

Memorandum

February 6, 2023

Project# 27003.003

To: Sandra Hikari, Project Manager
 Oregon Department of Transportation
 123 NW Flanders Street
 Portland, OR 97209

From: Camilla Dartnell, PE, Russ Doubleday, and Hermanus Steyn, PE, PE

CC: Scott Turnoy, ODOT; Scott Hoelscher, Clackamas County

RE: Safety Countermeasures Toolkit

SAFETY COUNTERMEASURES TOOLKIT

This document identified potential pedestrian and bicycle safety countermeasures that may be applicable to different contexts along McLoughlin Boulevard (OR 99E) between milepost 6.7 north of the SE Park Avenue MAX station and milepost 11.2 on the bridge over the Clackamas River. Many of these are systemic engineering countermeasures that can be applied on a wide-scale for relatively low-cost. Many of these may be incorporated into ongoing maintenance activities to maximize cost-effectiveness. We have presented the countermeasures in two general groups and summarized the documented effectiveness at reducing crashes through the Crash Reduction Factor (CRF), when available:

- » **Pedestrian Crash Countermeasures**, which are treatments that are designed to reduce pedestrian crashes both at intersections and at midblock locations. With very limited sidewalk gaps along McLoughlin Boulevard, the treatments are primarily focused on crossing treatments.
- » **Bicycle Crash Countermeasures**, which are treatments that are designed to reduce bicycle crashes both at intersections and along segments. With bike lanes present along the whole length of this section of McLoughlin Boulevard (and some buffered bike lanes present south of SE Roethe Road), the treatments are primarily focused on more comfortable segment treatments and intersection treatments.

Table 1. Systemic Treatments for Pedestrians and Bicyclists along Roadway Segments

ID	Countermeasure	Applicable Crash Types	Crash Reduction Factor (CRF)	Planning Level Cost
<i>Pedestrian Crash Countermeasures</i>				
1.1	Install Pedestrian-Scale Lighting	Nighttime Pedestrian Crashes	42% (ARTS)	\$
1.2	Install Pedestrian Countdown Timer	Pedestrian Crashes at Intersections	0 – 70% (ARTS)	\$
1.3	Install Leading Pedestrian Interval at Signal	Pedestrian Crashes at Intersections	37 – 45% (ARTS)	\$
1.4	Install Curb Ramps and Extensions with a Marked Crosswalk and Pedestrian Warning Signs	Pedestrian Crashes at Intersections	37% (ARTS)	\$

ID	Countermeasure	Applicable Crash Types	Crash Reduction Factor (CRF)	Planning Level Cost
1.5	Install Pedestrian Refuge Island	Pedestrian Crashes at Intersections	26 – 31% (ARTS)	\$
1.6	Install Rapid Rectangular Flashing Beacon	Midblock Pedestrian Crashes	10 – 56% (ARTS)	\$
1.7	Install Pedestrian Hybrid Beacon	Midblock or Unsignalized Pedestrian Crashes	55 – 69% (ARTS)	\$\$
1.8	Install Pedestrian Signal	Midblock or Unsignalized Pedestrian Crashes	15 – 69% (ARTS)	\$\$
1.9	Prohibit Right Turns on Red	Pedestrian Crashes at Intersections	26 – 44% (ARTS)	\$
1.10	Increase Length of Signal Phases to Allow Pedestrians More Crossing Time	Pedestrian Crashes at Intersections	51% (CMF ID 5252)	\$
1.11	Sidewalk	Pedestrian Crashes on Segments	20% (ARTS)	\$\$\$
Bicycle Crash Countermeasures				
2.1	Install Buffered Bike Lanes	Bicycle Crashes on Segments	47% (ARTS)	\$\$
2.2	Install Separated Bike Lanes	Bicycle Crashes on Segments	59 – 74% (ARTS)	\$\$\$
2.3	Install Green Bike Lanes at Conflict Points	Bicycle Crashes at Intersections at Intersections or on Segments	39% (ARTS)	\$
2.4	Install Bike Box at Conflict Points	Bicycle Crashes at Intersections at Intersections or on Segments	35% (ARTS)	\$
2.5	Two-Stage Turn Boxes	Bicycle Crashes at Intersections	Not Documented	\$
2.6	Install Bike Signal	Bicycle Crashes at Intersections	45% (ARTS)	\$
2.7	Install Protected Intersection	Bicycle Crashes at Intersections	Not Documented	\$\$\$
2.8	Install Speed Feedback Sign	Bicycle Crashes on Segments	10%	\$