U.S. Department of Transportation
Federal Highway Administration

EDC

Washington Department of Transportation

ACTION PLAN FOR IMPLEMENTING PEDESTRIAN CROSSING COUNTERMEASURES AT UNCONTROLLED LOCATIONS

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Photo: Toole Design

WSDOT

Acknowledgments

This Safety Plan was developed by a group of dedicated individuals that are committed to reducing the number of lives taken prematurely on our nation's roadways.

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List of Abbreviations

AADT	annual average daily traffic
AASHTO	American Association of State Highway and Transportation Officials
ADA	Americans with Disabilities Act
ADT	average daily traffic
CMF	crash modification factor
CRF	crash reduction factor
EDC	Every Day Counts
FARS	Fatality Analysis Reporting System
FHWA	Federal Highway Administration
GIS	geographic information system
HSIP	Highway Safety Improvement Program
HSP	Highway Safety Plan
MUTCD	Manual on Uniform Traffic Control Devices
NHTSA	National Highway Traffic Safety Administration
PHB	Pedestrian Hybrid Beacon
RSA	Road Safety Audit
SHSP	Strategic Highway Safety Plan
STBG	Surface Transportation Block Grant
STEP	Safe Transportation for Every Pedestrian
TZD	Toward Zero Deaths
VMT	Vehicle Miles Traveled
VZ	Vision Zero

Executive Summary

A well-designed multimodal transportation system acknowledges the realities of human needs and behaviors across all modes. Such a system utilizes street designs and traffic controls addressing the movements of users of every mode with the goal of structuring safer interactions, and includes locations where people walking and using mobility assistive devices can cross the street to continue their travel. This Action Plan provides recommendations for process change to help WSDOT better understand the overall system:

- Where pedestrian crossing needs exist;
- How to prioritize unmet need and make best use of existing and future funding;
- How to obtain the right mix of effective treatments.

This plan is intended to inform a desired future state as well as improve current practice to become more efficient and effective in serving people who walk. It takes into account both that current unmet need exists and that as long as road and land use changes continue there will be changes in pedestrian crossing demand. While acknowledging that insufficient funds are available for the installation/maintenance of all needed pedestrian crossing improvements in the short term, an analysis of unmet need is a necessary first step to identifying resources that will support pedestrian traffic control devices as an essential element of the overall transportation system over time.

State Participation in STEP Planning Initiative

This Plan has been developed as part of the Safe Transportation for Every Pedestrian (STEP) initiative and targets specific countermeasures for improving pedestrian safety at uncontrolled intersections. STEP is a FHWA effort which is part of the Every Day Counts (EDC) initiative. Washington State Department of Transportation (WSDOT) is leading this initiative in the state in coordination with the FHWA Division Office.

The plan was developed as a collaborative effort between the FHWA Regional Office and WSDOT. A full day work session was held with WSDOT staff to review existing practices and policies affecting crossings and to develop the recommended actions reflected in this Plan. This was preceded by a thorough review of the current use of the countermeasures and pedestrian safety processes.

In general, implementation of this plan will be divided consistent with the usual roles and responsibilities of the divisions and offices within the agency. It is recognized that the responsible parties identified below may shift over time as the work is clarified and expanded. The role of the Active Transportation Division staff is to oversee the work, assist with execution where practical and track completion of the recommendations over time.

Recommendations

This Plan recommends actions that when implemented are intended to reduce the number and rate per trip of pedestrian-involved crashes, fatalities, and injuries on Washington State highways. If emulated by local transportation agencies, these benefits may also be realized on local streets and roads. Washington has taken actions in the past several years not only to raise awareness of pedestrian travel, but to improve pedestrian safety. More importantly, Washington is poised to take additional steps to implement the following STEP recommendations in this plan:

Recommendation	Lead Division/Office
Overarching Policy: Recommendations	
RECOMMENDATION 1: The commitment to pedestrian safety will be reflected in WSDOT policies, projects and programs.	All of WSDOT Executive Leadership Team to identify timeline and action owners for implementation
RECOMMENDATION 2: WSDOT will identify and make use of opportunities to reduce crash potential for pedestrians, utilizing all appropriate funding sources.	All of WSDOT Executive Leadership Team to identify timeline and action owners for implementation
RECOMMENDATION 3: Whenever WSDOT policy, planning or design documents are revised, WSDOT staff will look for opportunities to include guidance for improving pedestrian safety, with the intent of reducing pedestrian injuries and fatalities.	All of WSDOT Division Directors to develop lists of guiding standards/documents with timeline for review/ update
RECOMMENDATION 4: Implement the currently adopted ADA Transition Plan. This will include: » Following the schedule recommended in the plan for implementation; » Expanding the policy language needed for implementation.	All of WSDOT
RECOMMENDATION 5: WSDOT will continue and expand its utilization of creative and more inclusive models for conducting community engagement.	All of WSDOT
Crosswalk Location Identification, Prioritization and Countermeasure Consideration	
RECOMMENDATION 6: WSDOT will continue to collect and map pedestrian-involved crashes, on a yearly basis, to identify high crash locations and corridor segments. This information will be made available to project managers and others in headquarters and regional offices to help identify and prioritize locations to apply proven pedestrian safety countermeasures, similar to the CAL/CAC/IAL process. (See prioritization recommendation 9)	The Active Transportation Division and Region Active Transportation Coordinators will lead this effort with assistance from the Transportation Data GIS Modeling Office.

Recommendation	Lead Division/Office
RECOMMENDATION 7: WSDOT will use the Enhancement Criteria for Uncontrolled Pedestrian Crossing Locations guidance developed in May 2018 and other relevant references. WSDOT will also look to the adopted AASHTO Bicycle and Pedestrian Guides for additional guidance once they are available.	The Traffic Office will be responsible for leading this effort, assisted by the regions and project development.
RECOMMENDATION 8: WSDOT will conduct and use network analysis methodology, tied to agency performance measures, and local plans that will help prioritize project locations. Among other things, this information will be used to develop and prioritize locations for joint safety projects with local jurisdictions.	The Active Transportation Division will be responsible for leading this effort. The Traffic Division and Region Planning offices will assist.
RECOMMENDATION 9: WSDOT will explore using the ActiveTrans Priority Tool (NCHRP Report 803) to prioritize Locations for pedestrian improvements.	The Active Transportation Division will lead this effort as part of the State Active Transportation Plan update 2018-2019.
RECOMMENDATION 10: WSDOT will continue to monitor emerging methodologies for completing a systemic analysis to better understand how to select, identify and develop strategies for reducing crashes at high-risk locations, before crashes occur, through targeted integrated countermeasures. (UW study, Advancing Multimodal Safety through Pedestrian Risk Reduction, currently underway.)	The Active Transportation Division, the Traffic Division, the Research Office and Transportation Safety Office will work together on this effort.
RECOMMENDATION 11: Over the next year, WSDOT will update its guidelines on installing marked crosswalks to address context, allowing for greater crosswalk frequency as needed and utilizing best practice treatments.	The Traffic Division will be responsible for leading this effort and Active Transportation Division, Design Division and Public Transportation Division will assist.
RECOMMENDATION 12: Using photo logs, ADA infrastructure inventory, and field checks as needed, WSDOT will continue to update its detailed inventory of marked crosswalks at uncontrolled locations on state roads.	The Active Transportation Division will be responsible for leading this effort in concert with the agency's asset management planning process, field assessments and other activities of Region offices, and our local agency partners.
RECOMMENDATION 13: A method will be identified and used to determine where additional pedestrian crossing treatments are needed and should be prioritized for enhancement using land use context, network analysis methodology and considering modal balance and safety. (UW Advancing Multimodal Safety through Pedestrian Risk Reduction research underway.)	The Active Transportation Division, Planning and Traffic will be responsible for leading this effort.

Recommendation	Lead Division/Office
RECOMMENDATION 14: Consideration will be given to dividing recommended improvements into three types of interventions: simple measures, moderately complex measures, and complex measures. The more complex the measure the more time, money, and coordination among different divisions may be required. (Complexity will not be used as a proxy for prioritizing.)	The Traffic Division will be responsible for leading this effort with assistance from the Active Transportation Division, Region offices, and local jurisdiction partners.
RECOMMENDATION 15: WSDOT will actively pursue the use of road reconfigurations (also known as road diets) where appropriate and will: » Complete a network analysis to identify corridors in the urban core, urban and rural town center areas where traffic volumes are below 20,000 vehicles per day. Institutionalize a clear, predictable process whereby road reconfiguration will be considered during reconstruction, maintenance, and preservation projects at these locations. This will consider time/ staff expense for community engagement, design and traffic analysis conducted ahead of scheduled program activities.	The Region Traffic, and Active Transportation Division will be responsible for leading this effort and the Design Division, CPDM and Traffic Division will assist.
RECOMMENDATION 16: WSDOT will continue to move toward two- to three-year advance notice for the resurfacing program to allow for consideration of road reconfigurations, traffic calming and other pedestrian improvements, identifying the institutional changes needed to ensure agency buy-in to this revised approach and engaging local partners.	The CPDM and MM Tech Forum will be responsible for leading this effort, assisted by Design Division and the Traffic Division.
Policy Review, Updates, Expansion: Recommendations	
RECOMMENDATION 17: WSDOT will review and update the performance measures as found in the 2008 Washington State Bicycle Facilities and Pedestrian Walkways Plan, as part of the development of a new plan that is scheduled for completion in 2019.	The Active Transportation Division will be responsible for leading this effort and coordinating with the performance measure efforts led by the Multimodal Planning Division, TDGMO, Safety Office, and Traffic Division.
RECOMMENDATION 18: WSDOT will address pedestrian safety in its ongoing development of an overall performance framework for the agency that addresses statutory policy goals, one of which is safety.	The Active Transportation Division will be responsible for implementing this recommendation, coordinating with performance framework efforts led by the Multimodal Planning Division.

Recommendation	Lead Division/Office
RECOMMENDATION 19: WSDOT will continue to supply pedestrian crash data and provide related technical assistance to local agencies to support their efforts in pedestrian safety analysis.	The Active Transportation Division will be responsible for implementing this recommendation.
RECOMMENDATION 20: WSDOT will expand its entire count program. This will include: » Continued tracking of pedestrian counts through Washington's Pedestrian and Bicycle Documentation Project; (SHSP, p. 29 & 150) » Expansion of the permanent count program; » Development of internal capacity to estimate current pedestrian trips, future pedestrian demand and crash risk exposure.	TDGMO will lead this effort, Active Transportation Division, Planning and Traffic will assist.
RECOMMENDATION 21: WSDOT will look to the Pedestrian Safety Advisory Council and Bicyclist Safety Advisory Council for additional input and recommendations.	The Active Transportation Division and Traffic Office will lead this effort
RECOMMENDATION 22: WSDOT will identify funding strategies and recommendations for the installation and maintenance of pedestrian crossing countermeasures. This will include consideration for city size and coordinated investments and consideration of existing WSDOT policy on maintenance priorities.	The Active Transportation Division and Maintenance Office will lead this effort.
RECOMMENDATION 23: WSDOT will further clarify and negotiate authority and responsibility with local agencies regarding funding and maintenance of pedestrian facilities.	The Traffic Office, Maintenance Office and Local Programs
New Policy, Initiatives: Recommendations	
RECOMMENDATION 24: Over the next two years, WSDOT will conduct an analysis of traffic control devices at pedestrian crash locations. This will include a review of the data quality (as reported by enforcement officers) and the role of traffic control devices in combination with other contributing factors at pedestrian crash locations with the goal of using the information to determine the types of places where more traffic control may be needed.	The Active Transportation Division within WSDOT will be responsible for leading this effort. The State Patrol and Washington Traffic Safety Commission will be asked to assist.

