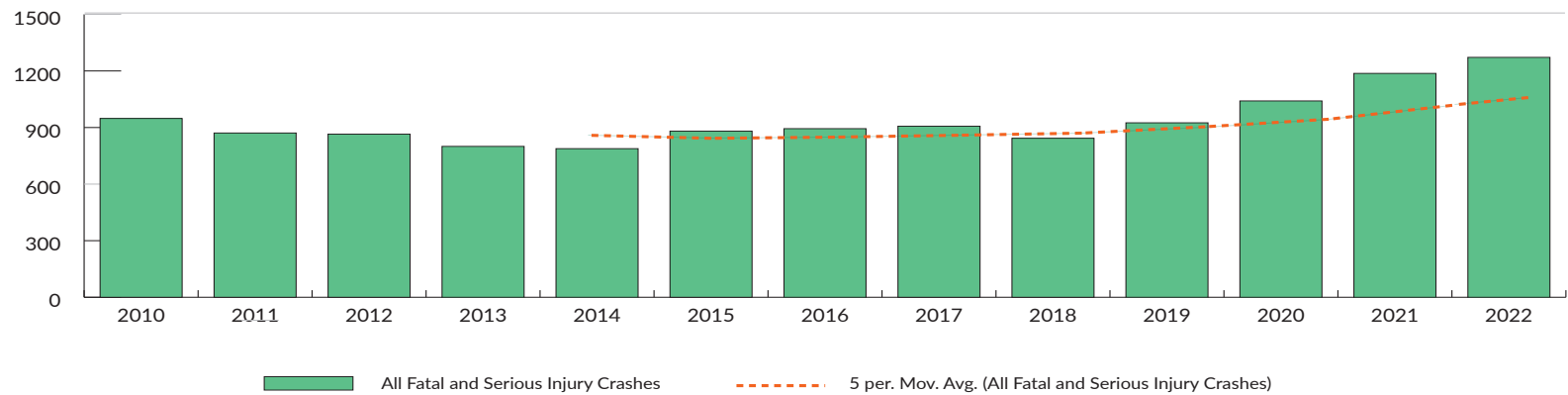
Appendix A: Emphasis Areas

Emphasis Areas	Fatal and Serious Injury Crashes												
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
All fatal and serious injury crashes	2520	2245	2278	2011	2114	2249	2399	2448	2417	2441	2600	3095	3333
Lane Departure Crashes	976	898	907	822	823	918	943	963	874	962	1085	1240	1272
Run off the road	791	729	706	685	648	761	753	745	700	760	871	980	1038
Opposite direction	185	169	201	137	175	157	190	218	174	202	214	260	234
Intersection Related Crashes	856	759	749	660	729	724	842	784	803	779	822	975	1095
Involving people walking and biking	469	473	525	394	483	492	590	565	633	571	516	657	686
Involving people walking	347	348	404	300	374	370	447	458	495	458	409	544	534
Involving people biking	122	125	122	95	109	122	143	107	139	113	108	113	153
Heavy Truck Involved	133	124	148	116	139	123	157	205	159	172	144	230	236
Motorcyclist Involved	442	412	453	400	401	456	441	456	452	490	477	540	639
Older driver 70 (plus) involved crashes	227	169	191	184	206	234	223	235	243	293	274	317	348
Younger driver (16-25) involved crashes	896	781	705	654	661	692	770	774	692	687	757	915	954

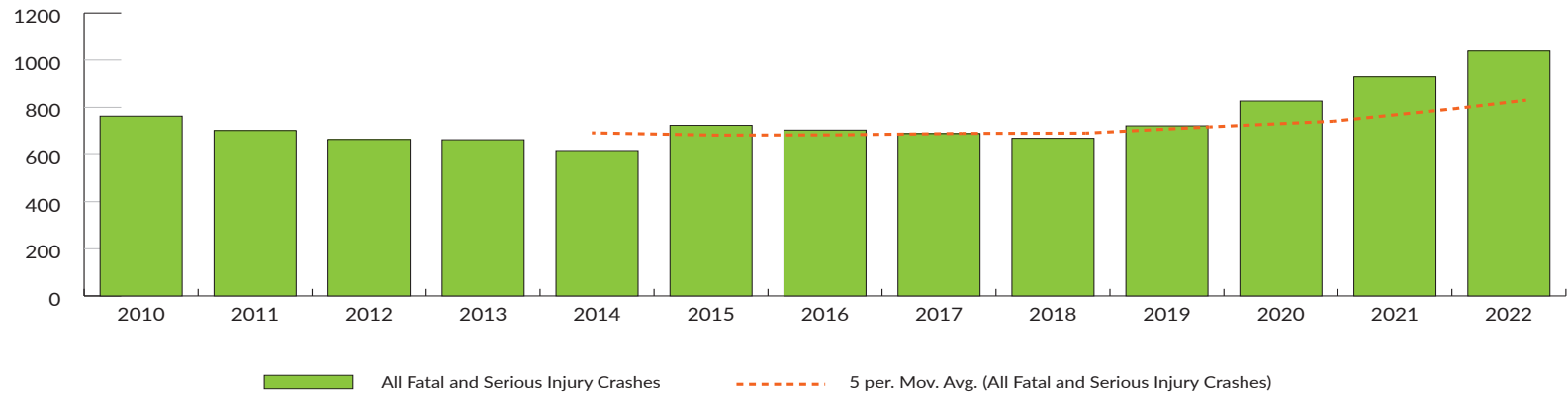
All Fatal and Serious Injury Crashes



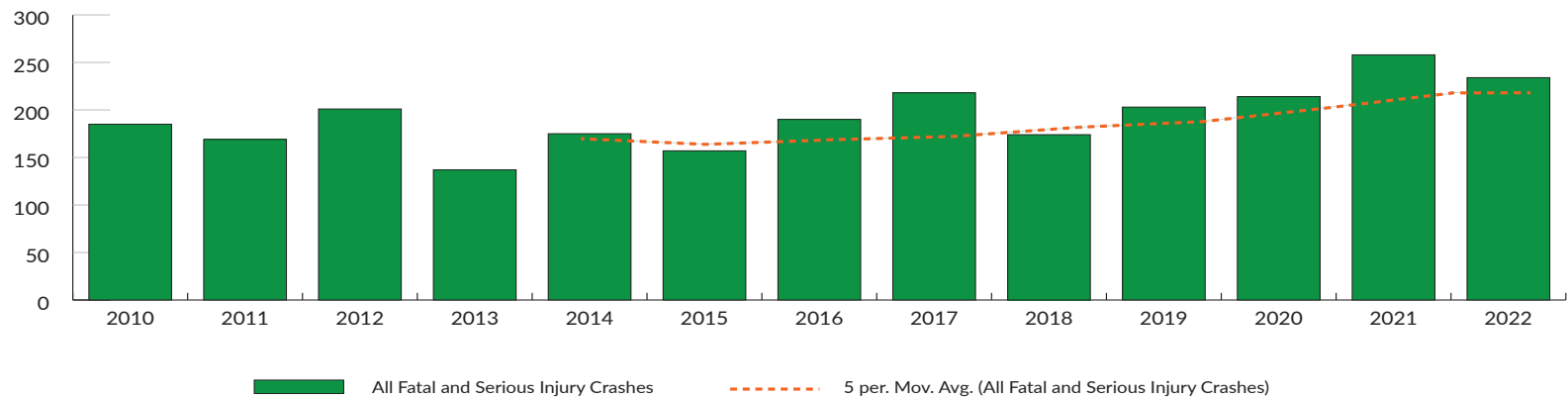
Lane Departure Fatal and Serious Injury Crashes



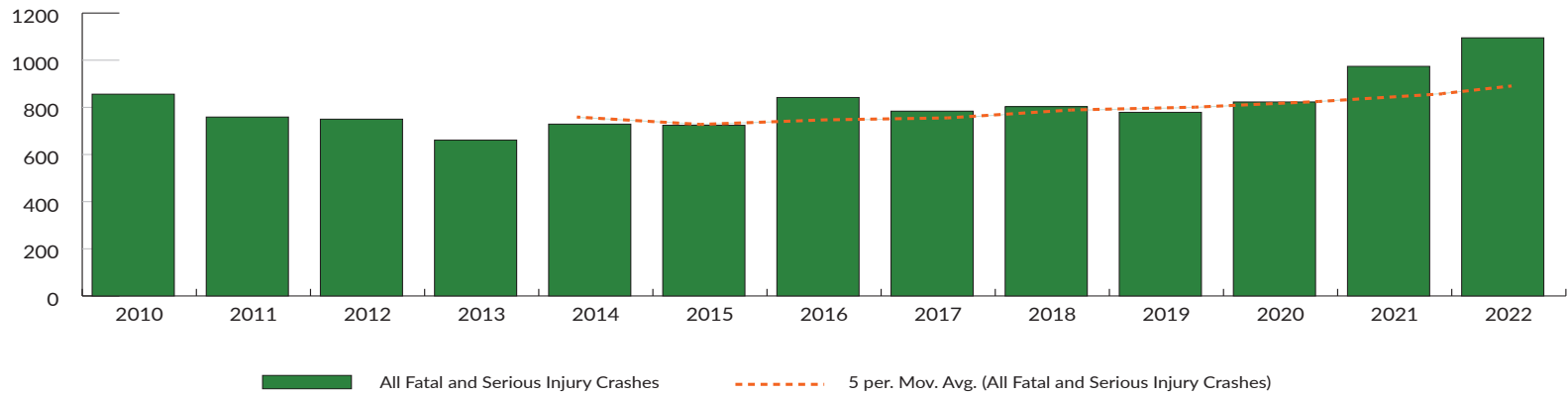
Run Off The Road Fatal and Serious Injury Crashes



