NE 8th St, Bellevue, King County, Washington

STEP Pedestrian Road Safety Assessment Report

March 25-26, 2021

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Acknowledgements

The City of Bellevue would like to thank the following organizations for providing valuable input throughout the RSA process:

- Complete Streets Bellevue
- King County Metro
- Washington State Department of Transportation
- usRAP & Road Safety Foundation
- Transoft Solutions
- FHWA Resource Center

The City would also like to thank the FHWA Office of Safety for facilitating the RSA through the STEP Program.

Introduction

Background

The purpose of this study was to complete a road safety assessment (RSA), focusing on pedestrian safety, for NE 8th St, from 140th Ave NE to 164th Ave NE (hereafter "study area"). The Federal Highway Administration (FHWA) supported the RSA through the Safe Transportation for Every Pedestrian (STEP) program. STEP is an innovation of the Every Day Counts (Rounds 4 and 5) initiative. NE 8th St was selected per the request of the City of Bellevue in consultation with the FHWA Washington Division. The City of Bellevue is home to approximately 150,000 people, and the King County Metro transit agency (Metro) and City provide operations and maintenance of their respective facilities along the major and minor arterials.

RSA Site Locations

The corridor is under the jurisdiction of the City of Bellevue. This roadway is primarily a two-way five-lane major arterial with an alternating center two-way left turn lane and raised median, curb and gutter throughout, and sidewalks on both sides from 140th Ave NE to 160th Ave NE. The roadway transitions to a three-lane cross section with a center two-way left turn lane from 160th Ave NE to 164th Ave NE. The posted speed limit is 35MPH from 140th Ave NE to 156th Ave NE and then drops to 30MPH eastward through 164th Ave NE. Annual average daily traffic (AADT) ranges from 20,000-25,000 with volumes higher

in the western portion of the corridor. AADT overall has fallen during the COVID-19 pandemic, but City staff report that volumes have rebounded to near pre-pandemic levels. Speed studies from 2017 indicated 85th percentile speeds near posted limits in the western section of the corridor.

Pedestrian and transit activity are highest near two nodes: 140th Ave NE and 156th Ave NE, with observed pedestrian activity at lower levels elsewhere in the study area. Land use patterns are similar across the corridor, with commercial land uses at intersections and institutional and residential (single family and multi-family) fronting the corridor. The Washington Department of Transportation (WSDOT) provided the pedestrian and bicyclist-involved crash data. ***Major arterials such as NE 8th St represent 94 percent of the City's traffic fatalities and serious injuries, but account for only 33 percent of the City's streets***.[1] The NE 8th St corridor is also part of the City's High Injury Network. This overrepresentation of reported crashes reinforced the need to address safety within the study area.

The RSA reviewed the following seven segments of NE 8th St (Figure 1). Each segment is approximately 1,000 ft long.

- Segment 1: 140th Ave NE to west of 143rd Ave NE
- Segment 2: 143rd Ave NE to 147th Pl NE
- Segment 3: 147th Pl NE to west of 151st Pl NE
- Segment 4: 151st Pl NE to west of 156th Ave NE
- Segment 5: 156th Ave NE to 158th Pl NE
- Segment 6: 158th Pl NE to Crossroads Park
- Segment 7: Crossroads Park to 164th Pl NE

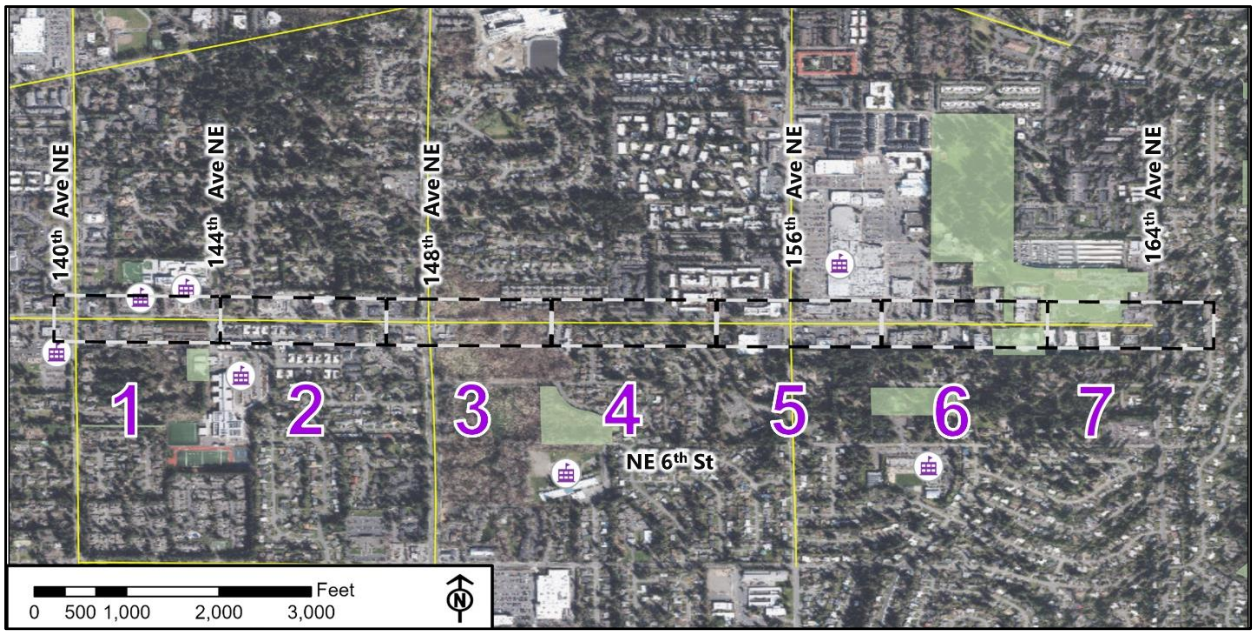


Figure 1 - Study Area Map Segments

[1] Vision Zero Strategic Plan – City of Bellevue, WA, https://bellevuewa.gov/sites/default/files/media/pdf_document/2021/vision-zero-strategic-plan-120120.pdf

RSA Process

RSA Team

The RSA team comprised the following people (presented in alphabetical order by last name):

- Darcy Akers, City of Bellevue
- Joel Barnett, FHWA Washington Division
- Michael Dunn, VHB on behalf of FHWA
- Matthew Enders, WSDOT
- Peter Eun, FHWA Resource Center
- Robbie Frankel, King County Metro
- David Grant, City of Bellevue
- Doug Harwood, usRAP *(guest speaker)*
- Vanessa Humphreys, City of Bellevue
- Chris Iverson, City of Bellevue
- Franz Loewenherz, City of Bellevue
- Tyler Moore, City of Bellevue
- John Murphy, City of Bellevue
- Stela Nikolova, City of Bellevue
- Kristi Oosterveen, City of Bellevue
- Chris Randels, Complete Streets Bellevue *(guest speaker)*
- Rebecca Rodni, City of Bellevue
- Max Scheideman, City of Bellevue
- Joe Seymour, VHB on behalf of FHWA
- Ed Spilker, WSDOT
- Raid Tirhi, City of Bellevue
- Ellen Webster, City of Bellevue

RSA Agenda

The RSA was conducted over a two-day period. Due to travel and group size restrictions from COVID-19, the traditional STEP RSA format was modified to two virtual meetings held on Microsoft Teams that were supplemented with field work from local RSA team members and a walking audit from Complete Streets Bellevue.[2] The general activities conducted by the RSA included:

> Day 1: The RSA team conducted a kick-off meeting and discussed crashes for each of the study area segments and overall conditions. After the kick-off meeting, the RSA team began a review of the corridor's segments with the assistance of a usRAP corridor analysis, aerial imagery, live intersection cameras, community walk audit results, and Transoft Solutions' conflict analytics data and videos. Following the conclusion of Day 1's virtual session, local RSA team members walked along the corridor and reviewed traffic conditions and then returned to the field to complete a nighttime corridor review.

[2] The organization Complete Streets Bellevue conducted a walking audit of the corridor from March 8th through March 13th with community members. The group used the STEP RSA segmentation and walking audit structures from AARP and the Pedestrian Bicyclist Information Center. Walking audits have been previously deployed to complement formal safety investigations, develop support for improvements, and build relationships between transportation practioners and community representatives. See FHWA STEP case study, "Broward MPO Plans for Pedestrian Safety," https://safety.fhwa.dot.gov/ped_bike/step/resources/docs/step_case_studies_broward_county.pdf.

Day 2: The RSA team reconvened over Microsoft Teams to continue discussing the corridor, including new findings and photos from the Day 1 field work and the nighttime field review. Discussion included a review of the STEP countermeasures, potential applications, and initial site-specific and corridor-wide recommendations.

The Appendix includes the RSA's daily agendas, background briefing materials, and other supporting items.

Left: Screenshot of Day 1 Virtual Introductions During the Pedestrian RSA. Credit: FHWA
Right: Picture of RSA team members during the optional afternoon field review on Day 1. Credit: FHWA

Assessment Findings

Area-Wide Positive Features

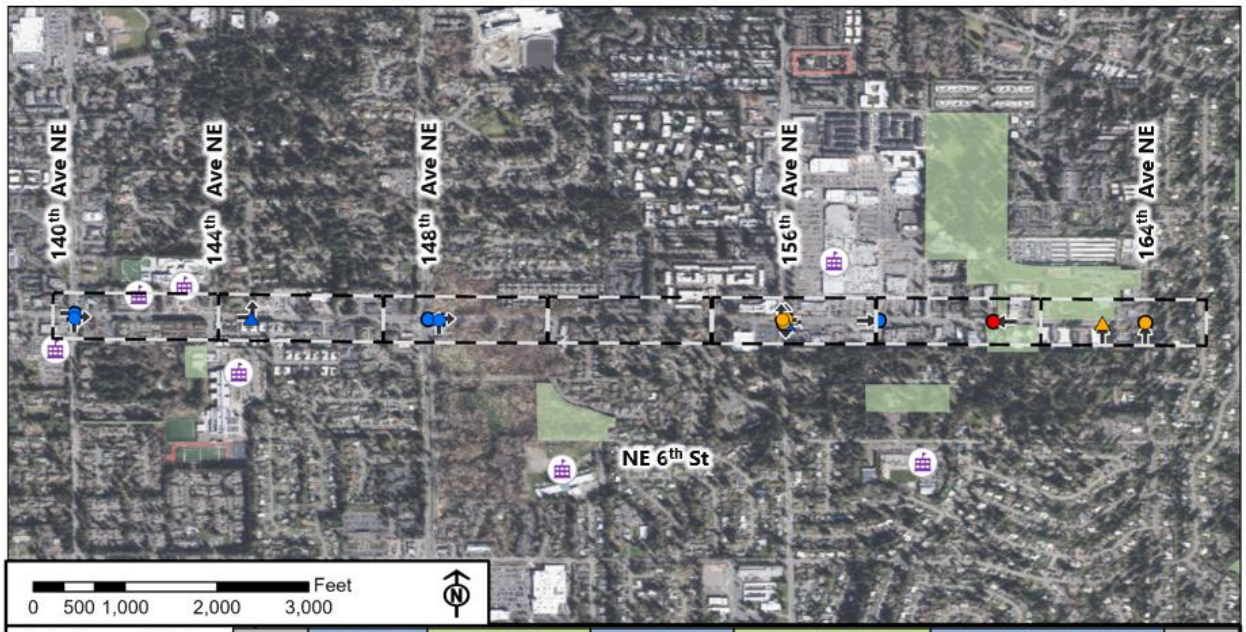
The study area includes numerous features that promote pedestrian safety. These include marked crosswalks and pedestrian signal heads, audible signals, and countdown timers at signalized intersections. Sidewalk is present along both sides of the corridor, and intersection curb ramps have been upgraded and include detectable warning strips. The corridor is posted for 35MPH for its majority length, and speed studies from 2017 indicated 85th percentile speeds in the western section close to 35MPH. Congestion and the traffic signal progression likely contribute to managing traffic speeds, though conducting a speed study is an RSA recommendation noted later on in this report.

King County Metro operates high frequency transit service along and perpendicular to the corridor, with significant boardings and alightings at the stop pair at 140th Ave NE, followed by the stop pair at 148th Ave NE. The combination of numerous stops and transfer activity at the 156th Ave NE intersection and north along 156th Ave NE make the location near the Crossroads Mall a transit hub. Most transit stops have amenities such as lighting, benches, or shelters. Overhead lighting is present throughout the corridor, though there are gaps, with operational and vegetation issues that reduce illumination of pedestrians. The area also demonstrates high pedestrian demand and activity through the combination of housing, transit, schools, parks, retail, grocers, and restaurants. These land uses present support for the improvement and expansion of the existing pedestrian facilities.

The City also coordinated with usRAP to perform an analysis of the corridor using the iRAP software. usRAP coded the corridor according to the iRAP methodology, specifying attributes such as sidewalk, travel speeds, vehicle volumes, and cross section details every 100 meters. This initial analysis indicated that the existing corridor scored four stars for pedestrians and three stars for bicyclists out of five stars. The City will coordinate with usRAP to continue evaluating the City's overall network and the NE 8th St corridor to refine the results and potentially develop an investment plan (i.e. set of improvements for user safety). The usRAP analysis is included in the Appendix.

Area-Wide Reported Pedestrian Crashes

The corridor had 13 reported pedestrian and bicycle crashes from 2016 through 2020 (Figure 2). Bicycle crashes were included in the RSA analysis because of potentially similar travel characteristics (i.e. riding on sidewalk in lieu of on-street bicycle lanes) and the City's commitment to Vision Zero. WSDOT provided the bicycle and pedestrian crash data in advance of the RSA to support analysis and preparation of the field materials and presentation. The City also provided access to conflict analytics analyses from Transoft Solutions for two intersections that detailed "close calls" between all road users (the Transoft findings are included in the Appendix and described in brief in Segments 1 and 5). The FHWA facilitators prepared the crash summaries and segment crash maps.



Year	Type		Time of Day			Lighting			Injury Severity			First Vehicle Action			Total
	Pedestrian	Bicycle	AM Peak	PM Peak	Off Peak	Dark-Street Lights On	Daylight	Dusk	Fatality	Suspected Minor Injury	Possible Injury	Going Straight Ahead	Making Left Turn	Making Right Turn	
2016		2	1		1		2				2		2		2
2017	5			1	4	2	3			2	3	3		2	5
2018	2			2		1	1			2				2	2
2019	1				1		1				1			1	1
2020	2	1	1	1	1		2	1	1	1	1	2	1		3
Total	10	3	2	4	7	3	9	1	1	5	7	5	3	5	13

Figure 2 - Reported Pedestrian and Bicycle Crashes, 2016-2020

Ten of the 13 reported pedestrian and bicycle crashes (77 percent) occurred near signalized intersections with marked crosswalks and pedestrian signal heads. One pedestrian fatality was reported, followed by five suspected minor injury, and seven possible injury crashes; the fatality occurred at midblock location. The 156th Ave NE intersection in Segment 5 experienced four crashes, while the other segments had two or fewer crashes at the intersections or driveway locations. This may indicate increased exposure for pedestrians at 156th Ave NE as well as the corridor's overall pedestrian-oriented land uses, transit access, and density of signalized intersections. Most crashes occurred outside of peak traffic hours and during daylight conditions (54 percent and 69 percent, respectively). However, it remains important to address the nonoperational and obscured lighting revealed in several corridor segments during the nighttime field review.

Crash mapping and reporting indicated conflicts at intersections and pedestrian and bicyclist visibility. First, most crashes involved a vehicle turning movement (23 percent turning left and 38 percent turning right), followed by vehicle going straight (38 percent). Second, the most commonly reported contributing motor vehicle crash circumstance was "Did Not Grant Right of Way to Non-Motorist" (36 percent), followed by inattention and other circumstances (14 percent each). These issues may indicate pedestrian visibility issues at intersections, lack of bicycle facilities (or expectation for bicyclists), and insufficient opportunities to cross the roadway outside of signalized intersections.

Area-Wide Issues

The RSA observed the following issues affecting pedestrian safety along the study corridor.

- *Motor Vehicle Speeds* – While the corridor does not have a marked issue of motor vehicles traveling above the speed limit, the prevailing speeds along the corridor (35-40 miles per hour) present a danger to pedestrians in the event of a crash. The roadway design, lane widths, topography, distance between marked crosswalks, and other factors contribute to the natural speed of motor vehicles and the character of the corridor.

- *Unsignalized Crossing Locations* – While the corridor has signalized intersections with marked crossings and pedestrian phases, they are often 1,000-2,500 feet apart, and pedestrians may decide to cross at unmarked locations to more directly reach transit, parks, work, and their homes. The RSA team observed pedestrians and bicyclists crossing between signalized intersections and also identified locations for potential crossing improvements based on land uses.

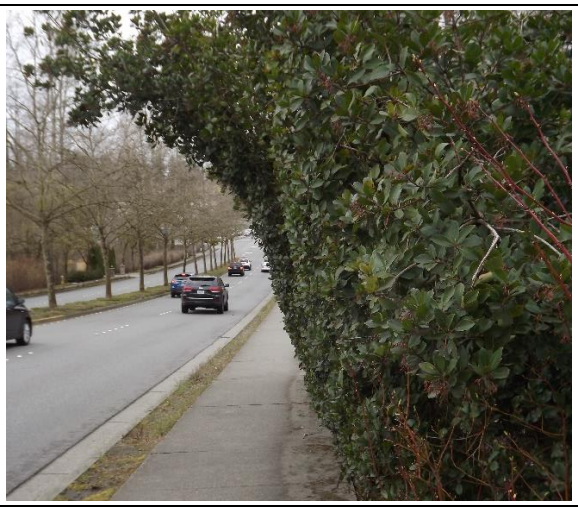
- *Stop Bars at Intersections* – None of the intersections along the corridor have stop bars in the through lanes. Video data observations showed vehicles encroaching on the crosswalks. Most of the left turn lanes have stop bars to allow turning vehicle maneuvers.

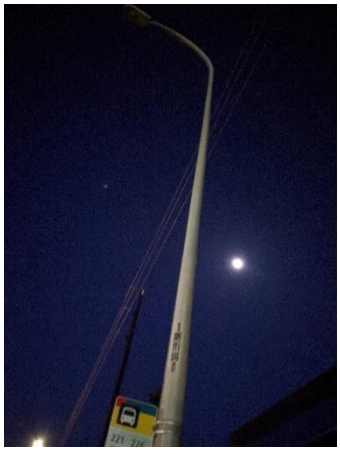
- *Accessibility of Sidewalks at Driveways* – Along the corridor, particularly in the heavy retail area around 156th Ave NE, the concrete driveways that provide vehicular access to businesses are of an older design. They result in bumps that make navigation along the corridor difficult for people using wheelchairs or other mobility devices.

- *Vegetation Encroaching on Sidewalks and Affecting Visibility* – The RSA team identified numerous locations along the corridor where encroaching vegetation limited the usable width of sidewalk or limited drivers' visibility of pedestrians.

- *Pending Corridor Development* – Throughout the RSA, several participants noted the potential of land use changes and new development, especially in the vicinity of Crossroads Mall and Crossroads Park. The City of Bellevue has seen an increase in development at other nearby locations, and such changes along the NE 8th St. corridor could lead to increased pedestrian volumes.

- *Lack of Bicycle Facilities* – While this RSA was focused on pedestrian issues and improvements, the RSA team observed bicyclist activity along the corridor and noted the lack of bicycle facilities. The bicyclist activity was most notable in the eastern half of the corridor, between 156th Ave NE and 164 Ave NE, and consisted of a wide range of cyclist ages and abilities crossing the roadway to access. The City of Bellevue's Bicycle Level of Traffic Stress (LTS) analysis indicated the corridor as Level 4, which is most stressful with no separation between vehicles and bicyclists, and likely utilized by the smallest segment of bicycle users. There are lower LTS routes on parallel lower speed and volumes roadways. NE 8th St is not designated as part of the primary bike network identified in the 2009 Ped-Bike Plan.





Upper Left – Picture of NE 8th St, looking west near 151st Pl NE, showing vegetation encroaching into the sidewalk and reducing its width and reducing illumination from the overhead lighting. Credit: Complete Streets Bellevue.
Upper Right – Picture of NE 8th St, looking east near Crossroads Park, showing the sidewalk cross slope that makes it difficult for people in wheelchairs. Credit: City of Bellevue.
Lower Left - Picture of NE 8th St, looking west, showing the lack of buffer or furnishing strip between the sidewalk and roadway. This was described by both the RSA team members and the walking audit participants as contributing to discomfort walking along the corridor. Credit: City of Bellevue.
Lower Right - Picture of NE 8th St, looking east near the Post Office, showing a street light that was not functioning. Credit: City of Bellevue.

Area-Wide Suggestions

The following suggestions are recommended within three implementation timeframes to promote pedestrian safety throughout the corridor. These suggestions are dependent on funding availability, project feasibility, other local constraints, and coordination between local, state, regional, and private entities. Though these suggestions are recommended in a sequence, they should be revisited depending on funding availability and for compatibility with concurrent improvement opportunities (e.g. roadway overlay schedules, new development, intersection upgrades, and expanded park facilities). Segment-based recommendations, implementation timeframes, and responsible parties are described later in this report and summarized in the Appendix.

Near-term/Quick Build (0-2 years)

- The City will conduct a comprehensive speed study to explore the potential for a corridor-wide speed reduction and management strategies.
- The City Transportation Department will discuss RSA findings with City of Bellevue land use planning staff.
- The City will trim vegetation that is obscuring pedestrian visibility or encroaching on sidewalk at noted locations as possible given budget constraints. The City will also notify private landowners and other agencies of locations where maintenance is needed. If needed, the City will explore the opportunity to conduct a safety project to contract vegetation trimming.
- The City will consider stop bar installation in conjunction with upcoming overlay projects to encourage appropriate vehicle stopping behavior at intersections.
- The City will consider implementing Leading Pedestrian Intervals (LPI) at all signalized intersections along the corridor, pending results of a nearly completed City of Bellevue pilot study.
- The City and King County Metro will collaborate to identify projects at and around transit stops, particularly those along High Injury Network corridors, to improve safety for people accessing public transit.
- The City will consider radar feedback signs and targeted police enforcement campaigns to manage speeds in coordination with the corridor speed study.
- The City will explore funding to study effectiveness of edge-lit signing at signalized intersections.

Intermediate (2-5 years)

- The City will evaluate the corridor for potential lane reductions to support vehicle access, improved bicycle facilities, and pedestrian crossings following completion of a corridor speed study.

- The City will evaluate installing new crosswalks with enhancements near high-volume pedestrian generators.
- The City will develop an ongoing public safety education campaign targeting safe vehicle speeds.

Long-term (5+ years)

- The City will update driveways along the corridor in conjunction with new development and other roadway projects so that gradients are ADA-compliant.
- The City Transportation Department will work with City of Bellevue Parks Department and Public Works to consider incorporation of less light-blocking vegetation at crossings and transit stop locations.

Segment 1 – 140th Ave NE to 143rd Ave NE

Reported Crashes

There were two reported crashes within Segment 1, and all were pedestrian crashes (Table 1). The crashes were possible injury crashes and occurred during daylight. Both crashes occurred at the 140th Ave NE intersection and were turning vehicle crashes. In both instances, the motorist contributing circumstance was not yielding to the pedestrian. The noted crash circumstances and collision types indicate a lack of visibility for pedestrians when crossing during the pedestrian phase. This intersection was also included in the Transoft Solutions conflict analytics analysis that identified the south and west crosswalk legs as locations of potential pedestrian crash events. However, the rates were low compared to motor vehicle rates for other intersection movements.

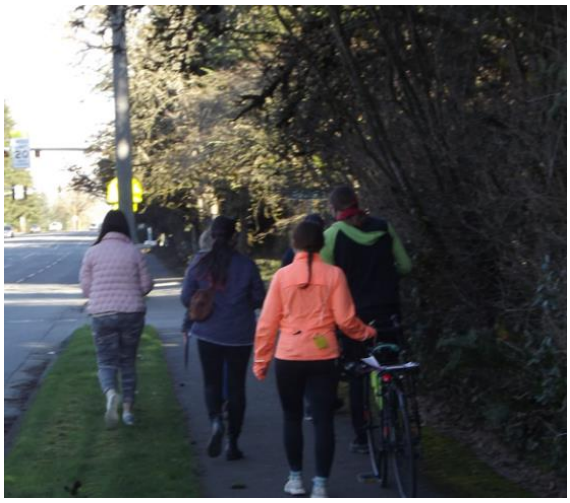
Table 1 - Segment 1 Reported Pedestrian and Bicycle Crashes, 2016-2020

Type	Date	Time	Severity	Lighting	Collision Type	Motorist Contributing Circumstance	Bike/Ped Contributing Circumstance
Pedestrian	6/22/2020	09:01	Possible Injury	Daylight	Vehicle turning left hits pedestrian	Did Not Grant R/W to Non Motorist	Other Contributing Circ Not Listed
Pedestrian	3/20/2019	10:03	Possible Injury	Daylight	Vehicle turning right hits pedestrian	Did Not Grant R/W to Non Motorist	None

Observations

- Land Use
  - There are two public schools and two Montessori schools along this segment.
  - There is a gas station on the northeast corner of the intersection at 140th Ave NE, with several points of ingress/egress.
  - Most of the segment has a good landscaping buffer to provide separation between pedestrians and motor vehicles.
- Pedestrian Facilities and Behavior
  - The crosswalks at both 140th Ave NE and 143rd Ave NE are both standard markings (two parallel lines). There is no marked crosswalk across NE 8th St at 143rd Ave NE on the western side of the intersection. This was done to concentrate schoolchildren crossings (assisted by crossing guards) to one leg of the intersection and minimize conflicts with turning vehicles.

    - There are pedestrian signal heads with countdown timers at all marked crosswalks at both intersections.
    - There are no midblock crossing locations in between 140th Ave NE and 143rd Ave NE. RSA participants observed pedestrians crossing in between these locations to access the bus stop and schools.
- Visibility
    - Vegetation on the southeast corner of the intersection at 140th Ave NE obscures the visibility of pedestrians approaching along the sidewalk or crossing NE 8th St.
- Traffic Control
    - Both 140th Ave NE and 143rd Ave NE have protected left turns and protected pedestrian phasing. When the pedestrian phase is activated, the left turn arrow remains red.
- Lighting
    - There is good pedestrian-scale lighting near the bus stops. Other luminaires are very tall.
    - At one location near 141st Pl NE, vegetation obscured lighting, causing a dark spot on the sidewalk.



Left – Picture of NE 8th St at 140th Ave, looking north, showing the presence of vegetation on the southeast corner than may reduce the visibility of pedestrians for turning vehicles, and also the lack of a stop bar for the right and thru lanes. Credit: Google.
Right – Picture of NE 8th St, looking east towards Odle Middle School, showing vegetation encroaching in to the sidewalk area and the presence of a wider furnishing strip to provide separation from the five-lane roadway. Credit: Complete Streets Bellevue.

Recommendations

Near-term (0-2 years)

- The City will trim back vegetation on the southeast corner of 140th Ave and NE 8th to improve visibility of pedestrians to the northbound right turn movements. The City will evaluate potential restriction of right-turn-on-red for the northbound right movement at 140th Ave NE if vegetation-related visibility issues are not addressed through trimming.

- The City will continue coordination with the Bellevue School District to maintain proper traffic circulation at Stevenson Elementary School and Odle Middle School, assuring that traffic does not back up onto NE 8th St.
- The City will evaluate land use and activity to explore a potential midblock crossing in between 140th Ave NE and 143rd Ave NE.
- The City will coordinate with Puget Sound Energy to fix lighting near westbound bus stop at 140th Ave NE.

Intermediate (2-5 years)

- The City will convene a staff group to develop a recommendation on the addition of a second school zone ticketing camera and propose a plan to the City Council.

Segment 2 – 143rd Ave NE to 147th Pl NE

Reported Crashes

There was one reported crash within Segment 2, and it was a bicycle crash (Table 2). The crash was a possible injury crash and occurred during daylight. The crash occurred at the uncontrolled 144th Ave NE intersection and involved a turning vehicle. Neither the motorist contributing circumstance nor bicyclist contributing circumstance was noted. There are no bicycle facilities on this route, and the bicyclist was struck in the travel lane, likely indicating that the rider was operating in the travel lane. The noted crash location indicates a lack of visibility for bicyclists and separation from motor vehicles.