Recommendation	Lead Division/Office
RECOMMENDATION 25: WSDOT will create, review and develop RFPs and RFQs so they include requirements for pedestrian/active transportation expertise. This may include an update to RFP/RFQ development policy.	The Project Managers will be responsible for leading this effort, working with the Active Transportation Division and Contract Services Office.
RECOMMENDATION 26: WSDOT will create a multi-agency, multi-jurisdiction work group to develop a target speed policy and guidelines that emphasizes lower speeds on state routes, city streets, county and tribal roads compatible with the needs and safety of all users. (Pedestrian Safety Advisory Council 2017 Recommendation, work underway.)	The Active Transportation Division, Traffic, Safety and Local Programs will work together on this recommendation.
Design Review, Updates, Expansion: Recommendations	
RECOMMENDATION 27: Continue to install high visibility crosswalk markings. Continue to implement 10 feet crosswalk width as standard and ensure standard plans are updated as needed to reflect this. Update Design Manual and standard plans to provide direction to select crosswalk width based on context.	The Traffic Division and Design will be responsible for leading this effort.
RECOMMENDATION 28: Update current guidelines to include more specific guidance on where advance stop lines and the R1-5 sign should be used, consistent with the MUTCD.	The Traffic Office will be responsible for leading this effort and Active Transportation Division will assist.
RECOMMENDATION 29: Update current guidelines to include more specific guidance on where advance stop lines and the R1-5 sign should be used, consistent with the MUTCD.	The Traffic Office will be responsible for leading this effort and Active Transportation Division will assist.
RECOMMENDATION 30: WSDOT will continue to provide lighting at marked crosswalks at uncontrolled locations per established guidelines.	The Traffic Division will be responsible for leading this effort.
RECOMMENDATION 31: An audit of the WSDOT Design Manual will be completed to cross-reference all guidance related to lighting and updated with reference to pedestrian-scale lighting. DM Chap 1040	The Active Transportation Division will be responsible for leading this effort in conjunction with the Traffic Division and the Design Division.

Recommendation	Lead Division/Office
RECOMMENDATION 32: WSDOT will continue to install curb extensions where appropriate and will explore revising the Design Manual to consider spot curbs and bulb outs in conjunction with transit stops on roadways without curbs and gutters (urban, suburban, and rural town centers) and the use of a swale or rain garden as a proxy to a curb extension. The Design Manual revision will clarify factors to consider when determining where to install curb extensions and their construction specifications. (New Design Manual Chapter 1500 being created. It will include information related to networks and crossing guidance.)	The Design Division and Active Transportation Division will share responsibility for leading this effort in conjunction with the Traffic Division.
RECOMMENDATION 33: WSDOT will revise its current guidelines to develop a more nuanced approach to curb radii. Consideration will be given to changing the text to convey the notion that different solutions may be needed for each corner of the intersection. The guidelines should include enhanced graphics, showing two or three ways to accommodate various situations. Training and cross-office coordination recommendations will be developed.	The Active Transportation Division in conjunction with the Traffic Division and Design Division will be responsible for leading this effort.
RECOMMENDATION 34: Over the next year, WSDOT will develop and provide written guidance on criteria for when to install raised crosswalks in cities under 27,500 (jurisdictions in which WSDOT has responsibility for design, operations and maintenance of main street highways), particularly in conjunction with roundabouts and free right turns. Design guidance on how to address drainage, snow plowing, EMS and parking will be included. WSDOT will work with local partners in larger jurisdictions as appropriate.	The Maintenance Office, Active Transportation Division Traffic Division and Design Division will be responsible for leading this effort.
RECOMMENDATION 35: WSDOT will review and refine the Design Manual, Traffic Manual and Standard Plan to include a more detailed information/discussion regarding geometrics and the placement of crossing islands and use of the two-way left turn lane.	The Design Division in conjunction with the Traffic Division, Safety and Active Transportation Division will be responsible for leading this effort.
RECOMMENDATION 36: Over the next two years, WSDOT will develop and provide additional guidance on use of traffic signals, pedestrian half signals and PHBs for pedestrian crossings. Included will be guidance on how to mitigate uncertainty concerning the choice of a PHB, a regular signal or a pedestrian half signal. Information will be shared with local agencies.	The Traffic Office will be responsible for leading this effort. Active Transportation Division will assist.

Recommendation	Lead Division/Office
RECOMMENDATION37: WSDOT will continue to use the RRFB per WSDOT policy and the new FHWA Interim Approval (IA-21). The Department will also provide guidance and encouragement to communities on appropriate use of RRFBs.	The Traffic Division will be responsible for leading this effort. The Active Transportation Division will assist.
RECOMMENDATION 38: Update the Design Manual to include in-street pedestrian crossing sign, consistent with the MUTCD.	The Traffic Division, Active Transportation Division and Design Division will share responsibility for leading this effort.
RECOMMENDATION 39: Update the Design Manual and Traffic Manual with a revised traffic impact analysis process that includes potential for pedestrian generators, attractors and land use context. Include Active Transportation staff as part of the review for this work.	The Design and Traffic Divisions will lead, Active Transportation Division will assist.
Organizational Capacity, Training: Recommendations	
RECOMMENDATION 40: WSDOT will work to increase the organizational capacity, by region, to be nimble in implementing planning, design, and operational solutions for pedestrians using a practical solutions approach. This will be done by: » Considering how to develop and incorporate appropriate expectations for subject matter knowledge and training in active transportation and pedestrian safety in position descriptions and performance expectations. » Work with colleges and universities to monitor, educate, and influence planning, engineering and design training about vulnerable road users. » Work with Workforce Development strategic goal leads on identifying training needs for pedestrian safety to meet, measure and report success and lessons learned.	The Design, Planning and Traffic Divisions will be responsible for leading this effort. ATD and Region Traffic will assist.

Recommendation	Lead Division/Office
RECOMMENDATION 41: WSDOT will review the current approach to training delivery, focusing on the following actions. While specific to STEP, some actions could also be applicable to other trainings. » Review marketing strategy – create better awareness of existing pedestrian training topics, lengths, etc. Transportation Division staff and Region-based active transportation coordinators will alert engineers to existing resources. » When the Design Manual and Traffic Manual are updated – coordinate with Development Division and Traffic Division to provide training; ensure training is digested and applied » Develop short 'how to do XYZ' trainings on selected topics related to pedestrian safety » Identify opportunities to provide trainings at professional conferences attended by WSDOT engineers and partner jurisdictions » Work with Region office leaders to identify and increase availability of funding and support for participation in training activities and relevant local, state and national conferences » Provide information and recommendations as talking points in the internal safety newsletter. Use small folios with the information to share with the Region offices and external partners.	The Active Transportation Division, Design and Multimodal Technical Forum will work together on this effort.

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Introduction and Background

Pedestrians are among the most vulnerable road users, accounting for approximately 16 percent of all roadway fatalities nationally in 2016, per the Fatality Analysis Reporting System (FARS) . Pedestrians are especially vulnerable at non-intersection locations where 72 percent of pedestrian fatalities occur.[1] In the State of Washington, pedestrians accounted for approximately 20 percent of all roadway fatalities in 2016. For the purposes of this report and consistent with the State of Washington definitions, pedestrians include people using a mobility assistive device such as a wheelchair.

What is STEP

This Plan has been developed as part of the Safe Transportation for Every Pedestrian (STEP) initiative and targets five specific countermeasures (described later in this guide) for improving pedestrian safety at uncontrolled crossings. STEP is an FHWA initiative which is part of the Every Day Counts (EDC) Round 4 effort. EDC is an FHWA-State DOT collaboration which focuses on underutilized innovations. Every two years a new set of initiatives is identified. STEP was identified as part of the fourth round of EDC innovations because of the cost-effectiveness of the countermeasures it offers with known safety benefits.

Every Day Counts (EDC)

The STEP initiative is part of EDC. In 2009, the Federal Highway Administration (FHWA) launched Every Day Counts (EDC) in cooperation with the American Association of State Highway and Transportation Officials (AASHTO) to speed up the delivery of highway projects and to address the challenges presented by limited budgets. EDC is a state-based model to identify and rapidly deploy proven but underutilized innovations to shorten the project delivery process, enhance roadway safety, reduce congestion and improve environmental sustainability.

Proven innovations through EDC facilitate greater efficiency at the state and local levels, saving time and resources that can be used to deliver more projects for the same money. By advancing 21st century solutions, the highway community is making every day count to ensure our roads and bridges are built better, faster and smarter.

HOW IT WORKS

Through the EDC model, FHWA works with state and local transportation agencies and industry stakeholders to identify a new collection of innovations to champion every two years. Innovations are selected collaboratively by stakeholders, taking into consideration market readiness, impacts, benefits and ease of adoption of the innovation. After selecting the EDC technologies for deployment, transportation leaders from across the country gather at regional summits to discuss the innovations and share best practices. These summits begin the process for states, local public agencies and Federal Lands Highway Divisions to focus on the innovations that make the most sense for their unique program needs, establish performance goals and commit to finding opportunities to get those innovations into practice over the next two years.

Throughout the two-year deployment cycle, specifications, best practices, lessons learned and relevant data are shared among stakeholders through case studies, webinars and demonstration projects. The result is rapid technology transfer and accelerated deployment of innovation across the nation.

1 NHSTA, "FARS Data Query: 2016 Data." Fatality Analysis Reporting System (FARS) Encyclopedia. (2017). https://www-fars.nhtsa.dot.gov/QueryTool/QuerySection/SelectYear.aspx

Why Create this Pedestrian Safety Action Plan?

The purpose of this pedestrian safety action plan ("Plan") is to provide specific recommendations for improving conditions for walking at uncontrolled pedestrian crossing locations, which occur where the pedestrian network, sidewalks or designated walkways are interrupted by roads where no traffic control (e.g., traffic signal or stop sign) is present. These common crossing types occur at intersections (where crosswalks may be marked or unmarked) and at midblock locations (where crosswalks must be marked). Overall, uncontrolled pedestrian crossing locations correspond to higher rates of crashes involving pedestrians than controlled locations, often due to inadequate pedestrian crossing accommodations.[2]

By focusing on uncontrolled crossing locations, WSDOT will prioritize significant safety problems and improve crossing comfort for pedestrians of all ages and abilities.

Recommendations in this Plan follow STEP guidance for implementing lower-cost countermeasures that can be deployed based on specific needs. They have a proven record of reducing crashes and represent underutilized innovations that can have an immediate effect.

This Plan also builds on existing State goals for improving safety, examining existing conditions, and using a data-driven approach to match countermeasures with demonstrated problem locations. Plan recommendations are structured to allow for immediate implementation.

State Participation in STEP

The Washington State Department of Transportation is leading this initiative in coordination with the FHWA Washington Division Office. This Plan recommends actions that when implemented will reduce the number and rate of pedestrian-involved crashes, fatalities, and injuries on the Washington State highway system. If emulated by local transportation agencies, these benefits may also be realized on county and city streets and roads.