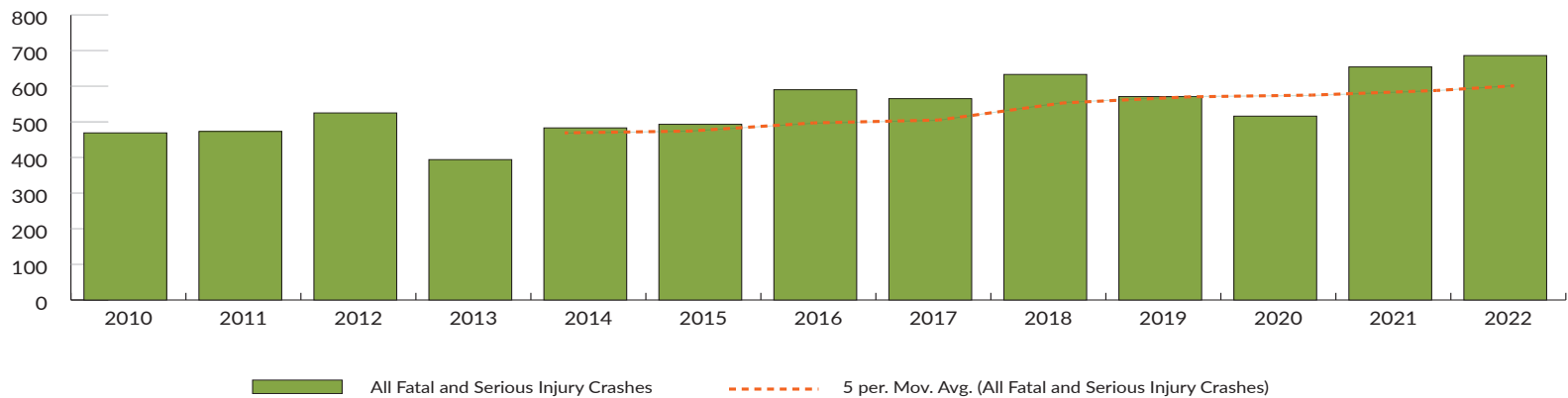
Opposite Direction Fatal and Serious Injury Crashes



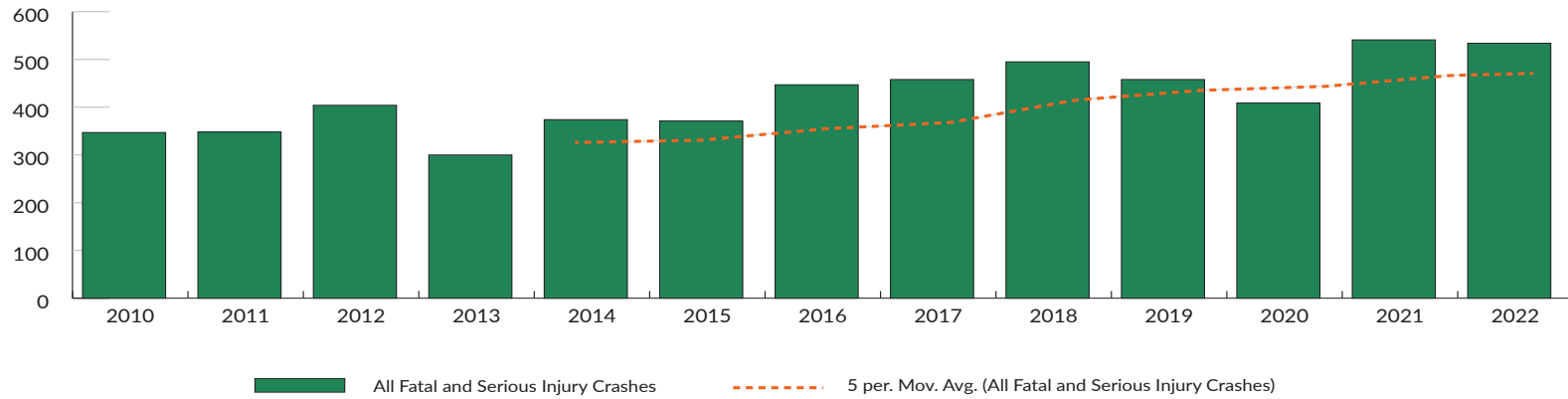
Intersection Related Fatal and Serious Injury Crashes



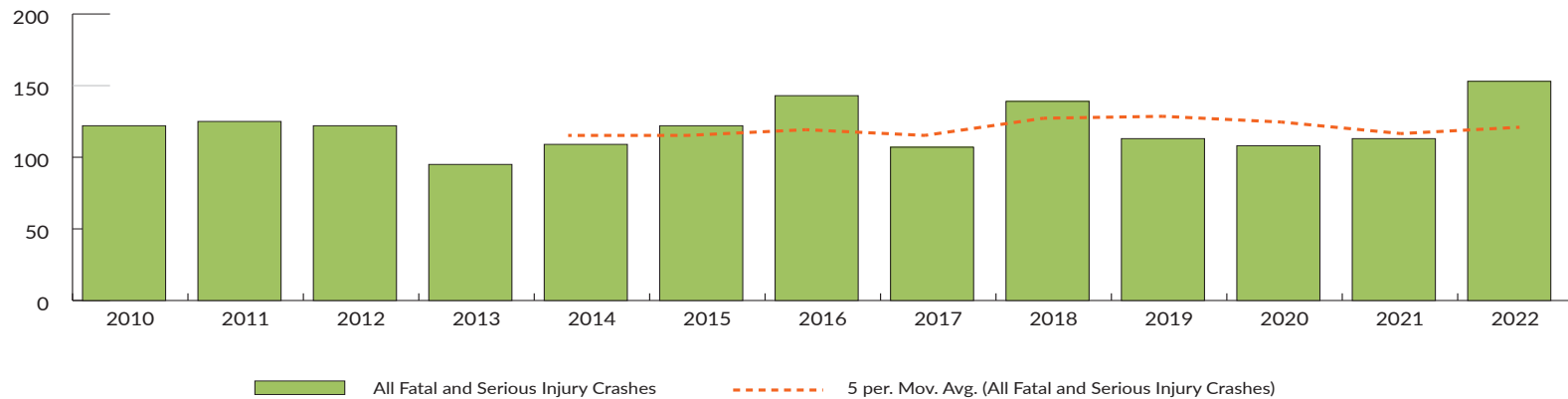
Fatal and Serious Injury Crashes Involving People Walking and Biking



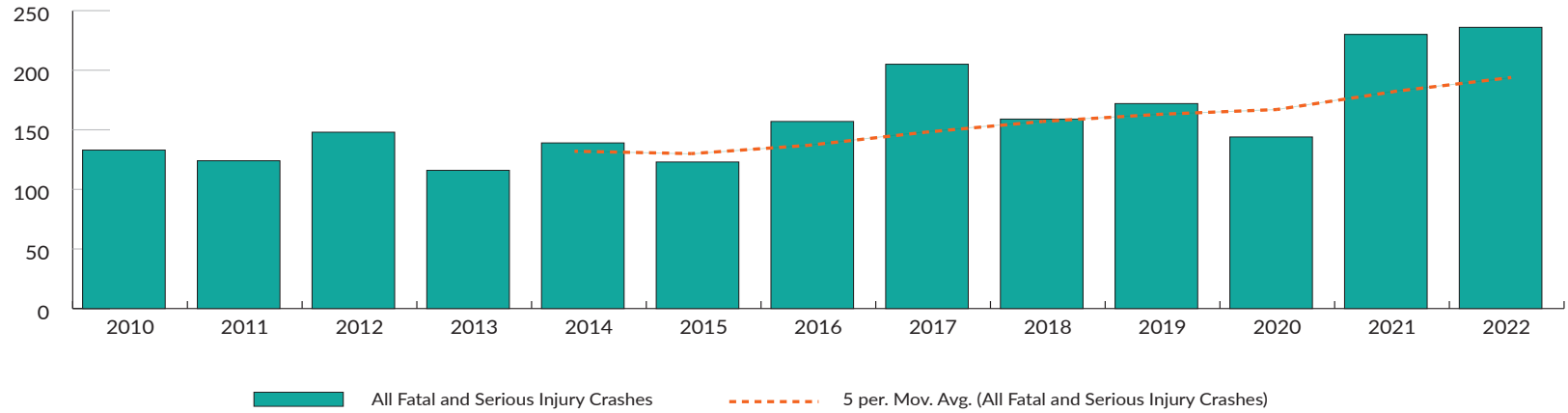
Fatal and Serious Injury Crashes Involving People Walking