Table 2 - Segment 2 Reported Pedestrian and Bicycle Crashes, 2016-2020

Type	Date	Time	Severity	Lighting	Collision Type	Motorist Contributing Circumstance	Bike/Ped Contributing Circumstance
Bicycle	11/17/2016	08:59	Possible Injury	Daylight	Vehicle - Pedalcyclist	Other Contributing Circ Not Listed	Other Contributing Circ Not Listed

Observations

- Land Use
  - This segment contains a church, a senior living facility, healthcare facilities, and other businesses, and residences.
- Pedestrian Facilities and Behavior
  - On the south side of NE 8th St. just east of 146th Ave NE, the sidewalk slopes uphill while the road slopes downhill, which is an ADA issue. The City has identified the issue in its ADA sidewalk inventory.
  - There is fencing along portions of the segment to help prevent midblock crossings.
- Visibility
  - There is a vertical crest along this segment of the corridor which limits sight distance.

Left – Picture of NE 8th St, looking east near 146th Ave NE, the sidewalk sloping up and downhill and the associated ADA issue identified by the City. Credit: Google.
Right – Picture of NE 8th St at 143rd Ave NE, looking west, showing the Metro transit stop near Stevenson Elementary under low light conditions. Credit: Metro.

Recommendations

Near-term (0-2 years)

- City will investigate the demand for a new marked midblock crossing in this segment. The investigation will also explore opportunities to provide access points along the noise mitigation walls in this segment and gauge neighborhood opinions on the noise walls.

Intermediate (2-5 years)

- City will form a working group with the Bellevue School District to review and implement partnerships that enhance transportation safety for students, parents, teachers, and staff.

Segment 3 – 147th Pl NE to 151st Pl NE

Reported Crashes

There were two reported crashes within Segment 3, and both were pedestrian crashes (Table 3). The crashes were possible injury crashes and occurred during daylight. Both crashes occurred at or near the 148th Ave NE intersection; one was a turning vehicle crash, and the other was a vehicle going straight crash. The motorist contributing circumstance for the turning vehicle crash was not yielding to the pedestrian, while the other crash was contributed to the pedestrian crossing against the signal. The noted crash circumstances and collision types indicate a lack of visibility for pedestrians when crossing during the pedestrian phase. This intersection is scheduled for widening with additional turn lanes. Given transit access and known pedestrian crossing levels, turning vehicle and pedestrian conflicts may increase.

Table 3 - Segment 3 Reported Pedestrian and Bicycle Crashes, 2016-2020

Type	Date	Time	Severity	Lighting	Collision Type	Motorist Contributing Circumstance	Bike/Ped Contributing Circumstance

Pedestrian	11/8/2017	12:44	Possible Injury	Daylight	Vehicle going straight hits pedestrian	None	Disregard Stop and Go Light
Pedestrian	6/10/2017	15:37	Possible Injury	Daylight	Vehicle turning right hits pedestrian	Did Not Grant R/W to Non Motorist	Inattention

Observations

- Land Use
  - There is a gas station in the southeast corner of the intersection at 148th Ave NE with multiple ingress/egress points.
  - There are undeveloped wetlands areas on both the north and south sides of NE 8th St east of the 148th Ave NE intersection.
- Roadway
  - There is a City congestion reduction project in the queue for this intersection which will widen some of the intersection approaches at 148th Ave NE to provide dual left turn lanes. This will increase crossing distances for pedestrians.
- Pedestrian Facilities and Behavior
  - There is a gap in the planter strip buffer on both sides of NE 8th St east of 148th Ave NE.
- Transit Facilities
  - There is no lighting at the westbound bus stop far-side 148th Ave NE
- Traffic Control
  - This is the location with the longest cycle length along the corridor. This results in the highest pedestrian delay among other corridor locations.

Left – Picture of NE 8th St, on north side of roadway looking east near 148th Ave NE, showing the four-lane median divided cross section under dusk conditions and a potential location for an investigation of a midblock crossing. Credit: Metro

Right – Picture of NE 8th St, on south side of sidewalk looking east near 148th Ave NE, showing a nonoperational transit stop light. Credit: Metro.

Recommendations

Near-term (0-2 years)

- The City will coordinate with Puget Sound Energy to fix pedestrian-scale lightning near the bus stop at 148th Ave NE.
- The City will review the 148th Ave NE intersection plans for potential strategies to improve the safety of pedestrian crossings given the proposed intersection widening project. These strategies may include reassessing the width and location of access points for the gas station on the southeast corner of the intersection.
- The City will coordinate with King County Metro to see if it is possible to add lighting to the westbound bus stop far-side 148th Ave NE as part of the intersection widening project.

Segment 4 – 151st Pl NE to 156th Ave NE

Reported Crashes

There were no reported pedestrian and bicycle crashes in Segment 4. However, previous community wikimapping in 2015 indicated "unsafe pedestrian behaviors" in this segment, such as crossing midblock. Complete Streets Bellevue also indicated vehicle and pedestrian and bicycle conflicts at the segment's driveways during their walking audit.

Observations

- Roadway
    - The roadway is fairly steeply graded along this segment. This leads to higher vehicle speeds in the downhill direction and more vehicle noise due to acceleration.
- Pedestrian Facilities and Behavior
    - This is the longest section of the corridor without a marked crossing. Several RSA participants observed pedestrians crossing midblock around 151st Pl NE and 153rd Ave NE.

Above – Picture of NE 8th St, near 151st Pl NE, showing the roadway's grade and lighting levels during nighttime conditions. Walk audit participants reported this area as dark and described it as a personal safety risk. Credit: Complete Streets Bellevue.

Recommendations

Near-term (0-2 years)

- The City will investigate the potential addition of a midblock crossing on the segment to decrease distance between marked crossings.

Intermediate (2-5 years)

- Pending a near-term City investigation for a midblock crossing location, the City and King County Metro will study the possibility of establishing a new bus stop pair in this segment.

Segment 5 – 156th Ave NE to 158th Pl NE

Reported Crashes

There were four reported crashes within Segment 5, and three were pedestrian crashes, and the fourth was a bicyclist crash (Table 4). The pedestrian crashes were minor injury crashes, and the bicyclist crash was a possible injury crash. Half of the crashes occurred during daylight, and the other two were under dark-lighted conditions. All crashes occurred at the 156th Ave NE intersection and involved turning vehicles.* In all instances, the motorist contributing circumstances were either not yielding to the pedestrian or inattention. The noted crash circumstances and collision types indicate a lack of visibility for pedestrians when crossing during the pedestrian phase and lack of separation for bicyclists. The City deployed Leading Pedestrian Intervals (LPI) in October 2020 for the E/W crossings at the 156th Ave NE intersection (north and south crosswalk legs) as part of a pilot study; the turning vehicle crashes occurred prior to LPI implementation.

Table 4 - Segment 5 Reported Pedestrian and Bicycle Crashes, 2016-2020

Type	Date	Time	Severity	Lighting	Collision Type	Motorist Contributing Circumstance	Bike/Ped Contributing Circumstance
Bicycle	2/14/2016	11:24	Possible Injury	Daylight	Vehicle – Pedalcyclist*	Inattention	None
Pedestrian	1/4/2018	18:06	Suspected Minor Injury	Dark-Street Lights On	Vehicle turning right hits pedestrian	Did Not Grant R/W to Non Motorist	None
Pedestrian	10/30/2017	19:31	Suspected Minor Injury	Dark-Street Lights On	Vehicle turning right hits pedestrian	Inattention	None
Pedestrian	5/26/2018	16:12	Suspected Minor Injury	Daylight	Vehicle going straight hits pedestrian**	Did Not Grant R/W to Non Motorist	None

**Vehicle movement listed as vehicle turning left, from east to south*

***Vehicle movement listed as vehicle turning right, from east to north*

This intersection was also included in the Transoft Solutions conflict analytics analysis that identified the north, west, and south crosswalk legs as locations of potential pedestrian crash events. These rates were

higher compared to those observed in Segment 1. Figure 3 below illustrates the potential safety events for pedestrians per 10,000 interactions.

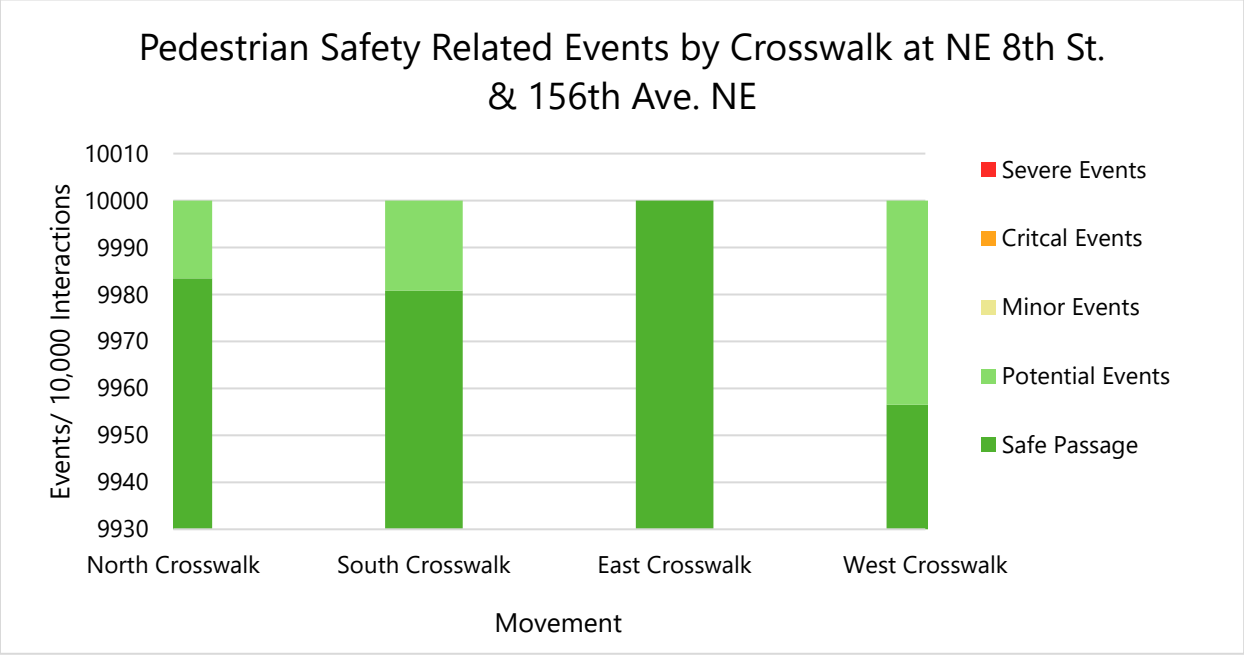


Figure 3 - Transoft Pedestrian Conflict Analytics for 156th Ave NE

Observations

- Land Use
  - This is a heavily developed retail area, and there are numerous driveways along the corridor to provide vehicle access to businesses.
- Pedestrian Facilities and Behavior
  - This segment represents the highest level of pedestrian activity along the corridor.
  - Video footage showed several instances of pedestrians running to cross the intersection during the WALK clearance phase.
- Transit Facilities
  - This segment has the highest concentration of transit activity. Passengers often make transfers between routes at the stops near 156th Ave NE.
- Traffic Control
  - There is a signalized intersection at 158th Pl NE (also known as Crossroads Pl), just east of 156th Ave NE. The eastbound left-turn movement into Crossroads Mall has a very short left turn lane which frequently backs up. Because of this, the left turn phase is double served.

Upper Left – Picture of the NE 8th St at 156th Ave NE intersection, showing stopped vehicles encroaching into the pedestrian crosswalk areas. Credit: City of Bellevue.
Upper Right – Picture of the NE 8th between 156th Ave NE and Crossroads Place, showing a pedestrian crossing midblock between the shopping complex and to potential destinations such as a transit stop and grocery store. Credit: City of Bellevue.
Lower Left – Picture of a transit shelter at the Crossroads Mall that lacks amenities compared to Metro-managed stops. Credit: Metro.
Lower Right – Picture of NE 8th St at 156th Ave NE, looking east, showing the signalized Crossroads Pl entrance near the USPS Post Office exit and the queue of left turning vehicles extending beyond the storage area.

Recommendations

Intermediate (2-5 years)

- The City will evaluate access management, lane configuration, and pedestrian improvements near 158th Pl NE (Crossroads Pl) and the USPS Post Office. This may involve reallocation of travel lanes to turning vehicle storage, narrowed lanes to support on-street bicycle facilities, and signal modifications at 158th Pl NE (Crossroads Pl) and 160th Pl NE (Segment 6).

Long-term (5+ years)

- The City will evaluate adding a pedestrian crossing east of 156th Ave NE to serve pedestrian demand, and will coordinate with King County Metro regarding bus stop locations in segments 5, 6, and 7.

Segment 6 – 158th Pl NE to Crossroads Park

Reported Crashes

There were two reported crashes within Segment 6, and both were pedestrian crashes (Table 5). One crash resulted in a fatality, and the other was a possible injury crash. Both crashes occurred during low light conditions. While both crashes involved vehicles going straight, one occurred at a signalized intersection (158th Ave NE), and the other was a midblock crash. In all instances, the non-motorists were noted as either not yielding to motorists or crossing against the signal. The crash circumstances and collision types indicate a desire for crossing NE 8th St and a lack of visibility for crossing pedestrians. This segment is near the Crossroads Mall and Crossroads Park, both areas that attract pedestrians, and the RSA team observed numerous pedestrians and bicyclists of all ages crossing at locations between the signalized intersections at 158th Ave NE and 164th Ave NE.

Table 5 - Reported Pedestrian and Bicycle Crashes in Segment 6, 2016-2020

Type	Date	Time	Severity	Lighting	Collision Type	Motorist Contributing Circumstance	Bike/Ped Contributing Circumstance
Pedestrian	8/21/2017	22:38	Possible Injury	Dark-Street Lights On	Vehicle going straight hits pedestrian	Driver Not Distracted	Disregard Stop and Go Light
Pedestrian	11/30/2020	17:19	Died in Hospital	Dusk	Vehicle going straight hits pedestrian	Other Contributing Circ Not Listed	Did Not Grant RW to Vehicle

Observations

- Land Use
  - There is an adult living facility and a fire station along this segment.
- Pedestrian Facilities and Behavior
  - The RSA team observed higher levels of pedestrian and bicyclist activity in the area east of 158th Pl NE (Crossroads Pl).
  - The Complete Streets Bellevue walking audit of the corridor identified a hole in the sidewalk along this segment.
- Bicycle Facilities
  - There is a stripped shoulder on each side of the road that begins with the transition from the five-lane to three-lane cross section, and the shoulder is approximately 4’ wide (inclusive of the gutter pan) and is intended for bicyclists.
- Transit Facilities
  - The bus stops on either side of NE 8th St throughout Segment 6 and 7 are offset by several hundred feet and many of these stops are located far from marked crossings.
- Traffic Control
  - East of 158th Pl NE (Crossroads Pl), there is an overhead yellow flashing beacon to warn drivers on NE 8th St of the presence of driveways and vehicles turning onto the roadway. It is the only location in the City with an overhead yellow flashing beacon. All other locations have red flashing beacons to alert drivers to all-way stop intersections.
- Lighting

- The lighting along this segment was described as very good, as light from businesses and nearby parking lots helped to illuminate the sidewalks and roadway, though there was a light out at 160th Pl NE.

Upper Left – Picture of the NE 8th at 160th Ave NE intersection, showing children on bicycles crossing at an uncontrolled intersection near the general flashing yellow beacon. Credit: FHWA.
Upper Right – Picture of the NE 8th at Crossroads Place intersection looking east, showing a pedestrian crossing midblock. Credit: City of Bellevue.
Bottom – Picture of northside sidewalk on NE 8th St near 160th Ave NE, looking east, showing a hole in the sidewalk. Credit: Complete Streets Bellevue.

Recommendations

Near-term (0-2 years)

- The City will evaluate the area around 160th Ave NE for consideration of a marked or enhanced pedestrian crossing, including the status of the existing signage, beacons, and pavement markings.
- The City and King County Metro will review management of vegetation at eastbound stop near Crossroads Park.
- The City will fix street lighting at 160th Pl NE.
- The City will repair the hole in the sidewalk on the north side of NE 8th St near 160th Pl NE.

Intermediate (2-5 years)

- The City will evaluate extending the length and increasing the shoulder bikeway width as part of its Segment 5 lane reallocation review.

Segment 7 – Crossroads Park to 164th Ave NE

Reported Crashes

There were two reported crashes within Segment 7, a pedestrian and a bicycle crash (Table 6). Both crashes resulted in suspected minor injuries and occurred during daylight conditions. The pedestrian crash occurred at the signalized intersection (164th Ave NE) and was attributed to the pedestrian crossing against the signal. The bicycle crash occurred in the travel lane and was attributed to a vehicle exiting a driveway and striking the bicyclist in the marked shoulder. The 2015 community wikimapping included reported pedestrian crash "near misses" in this segment.

Table 6 - Reported Pedestrian and Bicycle Crashes in Segment 7, 2016-2020

Type	Date	Time	Severity	Lighting	Collision Type	Motorist Contributing Circumstance	Bike/Ped Contributing Circumstance
Pedestrian	9/12/2017	17:15	Suspected Minor Injury	Daylight	Vehicle going straight hits pedestrian	None	Disregard Stop and Go Light
Bicycle	10/1/2020	11:20	Suspected Minor Injury	Daylight	Vehicle Strikes Pedalcyclist	Unknown Distraction	Other Distractions

Observations

- Land Use
  - The north side of NE 8th St in this segment contains Crossroads Park. The south side of NE 8th St has apartments, businesses, and offices.
  - There is a proposed 100+ unit apartment development for the northside of this segment.
- Pedestrian Facilities and Behavior
  - There is a marked midblock crosswalk with a Rectangular Rapid Flashing Beacon (RRFB) and pedestrian refuge island on the western end of this segment. The crossing does not include advance markings nor stop bars.
- Transit Facilities
  - The two transit stops on this segment have physical constraints. The stop in the westbound direction lacks pads for rear door access, so the stop is signed for front door use only. The eastbound direction stop does not have a deep enough sidewalk to be ADA accessible.
- Traffic Control
  - The City has a project planned to replace the signal at the intersection at 164th Ave NE within the next few years. This is slated to include the addition of left turn phasing. Currently the intersection operates as two-phase with all left turns being permitted movements.

Left – Picture of NE 8th at Crossroads Park, showing a family crossing after having activated the RRFB. Credit: City of Bellevue.
Right – Picture of NE 8th at Crossroads Park, looking west, showing the sidewalk with lack of furnishing strip, rolling topography that limits sight distance, the marked shoulder for bicyclists, and the position of the eastbound Metro transit stop against the retaining wall that prevents ADA accessibility. Credit: City of Bellevue.

Recommendations

Near-term (0-2 years)

- The City will investigate enhancement of the bikeway type on this section in coordination with the Segment 6 review and scheduled overlay project. The City will coordinate with King County Metro to ensure acceptable bus operations.
- The City will evaluate 164th Ave NE intersection for potential compact roundabout instead of signal replacement. The City will coordinate with King County Metro to ensure that roundabout geometry will not negatively impact bus maneuvers.
- The City will complete upgrading the luminaires on the south side of NE 8th St to LED.

Next Steps

The findings of the RSA should be revisited on a recurring basis. The City, Metro, and WSDOT may choose to review the RSA report with the original RSA team on an annual basis, for up to five years. The City may consider refreshing or revising the RSA process every 5 years. By developing performance measures for ongoing evaluation and review or utilizing those in place through the City's Vision Zero Plan, the City can track progress made at sites discussed by the RSA. Metrics can include the number of sites improved or the percent change in pedestrian crash rates over three or more years. The City, WSDOT, and Metro may also consider short-term and pilot projects to demonstrate and further evaluate concepts noted within this report. These may include further implementation of LPI, increased illumination, relocation of transit stops, and turning vehicle restrictions.

Funding Opportunities

In addition to local funding, the City should work with other agencies such as King County Metro, WSDOT, and other parties for funding opportunities—like transit route and facility updates and spot safety

improvements—and the long-range planning process to coordinate project development of safety measures.

Highway Safety Improvement Program (HSIP): The goal of the federally funded HSIP, as authorized in the FAST Act, is to achieve a significant reduction in traffic fatalities and serious injuries on all public roads, including non-State-owned public roads and roads on tribal lands. The HSIP requires a data-driven, strategic approach to improving highway safety on all public roads that focuses on performance. The City was awarded approximately $640,000 in HSIP funds in 2020 for RRFBs.[3]

Congestion Mitigation and Air Quality Improvement (CMAQ) Non-Mandatory Program: CMAQ is a Federal reimbursement program authorized through the FAST Act and administered by WSDOT. The CMAQ Program provides a flexible funding source to WSDOT and local governments and tribes for transportation projects and programs that help meet the requirements of the Clean Air Act. Bellevue is eligible for CMAQ funds, and it has previously secured funds through the program for design and construction of a separated multi-use trail along the south side of I-90 from I-405, traversing Factoria Boulevard SE, among other projects. Application information and the program guide are distributed by WSDOT.

Regional STP Funds (STP(UL)): STP(UL) funds are allocated from Surface Transportation Block Grant program funding through MPOs and county lead agencies. The City is considered an Urban Large area since its urbanized area is greater than 200,000. The City has been successful in developing recommended projects through the STP(UL) program. Application information and the program guide are distributed by the Puget Sound Regional Council (PSRC).

[3] WSDOT, "2020 City Safety Program—Approved Funding Awards," https://wsdot.wa.gov/sites/default/files/2020/12/03/LP-City-Safety-Program-Awards-2020%20.pdf

Appendix

This appendix contains the following items related to the RSA:

- Segment Implementation Resources
- RSA Agenda
- Transoft Solutions Conflict Analysis
- usRAP Corridor Analysis
- King County Metro Bus Stop Inventory
- Complete Street Bellevue Report
- Presentation Slides

Segment Implementation Recommendations

Location	Timeframe	Recommendation	Responsible Group(s)
Segment 1 140th Ave NE to West of 143rd Ave NE	Near-Term	Trim back vegetation on southeast corner of 140th Ave and NE 9th St to improve visibility of pedestrians to the northbound right turn movements. Evaluate potential restriction of right-turn-on-red for the northbound right movement at 140th Ave NE if visibility issues persist.	City
	Near-Term	Maintain proper traffic circulation at Stevenson Elementary School and Odle Middle School, assuring that traffic does not back up onto NE 8th St.	City, Bellevue School District
	Near-Term	Evaluate land use and activity to explore a potential midblock crossing in between 140th Ave NE and 143rd Ave NE.	City
	Near-Term	Coordinate with Puget Sound Energy to fix lighting near westbound bus stop at 140th Ave NE.	City, Puget Sound Energy
	Intermediate	Convene a staff group to develop a recommendation on the addition of a second school zone ticketing camera and propose a plan to the City Council.	City
Segment 2 143rd Ave NE to 147th Pl NE	Near-Term	Investigate the demand for a new marked midblock crossing in this segment. The investigation will also explore opportunities to provide access points along the noise mitigation walls in this segment and gauge neighborhood opinions on the noise walls.	City
	Intermediate	Form a working group with the Bellevue School District to review and implement partnerships that enhance transportation safety for students, parents, teachers, and staff.	City, Bellevue School District
Segment 3 147th Pl NE to West of 151st Pl NE	Near-Term	Coordinate with Puget Sound Energy to fix pedestrian-scale lightning near the bus stop at 148 Ave NE.	City, Puget Sound Energy
	Near-Term	Review the 148th Ave NE intersection plans for potential strategies to improve the safety of pedestrian crossings given the proposed intersection widening project. These strategies may include reassessing the width and location of access points for the gas station on the southeast corner of the intersection.	City
	Near-Term	Coordinate to see if it is possible to add lighting to the westbound far-side bus stop at 148th Ave NE as part of the intersection widening project.	City, Metro
Segment 4 151st Pl NE to West of 156th Ave NE	Near-Term	Investigate the potential addition of a midblock crossing on the segment to decrease distance between marked crossings.	City
	Intermediate	Pending near-term City investigation for a midblock crossing location, study the possibility of establishing a new bus stop pair in this segment.	City, Metro
Segment 5 156th Ave NE to 158th Pl NE	Intermediate	Evaluate access management, lane configuration, and pedestrian improvements near 158th Pl NE (Crossroads Pl) and the USPS Post Office. This may involve reallocation of travel lanes to turning vehicle storage, narrowed lanes to support on-street bicycle facilities, and signal modifications at 158th Pl NE (Crossroads Pl) and 160th Pl NE.	City
	Long-term	Evaluate adding a pedestrian crossing east of 156th Ave NE to serve pedestrian demand, and coordinate with King County Metro regarding bus stop locations in segments 5, 6, and 7.	City, Metro
Segment 6 158th Pl NE to Crossroads Park	Near-Term	Evaluate the area around 160th Ave NE for consideration of a marked or enhanced pedestrian crossing, including the status of the existing signage, beacons, and pavement markings.	City
	Near-Term	Review management of vegetation at eastbound stop near Crossroads Park.	City, Metro
	Near-Term	Fix street lighting at 160th Pl NE.	City
	Near-Term	Repair the hole in the sidewalk on the north side of NE 8th St near 160th Pl NE.	City
	Intermediate	Evaluate extending the length and increasing the width of the shoulder bikeway as part of Segment 5 lane reallocation review.	City
Segment 7 Crossroads Park to 164th Pl NE	Near-Term	Investigate enhancement of the bikeway type on this section in coordination with the Segment 6 review and scheduled overlay project; also coordinate with King County Metro to ensure acceptable bus operations.	City, Metro
	Near-Term	Evaluate 164th Ave NE intersection for potential compact roundabout instead of signal replacement; also coordinate with King County Metro to ensure that roundabout geometry will not negatively impact bus maneuvers.	City, Metro
	Near-Term	Complete upgrading the luminaires on the south side of NE 8th St to LED.	City

RSA Agenda

FHWA STEP Pedestrian Road Safety Assessment Agenda
March 25th & 26th, 2021

Bellevue, WA (NE 8th ST)

Day 1:

8:00-10:00 AM — RSA Kick-off Meeting - Online

- *Introduction of stakeholders and RSA team*
- *Introduction to the RSA process*
- *Pedestrian safety overview*
- *Overview of study area*
- *Complete Streets Bellevue Walk Audit Summary (9:30-9:40AM PT), Christopher Randels*
- *Overview of study area, continued*

10:00-10:15 AM — Break

10:15 AM-1:00 PM — Document Issues - Online

- *Segment by segment review: imagery, video, analytics results, other findings*
- *Assign homework and additional field investigation*

3:00 – 5:00 PM — Additional Field Investigation *(optional, determined day of)*

- *Meet at specified location, TBD*
- *Follow health and safety protocols*

7:30 – 9:00 PM — Nighttime Field Review *(optional)*

- *Meet at specified location, TBD*
- *Follow health and safety protocols*
- *Upload nighttime photos here >>*

Day 2:

8:00-10:00 AM — Recap Previous Day's Findings - Online

- *Review field and nighttime field data gathering*
- *Summarize issues*
- *Discuss corridor-relevant countermeasures*

10:00-10:15 AM — Break

10:15 AM -1:00 PM — Team Discussion/Preliminary Findings - Online

- *Prioritize sites*
- *Identify potential countermeasures*
- *Discuss next steps*

Transoft Conflict Analytics

Transoft Solutions (ITS) is a subsidiary of Transoft Solutions Inc. [hereon Transoft], developers of innovative and highly specialized software for aviation, civil infrastructure, and transportation professionals, which operates in over 130 countries serving more than 50,000 customers. Through its operation in Ontario Canada, Transoft pioneered the use of video analytics in transforming traffic movement data into traffic safety knowledge. Transoft provides automated video-based road safety solutions, BriskLUMINA and BriskVANTAGE, which have been assisting practitioners design and evaluate road structures. These products focus on understanding the causes of collisions before they happen, using surrogate (proactive) road safety techniques and video data. The outputs of the solutions provide the user with safety related event data (including near-misses, evasive actions, spatial violations, temporal violations, etc.), speeding violations, counts, and speeds.