How we developed this Safety Action Plan

This Plan is intended to be used in conjunction with two US DOT FHWA publications:

EDC GUIDE FOR IMPROVING PEDESTRIAN SAFETY AT UNCONTROLLED CROSSING LOCATIONS (2018) (EDC GUIDE)

This guide assists State or local transportation or traffic safety departments that are considering developing a policy or guide to support the installation of countermeasures at uncontrolled pedestrian crossing locations. This document provides guidance to agencies, including best practices for each step involved in selecting countermeasures. By focusing on uncontrolled crossing locations, agencies can address a significant national safety problem and improve quality of life for pedestrians of all ages and abilities. Agencies may use this guide to develop a customized policy or to supplement existing local decision-making guidelines.

FHWA HOW TO DEVELOP A PEDESTRIAN AND BICYCLE SAFETY ACTION PLAN (2017) (FHWA HOW TO)

The purpose of this guide is to assist agencies in developing and implementing a safety action plan to improve conditions for bicycling and walking. The plan lays out a vision for improving safety, examining existing conditions, and using a data-driven approach to match safety programs and improvements with demonstrated safety concerns. This guide will help agencies enhance their existing safety programs and activities, including identifying safety concerns and selecting optimal solutions. It will also serve as a reference for improving pedestrian and bicycle safety through a multidisciplinary and collaborative approach to safety, including street designs and countermeasures, policies, and behavioral programs.

2 Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations, p. 2

This Plan also builds on existing State goals for improving safety, examining existing conditions, and using a data-driven approach to match countermeasures with demonstrated problem locations. Plan recommendations are structured to allow for immediate implementation.

The Plan report also references other FHWA publications, American Association of State Highway Transportation Officials (AASHTO) guides, the Manual of Uniform Traffic Control Devices (MUTCD), and relevant State publications for additional information. A complete list of referenced documents and other resources is found at the end of this document.

The three-part process used to develop this Plan helps ensure that recommended actions represent the best use of agency resources:

1. Discovery: Current policies, plans, design guidance, prioritization methodologies, crash data and implementation strategies were identified, assembled and reviewed with the assistance of WSDOT staff.
2. One-day Work Session: WSDOT staff met to review materials assembled during the Discovery phase, and to develop the recommended actions reflected in this Plan.
3. Draft and Final Plan: Based on the one-day work session, a draft Action Plan was developed, reviewed by WSDOT, revised and finalized.

This Plan will be incorporated into the Washington State Active Transportation Plan and allow for consideration of pedestrian safety improvements to be incorporated in other (WSDOT) plans including Target Zero: Strategic Highway Safety Plan, Washington Transportation Plan, Highway System Plan, and the Design and Traffic Operations Manuals.

The recommendations in this Plan provide a roadmap for reducing the number and rate of pedestrian-involved crashes, fatalities and injuries. The recommendations identify current policies and practices that should be given priority, as well as others that should be modified or added, to better facilitate implementation.

Building a safe and connected pedestrian network requires consideration of topics beyond what is included in this Plan. Other engineering-based countermeasures exist for unsignalized and signalized intersections and for walking along streets and highways. Pedestrian crossings near schools are not specifically addressed in the Plan and will be subject to other State guidance. Crossing requirements per the Americans with Disabilities Act (ADA) are not specifically addressed in this Plan, although ADA requirements must be addressed as part of any pedestrian crossing improvements project. Resources and further guidance are provided at the end of this Plan.

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Mission, Goals, and Recommendations

Vision, Mission, Goals

The transportation system should accommodate people of all ages and abilities, including people too young to drive, people who cannot drive, and people who choose not to drive. Pedestrians can be expected to walk along and across all roadways, except where expressly prohibited. Walking is an important element of a multimodal transportation system that supports all users and is an essential form of transportation in particular for lower-income populations, making pedestrian safety important for transportation equity. Well-designed, well-maintained facilities, with low crash frequencies and severities, are important to creating safe, comfortable and convenient walking conditions.

WSDOT is committed to improving safety for users of all travel modes, including pedestrians. This commitment is reflected in the agency vision, mission and goals.

Vision

The Washington State Department of Transportation's vision is to be the best in providing a sustainable and integrated multimodal transportation system.[1]

Mission

The Washington State Department of Transportation provides and supports safe, reliable and cost-effective transportation options to improve livable communities and economic vitality for people and businesses.[2]

Goals

The commitment to safety is reflected in the 2016 Strategic Highway Safety Plan (SHSP).

Target Zero by 2030: Target Zero is a data-driven strategic plan used to identify priorities and solutions, help create common goals, and develop a language so we can work together across disciplines.[3]

RECOMMENDATION 1: The commitment to pedestrian safety will be reflected in WSDOT policies, projects and programs. All WSDOT will be responsible for implementing this recommendation. Executive Leadership Team to identify timeline and action owners for implementation.

RECOMMENDATION 2: WSDOT will identify and make use of opportunities to reduce crash potential for pedestrians, utilizing all appropriate funding

1 https://www.wsdot.wa.gov/about/agency-mission-vision-and-values
2 https://www.wsdot.wa.gov/about/agency-mission-vision-and-values
3 SHSP, p. 2

sources. All WSDOT will be responsible for implementing this recommendation. Executive Leadership Team to identify timeline and action owners for implementation.

Performance Measures

Performance measures are a way to measure the effectiveness of agency policies, projects and programs. They can be a measurement of outcomes (e.g., reduction in number of pedestrian injuries and fatalities), or they can be a measurement of production items (e.g., the number of crosswalk markings installed). They serve as a tool for building agency accountability. Deciding what to measure is important since it will guide the allocation of resources as agencies strive to meet performance measure objectives.

MAP-21 implementation includes performance measures for non-motorized safety, requiring states to reduce the number of serious injuries and fatalities of active transportation users. WSDOT currently has under way a comprehensive review and refinement of performance measures for each of its statutory policy goals, staffed by the Multimodal Planning Division. Safety is one of those goal areas—performance measures have not yet been reviewed and developed in detail beyond what currently exists in the Target Zero plan and other plans listed in this document.

The 2008 Washington State Bicycle Facilities and Pedestrian Walkways Plan provides the following performance measures related to pedestrian safety:

- Number of annual pedestrian or bicyclist-involved traffic crashes
- Number of annual fatal pedestrian or bicyclist/pedestrian-involved
- Washington's rank among states for pedestrian or bicyclist fatalities
- Percentage of pedestrian and bicyclist fatalities of all traffic fatalities
- Percentage reduction in pedestrian fatalities at crosswalks.
- Percentage pedestrian and bicyclist fatalities for at-risk groups (ages 0-14 and 71+).[4]

RECOMMENDATION 17: WSDOT will review and update the performance measures as found in the 2008 Washington State Bicycle Facilities and Pedestrian Walkways Plan, as part of the development of a new plan that is scheduled for completion in 2019. The Active Transportation Division will be responsible for leading this effort and coordinating with the performance measure efforts led by the Multimodal Planning Division, TDGMO, Safety Office, and Traffic Division.

RECOMMENDATION 18: WSDOT will address pedestrian safety in its ongoing development of an overall performance framework for the agency that addresses statutory policy goals, one of which is safety. The Active Transportation Division will be responsible for implementing this recommendation.

4 BFPWP

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Prioritizing Pedestrian Crossing Improvements at Uncontrolled/ Unimproved Locations

This work includes four basic steps:

- Identify locations and contexts where there are opportunities for pedestrian crossing improvements;
- Prioritize location types based on highest need (proximity to destinations, density of the population, severity of crash history);
- Determine the best improvements for the different location types;
- Develop a timeline and mechanism to fund both spot and systematic safety improvements.

Data Collection and Analysis

Individual Crash Location Analysis

Pedestrian-involved crashes, especially those involving fatalities, are relatively rare at any given individual location. Consequently, improvement of pedestrian safety requires identification of problem roadway segments as well as uncontrolled intersection and mid-block locations (note: this is not referring to controlled intersection and midblock crossing locations). A simple mapping of crash locations involving pedestrians will quickly identify high crash locations (likely only a few) and corridors. Typically, five years of crash data is appropriate, though in rapidly changing areas three years might be sufficient.

WSDOT maintains a database, by location, of all motor vehicle crashes, including those involving pedestrians. One shortcoming of this database and other data collection efforts in general is that crashes that do not involve a motor vehicle are not captured in the data, such as a bicyclist/pedestrian crash (while rare, these do occur), and no "near miss" data are collected. Data gaps are a topic of discussion for the Pedestrian Safety Advisory Council formed in 2016 and they have made several recommendations on this topic in their 2016 and 2017 reports.

RECOMMENDATION 6: WSDOT will continue to collect and map pedestrian-involved crashes, on a yearly basis, to identify high crash locations and corridor segments. This information will be made available to project managers and others in headquarters and regional offices to help identify and prioritize locations to apply proven pedestrian safety countermeasures, similar to the CAL/CAC/IAL process. (See prioritization recommendation 7.a). The Active Transportation Division and Region Active Transportation Coordinators will lead this effort with assistance from the Transportation Data GIS modeling Office

RECOMMENDATION 19: WSDOT will continue to supply pedestrian crash data and provide related technical assistance to local agencies to support their efforts in pedestrian safety analysis. The

Active Transportation Division will be responsible for implementing this recommendation.

System-wide Crash Analysis

To conduct more sophisticated analyses of pedestrian-involved crashes, additional data is needed. Detailed data, including crash location; road characteristics at the crash location; light, visibility and line of sight; demographic information about the individuals involved in the crash; and whether drugs or alcohol were involved, are extremely useful to determine whether there are patterns to pedestrian-involved crashes, and if so, to select the best countermeasures to address them. Analysis of detailed data can provide information on where crashes occur, when they occur, and characteristics of both the people involved in the crash and the relevant design elements.

It can also be helpful to categorize crashes by type. This is known as pedestrian crash typing and helps to better define the sequence of events leading up to crashes and the orientation of both the pedestrian and motorist when the crash occurred. Crash typing can categorize crashes based on road characteristics and is a way to target engineering countermeasures.

WSDOT collects a wide range of pedestrian crash data that is analyzed on an annual basis. This includes location by roadway segment and intersection, vehicle type, day of week, time, month, county, age of those involved in the crash, lighting, and other factors. Also included are behavioral factors such as alcohol use, drug use, distracted driving, and drowsy driving.

RECOMMENDATION 4: Over the next two years, WSDOT will conduct an analysis of traffic control devices at pedestrian crash locations. This will include a review of the data quality (as reported by enforcement officers) and the role of traffic control devices in combination with other contributing factors at pedestrian crash locations with the goal of using the information to determine the types of places where more traffic control may be needed. The Active Transportation Division within WSDOT will be responsible for leading this effort. The State Patrol and Washington Traffic Safety Commission will be asked to assist.

Pedestrian Volume, Land Use Context and Behavior Analysis

Pedestrian counts along with land use determination and field observations (e.g., driver yielding, conflicts, and pedestrian assertiveness) can be very useful in understanding pedestrian behavior and in considering the need for facilities. Counts and road characteristics studies, when combined with crash data, can also provide insights into specific crash causes and potential countermeasures, and allow the determination of crash rates. On-site observations will often reveal patterns that lead to the need for design changes. Before and after counts can be used to measure effectiveness; this data in turn can be used to help secure funding for additional improvements at other locations. Pedestrian counts, land use context, origin and destination locations are also important to assess when and where signals, stop signs, marked crosswalks, traffic calming measures and other pedestrian facilities should be installed. Pedestrian facilities should be prioritized in urban, suburban and rural town center locations even if pedestrian volumes are not high, especially where road characteristics may discourage pedestrian crossing. Local agency comprehensive plans and visioning documents should also be used in this consideration and an understanding of the desired overall pedestrian network should be established to address latent and future demand.