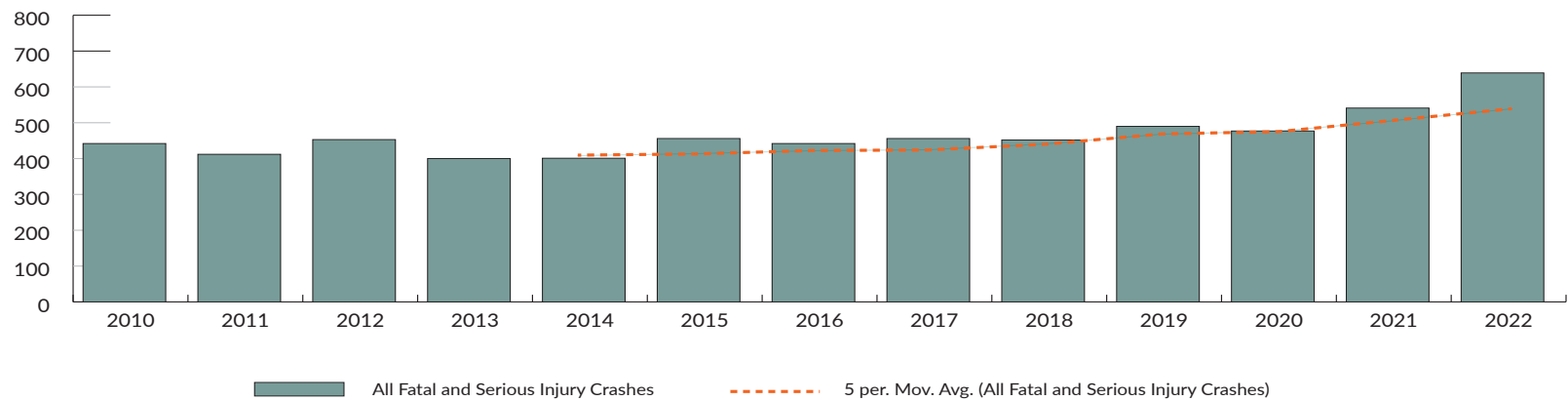
Fatal and Serious Injury Crashes Involving People Biking



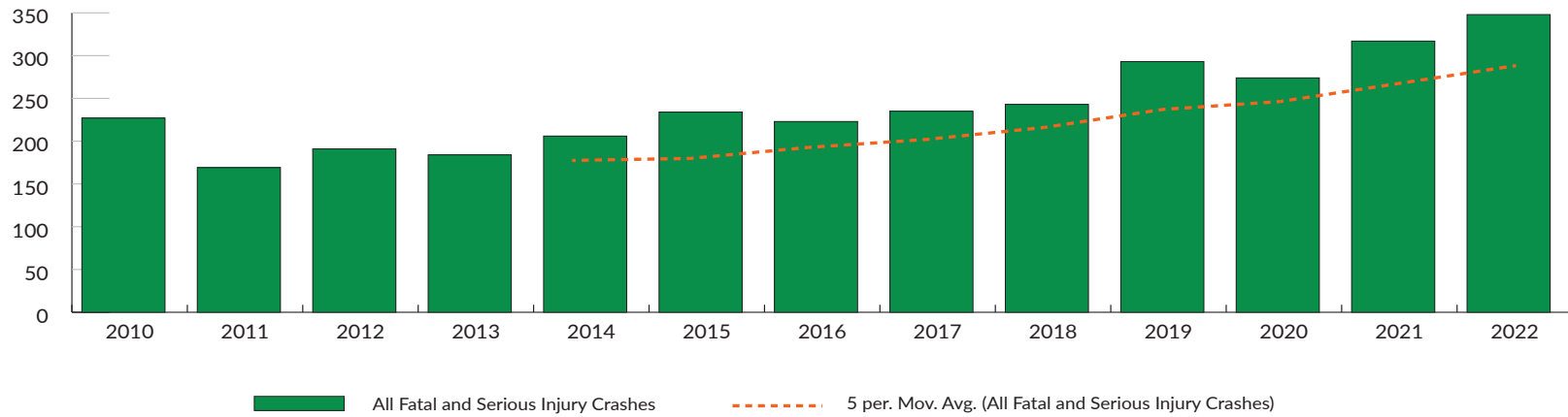
Fatal and Serious Injury Crashes Involving Heavy Trucks



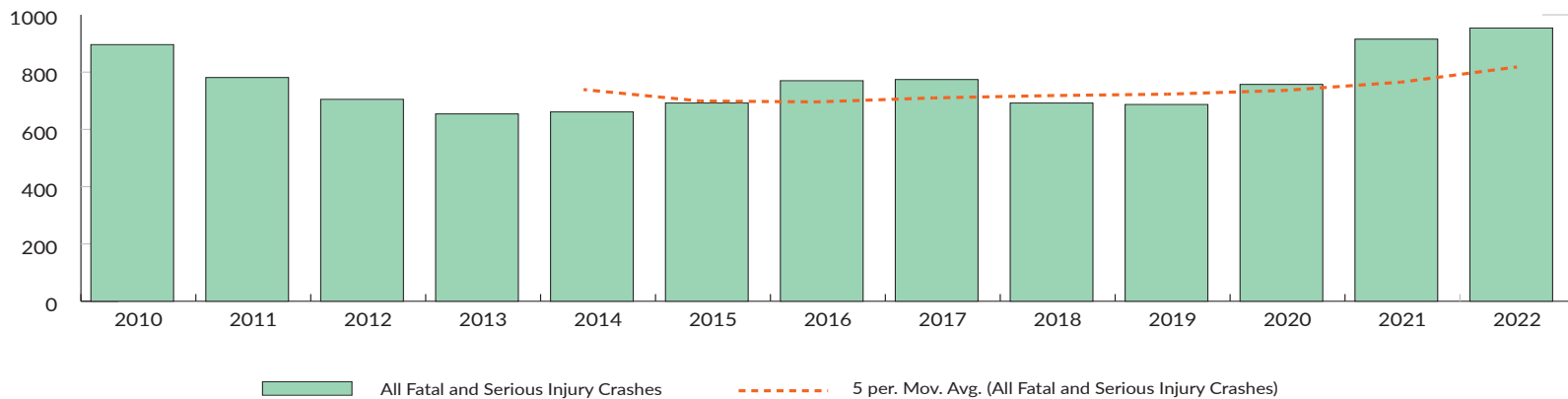
Fatal and Serious Injury Crashes Involving Motorcyclist



Fatal and Serious Injury Crashes Involving Older Driver (70 plus)



Fatal and Serious Injury Crashes Involving Young Driver



Appendix B: Fatal and Suspected Serious Injury Crashes Across Jurisdictions

Jurisdiction	All crashes	Fatal and serious injury crashes	% of fatal and serious injury crashes for the jurisdiction	Fatal and serious injury crash density for the jurisdiction (# of crashes/mi)	% of statewide fatal and serious injury crashes	Fatal and Serious Injury Crash Cost (2022)	Total Crash Cost (2022)
All public roadways in WA state Miles 80,705.04							
Crashes	520,405	13,886	100.0%	0.17	100.0%	\$11,410,192,200	\$17,354,535,200
Crash types							
Lane departure	125,585	5,433	39.1%	0.07	39.1%	\$4,354,564,800	\$5,735,642,900
Run off the road	116,236	4,349	31.3%	0.05	31.3%	\$3,553,489,200	\$4,773,422,500
Opposite direction	9,349	1,084	7.8%	0.01	7.8%	\$801,075,600	\$962,220,400
Intersection related	200,599	4,474	32.2%	0.06	32.2%	\$3,748,623,000	\$6,316,712,400
Users							
Involving people walking or biking	14,790	3,063	22.1%	0.04	22.1%	\$2,348,452,400	\$2,747,636,700
Involving people walking	9,541	2,440	17.6%	0.03	17.6%	\$1,828,095,600	\$2,073,915,300
Involving people biking	5,253	626	4.5%	0.01	4.5%	\$523,780,200	\$677,144,800
Involving motorcyclists	9,549	2,598	18.7%	0.03	18.7%	\$2,187,552,600	\$2,396,042,200
Involving heavy trucks	30,814	941	6.8%	0.01	6.8%	\$807,922,400	\$1,106,837,400