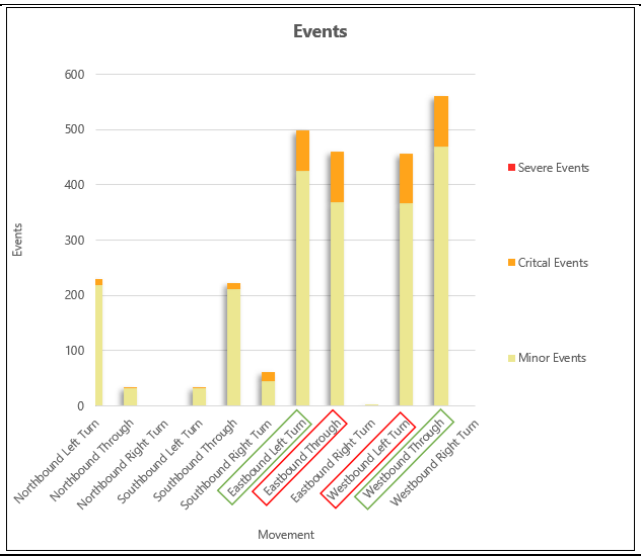
The approach used by Transoft utilizes the use of surrogate safety for road safety evaluation, rather than simply relying on crash data due to its many shortcomings. Studying collision data is reactive; safety evaluation takes place after collisions occur, making it nearly impossible to achieve the goal of zero traffic deaths and serious injury collisions. Additionally, the infrequent nature of traffic collisions necessitates years of observation to achieve statistical significance and it is well-documented that traffic crashes and injuries are under-reported in many localities. These concerns have led to the use surrogate safety measures to proactively identify locations that have a high risk of crashes but where the risk has not yet resulted in actual crashes. A wide variety of surrogate safety measures exist, including speed, delay, violations, deceleration distribution, etc. In addition, Transoft relies on the industry standard metric know as post encroachment time (PET) which is the time difference between when the first road user leaves the conflict point and the second road user arrives at the conflict point. The lower the PET value, the higher the probability of a collision having occurred. Additionally, Transoft Solutions couples this value with other metrics describing severity (such conflict speeds, angles, road users, etc.) to quantify the true risk of an interaction.

For this assessment, data was used from Bellevue's partnership with Transoft Solutions conducted in 2019. Data for a whole week of data from 2019, from September 13th to 19th, from 6 AM to 10 PM was used to perform the analysis. For both intersections, the following methodology was followed. The results of the network screening performed were looked at to assess the volume, speed, and conflict data in relation to other locations. Then, the trajectory images were added to indicate all the movements present at these locations. All road users were detected using the video analytics and all interactions with a PET of 10s were noted. Using their conflict speeds and PET values, these events were then classified into severe events, critical events, minor events, potential events, and safe passage based off of the Swedish Traffic Conflict Technique. Transoft then looked at the data for the whole site, followed by a movement basis, and then a scenario (a combination of two movements that may result in a collision) basis. The pure counts as well as the rates were looked at in this analysis. Lastly, video clips for events with low PETs were looked at to observe a pattern.

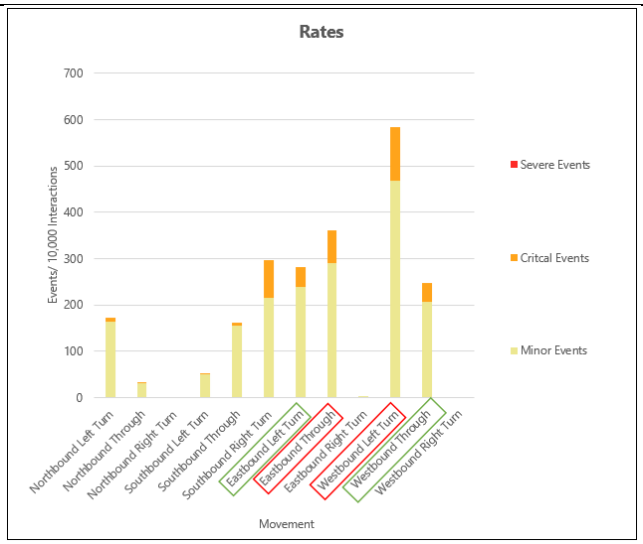
NE 8th St. & 140th Ave. NE

In terms of volume, this location ranked 25th out of 40 for vehicular volume and had less than 2% vulnerable road user volumes. The 75th percentile speeds for right turning, left tuning, and through movements were 20.7 mph, 25.6 mph, and 33.3 mph respectively. Given that the speed limit of the intersection is 35 mph, this indicates that a little less than 25% of the through drivers were speeding. As for conflicts, this location was the 5th highest in terms of overall number of interactions and 7th highest in terms of critical events. The vulnerable road user conflict rate was observed to be low.

Th number and rates of events per movement are presented in the charts below. A superficial look at the data indicates that the movements with the highest number of events and highest rates appear to form left turning and through scenario pairs – Westbound Left Turn with Eastbound Through and Eastbound Left Turn with Westbound Through.



Safety related events by movement



Safety related event rates by movement

A further look at the platform did indicate that those two scenarios were in fact among the top 3 conflict scenarios. The most critical conflict scenarios at this location were:

1. Eastbound Through and Westbound Left Turn
2. Southbound Right Turn and Westbound Through
3. Eastbound Left Turn and Westbound Through
4. Northbound Left Turn and Southbound Through
5. Northbound Left Turn and Southbound Right Turn
6. Westbound Through and West Crosswalk
7. Eastbound Through and West Crosswalk.

This list also indicates that pedestrians crossing the West crosswalk appear to be getting involved in more critical conflicts than other crosswalks. Additionally, looking at the 2 movements these crosswalks are getting in conflict with, and bearing in mind that this is a signalized intersection, it is alarming that both are with through movements. This indicates that either the pedestrians or the drivers are not fully respecting their signal phasing.

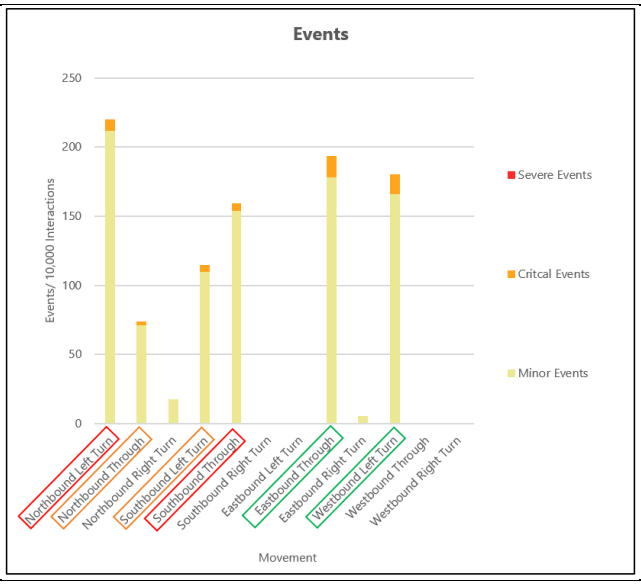
Lastly, the following conflict video screenshots were taken to support the above data and to gain safety insights about the location.

	
A westbound left turning motorcyclist arriving at the conflict point 0.98 seconds after an eastbound through vehicle	An eastbound left turning vehicle arriving at the conflict point 1 second after a westbound through vehicle
	
A westbound left turning vehicle tailgating an eastbound right turning vehicle 0.96 seconds behind	A pedestrian jaywalking out of phase and walking after a through driver by 1.42 seconds

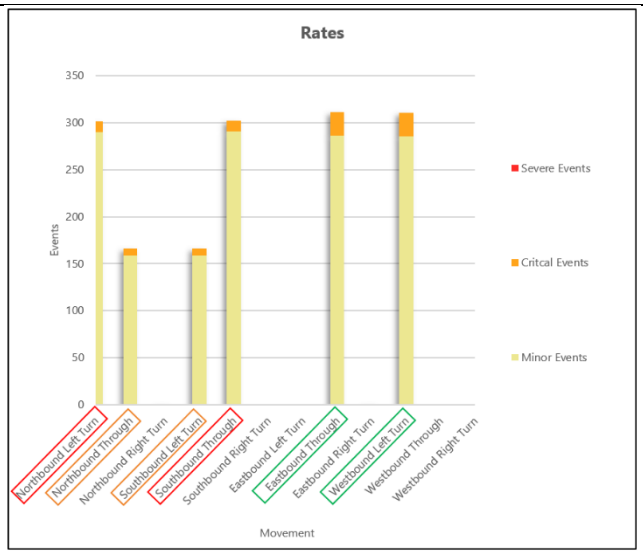
NE 8th St. & 156th Ave. NE

In terms of volume, this location ranked 24th out of 40 for vehicular volume and had less than 2% vulnerable road user volumes. The 75th percentile speeds for right turning, left tuning, and through movements were 22.6 mph, 24.4 mph, and 33.3 mph respectively. Given that the speed limit of the intersection is 35 mph, this indicates that a little over 25% of the through drivers were speeding. As for conflicts, this location was the 7th highest in terms of overall number of interactions and 11th highest in terms of critical events. The vulnerable road user conflict rate was observed to be low.

Th number and rates of events per movement are presented in the charts below. A superficial look at the data indicates that the movements with the highest number of events and highest rates appear to form left turning and through scenario pairs – Northbound Left Turn with Southbound Through, Southbound Left Turn with Northbound Through, and Westbound Left Turn with Eastbound Through.



Safety related events by movement



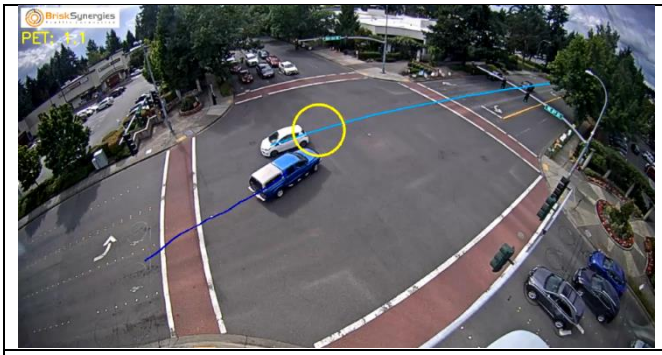
Safety related event rates by movement

A further look at the platform did indicate that those two scenarios were in fact among the top 3 conflict scenarios. The most critical conflict scenarios at this location were:

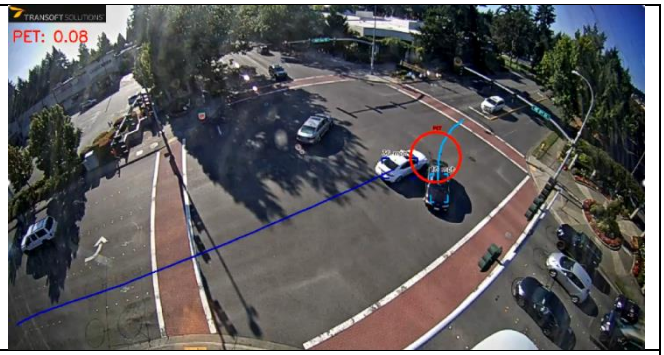
1. Eastbound Through and Westbound Left Turn
2. Northbound Left Turn and Southbound Through
3. Northbound Through and Southbound Left Turn
4. Northbound Right Turn and Eastbound Through
5. Southbound Through and South Crosswalk
6. Northbound Through and South Crosswalk
7. Westbound Through and West Crosswalk

This list also indicates that pedestrians crossing the South crosswalk appear to be getting involved in more critical conflicts than other crosswalks. Additionally, looking at the 2 movements these crosswalks are getting in conflict with, and bearing in mind that this is a signalized intersection, it is alarming that both are with through movements. This indicates that either the pedestrians or the drivers are not fully respecting their signal phasing.

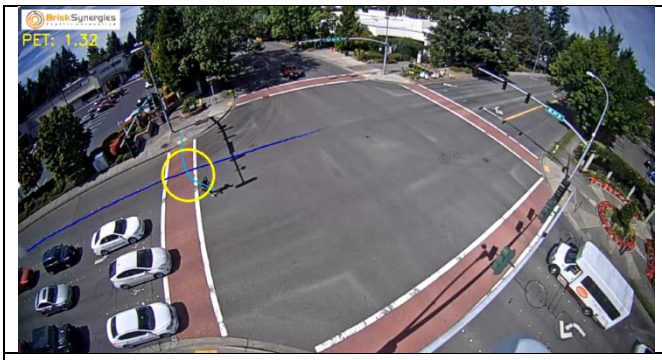
Lastly, the following conflict video screenshots were taken to support the above data and to gain safety insights about the location.



A northbound left turning vehicle arriving at the conflict point 1.1 seconds after a southbound through vehicle



A northbound through vehicle missing a southbound left turning vehicle by a mere 0.08 seconds

	
A jaywalking south crosswalk pedestrian running after a passing southbound though vehicle	A jaywalking south crosswalk pedestrian waiting in the middle of the road to cross after a southbound through vehicle

usRAP Corridor Analysis

Doug Harwood provided the usRAP analysis results for the NE 8th St RSA corridor, developed as part of the larger effort to analyze the entire set of high-priority corridors in Bellevue. This allowed for the computation of calibration factors for all sites, including NE 8th St. The analysis included development of a Safer Roads Investment Plan for the corridor. Figure 4 and Figure 5 summarize the Safer Roads Investment Plan results for two minimum benefit-cost ratio values.

Figure 4 shows the results corresponding to a minimum benefit-cost ratio of 1.0. This means that each of the individual candidate countermeasures has a benefit-cost ratio of at least 1.0. Under this plan, a total investment of $271,290 would fund the list of candidate improvements, resulting in a net present value (NPV) of $802,710 in safety benefits over the 20-year analysis period. This equates to an overall benefit-cost ratio of 3.0 if all the candidate improvements are implemented.

This plan includes two pedestrian-specific candidates countermeasures: installation of a refuge island (or islands) for pedestrians crossing NE 8th St. at 144th Ave NE and installation of an unsignalized crossing for pedestrians crossing NE 8th St at 153rd Ave NE. Both of these candidate improvements have benefit-cost ratios of just above 1.0. The RSA team also recommended evaluating unsignalized enhanced crossings at these general locations.

Safer Roads Investment Plan

Currency: $ USD - Analysis Period: 20 years

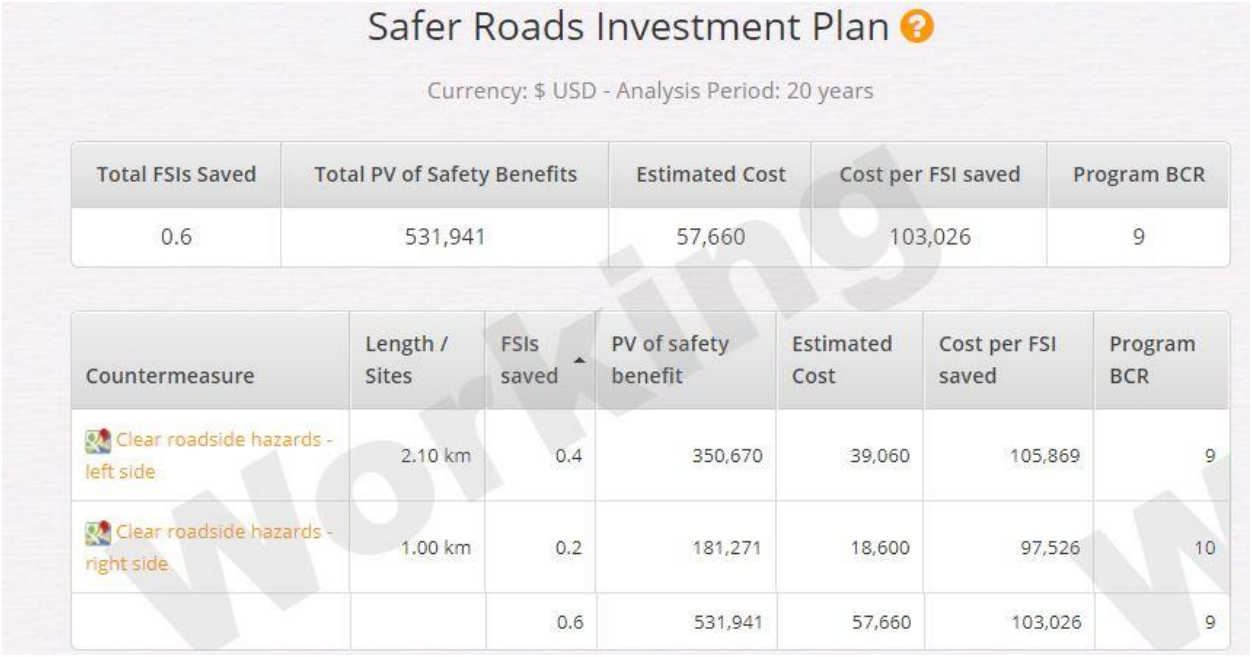
Total FSIs Saved	Total PV of Safety Benefits	Estimated Cost	Cost per FSI saved	Program BCR
0.8	802,710	271,290	321,226	3

Countermeasure	Length / Sites	FSIs saved	PV of safety benefit	Estimated Cost	Cost per FSI saved	Program BCR
Clear roadside hazards - driver side	2.20 km	0.4	360,389	40,920	107,919	9
Clear roadside hazards - passenger side	1.00 km	0.2	181,271	18,600	97,526	10
Refuge Island	1 sites	0.1	74,300	60,334	771,809	1
Unsignalised crossing	1 sites	0.1	141,756	140,276	940,543	1
Clear roadside hazards (bike lane)	0.60 km	0.0	44,994	11,160	235,744	4
		0.8	802,710	271,290	321,226	3

Figure 4. usRAP Safer Roads Investment Plan for NE 9th St. from 140th Ave. NE to 164th Ave. NE, minimum benefit-cost ratio of 1.0.

Figure 5 shows the results corresponding to a minimum benefit-cost ratio of 6.0. This means that each of the individual candidate countermeasures has a benefit-cost ratio of at least 6.0. Under this plan, a total investment of $57,660 would fund the list of candidate improvements, resulting in a net present value (NPV) of $531,941 in safety benefits over the 20-year analysis period. This equates to an overall benefit-cost ratio of 9.0 if all the candidate improvements are implemented.

When the minimum benefit-cost ratio for the analysis was increased from 1.0 to 6.0, the pedestrian-oriented improvements were dropped from the Safer Roads Investment Plan (as stated above, the benefit-cost ratios for these two improvements were just above 1.0).



Safer Roads Investment Plan

Currency: $ USD - Analysis Period: 20 years

Total FSIs Saved	Total PV of Safety Benefits	Estimated Cost	Cost per FSI saved	Program BCR
0.6	531,941	57,660	103,026	9

Countermeasure	Length / Sites	FSIs saved	PV of safety benefit	Estimated Cost	Cost per FSI saved	Program BCR
Clear roadside hazards - left side	2.10 km	0.4	350,670	39,060	105,869	9
Clear roadside hazards - right side	1.00 km	0.2	181,271	18,600	97,526	10
		0.6	531,941	57,660	103,026	9

Figure 5. usRAP Safer Roads Investment Plan for NE 9th St. from 140th Ave. NE to 164th Ave. NE, minimum benefit-cost ratio of 6.0.

The countermeasures suggested in these Safer Roads Investment Plan results are candidates that merit further investigation prior to making a final decision on their implementation. Mr. Harwood recommended conducting a full engineering study to assess site conditions and take into account other data gathered during the RSA process. Additionally, an engineering study would provide more accurate cost estimates for the improvements, improving the estimates of benefit-cost ratio provided in these Safer Roads Implementation Plans.

King County Metro Bus Stop Inventory

Robbie Frankel (King County Metro) provided an inventory of the bus stops in the RSA study area operated and maintained by King County Metro. Table 7 summarizes this inventory, and contains information on the ridership levels, amenities, and any outstanding issues for each stop.

Table 7. King County Metro bus stops in the RSA study area.

Stop ID	Location	Fall 2019 Ridership		Facilities Notes		Customer Comments				Operator Reports	Incident Reports
		On	Off	Amenities	Accessible?	Driver Missed Stop	Lighting	Shopping Carts	Road Safety		
67520	NE 8th St @ 140th Ave NE (WB/FS)	189	96	2 large hard-wired RR shelters, 1 trash, 1 tech pylon, 2 ped lights, 1 standalone bench, 1 iStop, 2 bike racks	Yes	2	0	0	0	N/A	No repeat issues
68150	NE 8th St @ 140th Ave NE (EB/FS)	95	203	1 large hard-wired RR shelter, 1 trash, 1 tech pylon, 2 ped lights, 1 standalone bench, 1 iStop, 2 bike racks	Yes	0	0	0	0	N/A	No repeat issues
67510	NE 8th St @ 143rd Ave NE (WB/FS)	51	64	1 small hard-wired RR shelter, 1 trash, 1 ped light, 1 standalone bench, 1 iStop, 2 bike racks	Yes	5	0	0	0	N/A	No repeat issues
68160	NE 8th St @ 143rd Ave NE (EB/FS)	73	57	1 small hard-wired RR shelter, 1 trash, 1 ped light, 1 standalone bench, 1 iStop, 1 bike rack	Yes	0	0	0	0	N/A	No repeat issues
67500	NE 8th St @ 148th Ave NE (WB/FS)	82	40	1 small solar RR shelter (poor solar location), 1 trash, 1 standalone bench, 1 iStop, 2 bike racks	Yes	1	2	2	0	N/A	No repeat issues
84940	148th Ave NE @ NE 8th St (NB/FS)	25	11	Front door landing pad only, 1 iStop	Yes	0	0	0	0	N/A	No repeat issues
68180	NE 8th St @ 148th Ave NE (EB/FS)	42	99	1 small hard-wired RR shelter, 1 trash, 1 standalone bench, 1 iStop, 1 bike rack	Yes	2	0	0	0	N/A	No repeat issues
67470	NE 8th St @ 156th Ave NE (WB/FS)	28	24	1 small solar standard shelter (F-21) and 1 trash	Yes	0	0	0	0	N/A	No repeat issues

68740	156th Ave NE @ NE 8th St (NB/NS)	27	116	1 destination sign	Yes	2	0	0	0	Request for 226 not to serve stop	No repeat issues
68440	156th Ave NE @ NE 8th St (SB/FS)	101	43	1 small standard solar shelter (F-21), 1 trash, and 1 destination sign	Yes	4	1	0	0	N/A	No repeat issues
68200	NE 8th St @ 156th Ave NE (EB/FS)	70	62	1 small standard shelter (F-11, no lighting) and 2 trashes	Yes	2	0	0	0	Request to consolidate 68740/68200	No repeat issues
67460	NE 8th St @ 160th Ave NE (WB/FM)	36	51	1 custom shelter (crossroads mall)	Yes	0	0	0	0	Request to remove zone	No repeat issues
68210	NE 8th St @ 160th Ave NE (EB/NS)	19	15	1 small standard shelter (F-11, no lighting) and 1 trash	Yes	1	0	0	0	N/A	No repeat issues
67450	NE 8th St @ 160th Ave NE (WB/NS)	9	9	1 small standard shelter (F-11, no lighting)	Maybe	2	0	0	0	N/A	No repeat issues
68230	NE 8th St @ 164th Ave NE (EB/NM)	12	23	5 ft sidewalk only	**No (<8' depth)**	1	0	0	0	N/A	No repeat issues
67430	NE 8th St @ 164th Ave NE (WB/FS)	25	24	1 small standard shelter (F-51, no lighting), 1 trash, **no rear door landing pad**	**No (<8' depth)**	0	1	0	0	Issue with no rear door alighting	No repeat issues
66780	164th Ave NE @ NE 8th St (SB/FS)	6	10	5 ft sidewalk only	**No (<8' depth)**	1	0	0	0	N/A	No repeat issues
68240	NE 8th St @ 164th Ave NE (EB/FS)	7	7	Sidewalk and expanded front door boarding area	Yes	0	0	0	0	Visibility because of trees	No repeat issues

Complete Streets Bellevue Report

Complete Streets Bellevue developed a full report detailing the findings of the community walking audits conducted on the NE 8th St corridor. It is presented in full on the following pages.

NE 8th St
Walking Audits

Informed by our community

Written by Christopher Randels

Photos by Caitlin Whitehead

Complete Streets Bellevue

Table of Contents

Previous, left: This sidewalk at the intersection of NE 8th St & 148th Ave NE is immediately adjacent to high-speed traffic.

Previous, right: Participants assemble for a group photo before our final walking audit.

Below, left: Our group waits for a walk signal at 140th Ave NE.

Below, right: Several intersections along NE 8th St, like this one at 158th Pl NE, do not have crosswalks on all sides.

Land Acknowledgement

Complete Streets Bellevue acknowledges that our members are on the Indigenous Land of Coast Salish peoples who have reserved treaty rights to this land, which include (but are not limited to) the Duwamish (dxʷdəwʔabš) and Snoqualmie Indian Tribe (sdukʷalbixʷ). We thank these caretakers of this land who have lived, and continue to live, here since time immemorial. We commit to care for this land and center equity at the core of our actions.

A Letter of Thanks & Hope

To Bellevue Transportation staff, city leaders, and our community:

It is no secret that Bellevue is a city that was built for and designed around the personal car. The wide arterials through our Downtown, the sprawling & meandering roads that adorn our subdivisions, and the urban highways connecting us to our region all are remnants of intentional policy decisions that based our city's transportation and land use around every resident owning their very own automobile. For a significant portion of the 20th century, this appeared to be the logical choice - residents would have the freedom to get where they wanted, when they wanted, while supporting the economic growth of the Puget Sound region.

However, our city has since learned that this automobile dependence has come at an immense cost to our environment, our health, and our society. As our planet continues to warm due to rising carbon dioxide (CO2) emissions, the link between automobile usage and rising temperatures has become clear as day. In Bellevue, nearly 45% of our emissions come from transportation, and emissions from personal automobiles comprise the largest portion of this sector. Our city, like many others around the country, is facing a road safety crisis unlike anything we've seen - 30 people were seriously injured or killed on Bellevue roads in 2019, the most in more than a decade. Because this traffic violence disproportionately impacts seniors, people with disabilities, and people of color, our current auto-dominated transportation system further perpetuates historical inequities. And it's become abundantly clear how our city's wide roadways impede good urban design & features that could contribute to a unique sense of place and building of community.

Our city's transportation system often gets a bad reputation among regional urbanists and safe streets advocates because people see our roads & communities for what they *are* and not for what they *can be*. People see the legacies of decades of policy choices and not the current actions of city staff and leaders who are working to make the situation better. And there's certainly a lot to be excited about in Bellevue! Between 2017 and 2019, nearly 45 miles of bicycle facilities and over 10 miles of pedestrian facilities were added throughout the city. With dedicated funding from the 2016

Transportation levy and new funds from the Vision Zero and Growth Corridor Bike Network CIP items, these numbers are sure to continue & grow well into the future.

> ***"The lessons learned here must be remembered and applied citywide as soon as possible."***

The existence of this Road Safety Analysis (RSA) report is proof of the meaningful improvements that Bellevue Transportation staff members are undertaking to reduce danger for people using our city's transportation system. NE 8th St is by far Bellevue's most dangerous road - three people have died on or at NE 8th St in a 15-month period - and this work that transportation staff are undertaking meets the urgency of this crisis.

Complete Streets Bellevue wants to recognize & thank the staff who are working tirelessly to make our city a better & safer place for us all to get around. We cannot express enough gratitude for the chance to lead this important outreach opportunity, but we hope to repay this generosity by providing valuable community feedback that meaningfully contributes to safer road design. Thanks also go to the over 20 community members, including representatives from organizations like Disability Mobility Initiative, Feet First, and Greater Redmond Transportation Management Association (GRTMA), who shared their values, experiences, and opinions with us. Our organization could not have done this work without you.