The Washington State Documentation (Manual Count) Project collects bicyclist and pedestrian usage data in about 400 locations throughout the State. It is similar to the National Documentation Project and occurs annually in the early fall. WSDOT has installed 49 counters and by the end of 2019 will have about 60 permanent automatic counters installed around the state. The count data is available on a WSDOT portal

for download. This information is being collected to provide data to calculate pedestrian miles traveled, and average daily pedestrian trips. Calculations will be based on methodology in the "Collecting Network-wide Bicycle and Pedestrian Data: Guidebook for When and Where to Count".

RECOMMENDATION 20: WSDOT will expand its entire count program. This will include:

- Continued tracking of pedestrian counts through Washington's Pedestrian and Bicycle Documentation Project;[1]
- Expansion of the permanent count program;
- Development of internal capacity to estimate current pedestrian trips, future pedestrian demand and crash risk exposure.

TDGMO will lead this effort, Active Transportation Division, Planning and Traffic will assist.

Engineering Studies

Many factors can affect crossing opportunities including motorist approach speeds and volumes, motorist yielding, roadway configuration (width of roadway, number of travel lanes, etc.), and classification of vehicles, in addition to the volume and actions of pedestrians and bicyclists mentioned above.

As part of the engineering studies, sight distances should also be evaluated. Motorists must be provided sufficient stopping sight distance to be able to see, react, and yield to crossing pedestrians. Likewise, pedestrians, including those with limited vision, require sufficient sight distance to identify and judge gaps in traffic.[2] Where sight distance is limited, efforts should be made to increase it by removing parking or other sight obstructions, or to install curb extensions to allow pedestrians to wait closer to the edge of the roadway. Where sight distance cannot be provided, an engineering study should be completed to determine what enhancement(s) should be provided.

The WSDOT Design Manual highlights the importance of evaluating sight lines between pedestrians and motorists when locating a crosswalk.[3] Motorists must have a clear line of sight to all modes, including pedestrians; and pedestrians must have a clear line of sight to all traffic that may affect pedestrian movements. WSDOT has developed new guidance on how to complete a study at proposed crosswalk locations.

RECOMMENDATION 7: WSDOT will use the Enhancement Criteria for Uncontrolled Pedestrian Crossing Locations guidance developed in May 2018 and other relevant references. WSDOT will also look to the adopted AASHTO Bicycle and Pedestrian Guides for additional guidance once they are available. The Traffic Office will be responsible for leading this effort, assisted by the regions and project development.

Prioritizing Pedestrian Crossing Improvements

A pre-defined methodology for prioritizing pedestrian improvements ensures that resources are allocated in a way that best meets goals to reduce pedestrian injuries and fatalities. A prioritization methodology should be:

- Responsive to Local Agency plans and community values.
- Based on WSDOT vision, mission and goals.
- Flexible: Rather than being a rigid, "one-size-fits-all" tool, a prioritization methodology should be flexible and allow practitioners to choose the

1 SHSP, p. 29 & 150
2 For further federal guidance on creating inclusive pedestrian environments: https://humancentereddesign.org/pedestrian/files/federal_ab.html.
3 WSDOT Design Manual, p. 1510-26

most appropriate approach that reflects agency goals and resource availability.

» Transparent: A prioritization process should be broken down into a series of discrete steps, each of which can be easily documented and explained to the public.

WSDOT currently uses a variety of approaches to prioritization, depending on the project and funding source. The approach to prioritization will vary where state routes go through incorporated cities and along roadways serving WSDOT state ferry facilities. WSDOT also routinely conducts field visits to determine project priorities. Such a field assessment may look at accessibility and livability measures that would recognize desire lines, density, and distance people would need to walk to get to a controlled crossing.

RECOMMENDATION 8: WSDOT will conduct and use network analysis methodology, tied to agency performance measures, and local plans that will help prioritize project locations. Among other things, this information will be used to develop and prioritize locations for joint safety projects with local jurisdictions. The Active Transportation Division will be responsible for leading this effort. The Traffic Division and Region Planning offices will assist.

RECOMMENDATION 9: WSDOT will explore using the ActiveTrans Priority Tool (NCHRP Report 803) to prioritize locations for pedestrian improvements. The Active Transportation Division will lead this effort as part of the State Active Transportation Plan update 2018-2019.

Systemic Analysis Approach to Prioritization

Many areas may have low pedestrian-involved crash rates, but still have a high risk for pedestrian-involved or simply a need to complete the pedestrian network. Emerging methodologies identify these sites based on roadway characteristics combined with land use features of the area. In some cases, it may be possible to select countermeasures to address these high-risk factors before pedestrian-involved occur. Systemic analysis considers factors such as roadway design characteristics and traffic control devices, lighting conditions, motorist speed, and nearby pedestrian destinations. Combinations of these factors and consideration of land use context will also help identify countermeasures so we can systematically implement these measures to address and prevent pedestrian-involved. WSDOT is working with the University of Washington on research to develop a methodology for Washington.

RECOMMENDATION 10: WSDOT will continue to monitor emerging methodologies for completing a systemic analysis to better understand how to select, identify and develop strategies for reducing crashes at high-risk locations, before crashes occur, through targeted integrated countermeasures. (UW study, Advancing Multimodal Safety through Pedestrian Risk Reduction, currently underway). The Active Transportation Division, the Traffic Division, the Research Office and Transportation Safety Office will work together on this effort.

4

Marked Crosswalks at Uncontrolled Locations

Marked Crosswalk Policy

Marked crosswalks delineate the optimal or preferred location for a pedestrian to cross a street and indicate to motorists where to expect pedestrians. New marked crosswalk installations at uncontrolled locations require an engineering study.[1]

Marked crosswalks alone under the right application may help to improve pedestrian safety and the connectivity of the pedestrian network. A marked crosswalk policy creates a consistent approach for the evaluation and installation of marked crosswalks. Uniform and consistent application of marked crosswalks can help increase predictability for both pedestrians and drivers. A marked crosswalk policy should:

- Identify what factors are taken into consideration during evaluation of proposed marked crosswalks at uncontrolled locations (e.g., traffic volume, traffic speeds, crashes, destinations, roadway design, pedestrian volumes, context, modal balance, etc.).
- Establish the primary types of crossing treatments to be considered for any marked crosswalk location (including high visibility crosswalks).
- Determine a prioritization process for how crosswalk marking is implemented. Inputs to this prioritization may include locational data such as transit stops, school walking routes, senior walking routes, high collision locations, and midblock locations with high numbers of people crossing the street.

See the WSDOT Enhancement Criteria for Uncontrolled Pedestrian Crossing Locations for guidance. Other resources include:

- FHWA's *Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations* (2018) provides options for crossing improvements once an agency has determined where to install a marked crosswalk.
- WSDOT Design Manual chapter 1103 instructs to contemplate the pedestrian modal accommodation level when making design decisions that address or affect needs associated with pedestrian travel. Consider project specific conditions related to the quality of travel experience, and identified performance targets, that can be influenced by the project design, such as pedestrian route type, efficiency of travel, range, pedestrian safety, block length, and other

1 MUTCD p. 384

factors determined by subject matter experts or the project advisory team.

The 2016 Target Zero plan notes that more than half of fatal and serious injury pedestrian-involved crashes occur while the pedestrian is crossing the street. In locations with context that suggests current or potential pedestrian activity, an increase in the frequency of marked crosswalks facilitates pedestrian travel and channels them to locations where drivers will be aware of their presence. Presence of more frequent marked crosswalks communicates to drivers that they're entering a different kind of roadway segment, aiding in reduction of crash exposure at these locations.[2] The Target Zero plan goes on to recommend more frequent pedestrian crossing opportunities.[3] The WSDOT Design Manual further recommends that on roadways with pedestrian crossing traffic caused by nearby pedestrian generators, a midblock crossing may be appropriate. Along populated urban and rural town center routes, there is a need to create a minimum distance threshold between controlled/comfortable crossings. On urban five-lane highways with no mid-block crossings, signals spaced at ½ mile, and intermediate and high vehicle speeds (45-50 mph and up) it may be appropriate to reduce the speed, narrow lanes, and install controlled crossings.

RECOMMENDATION 11: Over the next year, WSDOT will update its guidelines on installing marked crosswalks to address context, allowing for greater crosswalk frequency as needed and utilizing best practice treatments. The Traffic Division will be responsible for leading this effort and Active Transportation Division, Design Division and Public Transportation Division will assist.

Inventory and Evaluation of Marked Crosswalks at Uncontrolled Locations

A systematic inventory of conditions at existing marked crosswalks and potential locations is necessary for prioritizing locations and selecting countermeasures. This also will eventually require a complete list of existing marked crosswalks locations; however, lack of a complete list should not delay making improvements at known problem locations. The review of existing marked crosswalks should be based on the guidelines in the marked crosswalk policy. The results can be used to create a plan for making improvements at marked crosswalks at uncontrolled locations.

The WSDOT Statewide Bicycle and Pedestrian Facility Inventory was completed in 2002-2003. A photo log captured most facilities, including marked crosswalks at uncontrolled locations. The ADA ramp inventory provides an update of crosswalk locations and conditions at marked crosswalks.

RECOMMENDATION 2: Using photo logs, ADA infrastructure inventory, and field checks as needed, WSDOT will continue to update its detailed inventory of marked crosswalks at uncontrolled locations on state roads. The Active Transportation Division will be responsible for leading this effort in concert with the agency's asset management planning process, field assessments and other activities of Region offices, and our local agency partners.

RECOMMENDATION 3: A method will be identified and used to determine where additional pedestrian crossing treatments are needed and should be prioritized for enhancement using land use context, network analysis methodology and considering modal balance and safety. (UW Advancing Multimodal Safety through Pedestrian Risk Reduction research underway). The Active

2 SHSP, p. 150
3 WSDOT Design Manual, 1510.10(3)

Transportation Division, Planning and Traffic will be responsible for leading this effort.

Selecting Countermeasures and Prioritizing Locations for Improvements

The goal of this action plan is to improve pedestrian crossing facilities at uncontrolled marked crosswalks so that they will operate as they are designed to work, with drivers yielding to pedestrians and pedestrians getting across the road without conflicts. Rather than just deciding whether marked crosswalks should or should not be provided, the action plan asks, "what are the most effective measures that can be used to help pedestrians cross the street?". Action plans are typically divided into three types of strategies: simple measures, moderately complex measures, and complex measures. The more complex the measure the more time, money, and coordination among different divisions and partners may be required.

Simple measures include sign replacement and enhancement, high visibility crosswalk remarking, advance stop bars, curb ramps, and lighting adjustments. Moderately complex measures include rapid flashing beacons, pedestrian refuge islands (where no rechannelization of lanes is required), curb extensions, and lighting additions. Complex measures include Pedestrian Hybrid Beacons/HAWK, traffic calming and road diets/channelization, changes in pedestrian circulation, crossing islands (where re-channelization is required), raised crosswalks, and intersection redesign. After prioritizing locations using the prioritization methodology, they should be further organized according to complexity.