Jurisdiction	All crashes	Fatal and serious injury crashes	% of fatal and serious injury crashes for the jurisdiction	Fatal and serious injury crash density for the jurisdiction (# of crashes/mi)	% of statewide fatal and serious injury crashes	Fatal and Serious Injury Crash Cost (2022)	Total Crash Cost (2022)
Local jurisdiction							
Miles 56,839.55							
Crashes	325,155	9,174	100%	0.16	66.1%	\$7,634,182,000	\$11,530,863,300
Crash types							
Lane departure	78,174	3,312	36.1%	0.06	23.9%	\$2,728,449,800	\$3,572,417,300
Run off the road	71,256	2,691	29.3%	0.05	19.4%	\$2,256,020,600	\$2,980,234,200
Opposite direction	6,918	621	6.8%	0.01	4.5%	\$472,429,200	\$592,183,100
Intersection related	156,160	3,482	38.0%	0.06	25.1%	\$2,947,547,400	\$5,027,113,500
Users							
Involving people walking or biking	13,291	2,517	27.4%	0.04	18.1%	\$1,917,104,000	\$2,279,091,700
Involving people walking	8,464	1,972	21.5%	0.03	14.2%	\$1,472,062,000	\$1,692,604,500
Involving people biking	4,831	548	6.0%	0.01	3.9%	\$448,465,400	\$589,910,600
Involving motorcyclists	6,110	1,673	18.2%	0.03	12.0%	\$1,444,674,800	\$1,575,142,000
Involving heavy trucks	13,219	375	4.1%	0.01	2.7%	\$338,916,600	\$467,173,000

Jurisdiction	All crashes	Fatal and serious injury crashes	% of fatal and serious injury crashes for the jurisdiction	Fatal and serious injury crash density for the jurisdiction (# of crashes/mi)	% of statewide fatal and serious injury crashes	Fatal and Serious Injury Crash Cost (2022)	Total Crash Cost (2022)
WSDOT Jurisdiction							
Miles 7,935.24							
Crashes	195,033	4,709	100%	0.59	33.9%	\$2,909,890,000	\$4,602,796,400
Crash types							
Lane departure	47,393	2,120	45.0%	0.27	15.3%	\$1,626,115,000	\$2,163,225,600
Run off the road	44,962	1,657	35.2%	0.21	11.9%	\$1,297,468,600	\$1,793,188,300
Opposite direction	2,431	463	9.8%	0.06	3.3%	\$328,646,400	\$370,037,300
Intersection related	44,305	990	21.0%	0.12	7.1%	\$801,075,600	\$1,289,569,300
Users							
Involving people walking or biking	1,492	545	11.6%	0.07	3.9%	\$431,348,400	\$468,545,000
Involving people walking	1,073	468	9.9%	0.06	3.4%	\$356,033,600	\$381,310,800
Involving people biking	419	77	1.6%	0.01	0.6%	\$75,314,800	\$87,234,200
Involving motorcyclists	3,438	924	19.6%	0.12	6.7%	\$742,877,800	\$820,900,200
Involving heavy trucks	17,581	566	12.0%	0.07	4.1%	\$469,005,800	\$639,664,400

Jurisdiction	All crashes	Fatal and serious injury crashes	% of fatal and serious injury crashes for the jurisdiction	Fatal and serious injury crash density for the jurisdiction (# of crashes/mi)	% of statewide fatal and serious injury crashes	Fatal and Serious Injury Crash Cost (2022)	Total Crash Cost (2022)
City Streets (excluding state routes within cities with a population over 27,500)							
Miles 17,284.71							
Crashes	218,035	5,082	100%	0.29	36.6%	\$4,275,826,600	\$6,864,843,000
Crash types							
Lane departure	45,941	1,399	27.5%	0.08	10.1%	\$1,143,415,600	\$1,597,943,400
Run off the road	42,048	1,131	22.3%	0.07	8.1%	\$955,128,600	\$1,342,709,800
Opposite direction	3,893	268	5.3%	0.02	1.9%	\$188,287,000	\$255,233,600
Intersection related	109,994	2,284	44.9%	0.13	16.4%	\$1,999,265,600	\$3,479,105,400
Users							
Involving people walking or biking	10,551	1,824	35.9%	0.11	13.1%	\$1,434,404,600	\$1,725,484,100
Involving people walking	6,589	1,395	27.4%	0.08	10.0%	\$1,085,217,800	\$1,261,348,700
Involving people biking	3,966	432	8.5%	0.02	3.1%	\$352,610,200	\$467,558,800
Involving motorcyclists	3,557	873	17.2%	0.05	6.3%	\$787,382,000	\$860,902,200
Involving heavy trucks	8,789	184	3.6%	0.01	1.3%	\$167,746,600	\$246,577,300

Jurisdiction	All crashes	Fatal and serious injury crashes	% of fatal and serious injury crashes for the jurisdiction	Fatal and serious injury crash density for the jurisdiction (# of crashes/mi)	% of statewide fatal and serious injury crashes	Fatal and Serious Injury Crash Cost (2022)	Total Crash Cost (2022)
State routes within cities with a population over 27,500 (local jurisdiction)							
Miles 354.96							
Crashes	40,364	1,021	100%	2.88	7.4%	\$896,930,800	\$1,396,305,700
Crash types							
Lane departure	2,783	170	16.7%	0.48	1.2%	\$184,863,600	\$217,715,100
Run off the road	2,301	122	11.9%	0.34	0.9%	\$140,359,400	\$166,390,700
Opposite Direction	482	48	4.7%	0.14	0.3%	\$44,504,200	\$51,324,400
Intersection related	24,580	511	50.0%	1.44	3.7%	\$390,267,600	\$711,954,800
Users							
Involving people walking or biking	1,585	359	35.2%	1.01	2.6%	\$236,214,600	\$281,519,400
Involving people walking	1,138	314	30.8%	0.88	2.3%	\$212,250,800	\$243,098,800
Involving people biking	447	45	4.4%	0.13	0.3%	\$23,963,800	\$38,420,600
Involving motorcyclists	662	185	18.1%	0.52	1.3%	\$181,440,200	\$199,375,000
Involving heavy trucks	1,873	58	5.7%	0.16	0.4%	\$44,504,200	\$65,119,700

Jurisdiction	All crashes	Fatal and serious injury crashes	% of fatal and serious injury crashes for the jurisdiction	Fatal and serious injury crash density for the jurisdiction (# of crashes/mi)	% of statewide fatal and serious injury crashes	Fatal and Serious Injury Crash Cost (2022)	Total Crash Cost (2022)
City jurisdiction (city streets and state routes within cities with a population over 27,500)							
Miles 17,639.67							
Crashes	258,399	6,103	100.0%	0.35	44.0%	\$5,172,757,400	\$8,261,148,700
Crash types							
Lane departure	48,724	1,569	25.7%	0.09	11.3%	\$1,328,279,200	\$1,815,658,500
Run off the road	44,349	1,253	20.5%	0.07	9.0%	\$1,095,488,000	\$1,509,100,500
Opposite Direction	4,375	316	5.2%	0.02	2.3%	\$232,791,200	\$306,558,000
Intersection related	134,574	2,795	45.8%	0.16	20.1%	\$2,389,533,200	\$4,191,060,200
Users							
Involving people walking or biking	12,136	2,183	35.8%	0.12	15.7%	\$1,670,619,200	\$2,007,003,500
Involving people walking	7,727	1,709	28.0%	0.10	12.3%	\$1,297,468,600	\$1,504,447,500
Involving people biking	4,413	477	7.8%	0.03	3.4%	\$376,574,000	\$505,979,400
Involving motorcyclists	4,219	1,058	17.3%	0.06	7.6%	\$968,822,200	\$1,060,277,200
Involving heavy trucks	10,662	242	4.0%	0.01	1.7%	\$212,250,800	\$311,697,000

Jurisdiction	All crashes	Fatal and serious injury crashes	% of fatal and serious injury crashes for the jurisdiction	Fatal and serious injury crash density for the jurisdiction (# of crashes/mi)	% of statewide fatal and serious injury crashes	Fatal and Serious Injury Crash Cost (2022)	Total Crash Cost (2022)
County roads							
Miles 39,199.88							
Crashes	66,756	3,071	100.0%	0.08	22.1%	\$2,461,424,600	\$3,269,714,600
Crash types							
Lane departure	29,450	1,743	56.8%	0.04	12.6%	\$1,400,170,600	\$1,756,758,800
Run off the road	26,907	1,438	46.8%	0.04	10.4%	\$1,160,532,600	\$1,471,133,700
Opposite direction	2,543	305	9.9%	0.01	2.2%	\$239,638,000	\$285,625,100
Intersection related	21,586	687	22.4%	0.02	4.9%	\$558,014,200	\$836,053,300
Users							
Involving people walking or biking	1,155	334	10.9%	0.01	2.4%	\$246,484,800	\$272,088,200
Involving people walking	737	263	8.6%	0.01	1.9%	\$174,593,400	\$188,157,000
Involving people biking	418	71	2.3%	0.00	0.5%	\$71,891,400	\$83,931,200
Involving motorcyclists	1,891	615	20.0%	0.02	4.4%	\$475,852,600	\$514,864,800
Involving heavy trucks	2,557	133	4.3%	0.00	1.0%	\$126,665,800	\$155,476,000

Note: Statewide centerline miles from the 2019 Miles and Daily Vehicle Miles Travelled (DVMT) Information web page at <https://wsdot.wa.gov/mapsdata/travel/hpms/annualmileage.htm>.

The societal cost values were estimated using WSDOT specific crash costs derived using the methodology outlined in the FHWA Guide, Crash Costs for Highway Safety Analysis, 2018.