This work is invaluable & important, but it must be the first step in a larger transformation of how Bellevue designs its roadways. Community members frequently noted issues that were outside the study area, or shared how the dangers they saw reminded them of conditions in other parts of the city. *NE 8th St is not the only unsafe street in Bellevue* - for this RSA to truly be effective, the lessons learned here must be remembered and applied citywide as soon as possible. Our city's Vision Zero Strategic Plan rightly recognizes that a systemic approach is required to reach zero deaths and serious injuries by 2030 - and systemic changes, by definition, will require changes to the whole system. We know the process will be long & difficult, but our organization and our members are excited and optimistic for what the future brings.

Our deepest gratitude,

Complete Streets Bellevue

GREATER REDMOND TRANSPORTATION MANAGEMENT ASSOCIATION

DISABILITY MOBILITY INITIATIVE

feet first promoting walkable communities

Background

Left: The group for Saturday's *Errands* walk met under the southern pavilion at Crossroads Park.

Right: NE 8th St and surrounding streets like 156th Ave NE are well-traveled transit corridors.

Timeline & Outreach

The observations collected in this report are the product of several weeks of preparation, planning, advertising, outreach, and collaboration with many organizations & community leaders throughout the Eastside. Shortly after CSB was formally founded in November of 2020, our organization laid groundwork for this project by lobbying Bellevue City Councilmembers to expedite funding for the Vision Zero Tactical Improvement CIP budget item.[1] Bellevue City Council's passage of the 2021-2022 biennium budget and Councilmember Zahn's introduction of an amendment to begin Vision Zero funding in 2021 are what ultimately made this work possible. We'd therefore like to express our deepest gratitude to Council for showing leadership by supporting this crucial funding, and to our community for organizing around this important issue.

On January 29th, Complete Streets Bellevue was contacted by Bellevue Transportation staff to inform us of an upcoming RSA for 116th Ave NE between Main St and NE 12th St (0.75 miles in length). Staff expressed their desire for CSB to lead community walking audits along this corridor. These events would provide the community an opportunity to identify dangers & problems they encounter day-to-day on the corridor, observations that would help ground the engineers and staff members who would later look at the road's safety from a more technical view.

Outreach began in earnest to advertise our organization's original event planned for Saturday, February 20th along the corridor, but city staff informed us on February 9th that they would be shifting the RSA's focus from 116th Ave NE to NE 8th St between 140th Ave NE and 164th Ave NE (1.5 miles in length). Our organization was able to pivot quickly by cancelling our original event and expanding it to three shorter walks in March, both to allow people more opportunities to participate and to split the now longer corridor into smaller, more manageable segments. Additionally, feedback from a core team of passionate CSB members led to the addition of a thematic element to each walk that would ground our group's observations and feedback. By taking advantage of features & establishments along particular sections of the corridor, our group was able to direct conversations around concrete problems and barriers that people would face as they go about their day-to-day lives while walking, biking, rolling, or taking transit on the corridor. The chosen themes and event details are below:

- Monday, March 8th, 6:00 - 7:00 pm - Healthcare - 148th Ave NE to 156th Ave NE
- Wednesday, March 10th, 3:00 - 4:00 pm - Schools - 140th Ave NE to 143rd Ave NE
- Saturday, March 13th, 11:00 am - 12:00 pm - Errands - 156th Ave NE to Crossroads Park

Once dates were chosen and routes were decided, our organization's leaders worked to advertise the events through multiple formats throughout the community. Outreach included:

- Regular posts on CSB's social media pages (Facebook & Twitter)
- Information in CSB's regular newsletters
- Signs along the study corridor with registration link
- Publicized through street advocacy orgs & their newsletters (Feet First, Greater Redmond Transportation Management Association, Cascade Bicycle Club)
- Contacts and/or meetings with environmental, safety, and equity organizations:
    - 4Tomorrow
    - 350 Eastside
    - Cascade Bicycle Club
    - Chinese Information & Services Center (CISC)
    - Congregations for the Homeless
    - Disability Mobility Initiative
    - Eastside for All
    - Feet First
    - Greater Redmond Transportation Management Association (GRTMA)
    - Indian Association of Western Washington (IAWW)
    - Indivisible Eastside
    - Transit Riders Union

Although there is more outreach our organization could have conducted in-person to support more input from diverse communities (more information in the *Participants* section below), our leadership team appreciates how our wide net enabled us to capture perspectives from residents & community leaders with diverse perspectives & backgrounds.

Participants

Our organization counted 25 attendees across all three events, with three people attending more than one walking audit. Monday's evening walk was the most well-attended, with nine community members participating (including two representatives from GRTMA). Both Wednesday and Saturday's events were attended by eight people; on Wednesday, our group was joined by representatives from Disability Mobility Initiative and Feet First, and Bellevue City Councilmember Janice Zahn joined our group's final event on Saturday.

Although formal demographic & geographic data was not collected, anecdotally participants stemmed from all corners of Bellevue - from Newport Hills to Crossroads to Downtown and many more neighborhoods in

Left: Our group assembles near the Bellevue Aquatic Center before we embarked on our Wednesday walk, *Schools*. Members of several community organizations, like 350 Eastside, Eastside DSA, and Indivisible Eastside, attended at least one walk.

between. Several participants also had advocacy experience in other different but adjacent progressive policy areas (e.g. environmental stewardship, racial justice, etc.) and were interested in the intersections between their respective fields and safe streets advocacy. This diversity of perspectives enriched our observations and helped ensure we thought about our observations from multiple angles of impact.

One caveat of our findings is that participants across the three walking audits were not demographically representative of Bellevue's diversity. Although 50% of Bellevue's population is nonwhite, the overwhelming majority of participants across all three audits were white. As noted in the previous section, CSB reached out to several organizations and groups which directly serve Black, Indigenous, and People of Color (BIPOC) groups and other communities that have historically left out of transportation decisions. Several legitimate concerns were raised surrounding the risk of in-person gatherings due to the COVID-19 pandemic, as well as immediate economic challenges & hardships these communities were facing as a result of pandemic shutdowns.

Our organization recognizes the challenges present in this unique moment in history and will continue to build authentic relationships with these groups so that we can support their missions and visions for a safe, sustainable, and equitable Bellevue. As our society comes out on the other side of the COVID-19 crisis, our organization looks forward to initiating in-person engagement that meets underserved communities where they are at and truly centers their voices as we build a better transportation system that works for all of us.

15-Minute Cities

In addition to noting safety issues and collecting feedback on the corridor, our organization saw these audits as a unique opportunity to educate community members on the policy intersections between planning, land use, and transportation. Recently, the "15-Minute City" paradigm has gathered salience amongst the general public - the idea that day-to-day basic needs (grocery stores, doctors' offices, employment centers, recreational opportunities, etc.) should be accessible to residents within a 15-minute trip by walking, biking, or taking transit. This vision is achieved through a combination of robust & connected pedestrian, cyclist, and transit networks alongside dense land uses to facilitate proximity of diverse destination types.

The term has even become popular with several Bellevue City Councilmembers, which suggests that this paradigm will inform their deliberations around land use and transportation going forward. Because of the concept's importance in local discourse, our organization felt it prudent to ground each of our events' discussions in a brief introduction of the concept, its benefits to safety, sustainability, and equity, and how our efforts facilitated but one part of a larger, planning-oriented equation that needs to be addressed to realize the concept's vision. Our organization encouraged interested participants to continue to follow local transportation issues, but also advocated that they focus attention & support on the broader land use reform required to make Bellevue a true 15-Minute City.

Left: Participants rest & discuss what they've seen at the intersection of NE 8th St & 156th Ave NE. Crossroads is a dense, mixed-use neighborhood with nearby access to shops, schools, parks, and residences. Safe & protected infrastructure for people walking, biking, and rolling would help unlock this neighborhood's potential to be a true 15-Minute City. However, Bellevue must ensure that these improvements do not lead to gentrification that displaces low-income or minority communities.

Observations

Left: Our group crosses the intersection of NE 8th St & 158th Pl NE during the final walking audit, *Errands.*

Right: We took some time while waiting for the walk signal at 148th Ave NE to discuss signal & crosswalk timing.

Monday, March 8th

148th Ave NE to 156th Ave NE

Healthcare

Our group gathered shortly before 6:00 pm at the northeast corner of NE 8th St & 156th Ave NE. This particular corner serves not just an entryway to the densest portion of the Crossroads neighborhood, but rather is also home to a local branch of the Washington State Department of Social & Human Services (DSHS). In addition to other topics, DSHS branches provide information for those seeking behavioral health, long-term caretaking, and food assistance services. Since this walking audit was themed around the experience of local residents accessing their day-to-day healthcare needs, the Crossroads DSHS branch was an ideal starting point for our group's discussion.

Left: Event facilitator Chris Randels explains the format of the feedback questionnaires before the walk begins. For the materials used for each walk, please consult the Appendix.

To ground our observations in the real-world issues that people might encounter as they're walking, biking, or taking transit, participants shared stories of navigating to healthcare appointments without a car. Several group members had never traveled to such appointments without an automobile, and those that had encountered difficulties that made the trips unsafe or stressful. One participant from Redmond noted the challenges in relying on public transportation to get to appointments on time - because her route required a transfer that could have been missed if the first bus was even a couple of minutes late, she was required to leave much earlier for her appointment than she would've needed to by car. Another participant, an avid cyclist, noted the general lack of safe cycling infrastructure near the Overlake Hospital campus. He felt comfortable riding to his appointment because he is young, healthy, and

an experienced rider, but we noted how the lack of safe infrastructure can preclude people who don't fulfill these criteria from feeling comfortable or safe riding to such appointments. Another participant shared experiences of her low-vision friend, who was not in attendance but had had dangerous encounters with cars nearly colliding with her in crosswalks in the Crossroads neighborhood. These examples served as sobering reminders that we need walking, biking, and transit infrastructure that 1) provides as much convenience as possible relative to that of the automobile, and 2) is safe enough to be used by people of all ages, abilities, and backgrounds.

A cacophony of vehicle noises was a loyal backdrop to our group's walk throughout the evening. During our pre-walk discussion, several participants found it hard to hear other speakers, and people often had to repeat their points during the walk to make sure they were heard by the group. The noise was very clearly due to the road design of NE 8th St and 156th Ave NE - because each were five lanes wide with speed limits of 35 and 30 mph respectively, the rush of vehicles constantly moving at speeds often higher than those posted was a source of great discomfort. One participant used an app on her phone to measure the decibel level as we started our walk westward along the north side of NE 8th St and recorded a value of 86 dB. This is very close to noise levels that, with prolonged exposure, can cause hearing damage.[2]

Also immediately evident on this section of roadway were the lack of safe & protected bicycle facilities, meaning we encountered several cyclists who were required to share the limited sidewalk space with pedestrians. In addition to creating unsafe conflict points between pedestrians and cyclists, sidewalk riding creates more dangerous conflict points with cars at driveways. Several driveways along the route already had limited visibility due to limited lighting (more evident as the evening progressed), vegetation, signage, or other obstructions, but this danger is often not as pronounced for pedestrians because they are moving at slower speeds and more likely to be seen by drivers. Because cyclists are often traveling at faster speeds, it is more readily possible that cars pulling out of driveways might not see them until it is too late. Placing safe & protected bicycle facilities on the roadway would therefore have numerous benefits: such facilities would 1) reduce conflicts between pedestrians and cyclists, 2) provide more time for cyclists to be seen by drivers, since the former group would now be more visible in the roadway, and 3) reduce street noise by decreasing both the available vehicle lanes (decreasing traffic and therefore traffic noise) and naturally calming the roadway to encourage lower speeds.

As we continued westward along the north side of the roadway, we noticed a couple of points where overhanging vegetation could provide discomfort or obstructions for pedestrians. Immediately west of 153rd Pl NE, one group member noted the spiny leaves of some Oregon grape plants were overhanging

Far Left: Overgrown vegetation overhangs the sidewalk by approximately 2 feet and is at face-level for most adults. Low-vision pedestrians might run into these obstructions without seeing them.

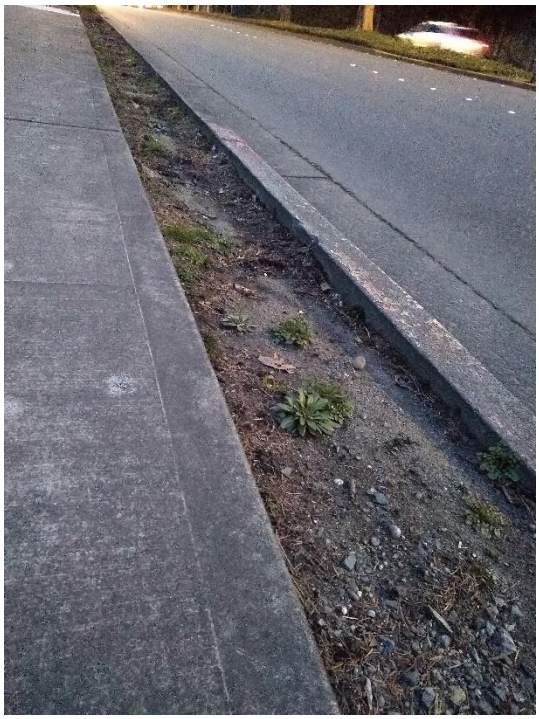
Left: Our group, even walking just two abreast, occupied the entire sidewalk and made it difficult for other sidewalk users to pass us.

the sidewalk. At another point west of 151st Pl NE, the tops of some cypress shrubs had grown such that portions above approximately five feet high were overhanging the sidewalk by two feet or more. Although both occurrences could be avoided by pedestrians moving to the other side of the sidewalk, these issues serve to reduce the effective width of the sidewalk, which can cause difficulties when multiple people are walking together. These issues could be solved through multiple methods, including 1) regular maintenance of vegetation to ensure it doesn't obstruct the sidewalk, and 2) choosing native vegetation that will require less maintenance and present fewer sharp edges that could injure pedestrians.

From the onset of our walk, our group had noticed how the sidewalk's narrowness (approximately 6 feet) would create difficulties when pedestrians heading in opposite directions would need to pass each other (especially in the socially-distant times of COVID-19). However, the conflict became most pronounced when, as we neared 148th Ave, a jogger heading in the opposite direction was required to head several feet into the roadway to maintain a safe distance from our group. Although he was running in the direction of oncoming traffic and thus was able to safely assess for himself that there was no danger in doing so, the fact that he would not have been able to safely pass our group without doing so speaks to the importance of having wide enough pedestrian facilities to accommodate bidirectional flow. The time where social distancing is required will soon be gone, but many sidewalks in Bellevue, including the ones on this portion of NE 8th St, are currently not wide enough to accommodate comfortable passing under even normal circumstances.

In addition to highlighting the importance of sidewalk width for pedestrian comfort, this walk also displayed how wide vegetative buffers can contribute to a safer walking & rolling experience. Heading westward from 156th Ave NE, we noticed how the buffer decreased in width from 2 feet to 1 foot to entirely

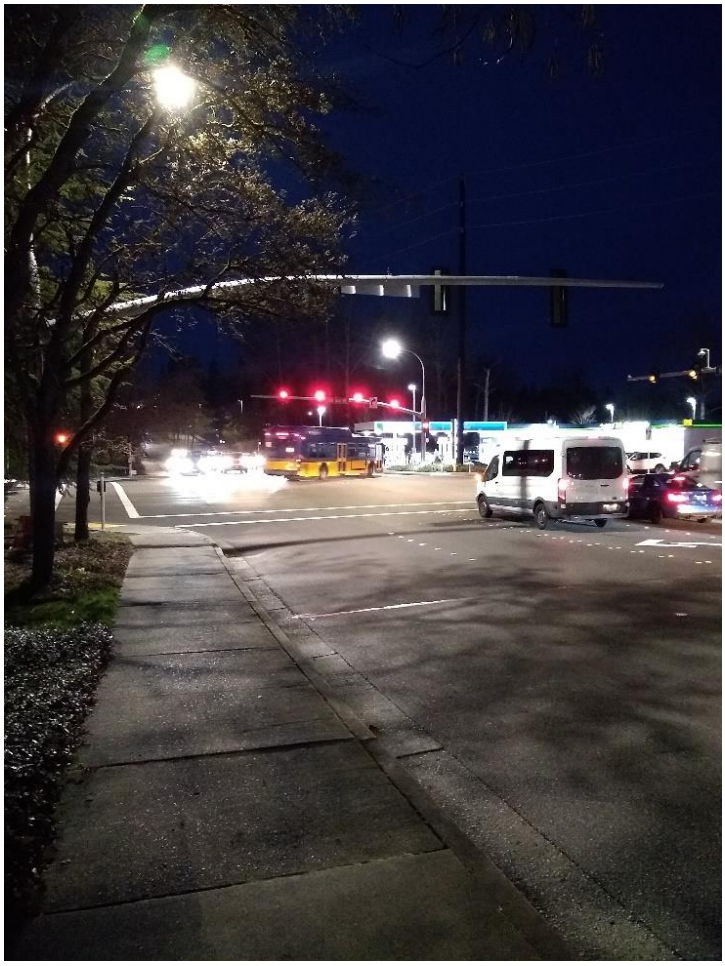
disappearing as our group approached 148th Ave NE. Although the lack of a buffer near 148th Ave enables a wider sidewalk, it leaves pedestrians immediately beside cars that are often reaching their highest speeds as they reach the bottom of a large hill. If larger vehicles have objects that extend slightly beyond the roadway (e.g. mirrors from trucks or buses), it's possible that pedestrians walking with traffic could be hit without seeing any danger coming. Additionally, our group saw how vegetative buffers really only provide protection if they are filled with vegetation; in several sections where the buffer was only one foot wide, there was no vegetation present and/or soil had been stripped away from the area, creating an uneven surface with the rest of the sidewalk. This uneven surface presents a legitimate stumbling hazard for pedestrians, who at best might end up with scraped hands and at worst could fall into high-speed traffic. Regular maintenance of these buffers, planting & maintaining native vegetation that provides actual protection for pedestrians, and (if possible) widening these buffers to increase the distance between pedestrians and vehicular traffic would all work to improve safety.



Left: Portions of the buffer between the sidewalk and the roadway were void of vegetation and soil, which created lips in the sidewalk that people could easily trip over. With cars frequently traveling in excess of 40 mph on this corridor, tripping into the roadway would be a dangerous safety hazard.

The intersection of NE 8th St & 148th Ave NE served not just as the halfway mark for our journey, but also as a nexus of several larger issues surrounding walkability and safety on this corridor. Because this intersection is a meeting point of two major vehicular thoroughfares, signal times are structured to maximize vehicular throughput. This comes at the cost of pedestrians' time, since they must often wait several minutes through the complete signal cycle before they receive permission to cross. Additionally, pressing the beg button even a few seconds after the vehicle traffic going in the same direction has been given a green light will often not grant pedestrians a walk signal, even if there is enough time in the cycle for a pedestrian to safely cross. Finally, crossing the multiple lanes of 148th Ave NE illustrated to our group how, once pedestrians are given the walk signal, we are not given enough time to cross comfortably or safely - all of our group was still tens of feet from the opposite sidewalk when the signal count reached zero. Although this intersection does see significant vehicle traffic, this should not negate the importance of or overly inconvenience the several pedestrians we saw along our walk who were traveling in all directions. This intersection has several establishments, including reproductive healthcare, a supplement store, a podiatrist, and many others, that can provide important healthcare services to local residents - readjusting signal and crosswalk timing to be more comfortable and accommodating for people of all mobility levels should therefore be a priority for improvements to this corridor.

Our group congregated at the northwest corner of the intersection to discuss what we had observed thus far. Because of the overall hostility of the corridor towards pedestrians, our group discussed the role that private partnerships can play in improving neighborhood walkability. Although outside the scope of this Road Safety Analysis, several group members noted how a walkway between the residential properties on the north side of NE 8th St could provide a safer & more secluded alternative that would protect people from the noise and danger of the roadway. Additionally, participants noticed the lack of pedestrian connections between the sidewalk and the plaza on the northwest corner; people accessing these establishments would need to either cut through dirt and vegetation or travel further westwards to enter at the driveway and then double back to their destination. Although our group is by no means composed of experts in land use policy, all group members supported finding ways to incentivize developers and private property owners to improve pedestrian connections on or between their properties.



Left: The intersection of NE 8th St & 148th Ave NE as viewed from the NW bus stop. Each side of this intersection is several lanes wide, which increases crossing time for pedestrians.

As we crossed to the south side of NE 8th St to head eastwards back to our starting point, a group member commented on her experiences seeing buses on the Rapid Ride B Line often having to stop twice at the intersection - once at a red light at the intersection, and once again if there was a passenger to pick up or drop off at the bus stop. The participant noted it might improve transit travel times to locate the bus stop before the intersection. Although King County Metro has found that, generally, bus stops after an intersection will improve traffic times,[3] it is possible that this intersection may prove to be an exception. Regardless, there are numerous changes that can be made to improve the reliability and comfort of transit use. For example, our group noticed that the stops on each side of 148th Ave NE only had a seat wide enough for one person - making this into a bench would enable more people to sit while waiting for their bus. Additionally, reconfiguring the intersection to use transit signal priority technology would improve transit speed and reliability but may negatively impact pedestrian mobility. Central to our group's discussion was the

Left: Public art installations like this one were well-liked by event participants. Long-time residents of Bellevue noted how these were created in the 1990s – perhaps it's time for a new artistic program to add vibrancy and placemaking features to our roadways?

difficulty striking a balance between multiple stakeholder interests, but we all agreed that much more can be done to improve the quality of this intersection for those outside of cars.

The south side of this portion of NE 8th St presented very similar challenges to those we encountered on the north side. Sidewalks remained narrow through the whole length of the corridor, a narrow (but grassy) vegetative buffer provided minimal protection from the high-speed roadway next to us, and visibility at each driveway was relatively limited. However, this side of the roadway appeared darker than the north side, and this didn't seem solely attributable to the fact that it was later in the evening. Several women in our group noted that they would not feel safe walking on this corridor alone during the night and would want to walk on the north side instead. However, this choice is not readily available to residents on the south side of the road, because there is no marked crosswalk linking the two sides of the road outside of the intersections at 148th Ave NE and 156th Ave NE. This means that this half-mile long section of the NE 8th St corridor does not have a marked or signalized midblock crossing to provide a safe route for pedestrians wanting to access the opposite side of the street. At best, this can lead to pedestrians needing to take circuitous routes to access a destination just across the street, and at worst can lead to people needing to unsafely cross five lanes of high-speed vehicular traffic. Our group supported adding multiple mid-block crossings throughout this segment to facilitate safe connections between neighborhoods and destinations on opposite sides of the street.

As our walk came to an end at the southwest corner of NE 8th St & 156th Ave NE, several group members shared parting words of praise for several artistic elements we found along the corridor. Back in the 1990s, local schoolchildren were asked to paint ceramic tiles that were incorporated at several locations

along NE 8th St. Nearly all group members expressed appreciation at how these artworks provided colorful character and a sense of place to a corridor that was otherwise lacking one in spite of being so well-traversed by local residents. Our group also appreciated the similar artistic display present at that southwest corridor, but noted how benches or other comfortable seating arrangements would've made the experience more pleasant and provided a nice resting point for people who were tired after traversing the steep hill.

Ultimately, our group was not surprised by the poor conditions we observed for people walking, biking, and taking transit throughout this segment. However, several participants were surprised at the number of people traversing the corridor outside of cars *in spite of* the current travel experience being uncomfortable or unsafe at several points. Although the risky nature of these current journeys is harrowing, our group chose to focus our parting words on the optimistic fact that, by improving the safety & comfort of this corridor, city staff can encourage more non-motorized transportation that supports our environmental stewardship and Vision Zero goals.

Wednesday, March 10th

140th Ave NE to 143rd Ave NE

Schools

Because we wanted a location that would be easily accessible for participants arriving by car or by transit, we selected the Bellevue Aquatic Center on 143rd Ave NE to be the meeting place for our second walking audit. Our organization structured this walk to examine the real-world issues that children and their parents might encounter as they are walking, biking, or taking transit to school. Two schools are present at 143rd Ave NE (Stevenson Elementary School & Odle Middle School) alongside several apartment complexes to the east and west, so this portion of the corridor was an ideal location to adopt this theme.

Several participants were parents of either currently or formerly school-aged children, so our discussions mostly revolved around how their children got to school and if they (the parents) were comfortable with their children walking or biking to school by themselves. Most parents present drove their children to

Left: Children approach the unsignalized intersection near Odle Middle School. Although outside the study area, Bellevue must incorporate walkability assessments and concerns into all planning decisions.

school, noting the lack of safe pedestrian and cycling infrastructure near their homes in south and east Bellevue to be an impeding factor. One participant did live nearby and felt comfortable with her children walking the short distance to school, but only if she accompanied them. Although our meeting location was well removed from NE 8th St and thus outside the RSA study area, several group members lamented how the approach to Odle Middle School on 143rd Ave NE was car-centric. During our approximately 15 minute conversation in front of the Aquatic Center, we saw several pedestrians wait at a marked but unsignaled crosswalk while cars drove through and rarely yielded the right of way. Our group observed this behavior at 3:00 pm on a Wednesday during COVID-19 and the era of remote schooling; when this area is dense with car traffic (at school day's end or after events at the Aquatic Center), it's likely that this experience is more pronounced and uncomfortable. This speaks to the larger importance of, when funding permits, not merely focusing on the RSA study area, but rather also examining how facilities interact with the larger multi-modal network.

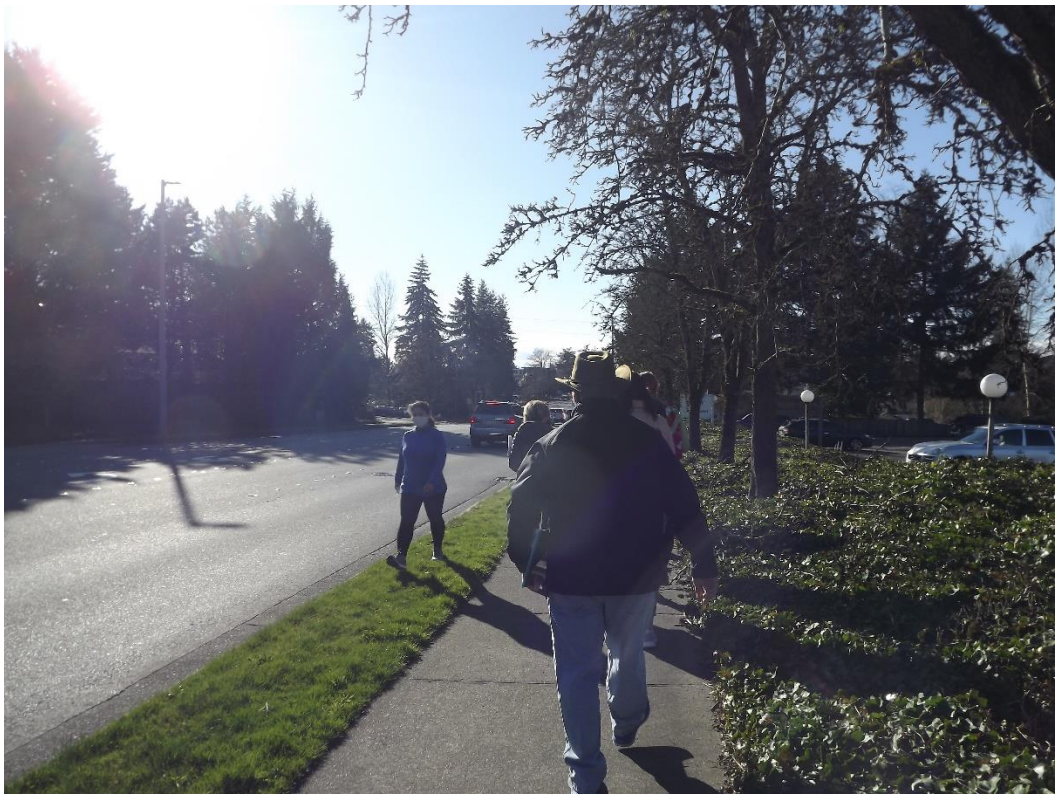
At the conclusion of our discussion, our group walked northwards along 143rd Ave NE to arrive at the southeast corner of NE 8th St & 143rd Ave NE. Immediately evident at this location was the lack of a crosswalk on the west side of the intersection. This means that pedestrians at the northwest corner of the intersection who need to access the southwest corner (or vice versa) are required to cross three crosswalks, adding time and distance to their journey. An addition of a crosswalk on this side of the intersection would be a straightforward fix to meaningfully improve the pedestrian experience. One participant noted how a crosswalk on the west side of the intersection would enable students accessing the school from the north side of NE 8th St to cross on to the west side of 143rd Ave NE, the side of the road students need to be on to access Odle Middle School. Providing a signalized crosswalk here would therefore offer an alternative to the previously mentioned unsignalized

crosswalk near the Bellevue Aquatic Center, which must be used by pedestrians on the east side of 143rd Ave NE to access the school and aquatic center.