RECOMMENDATION 4: Consideration will be given to dividing recommended improvements into three types of interventions: simple measures, moderately complex measures, and complex measures. The more complex the measure the more time, money, and coordination among different divisions may be required. (Complexity will not be used as a proxy for prioritizing). The Traffic Division will be responsible for leading this effort with assistance from the Active Transportation Division, Region offices, and local jurisdiction partners.

5

Toolbox: Pedestrian Crossing Countermeasures at Uncontrolled Locations

Introduction - Selecting Countermeasure(s)

The results of the crash analysis, road safety audit, and/or stakeholder input, collectively provide a comprehensive understanding of the risk factors at uncontrolled crossing locations. The countermeasures listed in this chapter can improve the visibility of crossing locations and reduce crashes, and they each address at least one additional safety concern associated with a higher risk of collision and/or severe injury. Collaboration with local agency partners will be a priority so these improvements are incorporated and consistent with their plans to ensure that we are working toward the same projects, goals, and overall network connectivity. In all cases, the countermeasures, when implemented, should follow MUTCD and other relevant AASHTO, FHWA and State guidance.[1]

Table 1 includes a comprehensive matrix and list of STEP pedestrian crash countermeasures suggested for application at uncontrolled crossing locations per roadway and traffic features. The countermeasures are assigned to specific matrix cells based on safety research, best practices, and established national guidelines. When a pedestrian crossing is established, the countermeasure options should be reviewed before selecting the optimal group of crossing treatments.

Previously obtained characteristics such as pedestrian volumes or pedestrian demand (actual, latent, and future projected), existing and desired vehicle operational speeds, land use context, and other site features should also be considered when selecting countermeasures. Traffic calming to reduce operating speeds is itself a countermeasure and is often beneficial to the success of other countermeasures chosen. WSDOT will work with local partners and reference the MUTCD and other national, State, and local guidelines when making the final selection of countermeasures.

Based on an identified need to enhance the crossing from the engineering study,

A. Location may be suitable for marked crosswalk with no or minimal additional enhancement.

B. Location suitable for marked crosswalk, additional enhancement recommended.

C. Marked crosswalks alone are insufficient, additional enhancement is required.

Additional pedestrian crossing enhancements may include, but are not limited to, the following enhancements. Enhancement selection is based on the preceding roadway and traffic characteristics, as well

1 Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations (2018), p. 15

Table 1. Pedestrian Crossing Enhancement Guidance

Traffic Volume (ADT)	Posted Speed	Roadway Configuration, Two-Directional*				
		2 lanes	2-3 lanes, with raised median**	3 lanes, without raised median	≥4 lanes, with raised median**,***	≥ lanes, without raised median***
< 9,000	≤ 30 mph	A	A	A	A	A
	35 mph	A	B	B	B	C
	≥ 40 mph	C	C	C	C	C
9,000-15,000	≤ 30 mph	A	A	A	B	B
	35 mph	B	B	B	B	C
	≥ 40 mph	C	C	C	C	C
≥15,000	≤ 30 mph	B	B	C	C	C
	35 mph	B	B	C	C	C
	≥ 40 mph	C	C	C	C	C

*Roadway configuration includes all lanes at crossing location

**Raised median must meet accessibility criteria as stated in Design Manual 1510.11(1)

***The installation of a midblock crosswalk on a roadway with two or more through lanes in one direction requires a stop line placed 20 to 50 ft in advance of the crosswalk. See MUTCD 3B.16 for guidance.

as additional factors relevant for each location (e.g. percentage of truck traffic). Traffic operational analysis may also be necessary to evaluate the appropriateness of enhancements at each location.

- Pedestrian scaled illumination (consideration for height and location)
- Pedestrian warning sign, at the crosswalk location and/or advanced (see Traffic Manual 2.8)
- Advanced pedestrian warning sign
- Stop line placed 20 to 50 ft in advance of the crosswalk
- Tighter turning radii
- In-street pedestrian crossing sign (in conjunction with refuge islands)
- Pedestrian crossing flags within incorporated cities (in coordination with local agency sponsorship)
- Pedestrian refuge island (subject to requirements in Design Manual 1510.11(1))
- Raised crosswalk
- Rapid flashing beacons (RFB) or warning beacons (subject to requirements in MUTCD 4L)
- Pedestrian hybrid beacon (PHB) (subject to requirements in MUTCD 4F)
- Pedestrian signal
- Curb extension
- Traffic-calming treatments
- Roadway narrowing or road diet

1. Enhancements at Marked Crosswalks

Locations with marked crosswalks can under the right circumstances increase safety with high visibility pavement markings, advanced stop bars and warning signs, in-street pedestrian crossing signs, illumination, curb extensions and tighter curb radii.

High-Visibility Crosswalk Markings

High-visibility crosswalk markings make it easier for drivers to see the crosswalk, not just the pedestrian. Two parallel lines indicating a marked crosswalk can be almost invisible to the motorist at uncontrolled locations. When a decision has been made to use crosswalk markings, high visibility markings such as ladder style ("piano keys") or continental markings ("zebra") should be used at locations without traffic control and are advised at locations with traffic control (signals, stop signs).

The WSDOT Design Manual suggests that the preferred type of marked crosswalk is a longitudinal pattern known as a Ladder Bar. The recommended width for crosswalk markings is 10 feet with a 6-foot

Table 2. Safety issues addressed per countermeasure.

Pedestrian Crash Countermeasure for Uncontrolled Crossings	Safety Issue Addressed				
	Conflicts at crossing locations	Excessive vehicle speed	Inadequate conspicuity/ visibility	Drivers not yielding to pedestrians in crosswalks	Insufficient separation from traffic
Crosswalk visibility enhancement	✓	✓	✓	✓	✓
High-visibility crosswalk markings*	✓		✓	✓	
Parking restriction on crosswalk approach*	✓		✓	✓	
Improved nighttime lighting*	✓		✓		
Advance Yield Here To (Stop Here For) Pedestrians sign and yield (stop) line*	✓		✓	✓	✓
In-Street Pedestrian Crossing sign*	✓	✓	✓	✓	
Curb extension*	✓	✓	✓		✓
Raised crosswalk	✓	✓	✓	✓	
Pedestrian refuge island	✓	✓	✓		✓
Pedestrian Hybrid Beacon	✓	✓	✓	✓	
Road Diet	✓	✓	✓		✓
Rectangular Rapid-Flashing Beacon	✓		✓	✓	✓

*These countermeasures make up the STEP countermeasure "crosswalk visibility enhancements." Multiple countermeasures may be implemented at a location as part of crosswalk visibility enhancements.

minimum only allowed with justification.[2] Target Zero also calls for installing high visibility markings.[3]

RECOMMENDATION 27: Continue to install high visibility crosswalk markings. Continue to implement 10 feet crosswalk width as standard and ensure standard plans are updated as needed to reflect this. Update Design Manual and standard plans to provide direction to select crosswalk width based on context. The Traffic Division and Design will be responsible for leading this effort.

Advance Stop Line and Stop Here for Pedestrians Sign

A multiple threat crash results when a driver in one lane stops to let the pedestrian cross, blocking the sight lines of the driver in the other lane of a multi-lane approach, who then advances through the crosswalk and hits the crossing pedestrian. If advance stop lines and 'Stop Here for Pedestrians' R1-5b/R1-5c signs are used in advance of a crosswalk, they should be placed together and 20 to 50 feet before the nearest crosswalk line; parking should be prohibited in the area between the stop line and the crosswalk. The MUTCD requires R1-5 signs when stop lines are used in advance of a crosswalk with an uncontrolled multi-lane approach.

WSDOT has a standard plan for the advance stop line.

RECOMMENDATION 29: Update current guidelines to include more specific guidance on where advance stop lines and the R1-5 sign should be used, consistent with the MUTCD. The Traffic Office will be responsible for leading this effort and Active Transportation Division will assist.

In-street Pedestrian Crossing Sign

In-street signs are placed in the middle of the road at a crossing and are often used in conjunction with refuge islands. These signs may be appropriate on 2-lane or 3-lane roads with speed limits of 30 mph or less. On 2-lane roads, additional consideration should be given to the level of maintenance that is needed for this treatment. On higher-speed, higher-volume, and/ or multilane roads, this treatment may not be as visually prominent; therefore, it may be less effective (drivers may not notice the signs in time to stop in advance of the crosswalk). For such roadways, more robust treatments will be needed. MUTCD Section 2B.12—In-Street and Overhead Pedestrian Crossing Signs contains additional information about these signs.

WSDOT does not have a policy for when and where to install in-street pedestrian crossing signs at uncontrolled locations.

RECOMMENDATION 38: Update the Design Manual to include in-street pedestrian crossing sign, consistent with the MUTCD. The Traffic Division, Active Transportation Division and Design Division will share responsibility for leading this effort.

Illumination

In Washington State, the highest number of crashes between motorists and pedestrians tends to occur during November through February, when there is poor visibility and fewer daylight hours. The WSDOT Design Manual notes that illumination of pedestrian crossings and other walkways is an important design consideration because lighting has a major impact on a pedestrian's safety and sense of security. Illumination provided solely for vehicular traffic is not always effective in lighting parallel walkways for pedestrians.[4]

2 WSDOT Design Manual, p. 1510-24
3 SHSP, p. 105
4 WSDOT Design Manual, p. 1510-42

RECOMMENDATION 30: WSDOT will continue to provide lighting at marked crosswalks at uncontrolled locations per established guidelines. The Traffic Division will be responsible for leading this effort.

RECOMMENDATION 31: An audit of the WSDOT Design Manual will be completed to cross-reference all guidance related to lighting and updated with reference to pedestrian-scale lighting. DM Chap 1040. The Active Transportation Division will be responsible for leading this effort in conjunction with the Traffic Division and the Design Division.

Curb Extensions

Curb extensions extend the sidewalk or curb face into the parking lane or shoulder at an intersection, thus improving sight distance between the driver and pedestrian. They are typically designed to extend no further than the edge of a parking lane or shoulder. They are also known as neckdowns, bumpouts or bulbouts. They are most commonly applied at intersections where they are intended to reduce the pedestrian crossing distance, slow right-turning vehicles, improve visibility between motorists and pedestrians, and provide more space for landscaping or stormwater management, among other features. When trees are planted on curb extensions, they can be an effective treatment to visually narrow a street and thus create traffic calming effects. It is important that the trees are selected and trimmed to avoid any sightline issues. Curb extensions can affect bicyclist mobility; design needs to take this into consideration.

The WSDOT Design Manual includes detailed guidance on curb extensions, noting that they may improve sight distance, reduce pedestrian crossing times and provide more space for pedestrians.[5]

RECOMMENDATION 32: WSDOT will continue to install curb extensions where appropriate and will explore revising the Design Manual to consider spot curbs and bulb outs in conjunction with transit stops on roadways without curbs and gutters (urban, suburban, and rural town centers) and the use of a swale or rain garden as a proxy to a curb extension. The Design Manual revision will clarify factors to consider when determining where to install curb extensions and their construction specifications.[6] The Design Division and Active Transportation Division will share responsibility for leading this effort in conjunction with the Traffic Division.

Tighter Curb Radii

Tighter curb radii can improve sight lines between driver and pedestrian, shorten the crossing distance, bring crosswalks closer to the intersection, and reduce speeds of right-turning vehicles. Intersection design will determine whether best practices for meeting ADA requirements can be applied. For example, tight curb radii will usually allow for two curb ramps at each corner as opposed to just one. The appropriate radius should be calculated for each corner on a case by case basis, taking into account the design vehicle.