Costs used are as follows:

- Fatal Crash - \$3,423,400
- Serious Injury Crash - \$3,423,400
- Evident Injury Crash - \$ 237,400
- Possible Injury Crash - \$ 142,300
- Property Damage Only Crash (PDO) - \$ 14,800

Appendix C: I-2 Detailed Project List

Projects funded through WSDOT HSIP and Local Program Funding for FFY 2024

Project Name	Project Number	Improvement Type	Project Cost	Program, Strategy or Activity	SHSP Emphasis Area	Functional Classification	Fund Code
City of Aberdeen - Systemic Pedestrian Safety	000S(656)	Pedestrians & Bicyclists (Install New Crosswalk)	\$550,000	Local Safety Program Pedestrians & Bicycles High Visibility Crosswalks	Pedestrians & Bicycles	Urban Major Collector	City
City of Auburn - Citywide Uncontrolled Intersection Crosswalk Enhancements	000S(657)	Pedestrians & Bicyclists (Rectangular Rapid Flashing Beacons - RRFB)	\$520,000	Local Safety Program Pedestrians & Bicycles RRFBs	Pedestrians & Bicycles	Urban Major Collector	City
City of Auburn - Roundabout Implementation at R Street SE and 21st Street SE	000S(654)	Intersection Traffic Control (Modify Control - Modern Roundabout)	\$115,000	Local Safety Program Intersections Roundabouts	Intersections	Urban Minor Arterial	City
City of Battle Ground - NW 20th Ave and NW 9th St I/S	N/A	Intersection Traffic Control (Modify Control - Modern Roundabout)	\$416,000	Local Safety Program Intersections Roundabouts	Intersections	N/A	City
City of Bellevue - Coal Creek Parkway Corridor Safety Improvements	N/A	Speed Management (Dynamic Speed Feedback Signs)	\$1,115,000	Local Safety Program Speeding Speed Feedback Signs	Speeding	N/A	City
City of Bothell - Citywide Pedestrian Safety Improvements	N/A	Pedestrians & Bicyclists (Rectangular Rapid Flashing Beacons - RRFB)	\$340,000	Local Safety Program Pedestrians & Bicycles RRFBs	Pedestrians & Bicycles	N/A	City
City of Bremerton - Rectangular Rapid Flashing Beacons	000S(629)	Pedestrians & Bicyclists (Rectangular Rapid Flashing Beacons - RRFB)	\$541,475	Local Safety Program Pedestrians & Bicycles RRFBs	Pedestrians & Bicycles	Urban Minor Arterial	City

Projects funded through WSDOT HSIP and Local Program Funding for FFY 2024

Project Name	Project Number	Improvement Type	Project Cost	Program, Strategy or Activity	SHSP Emphasis Area	Functional Classification	Fund Code
City of Camas - Citywide Horizontal Curve Safety	N/A	Roadway Signs & Traffic Control (Roadway Signs - Including Post - New or Updated)	\$260,000	Local Safety Program Lane Departure Signing	Lane Departure	N/A	City
City of DuPont - Systemic Pedestrian Safety	N/A	Pedestrians & Bicyclists (Install New Crosswalk)	\$477,000	Local Safety Program Pedestrians & Bicycles High Visibility Crosswalks	Pedestrians & Bicycles	N/A	City
City of Everett - Casino Rd. and 5th Ave. W. Pedestrian Safety	2796(002)	Intersection Traffic Control (Modify Traffic Signal - Add Flashing Yellow Arrow)	\$814,880	Local Safety Program Intersections Signal Operations/ Visibility	Intersections	Urban Principal Arterial - Other	City
City of Everett - Citywide Innovative Safety	000S(508)	Intersection Traffic Control (Modify Traffic Signal - Add Flashing Yellow Arrow)	\$641,190	Local Safety Program Intersections Signal Operations/ Visibility	Intersections	Urban Principal Arterial - Other	City
City of Everett - Citywide Safety Flashing Yellow Arrow Improvements	000S(606)	Intersection Traffic Control (Modify Traffic Signal - Add Flashing Yellow Arrow)	\$550,960	Local Safety Program Intersections Signal Operations/ Visibility	Intersections	Urban Minor Arterial	City
City of Federal Way - Systemic High Friction Surface Treatment Improvements	N/A	Roadway (Pavement Surface - High Friction Surface)	\$852,000	Local Safety Program Lane Departure HFST	Lane Departure	N/A	City
City of Fife - Citywide Flashing Yellow Arrow Treatment	000S(600)	Intersection Traffic Control (Modify Traffic Signal - Add Flashing Yellow Arrow)	\$119,248	Local Safety Program Intersections Signal Operations/ Visibility	Intersections	Urban Major Collector	City

Projects funded through WSDOT HSIP and Local Program Funding for FFY 2024

Project Name	Project Number	Improvement Type	Project Cost	Program, Strategy or Activity	SHSP Emphasis Area	Functional Classification	Fund Code
City of Fife - Citywide Intersection Illumination	N/A	Lighting (Intersection Lighting)	\$25,000	Local Safety Program Intersections Illumination	Intersections	N/A	City
City of Fife - Frank Albert Rd E and N Levee Rd. E.	N/A	Lighting (Intersection Lighting)	\$357,300	Local Safety Program Intersections Illumination	Intersections	N/A	City
City of Kelso - Citywide Safety Improvements	000S(593)	Pedestrians & Bicyclists (Rectangular Rapid Flashing Beacons - RRFB)	\$300,200	Local Safety Program Pedestrians & Bicycles RRFBs	Pedestrians & Bicycles	Urban Minor Arterial	City
City of Kelso - Systemic Pedestrian Safety	000S(647)	Pedestrians & Bicyclists (Rectangular Rapid Flashing Beacons - RRFB)	\$669,000	Local Safety Program Pedestrians & Bicycles RRFBs	Pedestrians & Bicycles	Urban Principal Arterial - Other	City
City of Kent - 104th Avenue Pedestrian Safety Improvements	N/A	Pedestrians & Bicyclists (Medians and Pedestrian Refuge Areas)	\$639,000	Local Safety Program Pedestrians & Bicycles Refuge Islands	Pedestrians & Bicycles	N/A	City
City of Kent - 4th Avenue Road Diet Phases 2 and 3	N/A	Roadway (Roadway Narrowing - Road Diet, Roadway Reconfiguration)	\$828,000	Local Safety Program Pedestrians & Bicycles Road Diets	Pedestrians & Bicycles	N/A	City
City of Kent - Canyon Drive and Weiland Street Access Control	N/A	Access Management (Median Crossover - Relocate/Close Crossover)	\$90,000	Local Safety Program Intersections Median Curbs	Intersections	N/A	City

Projects funded through WSDOT HSIP and Local Program Funding for FFY 2024

Project Name	Project Number	Improvement Type	Project Cost	Program, Strategy or Activity	SHSP Emphasis Area	Functional Classification	Fund Code
City of Kirkland - Lake St. & Kirkland Ave. Ped. Improvements	000S(534)	Intersection Traffic Control (Modify Traffic Signal - Other)	\$252,500	Local Safety Program Intersections Signal Operations/ Visibility	Intersections	Urban Principal Arterial - Other	City
City of Kirkland - Pedestrian and Bicyclist Safety Improvements	N/A	Pedestrians & Bicyclists (Medians and Pedestrian Refuge Areas)	\$430,000	Local Safety Program Pedestrians & Bicycles Refuge Islands	Pedestrians & Bicycles	N/A	City
City of La Center - Horizontal Curve and Roadway Departure Safety	000S(649)	Roadway Signs & Traffic Control (Roadway Signs - Including Post - New or Updated)	\$740,000	Local Safety Program Lane Departure Signing	Lane Departure	Rural Major Collector	City
City of Lakewood - Custer Rd Safety	N/A	Intersection Geometry (Add/ Modify Auxiliary Lanes)	\$325,000	Local Safety Program Intersections Left Turn Lanes	Intersections	N/A	City
City of Lakewood - Steilacoom Blvd SW (87th Ave SW to 83rd Ave SW)	N/A	Roadside (Increase Clear Zone - Tangent)	\$2,301,800	Local Safety Program Lane Departure Clear Zones	Lane Departure	N/A	City
City of Longview - Systemic Pedestrian Crossing	N/A	Pedestrians & Bicyclists (Rectangular Rapid Flashing Beacons - RRFB)	\$200,000	Local Safety Program Pedestrians & Bicycles RRFBs	Pedestrians & Bicycles	N/A	City
City of Marysville - Citywide Pedestrian Safety Improvements	N/A	Pedestrians & Bicyclists (Rectangular Rapid Flashing Beacons - RRFB)	\$585,000	Local Safety Program Pedestrians & Bicycles RRFBs	Pedestrians & Bicycles	N/A	City