One participant at this walk was mobility-challenged and required a cane to be able to accompany us. Her presence was important, because it illustrated at intersections how signal timing is currently structured to accommodate only able-bodied adults. Crossing to the north side of NE 8th St at 143rd Ave, for example, was a stressful endeavor, as our group was still two lanes removed from the other side of the street when the countdown timer reached zero. Because this intersection will be regularly used by large groups of schoolchildren of all sizes, ages, and abilities when COVID-19 restrictions end, the timing given to pedestrians to cross safely should be substantially increased.

Left: The vegetative buffer in front of Stevenson Elementary School was several feet wide, providing substantial protection from automobile traffic. Our group would have felt safer if this level of protection was present on the entire corridor.

On a positive note, our group was very impressed with the pedestrian infrastructure present immediately in front of Stevenson Elementary School. The sidewalk felt wide enough for our whole group to remain close to each other while still allowing people traveling in the opposite direction to pass us. Additionally, there was an incredibly wide vegetative buffer that was filled with aesthetically-pleasing ornamental plants and appeared to be regularly maintained. One participant praised the dedicated & comfortable pedestrian infrastructure that was present from the westbound B Line 143rd Ave transit stop to the school's front door. However, this level of pedestrian safety is only provided *immediately* in front of Stevenson Elementary - as soon as we crossed



Left: A pedestrian enters the grass to pass our group as we walk westwards towards 140th Ave NE. Wider sidewalks would provide safe distances for pedestrians to pass each other, especially because of COVID-19 concerns.

the property line on to the Montessori School to the west, the sidewalk & vegetative buffer both narrowed to levels that were uncomfortable for our group and passersby. Additionally, our group noted how visitors walking or rolling to either the Montessori School or the Asia Pacific Language School do not have a dedicated sidewalk - students would need to walk along the driveways and through parking spaces to access the front door. Although our group recognized that the latter two schools were private institutions (in contrast to Stevenson Elementary, a public school) and how there might be different regulations around walkability as a result, we wondered whether it would be possible to incentivize or require private property owners to factor walkability in their site designs.

For the remaining stretch of our walk on the north side of NE 8th St, our group only had a very narrow vegetative buffer to protect us from cars speeding by. Similar to our first walking audit, noise from traffic was very loud and made it difficult for our group to hear each other as we discussed the issues we saw. Because this section of NE 8th St is five lanes wide and the posted speed limit is 35 mph, consistent & loud traffic noise is baked into the road design. Our group supported repurposing a traffic lane to support dedicated transit or bicycle infrastructure - this would serve the twofold purpose of improving the reliability of transit/biking on this corridor while providing natural road narrowing and calming effects. Short of that, our group supported widening the vegetative buffer to at least offer more distance between pedestrians and vehicles. Our group was torn on whether to change the vegetation present from grass to shrubbery or other ornamentals, similar to the sidewalk section immediately in front of Stevenson Elementary - some group members appreciated the beauty and protection such landscaping would provide, but other participants noted the logistical difficulties that would be involved to regularly maintain new

vegetation. Ultimately, widening the vegetative buffer and planting low-maintenance ornamental plants would go a long way to improving pedestrian safety and comfort.

Before our group reached the northeast corner of NE 8th St & 140th Ave NE, we came across a portion of the sidewalk that was incredibly washed out by wet soil. Although not as high a priority as other items noted on our walk, repairing this portion of the sidewalk (or encouraging the private property owner to do so, if necessary) would improve the approach to the intersection for the dozens of couples, families, and students our group saw while walking this section of the corridor.

The intersection of NE 8th St & 140th Ave NE was also a challenging one for our group to cross safely. Crosswalk timing for each direction we utilized (the north, west, and south crosswalks) was significantly shorter than what our group needed. Most egregious was the western crosswalk, which required our group to cross 6 lanes of traffic and left our mobility-impaired participant literally halfway in the street when the crosswalk timing reached zero. Not every person using these crosswalks will face the same mobility issues as us, but we saw several families with strollers, couples, and elderly people using the intersection as they accessed the local businesses & apartments present at all corners. Reconfiguring this intersection to have longer crosswalk timing will more readily accommodate people of all mobility levels and circumstances. Additionally, cycle times at this intersection were long in order to accommodate significant vehicle traffic from both NE 8th St and 140th Ave NE. Our group acknowledged the importance in supporting vehicle throughput, but we pondered whether giving pedestrians priority at this intersection (e.g. through Leading Pedestrian Interval technology) or making the cycle more responsive to

Left: Most of our group was still tens of feet removed from the other side of the crosswalk when the timer reached zero. Because this intersection is used by families, seniors, and people of different mobility levels, these crosswalk times should be lengthened to safely accommodate more people.

pedestrian presence would be possible. For example, similar to other intersections in Bellevue, if a pedestrian does not press the beg button within the first few seconds of the traffic cycle, they will often be made to wait until the next cycle - even if there would have been enough time for the pedestrian to cross. Retooling the cycle time to more flexibly accommodate people crossing would go a long way to improving the experience for pedestrians on this well-traversed corridor.

Participants were able to share two additional pieces of information on this intersection based on their prior experiences. One participant noted how she had had close run-ins with vehicles that were using the turn lane on NE 8th St (from eastbound NE 8th St onto 140th Ave NE southbound) - cars are encouraged to travel quickly through the intersection and make their turn without accounting for if there are pedestrians in the southern crosswalk. Similarly, people crossing southbound in the western crosswalk will not be visible to cars turning right on southbound 140th Ave NE, since the view of their approach is often blocked by cars waiting at the light. When right-turning cars speed to the intersection and pull slightly into the crosswalk to gain visibility for oncoming traffic, it's possible for pedestrians or cyclists using the crosswalk to be hit and pushed into traffic. Removing this turn lane, or instituting a "no right on red" policy, would mitigate both of these issues, since cars would often need to come to a complete stop behind the intersection before proceeding into pedestrian space. Additionally, the mobility-impaired participant noted the presence of storm drain gratings at both the northeast and southwest corners of the intersection, immediately adjacent to the ADA accessible ramps to the sidewalk. She noted that it would be really easy for canes or other mobility aids to get stuck in these gratings, creating a stressful & dangerous situation for the disabled.

Although likely outside the scope of this RSA, a group member noted how the design of the RapidRide bus stops did little to protect transit users from rain and wind as they waited for their bus. Another noted how she often saw buses need to stop twice at the intersection - once for a red light, and then once again at the stop after the light if there were passengers to be picked up or dropped off. She noted that placing the transit stops before the intersection may lead to faster transit times. The infrastructure around the intersection would need to be heavily modified to accommodate this, but perhaps the intersection (and the NE 8th St corridor at large) could be further studied to investigate into which approach provides better & more reliable transit times.

Before walking along the south side of NE 8th St to return to our starting point, group members did find a couple of features which they felt contributed to a positive pedestrian experience. One participant noted how the regular presence of a food truck on the northeast corner of the intersection provided both delicious food and creative character to this otherwise drab location. Another noted how the transit map at the eastbound Rapid Ride B Line stop at NE 8th St & 140th Ave NE was very detailed and easy-to-understand. Because we will need people to switch from driving to transit in order to meet our environmental stewardship and safety goals, making our transit system easier to understand will make the overall experience more pleasant and approachable.

Similar to the north side of NE 8th St, our return walk on the south side of the street had a narrow sidewalk and an even narrower vegetative buffer. This pathway was not wide enough for our group to comfortably stay together, nor would it have been wide enough for people to pass our group comfortably without going into the street. Additionally, the lack of bicycle facilities on the roadway itself means that cyclists often share limited sidewalk space with pedestrians, which contributes to conflicts. Moving cyclists to a dedicated & protected space on the roadway while giving pedestrians a wider sidewalk would contribute to calmer & safer road conditions for all travelers.

Since most in our group were familiar with this section of the NE 8th St corridor, most participants were not surprised by the conditions we witnessed. Over the course of our walk, we saw several dozen families, children, and elderly people (many from communities of color who were walking and biking on this stretch of the corridor. In spite of the high number of pedestrians, this street remains primarily designed for cars - one participant who lives nearby noted how in pre-COVID times, cars would frequently line up in the eastbound right lane of NE 8th St as they waited to turn into Odle Middle School to drop or pick up their children. With safe & protected pedestrian, cycling, and transit infrastructure, we can create a neighborhood that allows children to access their educational institutions safely & independently. This would reduce automobile traffic on this corridor and make this road safer & greener for everyone.

Saturday, March 13th

156th Ave NE to Crossroads Park

Errands

Crossroads Park on a lively & packed Saturday morning served as an excellent meeting place for our organization's final walking audit. During preparations, our group observed over one hundred children, families, and seniors enjoying the beautiful weather with strolls & bike rides in & near the park. The park is immediately adjacent to numerous neighborhoods, businesses, community centers, and religious institutions - which means that nonmotorized connections to link all these amenities with each other should be a priority to make this neighborhood liveable, walkable, and safe. Because of this neighborhood's density and access to goods & services, we structured our feedback around the experiences of local residents who will be walking, biking, and taking transit to access local businesses and meet their day-to-day needs.

This event's pre-walk discussion was the most varied and detailed - our group spent nearly 40 minutes talking about our experiences walking, biking, and taking transit to run errands in our region and brainstormed ideas to help make the experience safer and more convenient. Although several people present were regular bikers in the city, many still expressed reservations about the quality of facilities the city has built. One participant noted her reticence biking on the road unless protected bike lanes were present throughout her whole trip. Several other participants echoed that sentiment and added that Bellevue's bike

and sidewalk networks are very patchwork in design. One participant noted how, on his walk to the event, the sidewalk on the opposite side of the street stopped and started two separate times in a ¾ mile stretch. In the stretch of NE 8th St that our group was analyzing that day, painted 5' bike lanes would disappear and transform into an additional traffic lane as one went west. Because of a lack of connectivity, already meager infrastructure is made worse when it's not built to completion. Our group was lucky enough to have Bellevue City Councilmember Janice Zahn present, who was able to receive these experiences and noted how Bellevue is working through a network approach to build out its sidewalk and bicycle networks. However, she noted that the city certainly has a long way to go before these networks are completed.

After significant delay due to a long (but thorough) conversation with participants, our group departed from the southern pavilion at Crossroads Park and walked westwards along the north side of NE 8th St. As soon as our group left the park's property, there was immediate discomfort in both the width of the sidewalk and its distance to the roadway. Along this portion of the roadway, there was no protective vegetative buffer between the sidewalk and roadway, although the aforementioned painted bike lane did provide some removal from passing cars. Notably absent from this stretch of NE 8th St was significant traffic noise, primarily due to fewer traffic lanes (three instead of five like on other sections of NE 8th St) and a lower speed limit (30 mph instead of 35 mph). This portion of NE 8th St shows what our organization's suggestions from previous walking audits around repurposing traffic lanes and lowering speed limits can create in terms of reduced harmful ambient noise.

Left: Our group stops at the site of a pedestrian fatality in November 2020 and reflects on the road design elements that contributed to this collision. The nearest marked & signalized crosswalks were several hundred feet away – an added distance that can be inaccessible for mobility-challenged residents.

Our group took time to stop at the 16000 block of NE 8th St to examine the conditions which led to a pedestrian fatality in November 2020.[4] A 92-year-old

gentleman was walking home and had nearly crossed the street when a driver collided with him. Members of our group noted how the nearest marked crosswalk was several hundred feet away from the collision location. The 16000 block of NE 8th St contains the Maurice G. Elbert House, a senior living facility that the gentleman was likely trying to access. Navigating to a marked crosswalk would've added an additional 1000 feet to his journey, which can be prohibitive for somebody with low mobility. Several members of the group expressed how they themselves would feel comfortable crossing at this intersection because of the high visibility to vehicles in both directions. All participants agreed that, for the number of businesses and establishments located on this portion of the corridor, there should be more marked and/or signalized crosswalks for pedestrians to use.

One participant was recovering from knee surgery from earlier in the week and accompanied our group in a wheelchair. Her presence pointed out several mobility challenges that our group may not have noticed without her. For example, a wide hole in the sidewalk just to the west of the Maurice G. Elbert House served as a difficult obstacle to go around due to the sidewalk's narrow width. Portions of this sidewalk were also terribly cracked and damaged, with uneven paving attempting to fix the issues but ultimately making the experience more dangerous. For those travelling on foot, this section of the sidewalk also had substantial overhanging vegetation about 4.5 feet above the sidewalk, meaning that the effective width of the already narrow sidewalk was even further reduced. Pedestrians must either nearly enter the roadway or duck down several feet to avoid it, and people with low vision may not see the obstacles until it is too late.

Our group elected to cross to the south side of NE 8th St at 158th Pl NE (the intersection in front of the US Postal Service branch). However, this intersection only has crosswalks on three sides - there is no crosswalk on the eastern side of the intersection, and as if to add insult to injury, there is an additional road sign reminding pedestrians to not cross in this direction. For people to the northeast of the intersection who need to access a business to the southeast, they would therefore need to use three crosswalks, which adds significant time and distance to a trip (especially for the mobility-challenged). Additionally, although signal cycles

Left: The eastern side of the intersection of NE 8th & 158th Pl NE is currently lacking a crosswalk. If people approaching from the east need to cross and then double back slightly to reach their destination, this adds time & distance to their trip.

Left: Nearly every driveway along this section of the corridor has a corresponding bump in the sidewalk that was most pronounced closest to the roadway but decreased as one moved away. This added bump has the consequence of making half of the sidewalk less accessible for people who are biking or rolling.

were more bearable at this intersection than others that our group has examined, our group found that we were still not given enough time to cross NE 8th St safely. By this point, the road had returned to its default five-lane width alongside the corresponding traffic noise, and our group found ourselves still caught in the intersection by the time the countdown timer had reached zero. Our group noticed that this intersection used leading pedestrian interval (LPI) technology when crossing in the southbound direction, which is something participants liked and agreed should be implemented at all intersections in Bellevue.

Once on the south side of NE 8th St, our group continued westwards toward 156th Ave NE, passing by several businesses and their respective driveways. One issue that became apparent very quickly is how at each business's driveway, a sharp incline was created at each intersection of the crosswalk - that is to say, portions of the sidewalk close to the roadway would dip sharply down at each driveway, and then rise sharply back up on the opposite side. This effect was less pronounced on portions of the sidewalk further away from the roadway, but this essentially reduced the effective width of the sidewalk to less than half, since the inclines would either be uncomfortable or insurmountable for people in wheelchairs. These bumps also impact bicycle riders (of which our group saw several) who are forced to ride on the sidewalk due to the lack of protected facilities on the roadway. In addition to the dangers arising from conflicts with pedestrians, these bumps are easily missed and can be dangerous when approached at high speeds, especially since this portion of the sidewalk is narrow and immediately adjacent to the roadway with no vegetative buffer. One group member noted sidewalk designs in the Netherlands and how intersections with driveways would keep the sidewalk level, rather than lowering the

Left: This bus shelter at the NW corner of NE 8th St & 158th Pl NE had no walls to protect patrons from the wind, is heavily graffitied, and does not include a bench. Although likely not under Bellevue's jurisdiction, improving this bus shelter would greatly better the transit experience for riders who regularly use this stop.

sidewalk to the level of the roadway. Using this approach at these driveways would create a natural calming effect for drivers while reducing accessibility issues for people walking, biking, and rolling.

The intersection of NE 8th St and 156th Ave NE, like other intersections our organization has examined over the course of these walks, experienced several problems that limited pedestrian accessibility. Although our group observed that some directions of this intersection had LPI technology, its use appeared inconsistent and dependent upon the direction one was traveling. Additionally, the amount of time to cross was still too short for our group to safely reach the other side. One member of the group noted how the audio signals to inform people with low-vision when it was safe to cross appeared inconsistent in both tone and loudness, but another participant noted how that might in part be due to allowing a person to differentiate which direction is safe to cross. Our group would need more experience in ADA-compliance related to audio signals at intersections in order to make an accurate judgement, but safe & clear audio signaling at this intersection and others is perhaps something that transportation staff should review.

After our group crossed to the north side of NE 8th St, we noted that the pedestrian experience became much safer and more comfortable. This side of the street had a sidewalk which was divided from the road by a vegetative buffer with tall trees that provided true separation from high-speed traffic. This side of the roadway also did not contain as many driveways, and the one that was present was substantially more accessible for wheelchair users. However, at the northwest corner of the intersection of NE 8th St & 158th Pl NE, there is a dilapidated bus shelter that contains no benches and is very poorly maintained. This bus stop is served by the 221 and provides good access to Crossroads Mall, so restoring this shelter to good condition and adding a bench or other seating

accommodations to make the waiting experience more comfortable should be a high priority.

For the final leg of our journey, our group again crossed southbound at the intersection of NE 8th St & 158th Pl NE, but this time we proceeded eastwards on the south side of the roadway to return to Crossroads Park. Again, the sidewalk on this side of the street was immediately adjacent to the roadway, with no protection offered from cars traveling 35 mph or greater. Several driveways along this stretch also contained several bumps which impeded accessibility - the person accompanying us in a wheelchair was stuck at several points and needed to back up and try again in order to traverse some driveways. Additionally, the bus stop immediately southeast of the intersection was surrounded on three sides by large privet bushes, which prevent bus drivers from readily seeing people waiting at the transit stop and vice versa. To complete our round-trip walk, our group crossed northwards at the signalized crosswalk in front of Crossroads Park. Participants appreciated the safety provided by the flashing lights and audio signals and wished there were more crosswalks with these facilities along the corridor.

The unideal conditions for people walking, biking, and rolling along this corridor were not surprising to our group, nor was the number of people we witnessed who were using these facilities anyway. Because Crossroads is a dense neighborhood with a diverse mix of businesses, residences, and neighborhoods, all participants agreed that further investments in walkable & bikeable infrastructure that is safe for people of all ages & abilities should be a priority for city leaders.

Left: Our group crosses a marked & signalized crosswalk in front of Crossroads Park. For the number of businesses & residences on this corridor, more crosswalks like these should be added to improve pedestrian safety.

Appendix

Left: Good girl Deedee enjoys a well-earned rest in the grass after our group's Wednesday walk.

Right. Despite lacking bicycle facilities throughout the majority of this corridor, our groups saw several people using bikes to get around.

Footnotes

1) https://completestreetsbellevue.org/2020/11/24/cm-zahn-introduces-budget-amendment-to-fast-track-vision-zero-funding/
2) https://www.asha.org/public/hearing/loud-noise-dangers/
3) https://kingcounty.gov/~/media/depts/metro/about/planning/speed-reliability-toolbox.pdf
4) https://www.kiro7.com/news/local/police-investigate-fatal-collision-involving-car-pedestrian/L67C4QLB75HGPAKBINKGNWB4LE/

Photographer Bio: Caitlin Whitehead

Caitlin Whitehead is a former resident of Bellevue & a professionally-trained illustrator. Graduating from the Savannah College of Art and Design (SCAD) in March 2015, she works in both digital and traditional media to create colorful & vibrant pieces. Her primary body of work is in a pattern style she calls “myrn,” which incorporates colorful shapes to create implied lines. She lives in Shoreline with her partners and three cats.

Visit her website, magpyecat.square.site to see her work & side projects.

March 8th – Health Name: _____

15-Minute City:

A community where life's daily necessities (groceries, healthcare, community services, workplaces, etc.) can be accessed within a 15-minute trip by walking, biking, transit, or other non-automobile mode of transportation.

Things to Think About Today:

Intersections & Signals
Do you have enough time to cross at intersections? How long do you have to wait for a walk signal? Are pedestrians prioritized in the signal cycle?

Crosswalks
Are crosswalks clearly painted and marked? Do you feel visible in and approaching the crosswalk? Do drivers give you space?

Driveways
Do you feel visible as you approach a driveway? Do drivers look at you before exiting?

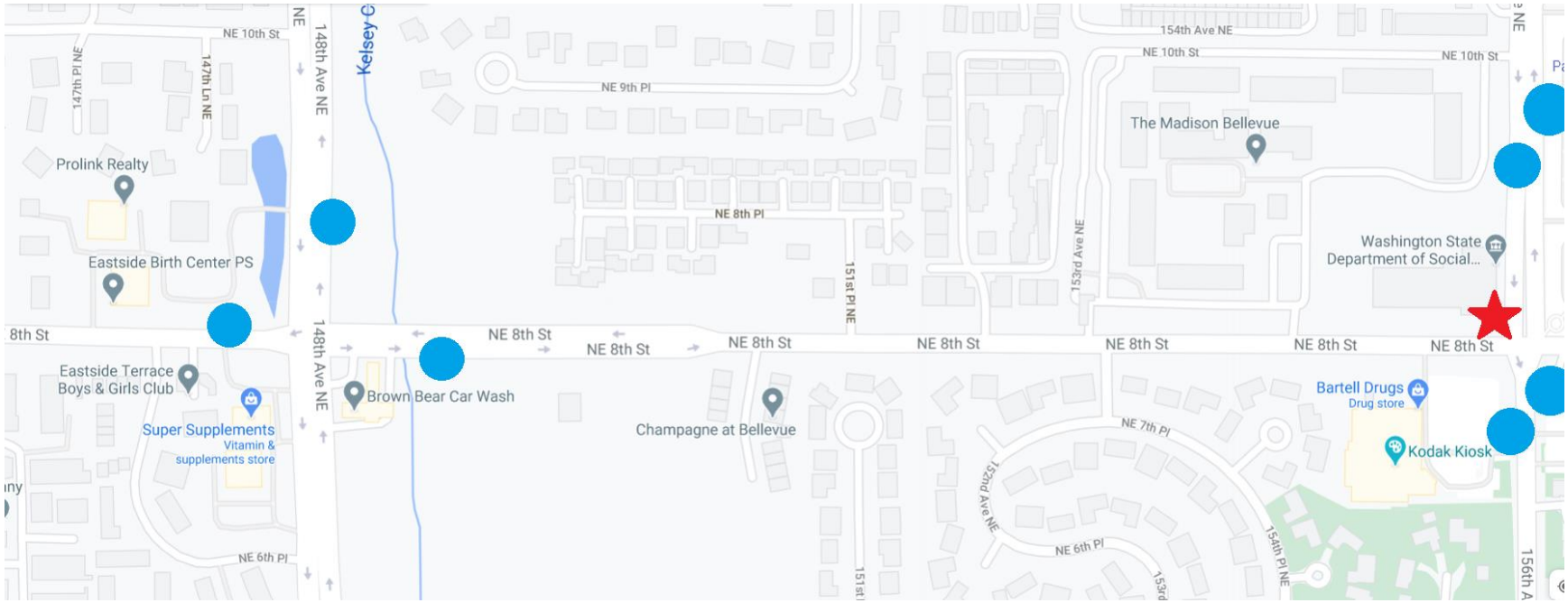
Drivers
How fast are drivers navigating the road? Do you hear any loud drivers? Any risky behaviors or unsafe maneuvers?

Lighting
How well-lit is the corridor? Are key conflict points illuminated to avoid potential collisions? Would you feel safe walking the corridor by yourself at night?

Transit Access
Is accessing the bus stops easy and intuitive? Is there enough space for riders to wait and pedestrians to pass?

People
How are people currently using the road today? What types of people do you see navigating the sidewalks (families, elderly, children), and how are they getting around (walking, biking, scooter)?

What infrastructure & behavior prevents people from accessing their healthcare needs by walking, biking, and transit on NE 8th St?


NE 10th St
147th Pl NE
147th Ln NE
148th Ave NE
Kelsey C
NE 9th Pl
154th Ave NE
NE 10th St
NE 10th St
The Madison Bellevue
Prolink Realty
NE 8th Pl
153rd Ave NE
151st Pl NE
Washington State Department of Social...
Eastside Birth Center PS
8th St
148th Ave NE
NE 8th St
NE 8th St
NE 8th St
NE 8th St
NE 8th St
NE 8th St
NE 8th St
Eastside Terrace Boys & Girls Club
Brown Bear Car Wash
Champagne at Bellevue
Bartell Drugs
Drug store
Super Supplements
Vitamin & supplements store
NE 7th Pl
Kodak Kiosk
152nd Ave NE
NE 6th Pl
154th Pl NE
156th A
NE 6th Pl

March 10th - School Name: _____

15-Minute City:

A community where life's daily necessities (groceries, healthcare, schools, workplaces, etc.) can be accessed within a 15-minute trip by walking, biking, transit, or other non-automobile mode of transportation.

Things to Think About Today:

Intersections & Signals
Would groups of kids have enough time to cross at signals? How long do you have to wait for a walk signal? Are pedestrians prioritized in the signal cycle? Are signals ADA-accessible?

Crosswalks
Are there crosswalks present in all directions? Do you feel visible in and approaching the crosswalk? Do drivers give you space?

Sidewalks
Is there enough space for kids to walk in groups? Is there protection from the roadway (through space, vegetation, etc.)? Are the sidewalks well maintained (not bumpy, dirty, no overhanging vegetation)?

Drivers
How fast are drivers navigating the road? Do you hear any loud drivers? Any risky behaviors or unsafe maneuvers?

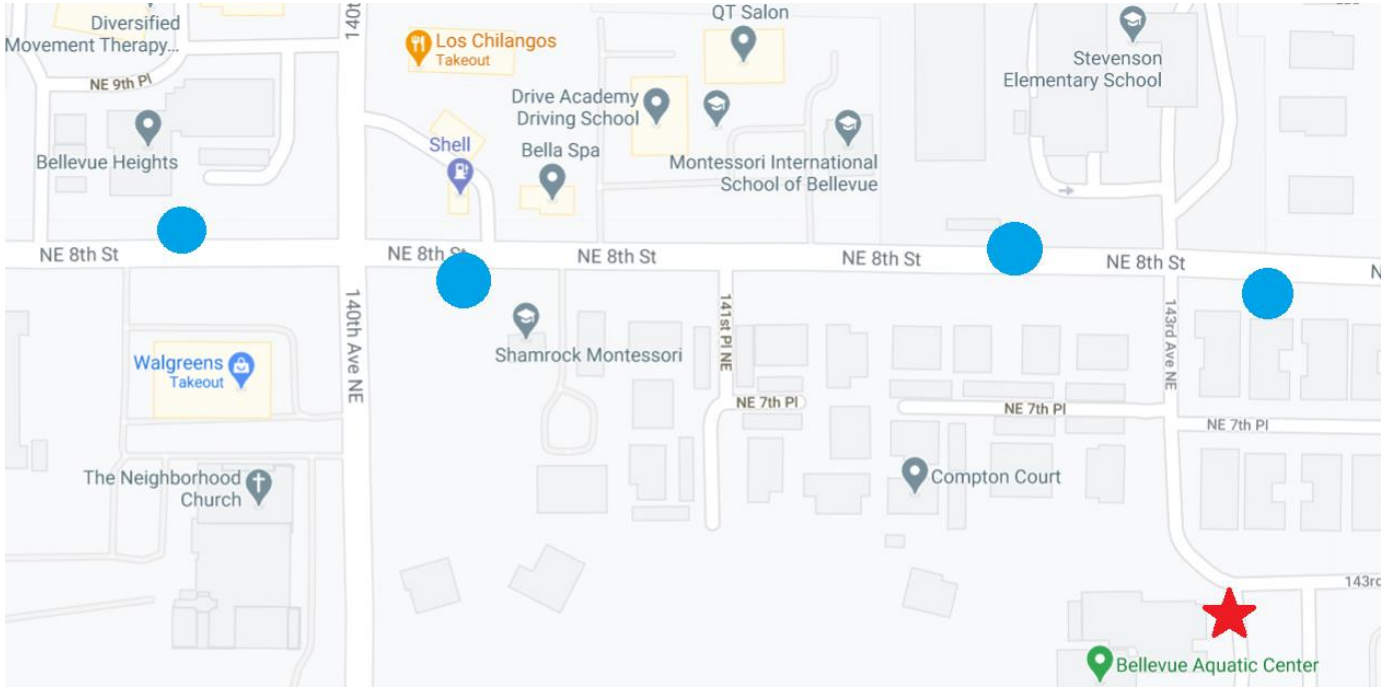
Transit Access
Is accessing the bus stops easy and intuitive? Is there enough space for groups to wait and other pedestrians to pass?