The WSDOT Design Manual includes a detailed discussion of the intersection design vehicle. Some key points are that an intersection design vehicle is a specific selection made at each intersection; that the purpose of providing flexibility related to the intersection design vehicle is to balance the design for the users and modes of the corridor, as well as to avoid the unnecessary expense of oversizing intersections.[7] When appropriate, consider accommodating larger vehicles instead of designing for them.[8] Execution of this will include an element of education, especially for design teams, so that fewer

5 WSDOT Design Manual, p. 1510-27
6 (New Design Manual Chapter 1500 being created. It will include information related to networks and crossing guidance.)
7 WSDOT Design Manual, p. 1003.3
8 WSDOT Design Manual, p. 1310-4

projects will default to the largest design vehicle. It will include information about using data and land use context early in the planning phase so that the determination of the design vehicle and appropriate curb radii doesn't result in project delays.

RECOMMENDATION 33: WSDOT will revise its current guidelines to develop a more nuanced approach to curb radii. Consideration will be given to changing the text to convey the notion that different solutions may be needed for each corner of the intersection. The guidelines should include enhanced graphics, showing two or three ways to accommodate various situations. Training and cross-office coordination recommendations will be developed. The Active Transportation Division in conjunction with the Traffic Division and Design Division will be responsible for leading this effort.

2. Raised Crosswalks

Raised crosswalks function as an extension of the sidewalk and allow a pedestrian to cross the street without stepping down to street level. A raised crosswalk is typically a candidate treatment on 2-lane or 3-lane roads with speed limits of 30 mph or less and AADTs below 9,000. Raised crossings are generally avoided on truck routes, emergency routes, and arterial streets. For retrofit projects, drainage needs to be evaluated and revised as necessary. See MUTCD Section 3B.25—Speed Hump Markings for additional information about markings that can be used alongside raised crosswalks.

WSDOT is considering the use of more raised crosswalks in conjunction with marked crossings at roundabouts and free right turns (next to a 'pork chop' island).

RECOMMENDATION 34: Over the next year, WSDOT will develop and provide written guidance on criteria for when to install raised crosswalks in cities under 27,500 (jurisdictions in which WSDOT has responsibility for design, operations and maintenance of main street highways), particularly in conjunction with roundabouts and free right turns. Design guidance on how to address drainage, snow plowing, EMS and parking will be included. WSDOT will work with local partners in larger jurisdictions as appropriate. The Maintenance Office, Active Transportation Division Traffic Division and Design Division will be responsible for leading this effort.

3. Pedestrian Refuge Islands

A pedestrian refuge island is typically constructed in the middle of a 2-way street and provides a place for pedestrians to stand and wait for motorists to stop. This countermeasure is highly desirable for midblock pedestrian crossings on roads with four or more lanes and should be considered especially for undivided crossings of four or more lanes with speed limits of 35 mph or greater and/or AADTs of 9,000 or greater. Median islands may also be a candidate treatment for uncontrolled pedestrian crossings on 3-lane or 2-lane roads, especially where the street is wide and/or where vehicle speed or volumes are moderate to high. Consideration should be given to creating a two-stage crossing with the island to encourage pedestrians to cross one direction of traffic at a time and look towards oncoming traffic before completing the second part of the crossing. The minimum pedestrian refuge island width is 6 feet. MUTCD Sections 3B.10—Approach Markings for Obstructions, 3B.18—Crosswalk Markings, and 3B.23—Curb Markings provide additional information.

The WSDOT Design Manual includes a detailed discussion of pedestrian refuge islands. Some key points are that pedestrian refuge islands minimize the pedestrian crossing distance, reduce the conflict area, and minimize the effects on vehicular traffic;[9] and that one of the primary functions of a median is

9 WSDOT Design Manual, p. 1310-11

to accommodate a pedestrian refuge area at crossing locations.[10] Target Zero recommends that pedestrian safety be improved by installing refuge islands at pedestrian crossings.[11]

RECOMMENDATION 20: WSDOT will review and refine the Design Manual, Traffic Manual and Standard Plan to include a more detailed information/ discussion regarding geometrics and the placement of crossing islands and use of the two-way left turn lane. The Design Division in conjunction with the Traffic Division, Safety and Active Transportation Division will be responsible for leading this effort.

4. Traffic Signals, Pedestrian Hybrid Beacons (PHBs), and Pedestrian Half Signals

In some locations drivers may need to come to a complete stop to allow pedestrians to cross and a traffic signal may be the preferred countermeasure. A PHB is a candidate treatment for midblock crossings, especially for roads with three or more lanes that generally have AADT above 9,000. Where the roadway speed limits are equal to or greater than 40 mph PHBs should be strongly considered for all midblock crossings and traffic signals or pedestrian half signals should be considered for intersection crossings. Refer to Table 1 for other conditions where PHBs and pedestrian half signals should be strongly considered and MUTCD Chapter 4F-Pedestrian Hybrid Beacons for their application.

PHBs and pedestrian half signals are used throughout the State. WSDOT often works with local transportation agencies to locate these pedestrian signal types.

RECOMMENDATION 21: Over the next two years, WSDOT will develop and provide additional guidance on use of traffic signals, pedestrian half signals and PHBs for pedestrian crossings. Included will be guidance on how to mitigate uncertainty concerning the choice of a PHB, a regular signal or a pedestrian half signal. Information will be shared with local agencies. The Traffic Office will be responsible for leading this effort. Active Transportation Division will assist.

5. Road Reconfiguration for All Modes

A road reconfiguration, also called a road diet, is a technique in transportation planning whereby the number of motor vehicle travel lanes and/or effective width of the road is reduced in order to achieve systemic improvements. A frequently implemented road reconfiguration involves converting a 4-lane, undivided roadway into a 3-lane roadway with a center turn lane. The reconfiguration may also include the addition of bike lanes, providing an additional buffer between pedestrian traffic and motor vehicle traffic. This is a candidate treatment for undivided roads with wide travel lanes or multiple lanes that can be narrowed or repurposed to improve pedestrian crossing safety and bicycling facilities.

After conducting a traffic analysis to consider its feasibility, a road reconfiguration may be a good candidate for use on roads with four or more lanes and traffic volumes of approximately 20,000 or less. In some cases, road reconfigurations have been implemented on roads with AADTs of up to 25,000 without a loss of capacity.[12] By reducing the width of the roadway, pedestrians benefit from shorter crossing distances and often bike lanes or streetscape features can be added. Road reconfigurations can improve safety for all modes with an overall crash reduction of 19 to 47 percent.[13] Road reconfigurations are often effectively accomplished during pavement resurfacing and enable the implementation of many of the other countermeasures discussed above.

10 WSDOT Design Manual, p. 1230-04
11 SHSP, p. 105
12 Road Diet Information Guide, Appendix A – Road Diet Safety Assessment Studies, p. 53
13 Road Diet Information Guide, p. 1

The WSDOT Design Manual includes a detailed discussion of road reconfigurations (road diets):

"…a road diet can improve intersection sight distance, and in some cases, improve mobility performance, for motorists…. FHWA recommends limiting road diet applications to roadways of 20,000 ADT or less, although road diets have been successful at locations with 25,000 ADT in various parts of the country…. However, locations with a different modal priority and higher ADT may still be candidates for road diets. The Region Traffic Engineer must approve road diet applications on state highways."[14]

RECOMMENDATION 15: WSDOT will actively pursue the use of road reconfigurations (also known as road diets) where appropriate and will:

» Complete a network analysis to identify corridors in the urban core, urban and rural town center areas where traffic volumes are below 20,000 vehicles per day. Institutionalize a clear, predictable process whereby road reconfiguration will be considered during reconstruction, maintenance, and preservation projects at these locations. This will consider time/staff expense for community engagement, design and traffic analysis conducted ahead of scheduled program activities.

Region Traffic, and Active Transportation Division will be responsible for leading this effort and the Design Division, CPDM and Traffic Division will assist.

In addition, Practical Solutions principles and approaches will be used to develop up-front design standards that don't overbuild roads so that streets have a narrower, pedestrian-friendly design, particularly in urbanized/urbanizing areas.

6. Rectangular Rapid Flash Beacon (RRFB)

At some uncontrolled crossings, particularly those with four or more lanes, and posted speeds above 25mph it can be difficult to achieve compliance with laws that require motorists to yield to pedestrians. Vehicle speeds create conditions which make it difficult for drivers to yield. One type of device proven to be successful in improving yielding compliance at these locations is the Rectangular Rapid Flash Beacon (RRFB). RRFBs are a pedestrian crossing sign combined with an intensely flashing beacon that is only activated when a pedestrian is present.

RRFBs are considerably less expensive to install than mast-arm mounted signals. They can also be installed with solar-power panels to eliminate the need for a power source. RRFBs should be consistent with WSDOT standard plans http://www.wsdot.wa.gov/publications/fulltext/Standards/psl/IS-22/IS-23.pdf. They are usually implemented at high-volume pedestrian crossings, but may also be considered for school crossings, priority bicycle route crossings or locations where bike facilities/trails cross roads at mid-block locations.

RRFBs must be in accordance with FHWA's Interim Approval (IA-21), issued on 3-20-18. WSDOT has already resubmitted, and received approval from FHWA, to use the RRFB. Target Zero supports the increased use of RRFBs where crosswalk enhancements are needed.[15]

RECOMMENDATION 37: WSDOT will continue to use the RRFB per WSDOT policy and the new FHWA Interim Approval (IA-21). The Department will also provide guidance and encouragement to communities on appropriate use of RRFBs. The Traffic Division will be responsible for leading this effort. The Active Transportation Division will assist.

14 WSDOT Design Manual, p. 1230-22
15 SHSP, p. 150

6

Policy Recommendations

"Institutionalization" is the integration of pedestrian considerations into agency policies, plans, projects and programs. The intent is to make walking and pedestrian safety a mainstream activity. The following implementation strategies provide a roadmap for implementation of this Plan through institutionalization, with the intent of making pedestrian safety a routine part of all WSDOT activities.

Policy Planning and Design Documents

In addition to FHWA, AASHTO and MUTCD guidance, WSDOT has developed agency policy, planning and design guidance on transportation-related topics. They define approaches to solving safety problems, setting priorities and providing decision-making guidance. Policy and planning documents provide a means to increase awareness of pedestrian safety issues while also providing specific objectives for reducing injuries and fatalities. These manuals are the most used resources for engineers within Departments of Transportation and incorporating countermeasure considerations into these manuals is one of the key steps to institutionalizing their routine use.

At any given time, one or more policy, planning and other agency documents are undergoing revisions and updates. This is the ideal time to make changes that begin to institutionalize pedestrian considerations.

Through its Multimodal Technical Work Group, WSDOT is undertaking an audit of guiding documents to identify opportunities to increase multimodal guidance and institutionalize appropriate information and practice.

RECOMMENDATION 3: Whenever WSDOT policy, planning or design documents are revised, WSDOT staff will look for opportunities to include guidance for improving pedestrian safety, with the intent of reducing pedestrian injuries and fatalities. All WSDOT will be responsible for implementing this recommendation. Executive Leadership Team to identify timeline and action owners for implementation.

RECOMMENDATION 40: WSDOT will work to increase the organizational capacity, by region, to be nimble in implementing planning, design, and operational solutions for pedestrians using a practical solutions approach. This will be done by:

- Considering how to develop and incorporate appropriate expectations for subject matter knowledge and training in active transportation and pedestrian safety in position descriptions and performance expectations.
- Work with colleges and universities to monitor, educate, and influence planning, engineering and design training about vulnerable road users.