Projects funded through WSDOT HSIP and Local Program Funding for FFY 2024

Project Name	Project Number	Improvement Type	Project Cost	Program, Strategy or Activity	SHSP Emphasis Area	Functional Classification	Fund Code
City of Mercer Island - Traffic Signal Safety Improvements	N/A	Pedestrians & Bicyclists (Leading Pedestrian Interval)	\$155,000	Local Safety Program Pedestrians & Bicycles Leading Pedestrian Intervals	Pedestrians & Bicycles	N/A	City
City of Pasco - A Street and 6th Avenue Pedestrian Crossing	3534(004)	Pedestrians & Bicyclists (Pedestrian Hybrid Beacon)	\$552,000	Local Safety Program Pedestrians & Bicycles Pedestrian Hybrid Beacons	Pedestrians & Bicycles	Urban Minor Arterial	City
City of Pasco - Citywide Injury Minimization and Speed Management Implementation	000S(650)	Speed Management (Dynamic Speed Feedback Signs)	\$200,000	Local Safety Program Speeding Speed Feedback Signs	Speeding	Urban Principal Arterial - Other	City
City of Port Angeles - E 1st St, Front St, and Marine Dr Ped Safety	N/A	Pedestrians & Bicyclists (Rectangular Rapid Flashing Beacons - RRFB)	\$100,000	Local Safety Program Pedestrians & Bicycles RRFBs	Pedestrians & Bicycles	N/A	City
City of Port Orchard - Bethel and Lincoln Roundabout	N/A	Intersection Traffic Control (Modify Control - Modern Roundabout)	\$500,000	Local Safety Program Intersections Roundabouts	Intersections	N/A	City
City of Port Orchard - Street Lighting	N/A	Lighting (Intersection Lighting)	\$220,000	Local Safety Program Intersections Illumination	Intersections	N/A	City
City of Port Townsend - Discovery Road Bicycle and Ped Safety	N/A	Pedestrians & Bicyclists (On Road Bicycle Lane)	\$201,000	Local Safety Program Pedestrians & Bicycles Bike Lanes/Cycle Tracks	Pedestrians & Bicycles	N/A	City

Projects funded through WSDOT HSIP and Local Program Funding for FFY 2024

Project Name	Project Number	Improvement Type	Project Cost	Program, Strategy or Activity	SHSP Emphasis Area	Functional Classification	Fund Code
City of Pullman - Citywide Intersections	N/A	Intersection Traffic Control (Modify Traffic Signal - Add Flashing Yellow Arrow)	\$86,000	Local Safety Program Intersections Signal Operations/ Visibility	Intersections	N/A	City
City of Pullman - Citywide Pedestrian Crossings	N/A	Pedestrians & Bicyclists (Rectangular Rapid Flashing Beacons - RRFB)	\$69,000	Local Safety Program Pedestrians & Bicycles RRFBs	Pedestrians & Bicycles	N/A	City
City of Richland - Pedestrian Safety	000S(652)	Pedestrians & Bicyclists (Rectangular Rapid Flashing Beacons - RRFB)	\$338,000	Local Safety Program Pedestrians & Bicycles RRFBs	Pedestrians & Bicycles	Urban Principal Arterial - Other	City
City of Richland - Stop-controlled Intersections	000S(653)	Intersection Traffic Control (Modify Control - Modern Roundabout)	\$1,199,000	Local Safety Program Intersections Roundabouts	Intersections	Urban Principal Arterial - Other	City
City of Ridgefield - S 11th Street and S Timm Road Intersection Safety	000S(658)	Lighting (Intersection Lighting)	\$350,000	Local Safety Program Intersections Illumination	Intersections	Urban Local Access	City
City of Ridgefield - Systemic Horizontal Curve Safety	000S(659)	Roadway Signs & Traffic Control (Roadway Signs - Including Post - New or Updated)	\$280,000	Local Safety Program Lane Departure Signing	Lane Departure	Urban Major Collector	City
City of Seattle - Pedestrian Crossing Safety Improvements	N/A	Pedestrians & Bicyclists (Medians and Pedestrian Refuge Areas)	\$1,100,000	Local Safety Program Pedestrians & Bicycles Refuge Islands	Pedestrians & Bicycles	Multiple locations	City

Appendix C: I-2 Detailed Project List

Projects funded through WSDOT HSIP and Local Program Funding for FFY 2024

Project Name	Project Number	Improvement Type	Project Cost	Program, Strategy or Activity	SHSP Emphasis Area	Functional Classification	Fund Code
City of Seattle - Pedestrian Refuge Islands	000S(597)	Pedestrians & Bicyclists (Medians and Pedestrian Refuge Areas)	\$850,000	Local Safety Program Pedestrians & Bicycles Refuge Islands	Pedestrians & Bicycles	Urban Minor Arterial	City
City of Shelton - Systemic Pedestrian Safety	N/A	Pedestrians & Bicyclists (Install Sidewalk)	\$225,000	Local Safety Program Pedestrians & Bicycles Sidewalks	Pedestrians & Bicycles	Multiple locations	City
City of Shoreline - Meridian Avenue Bicycle Lanes	N/A	Roadway (Roadway Narrowing - Road Diet, Roadway Reconfiguration)	\$107,000	Local Safety Program Pedestrians & Bicycles Road Diets	Pedestrians & Bicycles	Multiple locations	City
City of Spokane - Pedestrian Hybrid Beacons	N/A	Pedestrians & Bicyclists (Pedestrian Hybrid Beacon)	\$164,000	Local Safety Program Pedestrians & Bicycles Pedestrian Hybrid Beacons	Pedestrians & Bicycles	Multiple locations	City
City of Spokane Valley - Retroreflective Signal Backplates	N/A	Intersection Traffic Control (Modify Traffic Signal - Add Backplates with Retroreflective Borders)	\$111,000	Local Safety Program Intersections Signal Operations/ Visibility	Intersections	Multiple locations	City
City of Spokane Valley - Trent Avenue Access Control	N/A	Access Management (Median Crossover - Relocate/Close Crossover)	\$364,000	Local Safety Program Intersections Median Curbs	Intersections	Multiple locations	City

Projects funded through WSDOT HSIP and Local Program Funding for FFY 2024

Project Name	Project Number	Improvement Type	Project Cost	Program, Strategy or Activity	SHSP Emphasis Area	Functional Classification	Fund Code
City of Sunnyside - Pedestrian Safety	N/A	Pedestrians & Bicyclists (Medians and Pedestrian Refuge Areas)	\$109,000	Local Safety Program Pedestrians & Bicycles Curb Extensions	Pedestrians & Bicycles	Multiple locations	City
City of Tacoma - S 25th St Traffic Safety	N/A	Pedestrians & Bicyclists (On Road Bicycle Lane)	\$27,000	Local Safety Program Pedestrians & Bicycles Bike Lanes/Cycle Tracks	Pedestrians & Bicycles	Multiple locations	City
City of Washougal - 32nd St - Addy to Stiles Corridor	N/A	Shoulder Treatments (Widen Shoulder - Paved or Other)	\$762,000	Local Safety Program Lane Departure Shoulders	Lane Departure	Multiple locations	City
City of Wenatchee - Fifth and Emerson Pedestrian Crossing	N/A	Pedestrians & Bicyclists (Rectangular Rapid Flashing Beacons - RRFB)	\$26,000	Local Safety Program Pedestrians & Bicycles RRFBs	Pedestrians & Bicycles	Multiple locations	City
City of Yakima - Fruitvale Blvd at River Rd & River Rd at N 34th Ave Roundabouts	000S(473)	Intersection Traffic Control (Modify Control - Modern Roundabout)	\$851,168	Local Safety Program Intersections Roundabouts	Intersections	Urban	City
City of Yakima - Pedestrian Safety	N/A	Pedestrians & Bicyclists (Medians and Pedestrian Refuge Areas)	\$272,000	Local Safety Program Pedestrians & Bicycles Curb Extensions	Pedestrians & Bicycles	N/A	City
Clallam County - Black Diamond Rd #31030	05AG(002)	Shoulder Treatments (Widen Shoulder - Paved or Other)	\$250,000	Local Safety Program Lane Departure Shoulders	Lane Departure	Rural Minor Collector	County

Projects funded through WSDOT HSIP and Local Program Funding for FFY 2024

Project Name	Project Number	Improvement Type	Project Cost	Program, Strategy or Activity	SHSP Emphasis Area	Functional Classification	Fund Code
Clark County - NE Ward & NE Davis Rds Roundabout	000S(640)	Intersection Traffic Control (Modify Control - Modern Roundabout)	\$2,068,000	Local Safety Program Intersections Roundabouts	Intersections	Rural Minor Arterial	County
Douglas County - Grant Rd & Nile Ave Roundabout	5908(012)	Intersection Traffic Control (Modify Control - Modern Roundabout)	\$1,241,582	Local Safety Program Intersections Roundabouts	Intersections	Urban Principal Arterial - Other	County
Franklin County - Taylor Flats & Ringold Rds Safety	000S(641)	Shoulder Treatments (Widen Shoulder - Paved or Other)	\$1,620,000	Local Safety Program Lane Departure Shoulders	Lane Departure	Rural Major Collector	County
Garfield County - Lower Deadman Road Safety	T120(003)	Roadside (Barrier - Metal)	\$560,000	Local Safety Program Lane Departure Guardrail	Lane Departure	Rural Major Collector	County
King County - 16th Ave SW Pedestrian Improvements	1147(014)	Roadway (Roadway Narrowing - Road Diet, Roadway Reconfiguration)	\$703,260	Local Safety Program Pedestrians & Bicycles Road Diets	Pedestrians & Bicycles	Urban Principal Arterial - Other	County
Mason County - Bridge Rail Retrofit	000S(623)	Roadside (Barrier - Metal)	\$336,000	Local Safety Program Lane Departure Bridge Rail	Lane Departure	Rural Major Collector	County
Pierce County - Golden Given Rd E & 99th St E Roundabout	000S(612)	Intersection Traffic Control (Modify Control - Modern Roundabout)	\$1,001,000	Local Safety Program Intersections Roundabouts	Intersections	Urban Major Collector	County
Snohomish County - 84th St NE Spot Improvements	000S(630)	Roadway Delineation (Roadway Delineation - Other)	\$556,000	Local Safety Program Lane Departure Pavement Markings	Lane Departure	Rural Principal Arterial - Other	County