People
How are people currently using the road today? What types of people do you see navigating the sidewalks (families, elderly, children), and how are they getting around (walking, biking, scooter)?

Comfort
How loud is the hum of traffic? Are there enough signs to make wayfinding easy? Are there pleasing things to look at while you're walking?

What infrastructure & behavior prevents kids from safely being able to walk, bike, and take transit on NE 8th St? What would make you (parents) feel safer about having your child walk, bike, and take transit to school?

Document created with support from feet first
PROMOTING WALKABLE COMMUNITIES


Diversified Movement Therapy...
NE 9th Pl
Bellevue Heights
Los Chilangos
Takeout
QT Salon
Drive Academy Driving School
Shell
Bella Spa
Montessori International School of Bellevue
Stevenson Elementary School
NE 8th St
NE 8th St
NE 8th St
NE 8th St
140th Ave NE
141st Pl NE
143rd Ave NE
Walgreens
Takeout
Shamrock Montessori
NE 7th Pl
NE 7th Pl
NE 7th Pl
The Neighborhood Church
Compton Court
Bellevue Aquatic Center

March 13th - Errands

Name: _____

15-Minute City:

A community where life's daily necessities (groceries, healthcare, schools, workplaces, etc.) can be accessed within a 15-minute trip by walking, biking, transit, or other non-automobile mode of transportation.

Things to Think About Today:

Intersections & Signals
How long do you have to wait for a walk signal? Are pedestrians prioritized in the signal cycle? Are signals ADA-accessible? Are groups/mobility-impaired people given enough time to cross safely?

Crosswalks
Do you feel visible in all crosswalks? Do drivers give you space as you cross? Are there enough crosswalks available to access destinations?

Sidewalks
Is there enough space for people to comfortably pass each other? Is there protection from the roadway (through space, vegetation, etc.)? Are the sidewalks well maintained (not bumpy or dirty, no overhanging vegetation)?

Drivers
How fast are drivers navigating the road? Do you hear any loud drivers? Any risky behaviors or unsafe maneuvers?

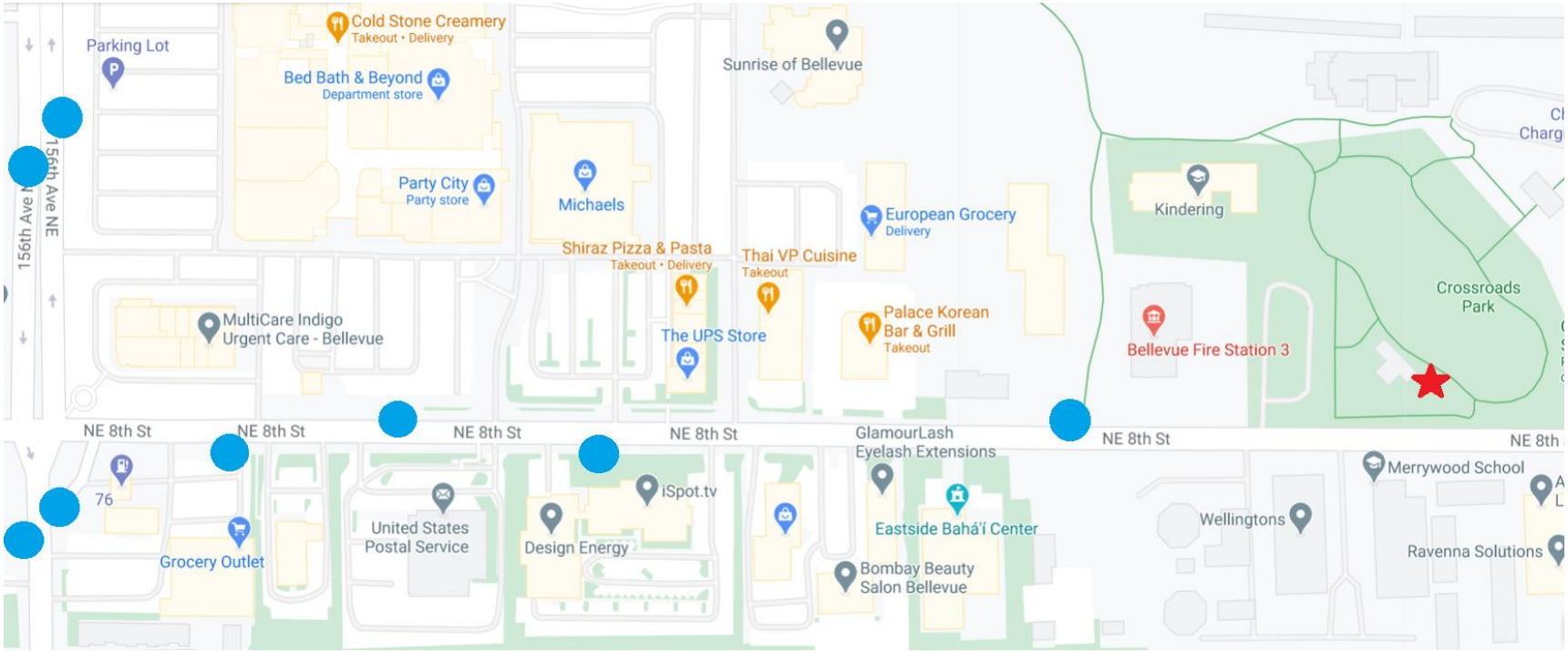
Driveways
Do drivers look at you and give you space when crossing? Is there safe & comfortable pedestrian access to businesses from the sidewalk? Are "dips" in the sidewalk accessible and comfortable?

People
How are people currently using the road today? What types of people do you see navigating the sidewalks (families, elderly, children), and how are they getting around (walking, biking, scooter)?

Comfort
How loud is the hum of traffic? Are there enough signs to make wayfinding easy? Are there pleasing things to look at while you're walking?

What infrastructure & behavior prevents you from safely being able to walk, bike, and take transit on NE 8th St? What factors make it difficult to complete errands on this street without a car?

Document created with support from feet first
PROMOTING WALKABLE COMMUNITIES


Cold Stone Creamery
Takeout • Delivery
Parking Lot
Bed Bath & Beyond
Department store
Sunrise of Bellevue
156th Ave NE
Party City
Party store
Michaels
European Grocery
Delivery
Kindering
Shiraz Pizza & Pasta
Takeout • Delivery
Thai VP Cuisine
Takeout
Crossroads Park
MultiCare Indigo
Urgent Care - Bellevue
The UPS Store
Palace Korean
Bar & Grill
Takeout
Bellevue Fire Station 3
NE 8th St
NE 8th St
NE 8th St
NE 8th St
GlamourLash
Eyelash Extensions
NE 8th St
NE 8th
Merrywood School
76
iSpot.tv
United States
Postal Service
Design Energy
Eastside Bahá'í Center
Wellingtons
Grocery Outlet
Bombay Beauty
Salon Bellevue
Ravenna Solutions

Thank you!

Presentation Slides

The following pages include the presentation slides used throughout both RSA sessions.

NE 8th St Pedestrian Road Safety Assessment

March 25-26, 2021

Good Morning!

Welcome

- **Joe Seymour, jseymour@vhb.com**
- **Michael Dunn, mdunn@vhb.com**

Introductions

- Your Name
- Who you represent or what you do
- Prior experience with a road safety audit/assessment?
- Prior experience with evaluating sites for pedestrian safety?
- What you hope to learn or gain from this process

Agenda

Day 1

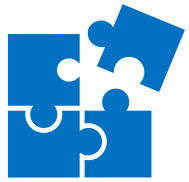
8:00 – 10:00 AM	**RSA Kick-off Meeting** • Introduction of stakeholders and RSA team • Introduction to the RSA process • Pedestrian safety overview • Review background data and input: CSB, usRAP
10:10 – 10:15 AM	**Break**
10:15 – 1:00 PM	**Begin to document the issues collectively, assign homework (to document potential solutions)**
3:00 – 5:00 PM	**Additional Field Investigation (optional)**
7:30 – 9:00 PM	**Nighttime Site Review (optional field visit for locals)**

Day 2

8:00 – 10:00 AM	**Brainstorming – reviewing homework and potential countermeasures** *Break as needed*
10:15 AM – 1:00 PM	**Finalize the potential countermeasures for each of the issues**

Overall Objectives for the RSA

- Enhance understanding about crash risk and unique vulnerabilities of pedestrians
- Engage with a variety of stakeholders to expand perspectives on pedestrian safety needs
- Identify and prioritize specific locations, along a set of select roadways in the area, where crash risk may be highest for pedestrians
- Discuss potential countermeasures and safety improvements for priority locations
- Increase staff confidence and skills for future road safety assessments, focused on pedestrian safety

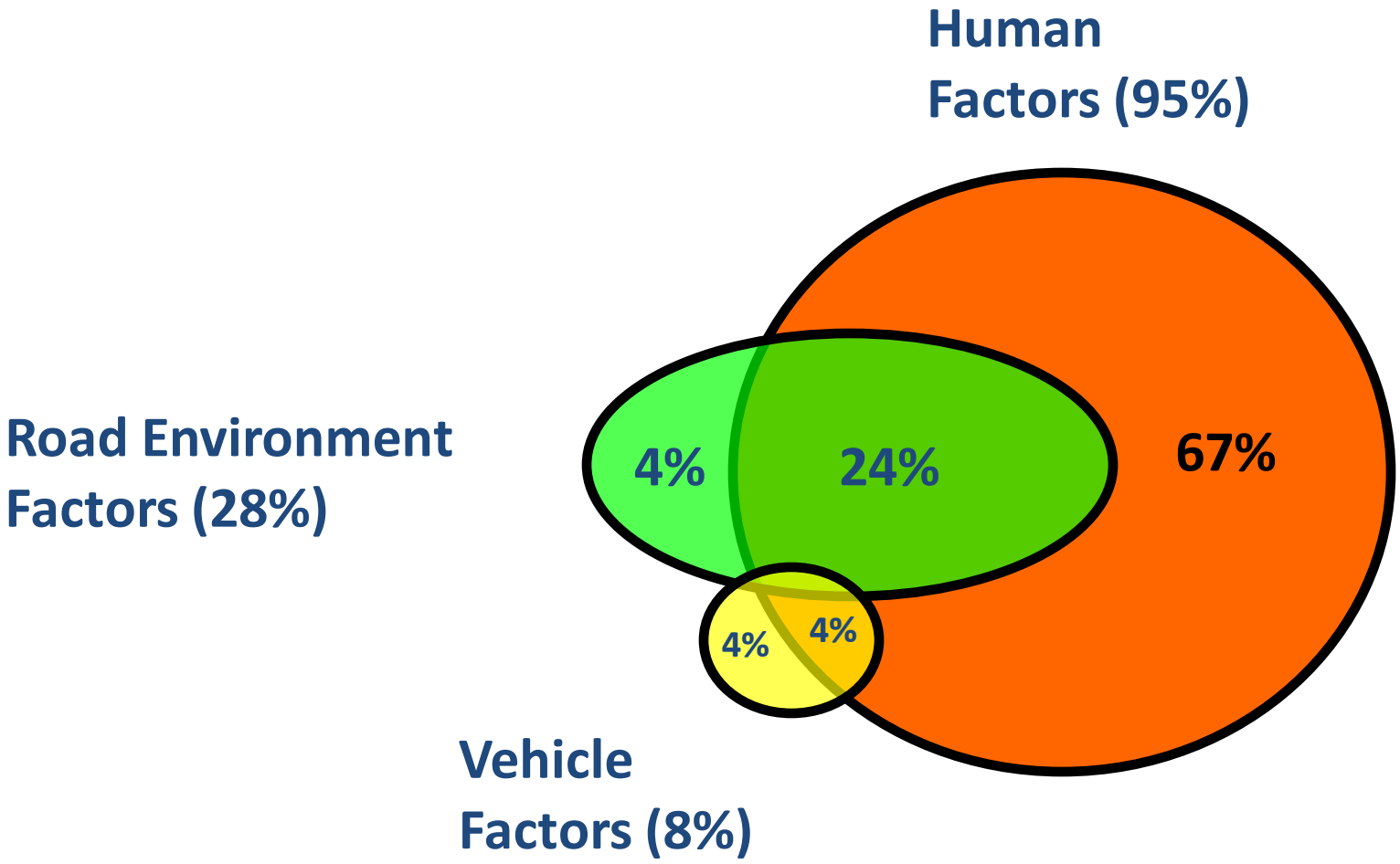


What is an RSA?

What is a Road Safety Audit / Assessment (RSA)?

A formal safety performance evaluation of an existing or future road or intersection by an independent, multidisciplinary team.

Why do we need RSAs?



TYPICAL REPORTED CRASH CAUSES

RSAs Support Other Goals

CITY OF BELLEVUE, WASHINGTON

RESOLUTION NO. 9769

A RESOLUTION approving the Safe Systems approach and strategies to move Bellevue towards Vision Zero and directing the Transportation Commission to review the Comprehensive Plan to determine if any updates, revisions, or additional policies are warranted to support the Safe Systems approach.

WHEREAS, the worldwide Vision Zero movement is founded on the belief that death and injury on city streets is unacceptable and preventable; and

WHEREAS, on December 7, 2015, the City Council adopted Resolution No. 9035 endorsing Vision Zero, for the city of Bellevue to strive to achieve zero traffic deaths and serious injuries on Bellevue streets by 2030; and

WHEREAS, the City Council directed the Transportation Commission to review the City's Comprehensive Plan to determine if any updates, revisions, or additional policies were warranted in light of Vision Zero and other transportation network goals; and

WHEREAS, on December 8, 2016, the City Council adopted Ordinance No. 6334 incorporating Vision Zero 2016 amendments to the Comprehensive Plan; and

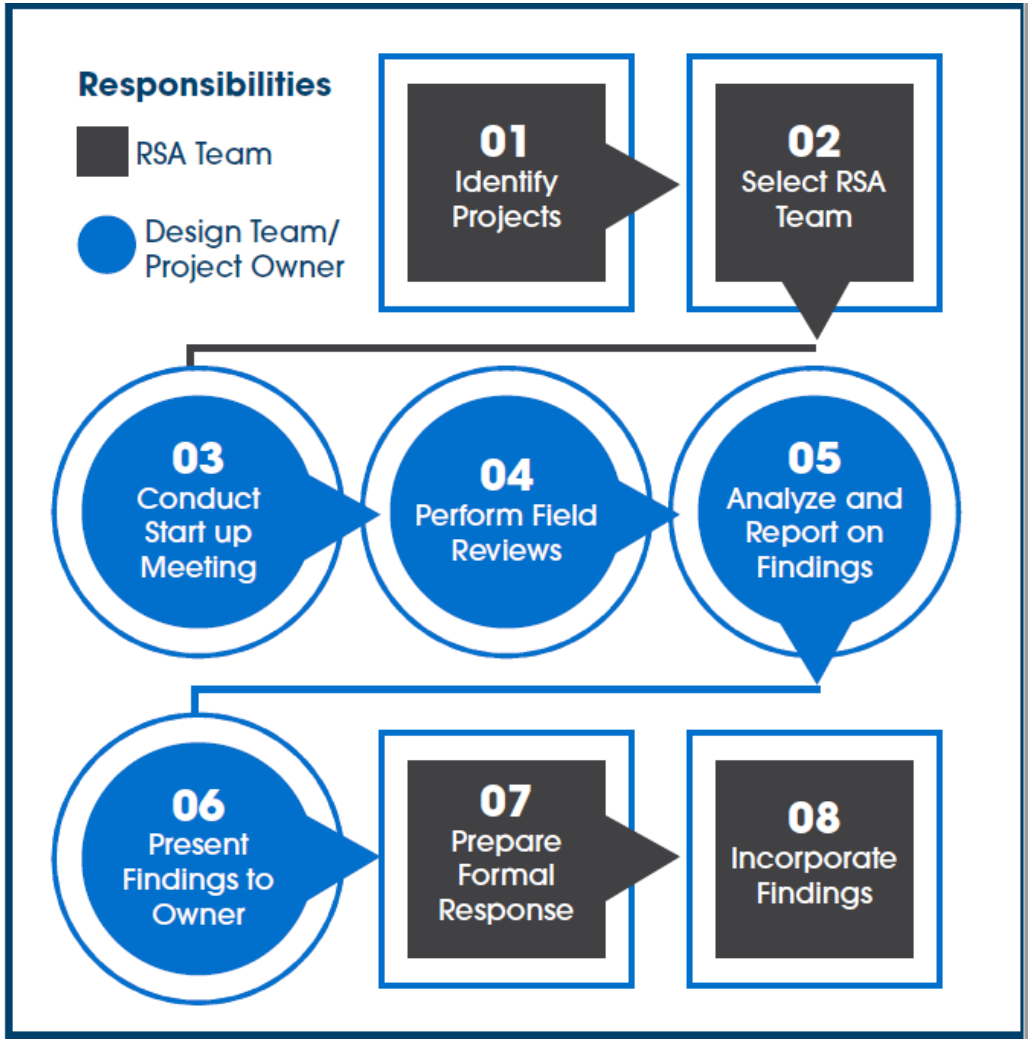
WHEREAS, in addition the City Council directed staff to: (i) prepare and implement a Vision Zero Action Plan; (ii) update Vision Zero strategies periodically; and (iii) provide Vision Zero status reports that aggregate and analyze data, document efforts, and communicate progress to the City Council and to the community; and

WHEREAS, Bellevue Comprehensive Plan Policy TR-61.2 provides direction to "Develop a programmatic approach to Vision Zero that integrates components of Education, Encouragement, Enforcement, Engineering, Equity and Evaluation"; and

WHEREAS, consistent with this policy and the direction from the City Council, the Transportation Commission considered Bellevue crash data, vetted existing road safety efforts in Bellevue and international Vision Zero best practices, listened to the community, and worked with staff to arrive at a recommended Safe Systems approach and strategies to move Bellevue towards Vision Zero (Attachment A); and

WHEREAS, the Safe Systems approach and strategies rests on four pillars (Safe Speeds, Safe People, Safe Vehicles, and Safe Streets) paired with four supportive elements (Data, Leadership, Partnerships, and Culture) and identifies 36 strategies that build upon the City Council's Vision Zero goal by articulating the

How are RSAs conducted?



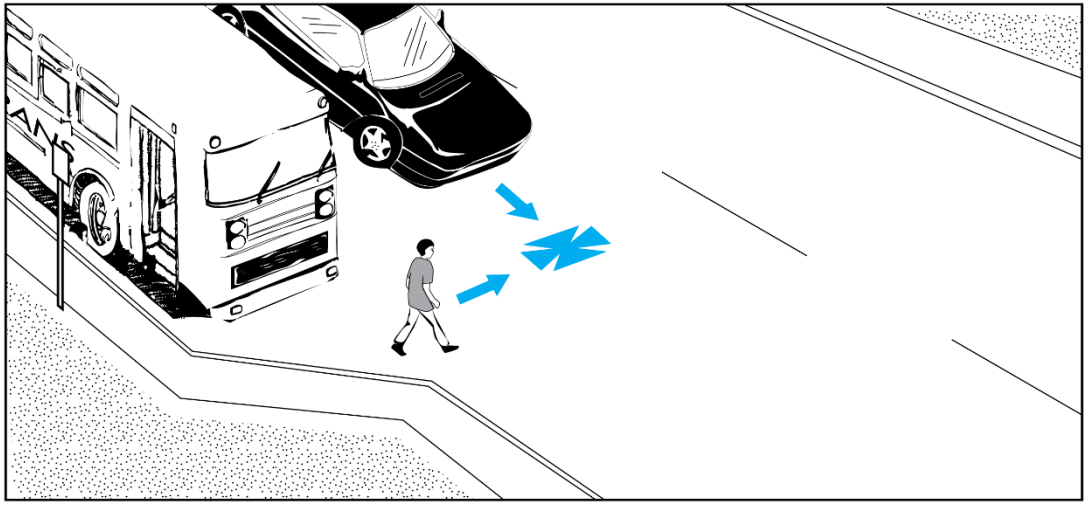
RSA Prompt Lists

- Presence of accommodations (bike, ped, and transit)
- Quality of facilities (bike, ped, and transit)
- Obstructions/continuity across network
- Overhead lighting
- Visibility of the crossing, pedestrians, and cyclists
- Driveways and conflicts
- Signs
- Pavement markings
- Signals (ped/bike accommodations)
- Destinations
- Traffic: speeds, gaps, turning movements