» Work with Workforce Development strategic goal leads on identifying training needs for pedestrian safety to meet, measure and report success and lessons learned.

The Design, Planning and Traffic Divisions will be responsible for leading this effort. The Active Transportation Division and Region Traffic will assist.

Annual Resurfacing Program

Integrating pedestrian facilities into routine reconstruction and resurfacing projects as part of WSDOT's Highway Improvement Program using road reconfigurations and other repurposing of roadway space is a cost-effective way to institutionalize the practice of incorporating pedestrian facilities into resurfacing projects.

WSDOT has started to review all resurfacing projects for opportunities to include pedestrian improvements at marked crosswalks at uncontrolled locations.

RECOMMENDATION 16: WSDOT will continue to move toward two- to three-year advance notice for the resurfacing program to allow for consideration of road reconfigurations, traffic calming and other pedestrian improvements, identifying the institutional changes needed to ensure agency buy-in to this revised approach and engaging local partners. CPDM and MM Tech Forum will be responsible for leading this effort, assisted by Design Division and the Traffic Division.

American Disabilities Act (ADA) Transition Plan

The draft WSDOT ADA Transition Plan ensures that all pedestrian facilities will become accessible over time. Implementation of the ADA Transition Plan also provides an opportunity to make safety improvements that benefit all pedestrians. Whenever streets are resurfaced curb ramps and other accessibility improvements must be made; this activity opens opportunities for crosswalk countermeasures. It is also an opportunity to review the design of the sidewalk interface with the curb ramp to consider a more direct approach, proper sightlines, and overhead pedestrian-scale lighting.

RECOMMENDATION 4: Implement the currently adopted ADA Transition Plan. This will include:

» Following the schedule recommended in the plan for implementation;

» Expanding the policy language needed for implementation.

All WSDOT will be responsible for implementing this recommendation.

Public Involvement as an Implementation Strategy

WSDOT recognizes that public involvement is another excellent way to get a better product. It also builds public support for programs and policies to reduce pedestrian-involved. To be effective, stakeholders must feel listened to and heard. WSDOT Region offices are making use of creative and inclusive approaches for engagement, for example utilizing school-based communication channels to reach households in an area that will be affected by a project, developing materials in multiple languages based on predominant languages in use in a community, and utilizing online open houses, surveys, and other mechanisms for involvement. They are also working closely with our local agency partners, so we have consistency and inclusion in their local plans. Such practices should be encouraged and used systematically.

WSDOT is also recognized as a national leader in its use of social media; reviewing its messaging approach to include pedestrian safety, reminders to drivers of their responsibility and how in certain contexts reducing the speed limit can save lives, and project implementation information will leverage this set of

tools. Its recently updated community engagement plan can be found at: https://www.wsdot.wa.gov/sites/default/files/2017/02/28/FinalCEP2016.pdf

The Pedestrian Safety Advisory Council was established in 2015 and issued its first report in 2016 (http://wtsc.wa.gov/download/5971). WSDOT staff participate in the Council. The Council identified a set of recommendations to include in its 2017 annual report to the Legislature based on its meetings during 2017 (http://wtsc.wa.gov/wp-content/uploads/dlm_uploads/2018/04/2017-Revised-Final-PSC-Annual-Report-18-0320.pdf). The 2018 work plan for the Council will include learning about and developing recommendations for the differing traffic safety needs of various disability communities and non-English speakers, as well as additional work on the relationship between speed and pedestrian fatalities and serious injuries.[1]

A parallel council focusing on bicyclist safety, the Cooper Jones Bicyclist Safety Advisory Council, was established in 2016 and issued its first report in 2017 (http://wtsc.wa.gov/wp-content/uploads/dlm_uploads/2018/04/2017-Final-BSAC-Annual-Report-18-0227.pdf). WSDOT staff participate in this Council as well. The two Councils will be meeting jointly at least once in 2018 and will discuss coordination of their recommendations. WSDOT should review both sets of recommendations to identify opportunities to cost-effectively address safety for both pedestrians and bicyclists as vulnerable road users.

RECOMMENDATION 5: WSDOT will continue and expand its utilization of creative and more inclusive models for conducting community engagement. All WSDOT will be responsible for implementing this recommendation.

RECOMMENDATION 21: WSDOT will look to the Pedestrian Safety Advisory Council and Bicyclist Safety Advisory Council for additional input and recommendations. The Active Transportation Division and the Traffic Office will be responsible for implementing this recommendation.

Request for Proposals (or Qualifications) – RFPs (or RFQs)

Including experts in pedestrian transportation planning on consulting teams for major public works ensures that opportunities for making pedestrian improvements are maximized. This can be accomplished by making sure that RFPs and RFQs issued by WSDOT include this requirement.

RECOMMENDATION 25: WSDOT will create, review and develop RFPs and RFQs so they include requirements for pedestrian/active transportation expertise. This may include an update to RFP/RFQ development policy. The Project Managers will be responsible for leading this effort, working with the Active Transportation Division and Contract Services Office.

Ongoing Training

WSDOT recognizes that the field of pedestrian transportation planning and design is changing rapidly as new research is completed and innovative approaches are implemented. The 2008 WSDOT Bicycle and Pedestrian Plan called for WSDOT to initiate a new training program for all transportation engineers (state and local) focused on bicyclist and pedestrian design and funding programs.[2] A variety of training programs have been offered but a majority of engineers have not participated in past opportunities.

RECOMMENDATION 41: WSDOT will review the current approach to training delivery, focusing on the following actions. While specific to STEP, some actions could also be applicable to other trainings.

1 Traffic Safety Annual Report 2017, p. 6
2 BFPWP, p. 2

Review marketing strategy – create better awareness of existing pedestrian training topics, lengths, etc. Transportation Division staff and Region-based active transportation coordinators will alert engineers to existing resources.

- When the Design Manual and Traffic Manual are updated – coordinate with Development Division and Traffic Division to provide training; ensure training is digested and applied
- Develop short 'how to do XYZ' trainings on selected topics related to pedestrian safety
- Identify opportunities to provide trainings at professional conferences attended by WSDOT engineers and partner jurisdictions
- Work with Region office leaders to identify and increase availability of funding and support for participation in training activities and relevant local, state and national conferences
- Provide information and recommendations as talking points in the internal safety newsletter. Use small folios with the information to share with the Region offices and external partners.

The Active Transportation Division, Design and Multimodal Technical Forum will work together on this effort.

Additional Recommendations

RECOMMENDATION 26: WSDOT will create a multi-agency, multi-jurisdiction work group to develop a target speed policy and guidelines that emphasizes lower speeds on state routes, city streets, county and tribal roads compatible with the needs and safety of all users. (Pedestrian Safety Advisory Council 2017 Recommendation, work underway.) ATD, Traffic, Safety and Local Programs will work together on this recommendation.

RECOMMENDATION 9: Update the Design Manual and Traffic Manual with a revised traffic impact analysis process that includes potential for pedestrian generators, attractors and land use context. Include Active Transportation staff as part of the review for this work. Design and Traffic will lead, ATD will assist.

RECOMMENDATION 2: WSDOT will identify funding strategies and recommendations for the installation and maintenance of pedestrian crossing countermeasures. This will include consideration for city size and coordinated investments and consideration of existing WSDOT policy on maintenance priorities. ATD will lead this effort.

RECOMMENDATION 33: WSDOT will identify funding strategies and recommendations for the installation and maintenance of pedestrian crossing countermeasures. This will include consideration for city size and coordinated investments and consideration of existing WSDOT policy on maintenance priorities. ATD and Maintenance Office will lead this effort.

RECOMMENDATION 23: WSDOT will further clarify and negotiate authority and responsibility with local agencies regarding funding and maintenance of pedestrian facilities. The Traffic Office, Maintenance Office and Local Programs will lead this effort.

Glossary

AVERAGE ANNUAL DAILY TRAFFIC (AADT)
The total volume of traffic passing a point or segment of a highway facility in both directions for one year divided by the number of days in the year.

AVERAGE DAILY TRAFFIC (ADT)
The average 24-hour volume of traffic passing a point or segment of a highway in both directions.

COMPLETE STREETS
Complete Streets are designed and operated to enable safe access for all users, including pedestrians, bicyclists, motorists, and transit riders of all ages and abilities. (Smart Growth America, National Complete Streets Coalition).

CONTROLLED PEDESTRIAN CROSSING
A pedestrian crossing where motorists are required to stop by either a STOP sign, traffic signal, or other traffic control device.

CRASH MODIFICATION FACTOR (CMF)
A multiplicative factor used to compute the expected number of crashes after implementing a given countermeasure. If available, calibrated or locally developed State estimates may provide a better estimate of effects for the State. (Crash Modification Factors Clearinghouse).

CRASH REDUCTION FACTOR (CRF)
The percentage crash reduction that might be expected after implementing a given countermeasure at a specific site.

CURB EXTENSIONS
A roadway edge treatment where a curb line is bulbed out toward the middle of the roadway to narrow the width of the street. Curb extensions are sometimes called "neckdowns."

HIGHWAY SAFETY IMPROVEMENT PROGRAM (HSIP)
A Federal-aid program with the purpose to achieve a significant reduction in traffic fatalities and serious injuries on all public roads, including non-State-owned roads and roads on tribal land. The HSIP requires a data-driven, strategic approach to improving highway safety on all public roads with a focus on performance. (FHWA).

HIGH VISIBILITY CROSSWALK
A pedestrian crossing location marked by patterns such as zebra, ladder, or continental markings as described by the MUTCD.

MARKED CROSSWALK
A pedestrian crossing that is delineated by white crosswalk pavement markings.

PARKING RESTRICTION
Parking restriction can include the removal of parking space markings, installation of new "parking prohibition" pavement markings or curb paint, and signs.

PEDESTRIAN HYBRID BEACON (PHB)
A traffic control device with a face that consists of two red lenses above a single yellow lens. Unlike a traffic signal, the PHB rests in dark until a pedestrian activates it via pushbutton or other form of detection.

RAISED CROSSWALK
Raised crosswalks are ramped speed tables spanning the entire width of the roadway, often placed at midblock crossing locations.

REFUGE ISLAND
A median with a refuge area that is intended to help protect pedestrians who are crossing the road. This countermeasure is sometimes referred to as a crossing island or pedestrian island.

ROAD DIET

A roadway reconfiguration resulting in a reduction in the number of travel lanes. The space gained by eliminating lanes is typically used for other uses and travel modes (FHWA).

ROAD SAFETY AUDIT (RSA)

A formal examination of an existing or future road or intersection by a multidisciplinary team. It qualitatively estimates and reports on potential road safety issues and identifies opportunities for improvements in safety for all road users (FHWA).

TOWARD ZERO DEATHS (TZD)

TZD is a traffic safety framework that seeks to eliminate highway fatalities by engaging diverse safety partners and technology to address traffic safety culture (also see Vision Zero).

UNCONTROLLED PEDESTRIAN CROSSING

An established pedestrian crossing that does not include a traffic signal, beacon, or STOP sign to require that motor vehicles stop before entering the crosswalk.

VEHICLE QUEUE

A line of stopped vehicles in a single travel lane, commonly caused by traffic control at an intersection.

VISION ZERO (VZ)

Similar to TZD, Vision Zero is a vision to eliminate traffic fatalities and serious injuries within the transportation system. VZ employs comprehensive strategies to address roadway design, traffic behavior, and law enforcement.