Projects funded through WSDOT HSIP and Local Program Funding for FFY 2024

Project Name	Project Number	Improvement Type	Project Cost	Program, Strategy or Activity	SHSP Emphasis Area	Functional Classification	Fund Code
Spokane County - Wellesley & Appleway Aves Roundabout	3892(001)	Intersection Traffic Control (Modify Control - Modern Roundabout)	\$1,095,000	Local Safety Program Intersections Roundabouts	Intersections	Urban Principal Arterial - Other	County
Thurston County - 2021 Countywide Safety	000S(644)	Lighting (Horizontal Curve Lighting)	\$1,215,000	Local Safety Program Lane Departure Illumination	Lane Departure	Urban Minor Arterial	County
Thurston County - 2024 County Road Safety	000S(594)	Roadside (Increase Clear Zone - Tangent)	\$2,313,000	Local Safety Program Lane Departure Clear Zones	Lane Departure	Urban Major Collector	County
Whatcom County - Birch Bay Lynden & Blaine Rds Roundabout	N/A	Intersection Traffic Control (Modify Control - Modern Roundabout)	\$1,000,000	Local Safety Program Intersections Roundabouts	Intersections	Multiple locations	County
Whatcom County - Birch Bay Lynden & Kickerville Rds I/S	N/A	Intersection Geometry (Add/Modify Auxiliary Lanes)	\$119,000	Local Safety Program Intersections Left Turn Lanes	Intersections	Multiple locations	County
Whatcom County - E Smith & Hannegan Roads Roundabout	N/A	Intersection Traffic Control (Modify Control - Modern Roundabout)	\$1,000,000	Local Safety Program Intersections Roundabouts	Intersections	Multiple locations	County
SR 20/Burlington to Sedro-Woolley - Corridor Improvements	0020(207)	RISK-I/S CHANNELIZATION	\$7,757,301	State Safety Program Intersections Channelization	Lane Departure	PRINCIPAL ARTERIAL, NHS	HSIP
SR 17/Cunningham Rd - Intersection Safety Improvement	0017(050)	RISK-I/S ROUNDABOUT ONE LANE	\$2,595,241	State Safety Program Intersections Roundabouts	Intersections	PRINCIPAL ARTERIAL, NHS	HSIP

Projects funded through WSDOT HSIP and Local Program Funding for FFY 2024

Project Name	Project Number	Improvement Type	Project Cost	Program, Strategy or Activity	SHSP Emphasis Area	Functional Classification	Fund Code
SR 282/Nat Washington Way - Roundabout	N/A	RISK-I/S ROUNDABOUT ONE LANE	\$356,748	State Safety Program Intersections Roundabouts	Intersections	PRINCIPAL ARTERIAL, NHS	HSIP
SR 3/E Agate Rd Intersection - Compact Roundabout	0003(135)	RISK-I/S ROUNDABOUT ONE LANE	\$1,906,370	State Safety Program Intersections Roundabouts	Intersections	PRINCIPAL ARTERIAL, NHS	164
SR 3/Division Ave & W Pleasant St Intersection - Roundabout	N/A	RISK-I/S ROUNDABOUT ONE LANE	\$32,729	State Safety Program Intersections Roundabouts	Intersections	PRINCIPAL ARTERIAL, NHS	STP
SR 3/Pickering Rd Intersection - Compact Roundabout	0003(136)	RISK-I/S ROUNDABOUT ONE LANE	\$1,644,541	State Safety Program Intersections Roundabouts	Intersections	PRINCIPAL ARTERIAL, NHS	164
SR 7/S of 260th St E to N of SR 507 Intersection - Roundabouts & Paving	0007(034)	RISK-I/S ROUNDABOUT ONE LANE	\$5,188,056	State Safety Program Intersections Roundabouts	Intersections	PRINCIPAL ARTERIAL, NHS	HSIP
SR 160/Long Lake Rd SE - Roundabout	0160(010)	RISK-I/S ROUNDABOUT ONE LANE	\$153,836	State Safety Program Intersections Roundabouts	Intersections	MINOR ARTERIAL, NON-NHS	164
SR 162/Orville Rd E Intersection - Compact Roundabout	0162(023)	RISK-I/S ROUNDABOUT ONE LANE	\$3,442,792	State Safety Program Intersections Roundabouts	Intersections	MINOR ARTERIAL, NON-NHS	164
SR 302/118th Ave NW Intersection - Compact Roundabout	0302(014)	RISK-I/S ROUNDABOUT ONE LANE	\$2,665,302	State Safety Program Intersections Roundabouts	Intersections	PRINCIPAL ARTERIAL, NHS	164

Projects funded through WSDOT HSIP and Local Program Funding for FFY 2024

Project Name	Project Number	Improvement Type	Project Cost	Program, Strategy or Activity	SHSP Emphasis Area	Functional Classification	Fund Code
SR 507/Vail Rd SE Intersection - Compact Roundabout	0507(037)	RISK-I/S ROUNDABOUT ONE LANE	\$2,032,371	State Safety Program Intersections Roundabouts	Intersections	MINOR ARTERIAL, NON-NHS	164
SR 507/208th St E Intersection - Compact Roundabout	0507(038)	RISK-I/S ROUNDABOUT ONE LANE	\$1,971,919	State Safety Program Intersections Roundabouts	Intersections	MINOR ARTERIAL, NON-NHS	164
SR 510/McAllister Ct SE & Rockcress Dr I/S - Compact Roundabout	0510(020)	RISK-I/S ROUNDABOUT ONE LANE	\$1,407,547	State Safety Program Intersections Roundabouts	Intersections	MINOR ARTERIAL, NON-NHS	164
SR 702/Harts Lake Rd S Intersection - Compact Roundabout	0702(018)	RISK-I/S ROUNDABOUT ONE LANE	\$1,690,589	State Safety Program Intersections Roundabouts	Intersections	MINOR ARTERIAL, NON-NHS	164
SR 702/40th Ave S & Allen Rd Intersection - Compact Roundabout	0702(017)	RISK-I/S ROUNDABOUT ONE LANE	\$1,390,410	State Safety Program Intersections Roundabouts	Intersections	MINOR ARTERIAL, NON-NHS	164
SR 702/8th Avenue S Intersection - Compact Roundabout	0702(016)	RISK-I/S ROUNDABOUT ONE LANE	\$2,539,248	State Safety Program Intersections Roundabouts	Intersections	MINOR ARTERIAL, NON-NHS	164
US 12/SR 7 - Intersection Improvements	0012(261)	AT-GRADE INTERSECTIONS (URBAN)	\$2,010,960	State Safety Program Intersections	Intersections	PRINCIPAL ARTERIAL, NHS	164
SR 500/NE Robinson Rd and NE 3rd St. - Intersection Safety Improvements	0500(026)	REDUCT/COLLIS ANALY LOCATIONS	\$4,730,684	State Safety Program Intersections	Intersections	MINOR ARTERIAL, NON-NHS	HSIP

Projects funded through WSDOT HSIP and Local Program Funding for FFY 2024

Project Name	Project Number	Improvement Type	Project Cost	Program, Strategy or Activity	SHSP Emphasis Area	Functional Classification	Fund Code
SR 503/NE Rock Creek Rd - Intersection Improvements	0503(041)	RISK-I/S ROUNDABOUT ONE LANE	\$844,309	State Safety Program Intersections Roundabouts	Intersections	MINOR ARTERIAL, NON-NHS	HSIP
US 12/Ackley Rd/Clover Lane - Intersection Safety Improvements	N/A	RISK-I/S CHANNELIZATION	\$1,129,857	State Safety Program Intersections Channelization	Intersections	PRINCIPAL ARTERIAL, NHS	HSIP
SR 22/SR 223 Chambers Rd Intersection - Intersection Safety	N/A	RISK-I/S ROUNDABOUT ONE LANE	\$939,909	State Safety Program Intersections Roundabouts	Intersections	MAJOR COLLECTOR, NON-NHS	HSIP
SR 24/SR 240 to Vernita - Shoulder and Centerline Rumble Strips	9999(851)	RUMBLE CENTERLINE & SHOULDER	\$45,466	State Safety Program Lane Departure Rumble Strips	Lane Departure	MINOR ARTERIAL, NON-NHS	164
US 97/Lateral A Intersection - Intersection Improvements	0097(175)	RISK-I/S ROUNDABOUT MULTI LANE	\$5,021,882	State Safety Program Intersections Roundabouts	Intersections	PRINCIPAL ARTERIAL, NHS	HSIP
US 97/Robbins Rd - Intersection Improvements	0097(177)	REDUCT/COLLIS ANALY LOCATIONS	\$7,249,658	State Safety Program Intersections Roundabout	Intersections	MINOR ARTERIAL, NON-NHS	HSIP
SR 241/Allen Rd Intersection - Intersection Safety	N/A	RISK-I/S ROUNDABOUT ONE LANE	\$2,270,678	State Safety Program Intersections Roundabouts	Intersections	MINOR ARTERIAL, NON-NHS	HSIP
SR 241/E Edison Rd Intersection - Intersection Safety	N/A	RISK-I/S ROUNDABOUT ONE LANE	\$2,075,773	State Safety Program Intersections Roundabouts	Intersections	MINOR ARTERIAL, NON-NHS	HSIP