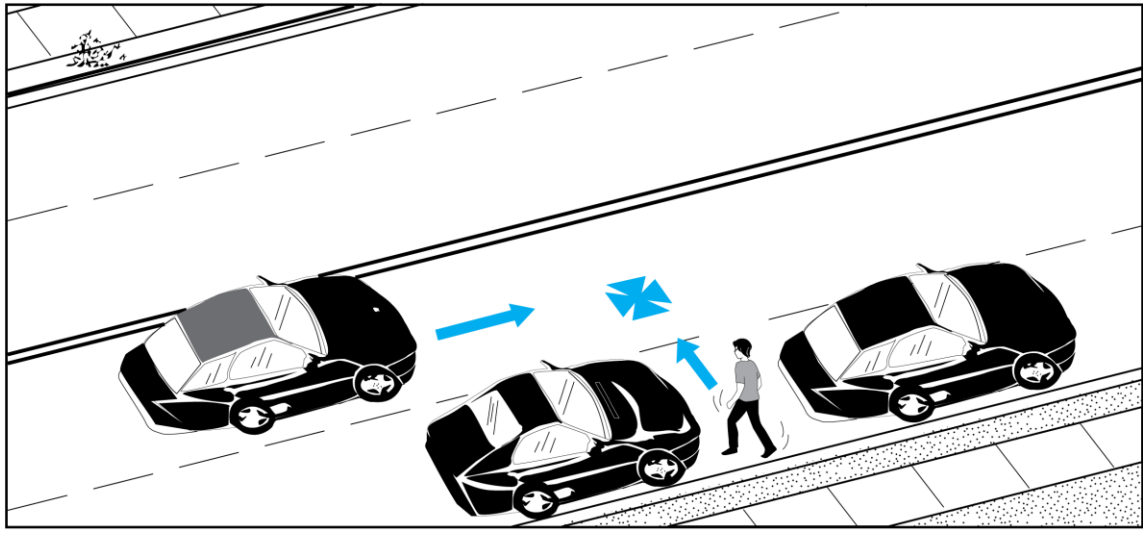
Crash Types

Multiple Threat Crash

Multiple Threat Crash



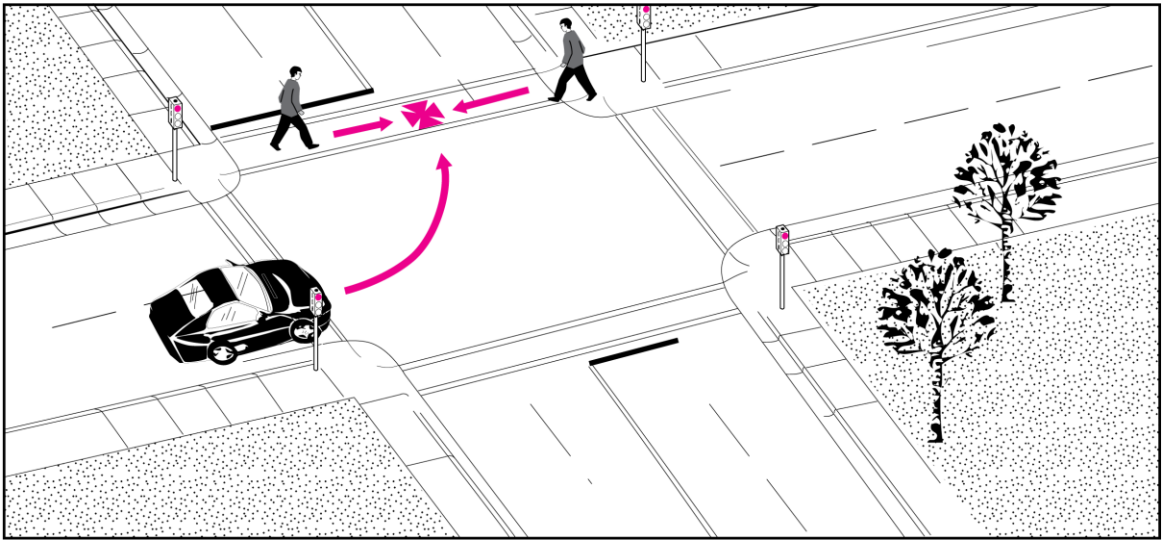
Multiple Threat- Commercial Bus



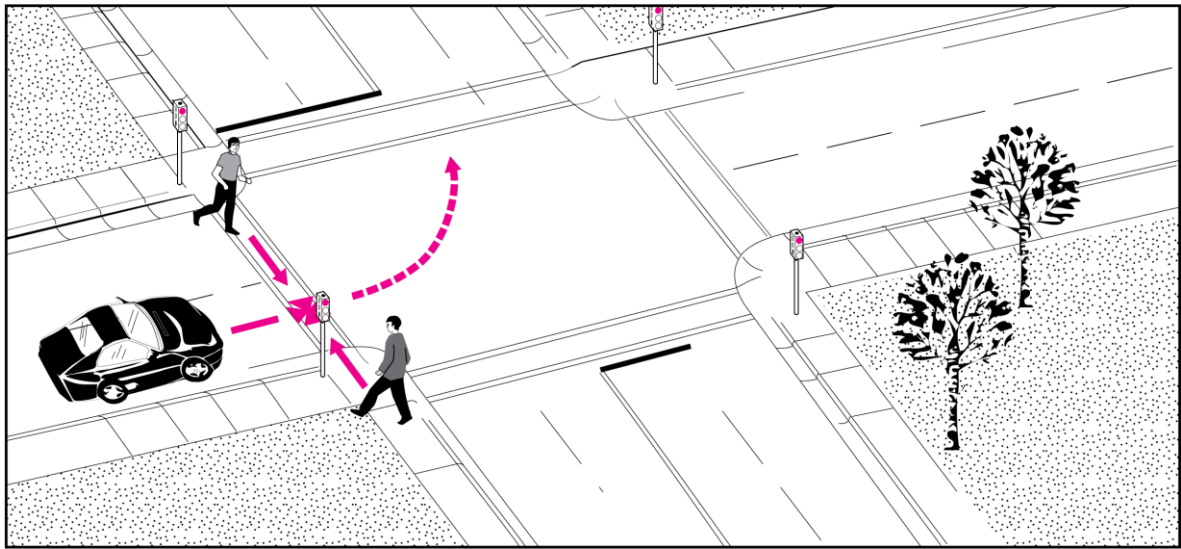
Multiple Threat- Trapped

Left Turn into Pedestrian Crossing Crash

Left Turn into Pedestrian Crossing Crash

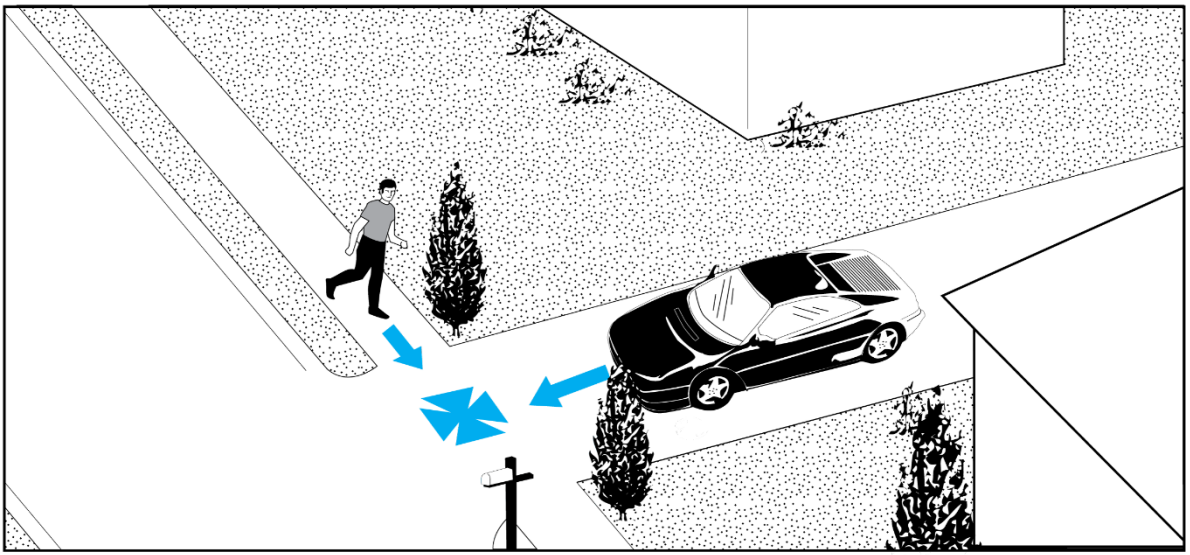


Motorist Left Turn-
Parallel Paths



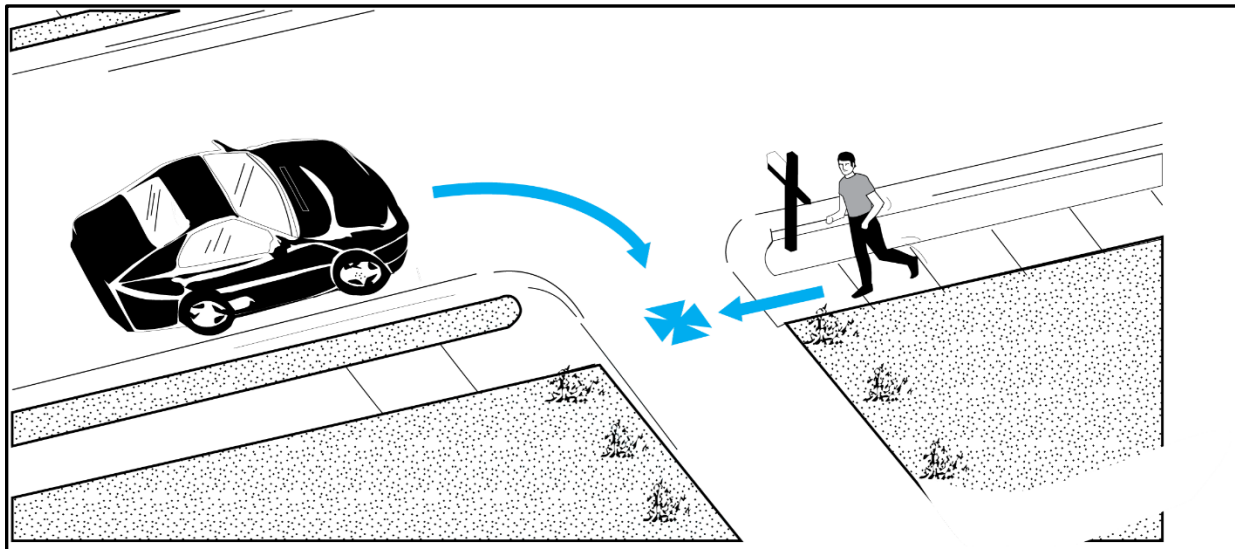
Motorist Left Turn-
Perpendicular Paths

Crossing Driveway

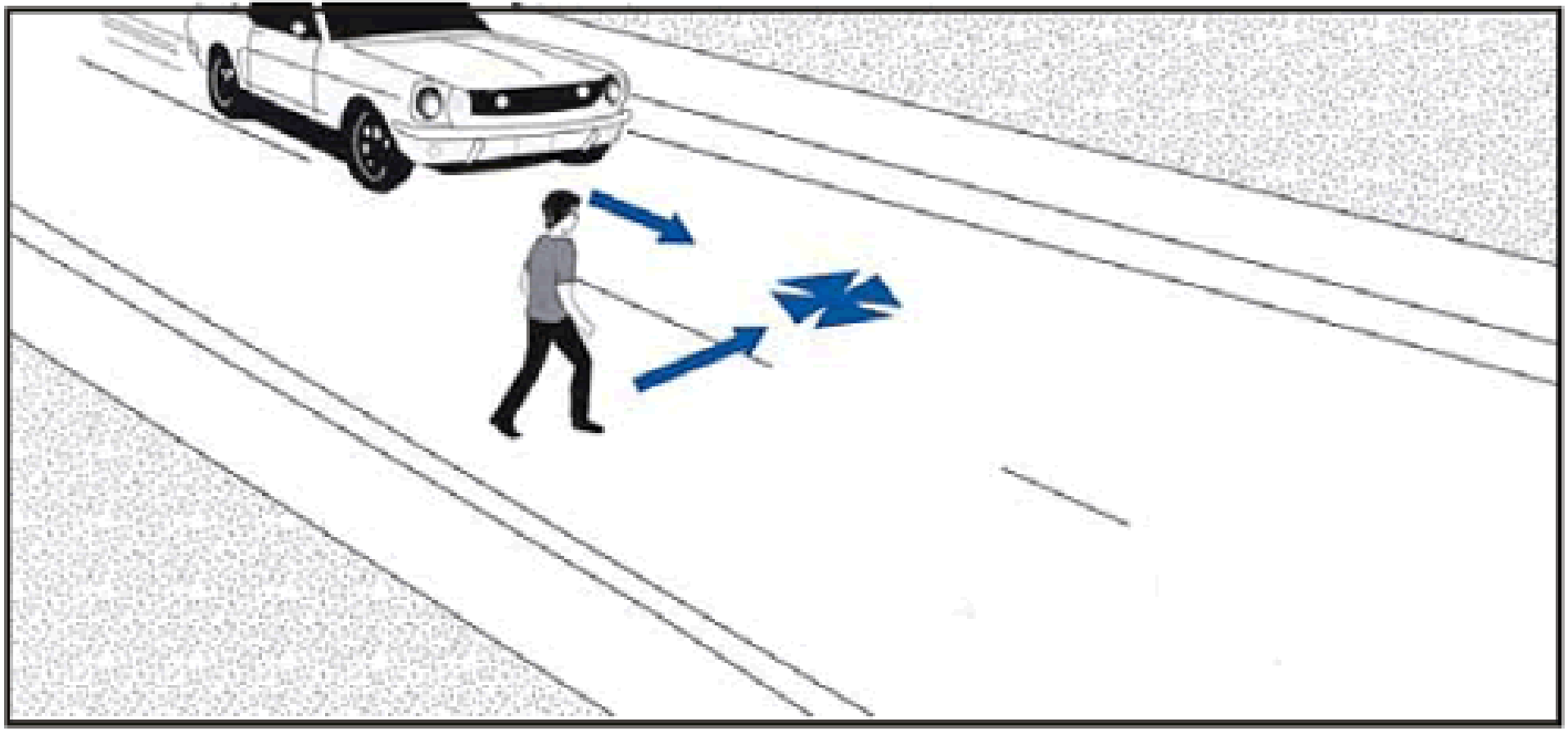


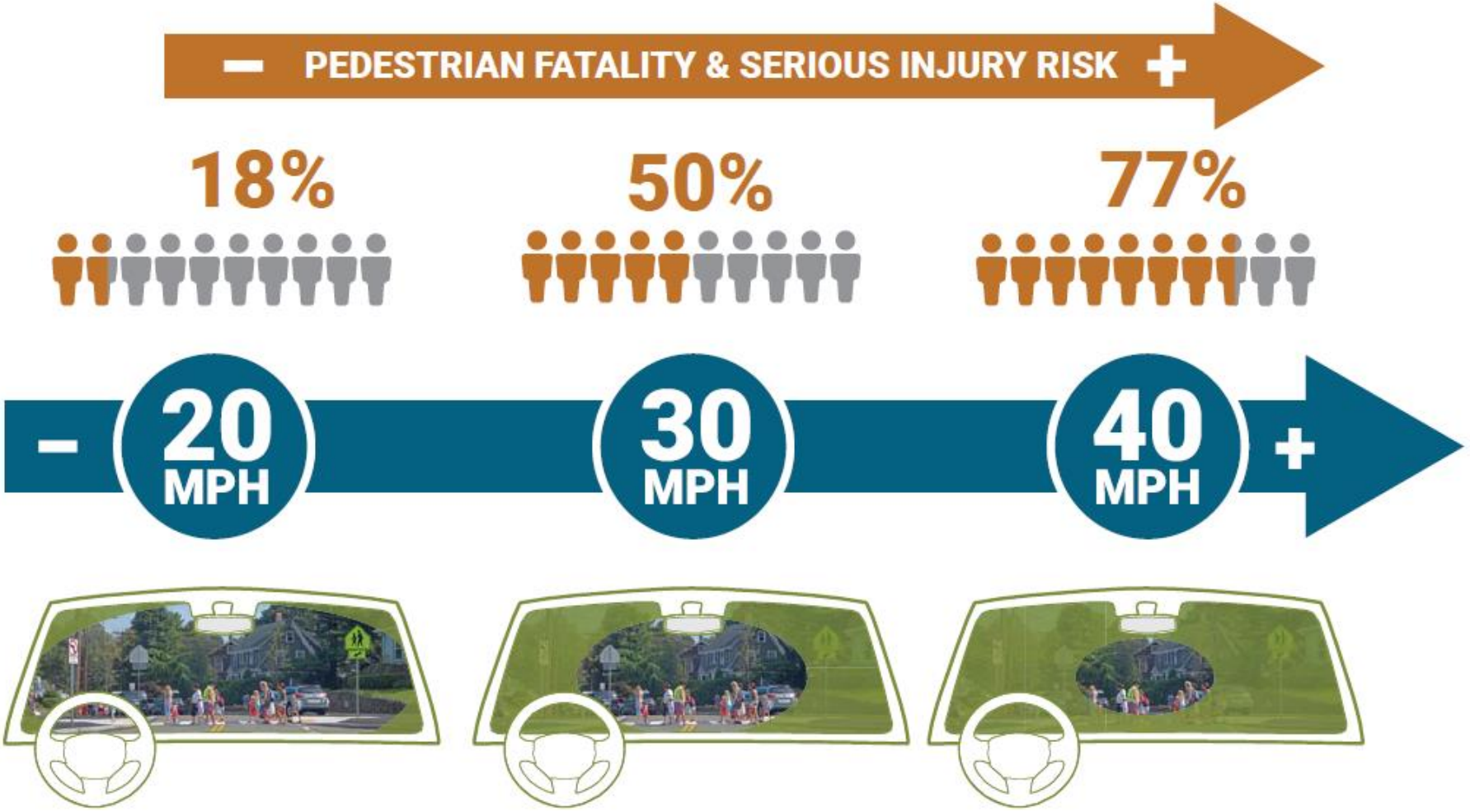
Motorist Exiting Driveway

Motorist Entering Driveway



Crashes Due to Excessive Speed

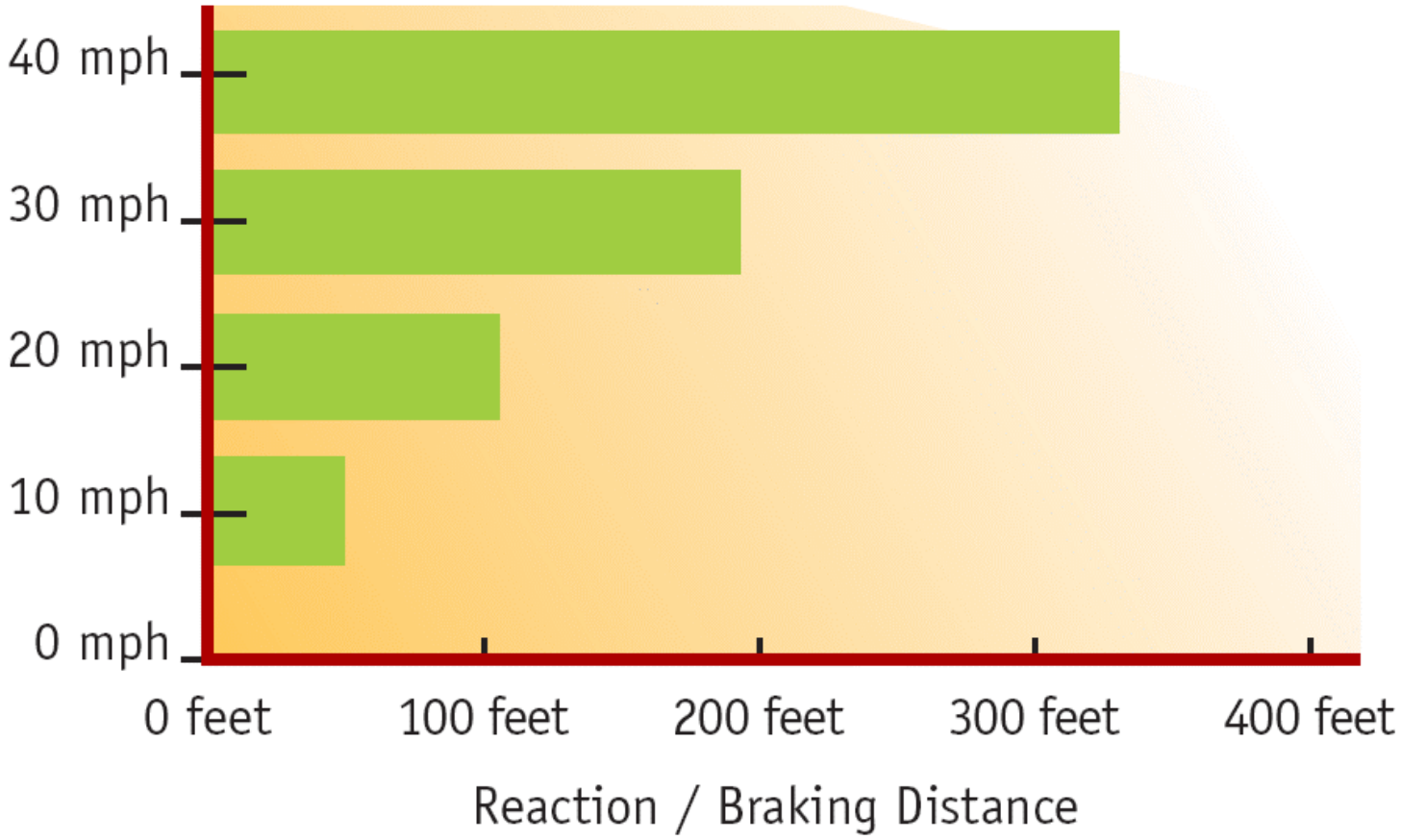




CONE OF VISION

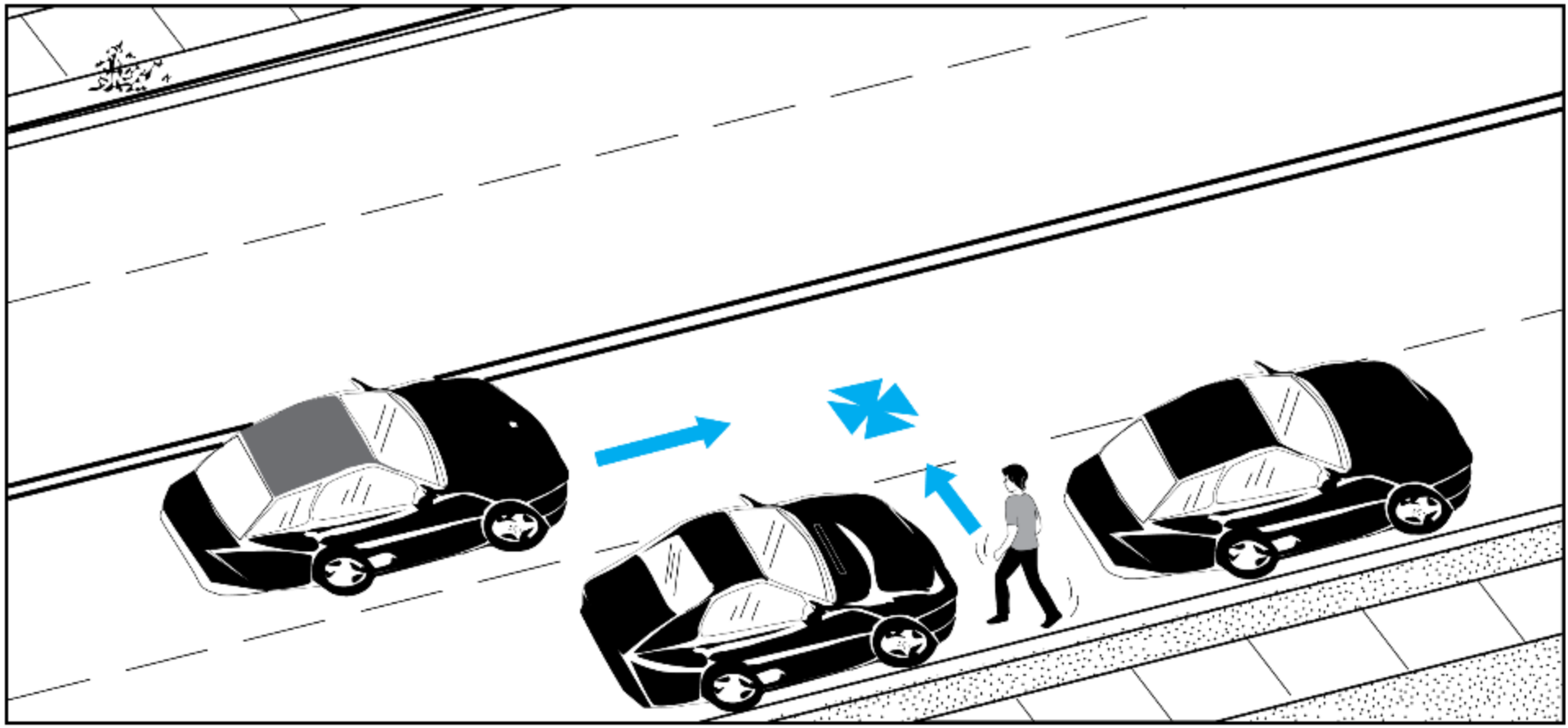
*As motor vehicle speeds increase, the risk of serious injury or fatality for a pedestrian also increases (**AARP Impact Speed and a Pedestrian's Risk of Severe Injury or Death 2011, p. 1**). Also, motorist visual field and peripheral vision is reduced at higher speeds.*

Speed Affects Crash Avoidance

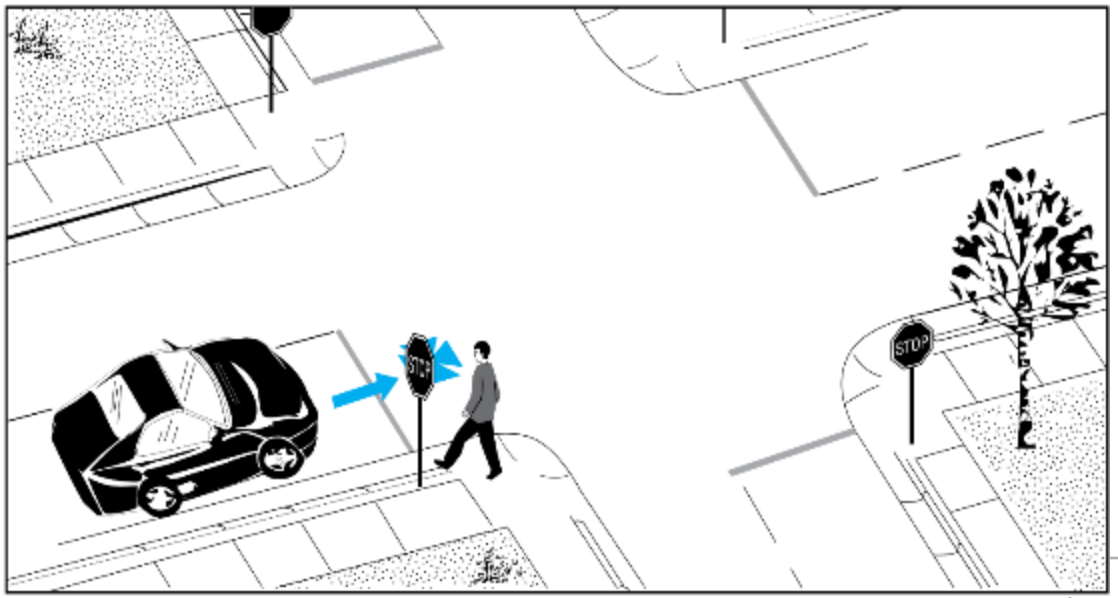


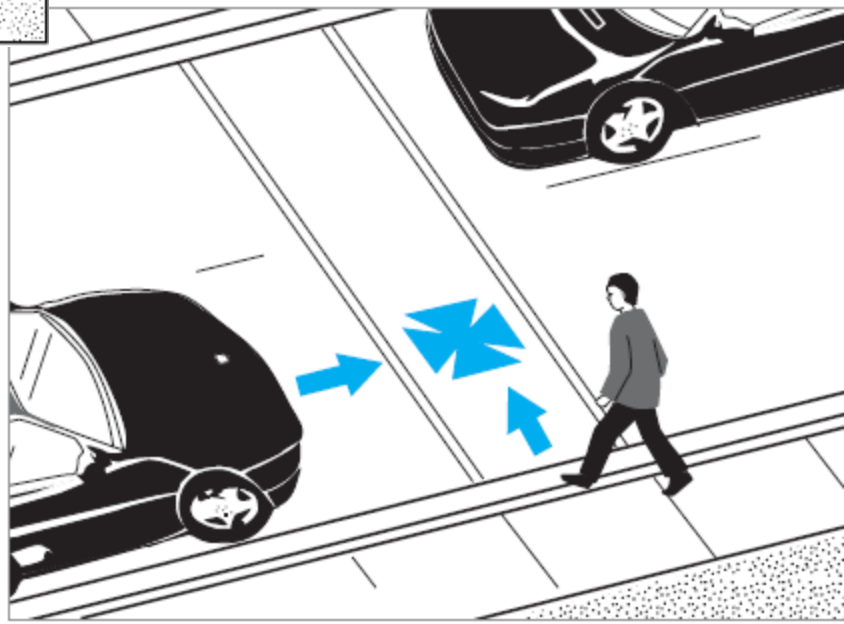
High speeds equate to greater reaction and stopping distance