1) Speed and separation – where pedestrian and motorized traffic mix speed should be low; where the speed differential is high pedestrians and motorists should be separated.

2) Functional harmony – when road characteristics are in agreement with expected user groups and adjacent land use context.

3) Predictability and simplicity – understanding that people will make fewer mistakes when they know what to expect and decisions are simple.

4) Forgivingness and restrictiveness – where the system is designed so that if someone makes a mistake it will not result in serious or fatal injury and where the road prevents people from making mistakes they might be inclined to make.

5) State Awareness – refers to things outside the realm of road design, such as drunk driving, distractions and inexperienced operators.

Appendix: CRF and CMF Summary Table

Table 3. CRFs and CMFs by countermeasure.

Countermeasure	CRF	CMF	Basis	Reference
Crosswalk visibility enhancement[1]	—	—	—	—
Advance STOP/YIELD signs and markings	25%	0.75	Pedestrian crashes[2]	Zegeer, et. al. 2017
Add overhead lighing	23%	0.77	Total injury crashes	Harkey, et. al. 2008
High-visibility marking[3]	48%	0.52	Pedestrian crashes	Chen, et. al., 2012
High-visibility markings (school zone)[3]	37%	0.63	Pedestrian crashes	Feldman, et. al. 2010
Parking restriction on crosswalk approach	30%	0.70	Pedestrian crashes	Gan, et. al., 2005
In-street Pedestrian Crossing sign	UNK	UNK	N/A	N/A
Curb extension	UNK	UNK	N/A	N/A
Raised crosswalk (speed tables)	45%	0.55	Pedestrian crashes	Elvik, et. al., 2004
	30%	0.70	Vehicle crashes	
Pedestrian refuge island	32%	0.68	Pedestrian crashes	Zegeer, et. al., 2017
PHB	55%	0.45	Pedestrian crashes	Zegeer, et. al., 2017
Road Diet – Urban area	19%	0.81	Total crashes	Pawlovich, et. al., 2006
Road Diet – Suburban area	47%	0.53	Total crashes	Persaud, et. al., 2010
RRFB	47%	0.53	Pedestrian crashes	Zegeer, et. al., 2017

[1]This category of countermeasure includes treatments which may improve the visibility between the motorist and the crossing pedestrian.

[2]Refers to pedestrian street crossing crashes, and does not include pedestrians walking along the road crashes or "unusual" crash types.

[3]The effects of high-visibility pavement markings (e.g., ladder, continental crosswalk markings) in the "after" period is compared to pedestrian crashes with parallel line markings in the "before" period.

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dlm_uploads/2018/04/2017-Revised-Final-PSC-Annual-Report-18-0320.pdf and 2016 report http://wtsc.wa.gov/wp-content/uploads/2014/06/2016-PSAC-Annual-Report-Final.pdf.

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9. Washington State's Strategic Highway Safety Plan 2016 (SHSP), Zero Deaths, Zero Serious Injuries, 2030, The Traffic Safety Partnership (Multiple State, Federal, Regional and Local agencies), 2016.

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12. Zegeer, C., R. Srinivasan, B. Lan, D. Carter, S. Smith, C. Sundstrom, N.J. Thirsk, J. Zegeer, C. Lyon, E. Ferguson, and R. Van Houten. NCHRP Report 841: Development of Crash Modification Factors for Uncontrolled Pedestrian Crossing Treatments. NCHRP, Transportation Research Board, Washington, DC, 2017.

Resources

EDC Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations (2018)

This guide assists State or local transportation or traffic safety departments that are considering developing a policy or guide to support the installation of countermeasures at uncontrolled pedestrian crossing locations. This document provides guidance to agencies, including best practices for each step involved in selecting countermeasures. By focusing on uncontrolled crossing locations, agencies can address a significant national safety problem and improve quality of life for pedestrians of all ages and abilities. Agencies may use this guide to develop a customized policy or to supplement existing local decision-making guidelines

FHWA How to Develop a Pedestrian and Bicycle Safety Action Plan (2017)

The purpose of this guide is to assist agencies in developing and implementing a safety action plan to improve conditions for bicycling and walking. The plan lays out a vision for improving safety, examining existing conditions, and using a data-driven approach to match safety programs and improvements with demonstrated safety concerns. This guide will help agencies enhance their existing safety programs and activities, including identifying safety concerns and selecting optimal solutions. It will also serve as a reference for improving pedestrian and bicycle safety through a multidisciplinary and collaborative approach to safety, including street designs and countermeasures, policies, and behavioral programs.

NCHRP Report 803: Pedestrian and Bicycle Transportation Along Existing Roads—ActiveTrans Priority Tool Guidebook (2015)

This resource includes an interactive tool and guidance to help agencies prioritize pedestrian and bicycle improvements, including safety projects, either as standalone or incidental to a roadway project.

FHWA Achieving Multimodal Networks: Applying Design Flexibility and Reducing Conflicts (2016)

This resource focuses on flexibility and options for the design of pedestrian and bicycle networks designed to minimize crash conflicts, including case studies to illustrate various design treatments.

FHWA State SHSP Resources

The FHWA Office of Safety posts a link to each State's current SHSP. This website also lists noteworthy practices. Many SHSP plans provide an emphasis on pedestrians and contain goals for reducing traffic fatalities and injuries.

FHWA HSIP Resources

The HSIP includes the projects selected for implementation, an evaluation of past projects, and an annual status report. Projects can include pedestrian safety improvement programs and projects. For example, the 2016 Oregon HSIP Annual Report details how the its All Roads Transportation Safety Program sets aside funding to address systemic pedestrian crash locations.

State HSP Documents

NHTSA posts the States' current HSP outlining non-infrastructure strategies for improving roadway safety. A State HSP is likely to contain a pedestrian fatality and injury reduction goal, an associated performance measure, and describe non-infrastructure initiatives like enforcement and education programs. For example, Colorado DOT's 2017 HSP (called the 2017 Integrated Safety Plan) supports the Denver Police Department's "Decoy Pedestrian Program" to enforce driver yielding compliance at high-crash pedestrian crossings.

Manual on Uniform Traffic Control Devices (MUTCD)

This manual provides transportation engineers and planners with detailed guidance for the design and application of traffic control devices, including signage, roadway markings, and intersection controls. Refer to the specific sections of the MUTCD listed in the countermeasure descriptions and consult State-level supplements for additional information.

PEDSAFE: Pedestrian Crash Typing

PEDSAFE provides definitions for 12 key pedestrian crash types identified by the software package, the Pedestrian and Bicycle Crash Analysis Tool (PBCAT). PBCAT is still used by many agencies but may not be compatible with some current operating systems.

NHTSA Pedestrian Safety Information

NHTSA publishes annual reports summarizing the latest pedestrian fatality statistics. These statistics are based on FARS and the reports describe pedestrian fatality trends per different socioeconomic groups and for each State.

Walkability Checklist

This tool can be used by community leaders during a walkability audit to evaluate pedestrian infrastructure and traffic behavior.

FHWA Model Road Safety Audit Policy (2014)

This resource outlines the steps typically taken to conduct an RSA and the roles of the stakeholders. Identifying safety issues is an element of the RSA that is accompanied by suggestions on how to enhance the specific road's safety.

Vision Zero Network

This collaborative website posts case studies and tracks cities who are implementing Vision Zero plans or goals. The Vision Zero Network website also notes best practices by agencies who are working to eliminate traffic fatalities and serious injuries. Vision Zero goals are accompanied by policies, strategies, and target dates. For example, Columbia, Missouri's Vision Zero Action Plan contains an outreach campaign to educate pedestrians and drivers on new and potentially confusing infrastructure improvements like pedestrian hybrid beacons and enhanced pedestrian crosswalks.

Countermeasure Selection System

This online tool includes links to research studies, crash reduction statistics, and case studies for nearly 70 pedestrian safety countermeasures. Its Countermeasure Selection Tool provides countermeasure recommendations for uncontrolled crossing locations based upon variables such as AADT, vehicle speed, and number of lanes.

Highway Safety Manual

This manual provides detailed guidance for the collection, analysis, and evaluation of roadway crash data, as well as related CMFs and treatment selection guidance.

FHWA Road Diet Desk Reference (2015)

This resource includes sample policy, case studies, and design guidance for agencies and decision-makers considering Road Diets. The benefits of Road Diets include reducing vehicle speeds, reducing number of lanes to cross, and allocating space for pedestrian refuge island.

FHWA Design Resource Index

This resource directs practitioners to the specific location of information about pedestrian and bicycle treatments or countermeasures, across various design guidelines published by organizations such as AASHTO, the Institute of Transportation Engineers, and National Association of City Transportation Officials.

TCRP REPORT 112/NCHRP REPORT 562: Improving Pedestrian Safety at Unsignalized Crossings (2006)

This document recommends treatments to improve safety for pedestrians crossing high-volume, high-speed roadways at unsignalized intersections, with

particular focus on roadways served by public transportation.

AASHTO Guide for the Planning, Design, and Operation of Pedestrian Facilities, 1st Edition (2004)
This guide provides recommendations for the planning, design, and operation of accommodations for pedestrians on public rights-of-way. This guide also discusses the impact of land use and site design on pedestrian safety and connectivity

FHWA Federal-aid Program Administration
This website includes links to guidance for local and State governments administering federally-funded projects, such as those funded by HSIP or STBG.

Pedestrian RSA Guidelines and Prompt Lists (2007)
This resource complements practices for RSAs with additional guidance and a field manual for a pedestrian-focused RSA. An RSA team will use the knowledge of a diverse team, analysis of crash data, and a site visit to identify pedestrian safety issues.

Pedestrian RSA Case Studies (2009)
This website provides links to several examples of RSAs focused on identifying pedestrian safety risks and improvement strategies. For example, the City of Tucson, Arizona conducted an RSA of roadways with PHBs to improve the countermeasures' visibility and usability.

FHWA Pedestrian and Bicycle Funding Opportunities Summary (2016)
This resource includes a matrix comparing eligibility of various federal transportation funding programs for different types of bicycle and pedestrian projects.

FHWA Guidebook for Developing Pedestrian and Bicycle Performance Measures (2016)
This resource identifies a wide variety of potential metrics for setting goals, prioritizing projects and evaluating outcomes of bicycle and pedestrian plans, including plans for pedestrian safety improvements. Performance measures may include pedestrian levels of service or pedestrian fatality rates.

NCHRP Report 841: Development of Crash Modification Factors for Uncontrolled Pedestrian Crossing Treatments (2017)
This report describes the safety benefits and CMFs for four types of pedestrian crossing treatments—rectangular rapid flashing beacons, PHBs, pedestrian refuge islands, and advance crosswalk signs and pavement markings.

NCHRP Synthesis 498: Application of Pedestrian Crossing Treatments for Streets and Highways (2016)
This is a compilation of existing practices regarding the selection and implementation of pedestrian crossing improvements, as well as a literature review of research on more than 25 pedestrian crossing treatments.

NHTSA "A Primer for Highway Safety Professionals" (2016)
This resource outlines a comprehensive approach to improving safety for bicyclists and pedestrians and offers a summary of the most frequently used engineering, enforcement, and education safety measures. The resource identifies how certain treatments may be placed in relation to other treatments, such as the coordinated installation of a pedestrian refuge island and lighting.

U.S. Department of Transportation
Federal Highway Administration