Exhibit 49. Estimated Funding and Benefits by Emphasis Area

Program, Strategy or Activity	Estimated # Projects	Estimated Funding	Estimated Benefits*
Intersections	50	\$70,204,237	\$238,694,404
Lane Departure	15	\$19,848,567	\$127,030,828
Pedestrian and Bicyclists	28	\$11,077,935	\$49,850,708
Speeding	2	\$1,315,000	\$4,471,000
Total	95	\$102,445,739	\$420,046,940

Exhibit 50. Funding Obligations and Benefits by Investment Subcategory

I-2 Safety Subprogram	Estimated # Projects	Estimated Funding	Estimated Benefits*
Prevention	80	\$77,411,687	\$333,263,163
Reduction	15	\$25,034,052	\$86,783,777
Total	95	\$102,445,739	\$420,046,940

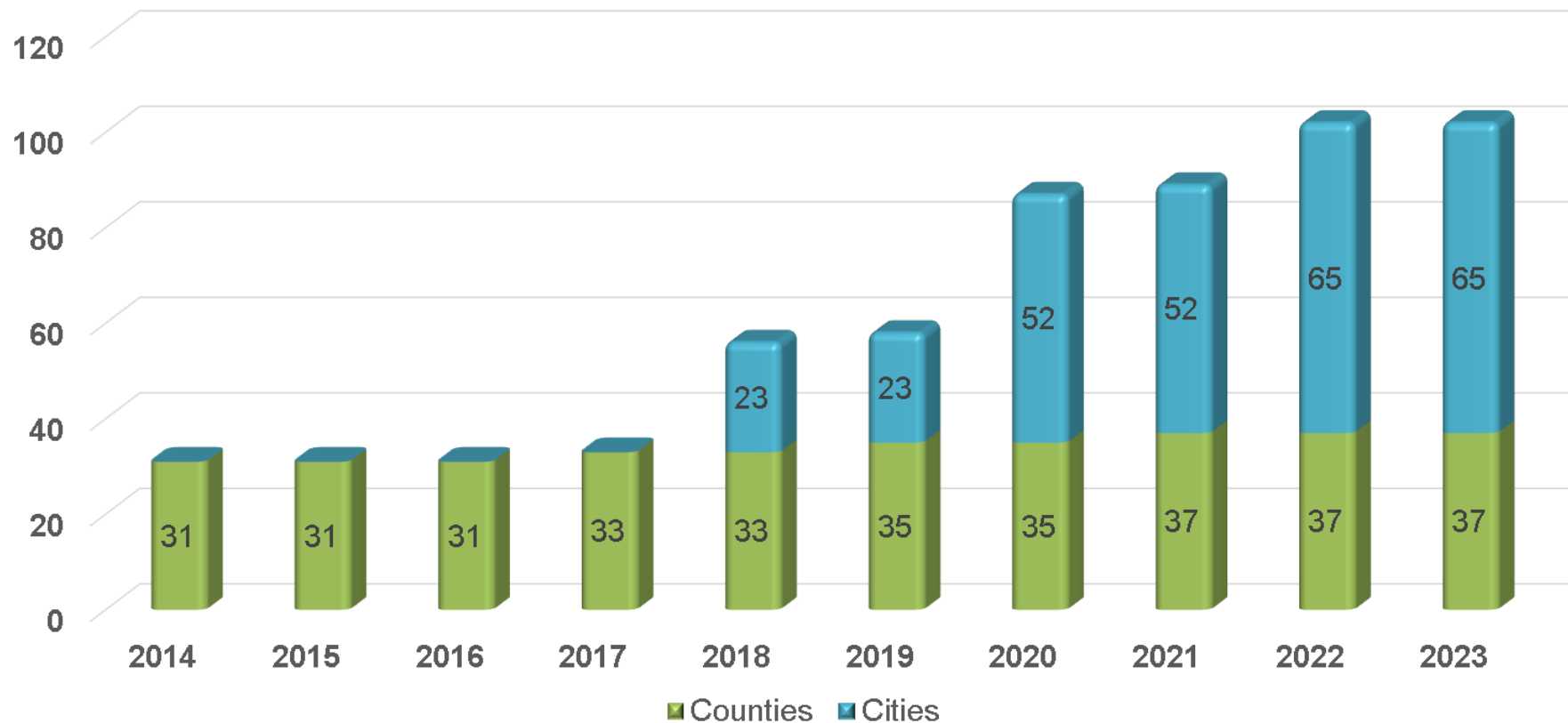
*Note: For this Detailed Project List the societal cost values were estimated using WSDOT specific crash costs derived using the methodology outlined in the FHWA Guide, Crash Costs for Highway Safety Analysis, 2018. Using the countermeasure type, as shown on project list, a typical cost/benefit ratio was developed. Benefits were assumed for a typical installation, as drawn from each of benefit cost sections for the respective reduction and proactive subcategories.

Appendix D: CMF Inventory

ID	CMF Title	CMF	Sites	Sample Size	Applicability of CMF
1	LED Stop Signs	0.339	8	Total: Before 8, After 2	Site Type: Rural 2L2W. Crash Type: All Countermeasure Relevant Crashes Crash Severity: All
2	HFST	CMF _{FI} = 0.074 CMF _{PDO} = 0.063	2	FI: Before 38, After 2; PDO: Before 130, After: 6	Site Type: Urban Freeway On-Ramp Crash Severity & PDO Crash Type: All Countermeasure Relevant Crashes
3	Curve Signage	0.462	7	Total: Before 21, After 7	Site Type: Rural 2L2W. Crash Type: All Countermeasure Relevant Crashes Crash Severity: All
4	24/7 Flashing Beacon Elk Crossing sign with 'next X miles' plaque	CMF _{-all animal} = 1.14 CMF _{-elk only} = 0.97	1	All Animal: Before 67, After 8 Elk Only: Before 55, After 59	Site Type: Rural 2L2W. Speed Limit: 55 mph Crash Type: Vehicle/Elk & Vehicle/All animal crashes. Crash Severity: All
5	Install 2 alternating 24/7 flashing beacons above the advanced reverse turn sign & to increase the 1st turn large arrow sign to add speed advisory	CMF=0.737	2	Total: Before 10, After 6	Site Type: Rural 2L2W, Speed Limit 50 mph Crash Type: All Curve Related Crashes (All Lane Departure & Vehicle Overturned Crashes). Crash Severity: All
6	ICWS (Intersection Control Warning System) -Various sign messages	CMF _{Total Intersection Crashes} = 1.12 CMF _{Rear-end Crashes} = 1.34 CMF _{Entering At Angle Crashes} = 0.86 CMF _{Entering At Angle Crashes' NWR} = 0.55	15 15 15 11	Total: Before 236, After 156; Rear-End: Before 103, After 68; Angle: Before 68, After 31 Angle NWR: Before 39, After 14	Site Type: Rural 2L2W Hwy, speed 35-60 mph Crash Type: All Intersection Crashes Crash Severity: All
7	PTSWF (Prepare To Stop When Flashing) System	Sites followed 2019 WSDOT Guidance: CMF _{Total Intersection Crashes} = 0.75 CMF _{Rear-End} = 0.75 All Sites in Study: CMF _{Total Intersection Crashes} = 1.01 CMF _{Rear-End} = 1.07	9 21	Total: Before 146, After 113 Rear-End: Before 103, After 75; Total: Before 363, After 383 Rear-End: Before 245	Site Type: Rural 2L2W. Speed 45-60 mph Crash Type: All Mainline Intersection Crashes & Rear-End Crashes Crash Severity: All

Appendix E: Local Program Safety Plans

Local Road Safety Plans in Washington by Number of Agencies



This chart shows the growth in the development of Local Road Safety Plans (LRSP) within the state over the past decade. LRSPs are a data-driven, risk-based approach to safety based on the identification of roadway characteristics common to locations with fatal and serious injury crashes. Those common roadway characteristics are identified across the network and then locations are prioritized based on the presence of those factors. The development of these LRSPs means that many agencies are now using a data-driven approach to identify safety priorities across their networks and are prioritizing projects for funding based on that process. The local safety program (HSIP) has established the development of a LRSP as a baseline requirement to apply for HSIP funding for safety projects, starting with counties in 2014, expanding to cities seeking systemic safety projects in 2018, and further expanding to all cities in 2020.