Crashes due to Limited Visibility

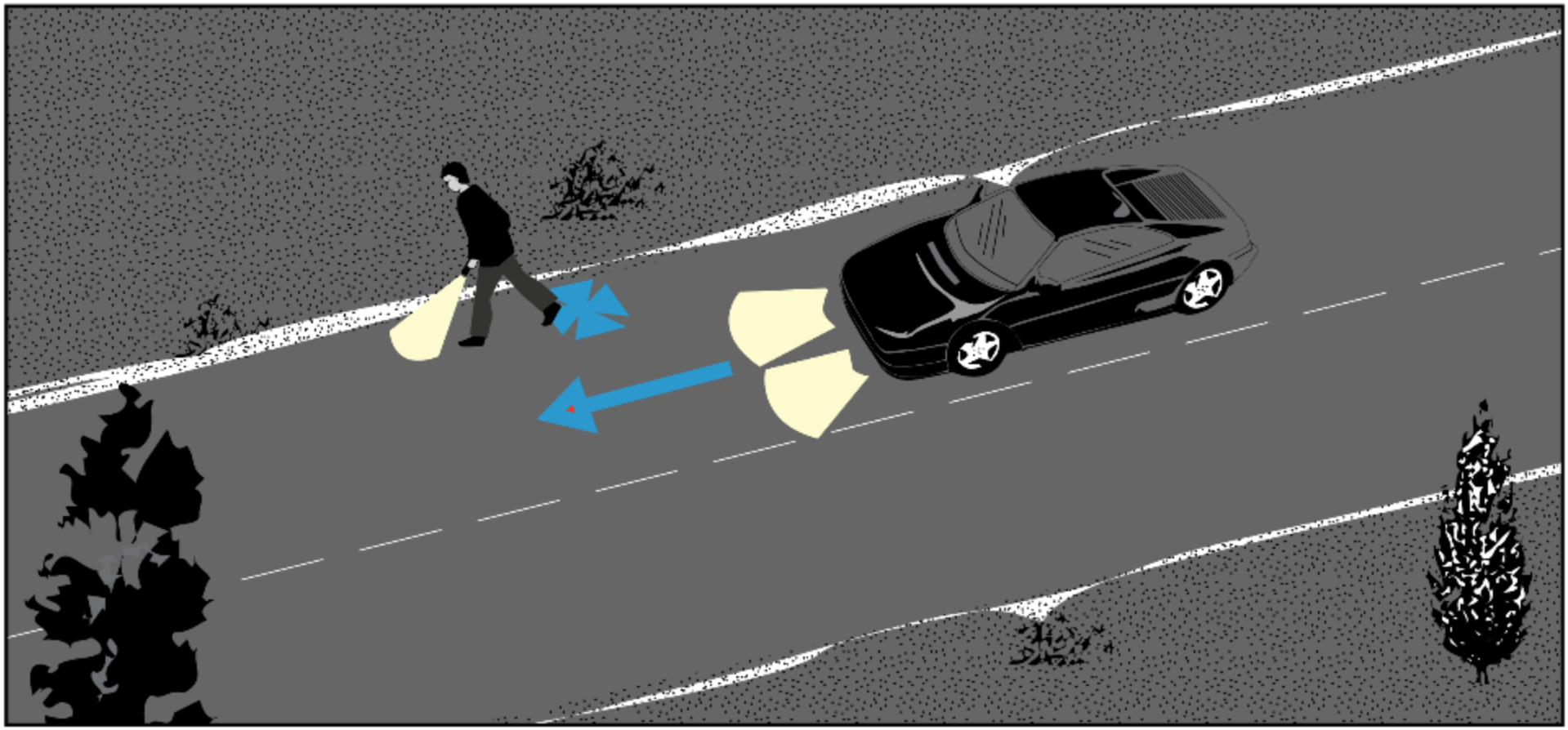


Crashes Resulting from Poor Yielding



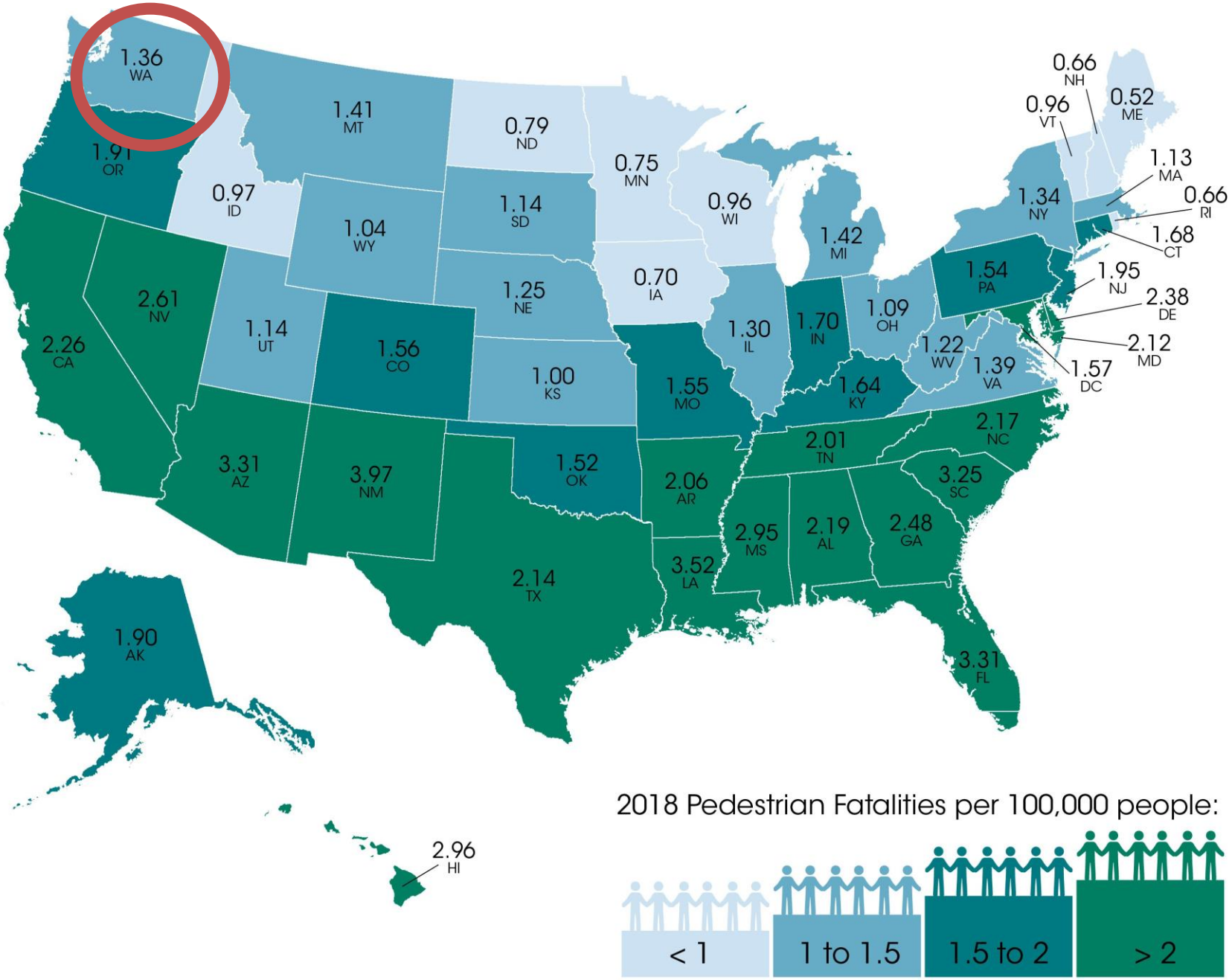


Crashes Due to Limited Separation

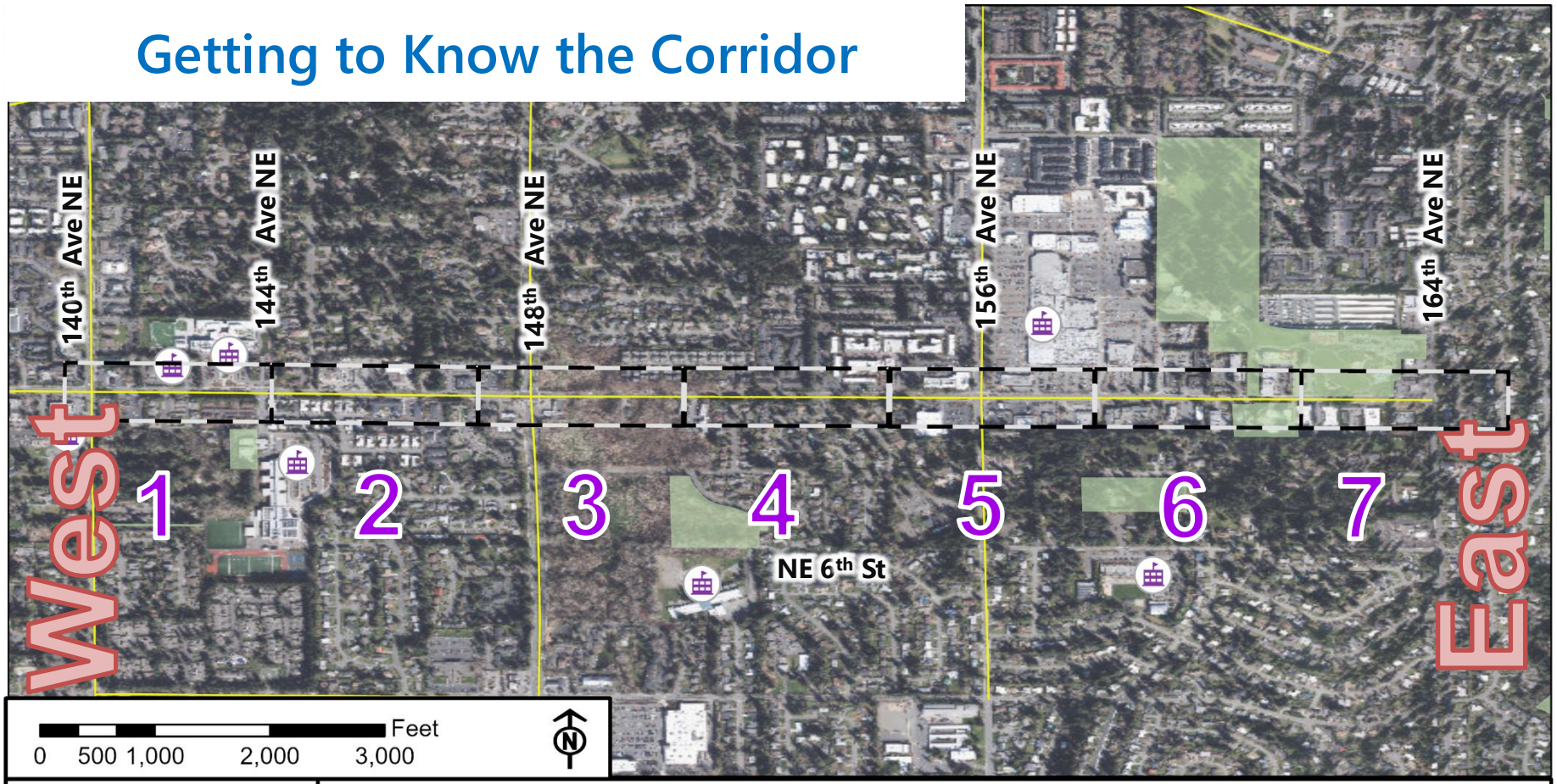


NE 8th St RSA Site Overview

Which States? Pedestrian Fatalities per 100k: 2018

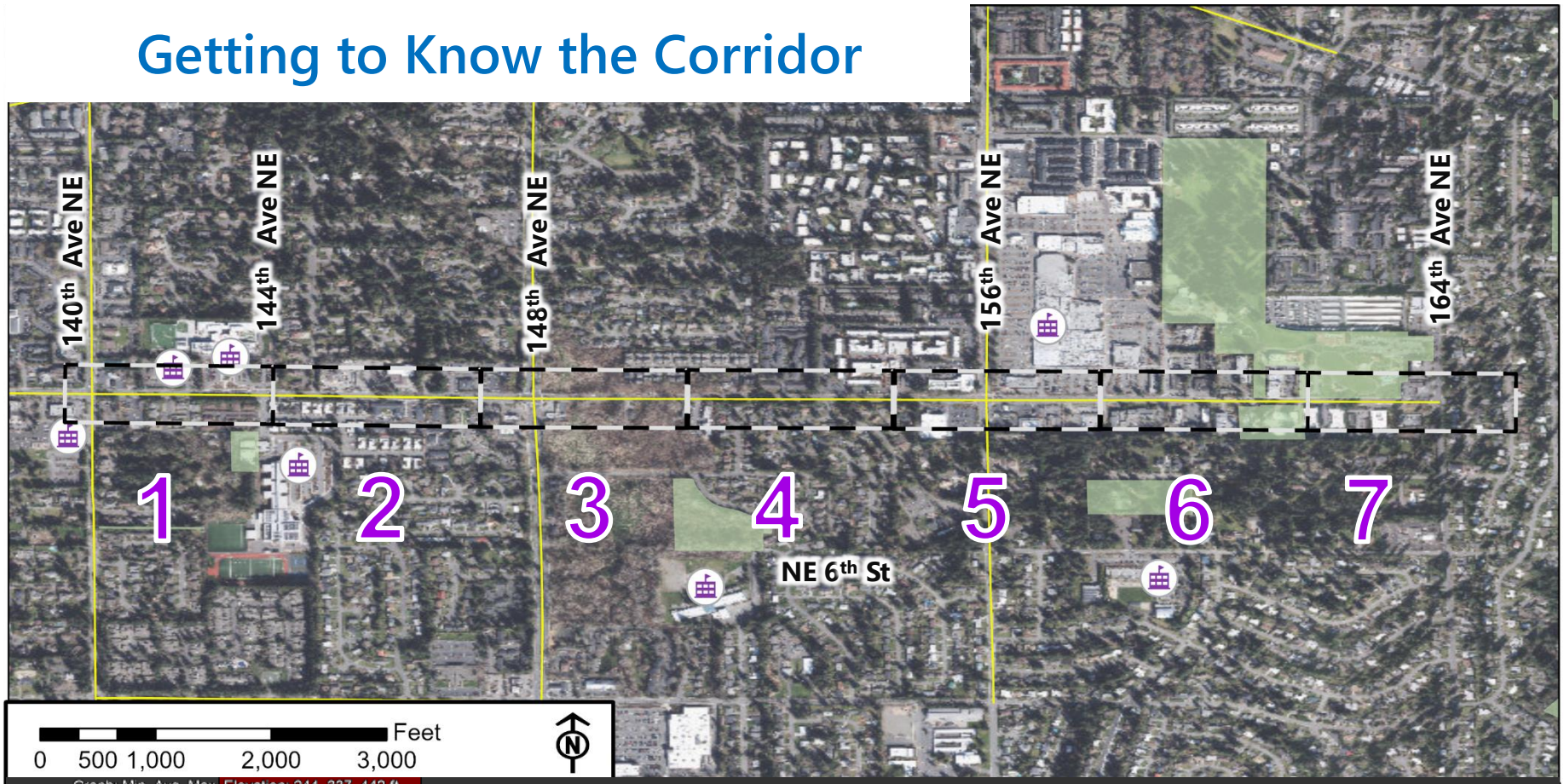


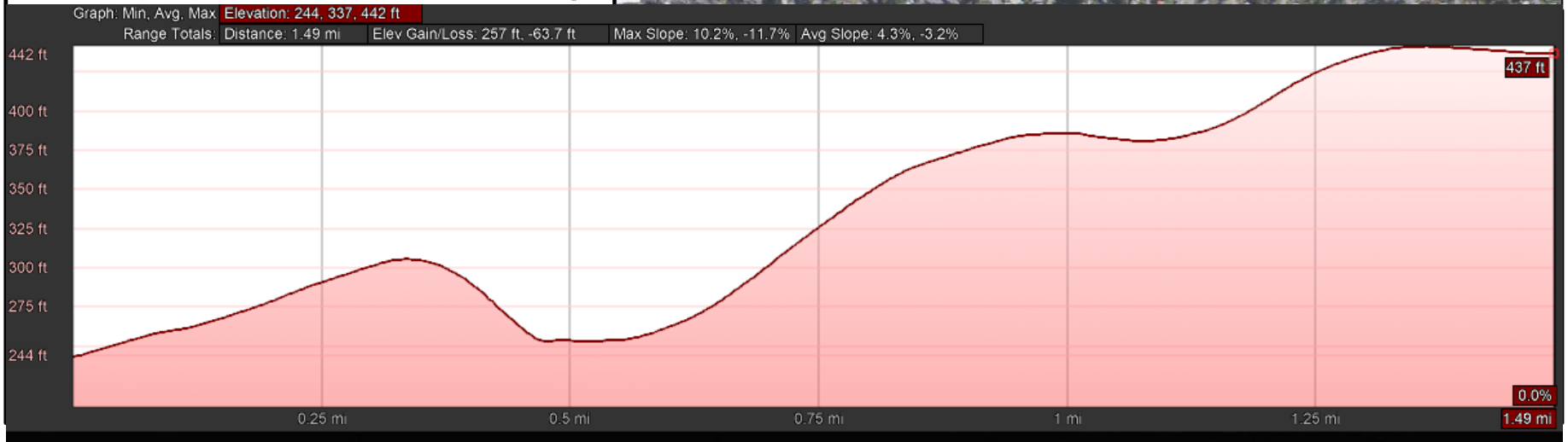
Getting to Know the Corridor



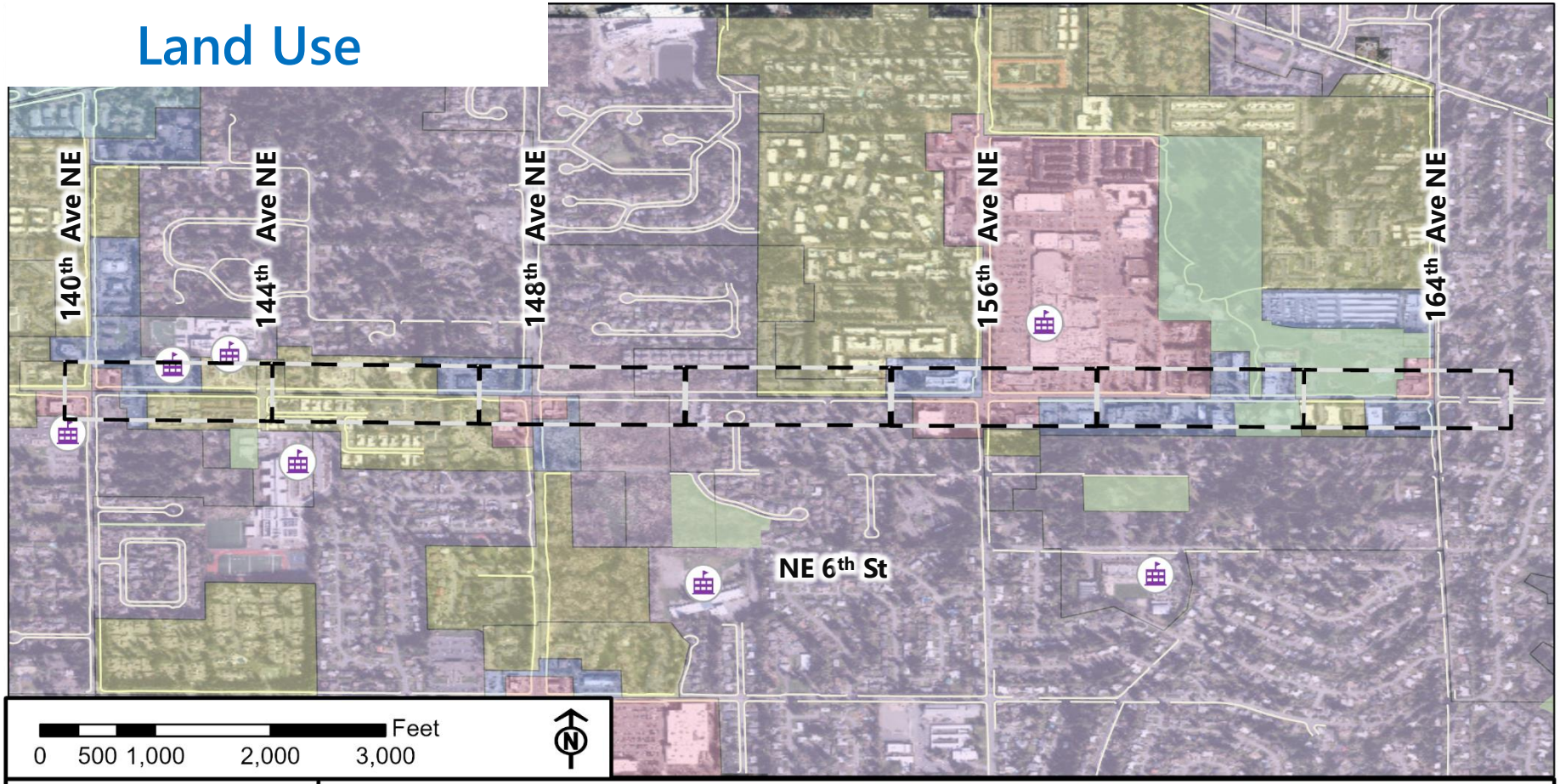
- NE 8th St corridor selected in consultation with Bellevue
  - 140th Ave NE to 164th Ave NE
  - ~1.5 mile long
  - Major Arterial and Minor Arterial (148th Ave NE divider)
  - 5-lane cross section, 3-lane cross section, TWLTL
  - Estimated 20-25k AADT
- Corridor on Bellevue's High Injury Network

Getting to Know the Corridor



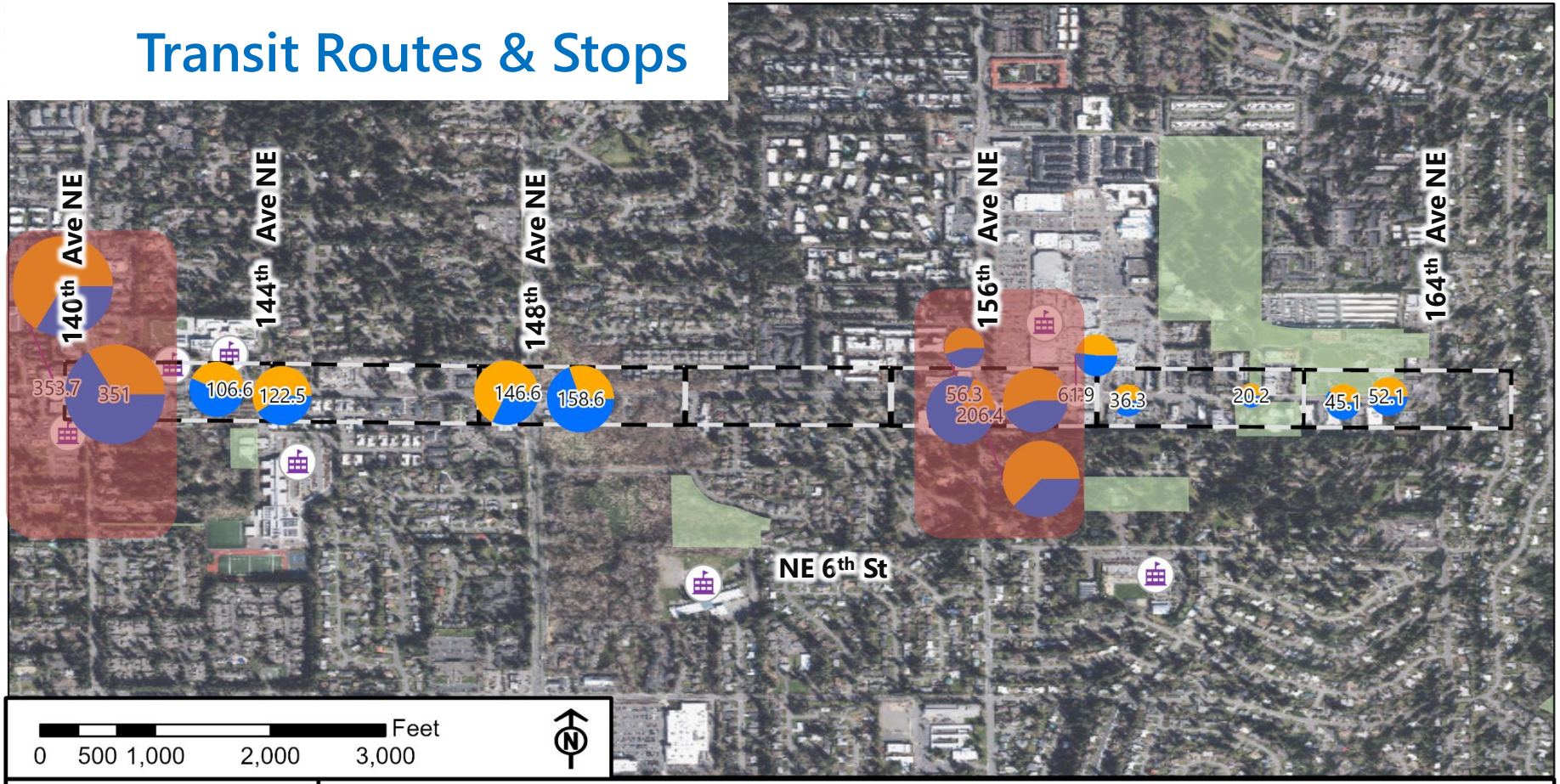


Land Use



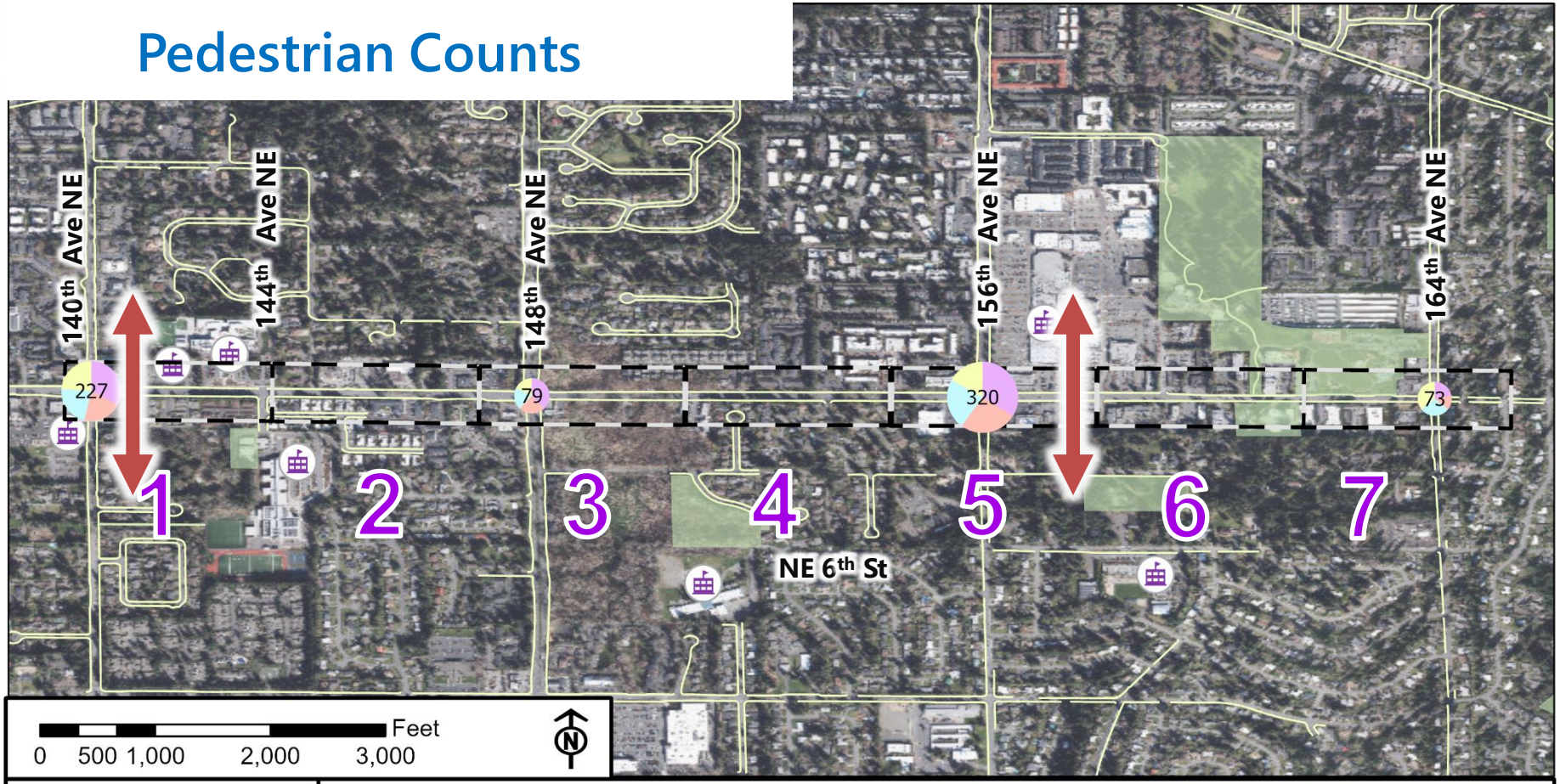
- **Retail** at corridor intersections
- **Single family and multifamily** adjacent or one block back
- **Office and educational** throughout
- **Parks and recreation facilities**

Transit Routes & Stops



- Several all-day routes through corridor
  - Routes 672, 221, 226, 245
  - Highest daily ridership Rt 672 stop west of 140th St (2/3 Boarding), followed by east stop (2/3 Alighting)
  - 6 stops located near 156th Ave NE, combined high ridership
  - Half have shelters
  - Most often far side intersection stop placement

Pedestrian Counts

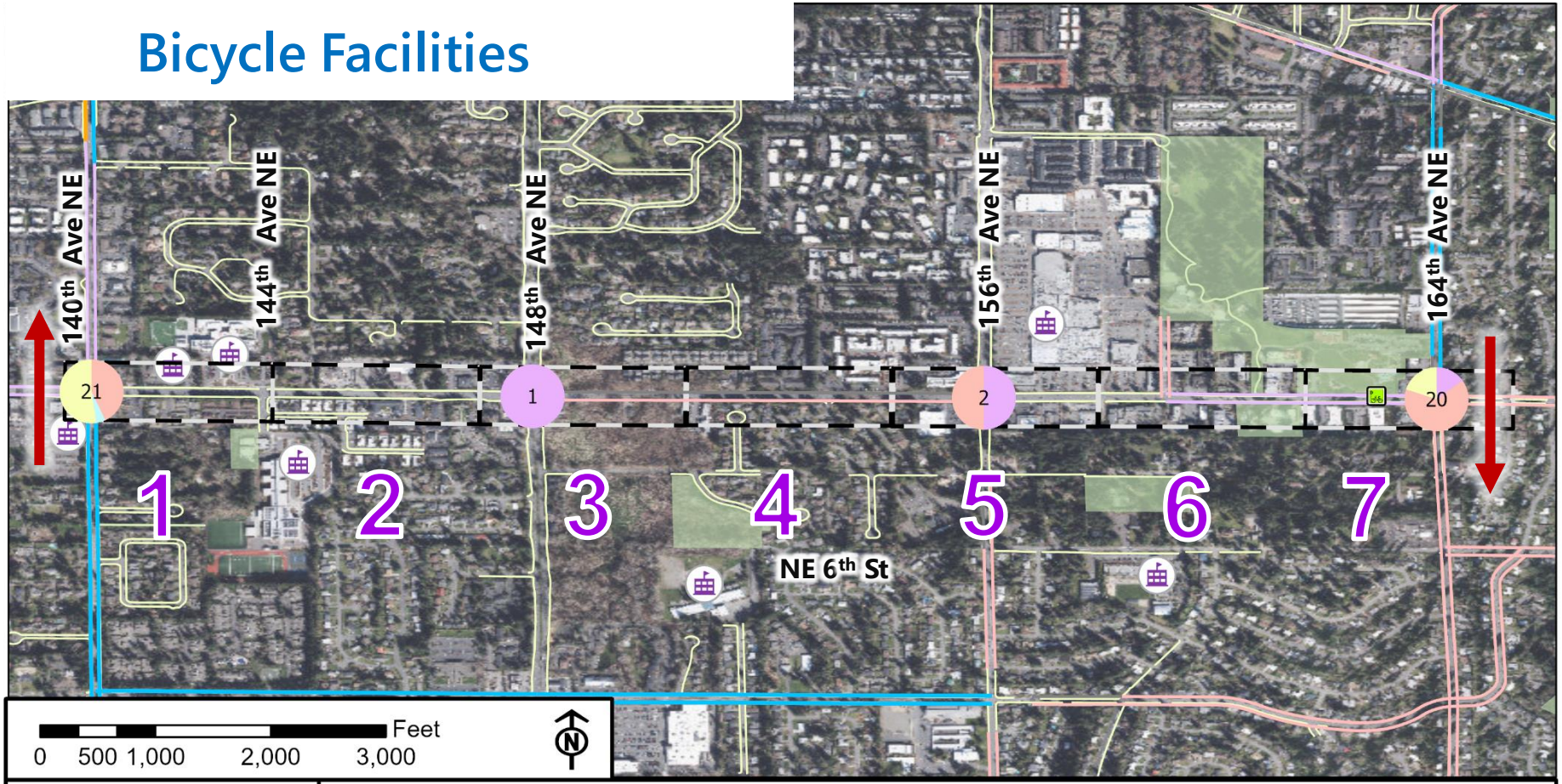


- Sidewalks throughout corridor
- PM 2-hour counts (2017)
  - Higher than AM counts
- Highest activity at 156th Ave NE
  - N/S movement highest on eastern leg, followed by E/W
- 140th Ave NE second highest area
  - N/S movement highest on eastern leg

Complete Streets Bellevue

usRAP

Bicycle Facilities

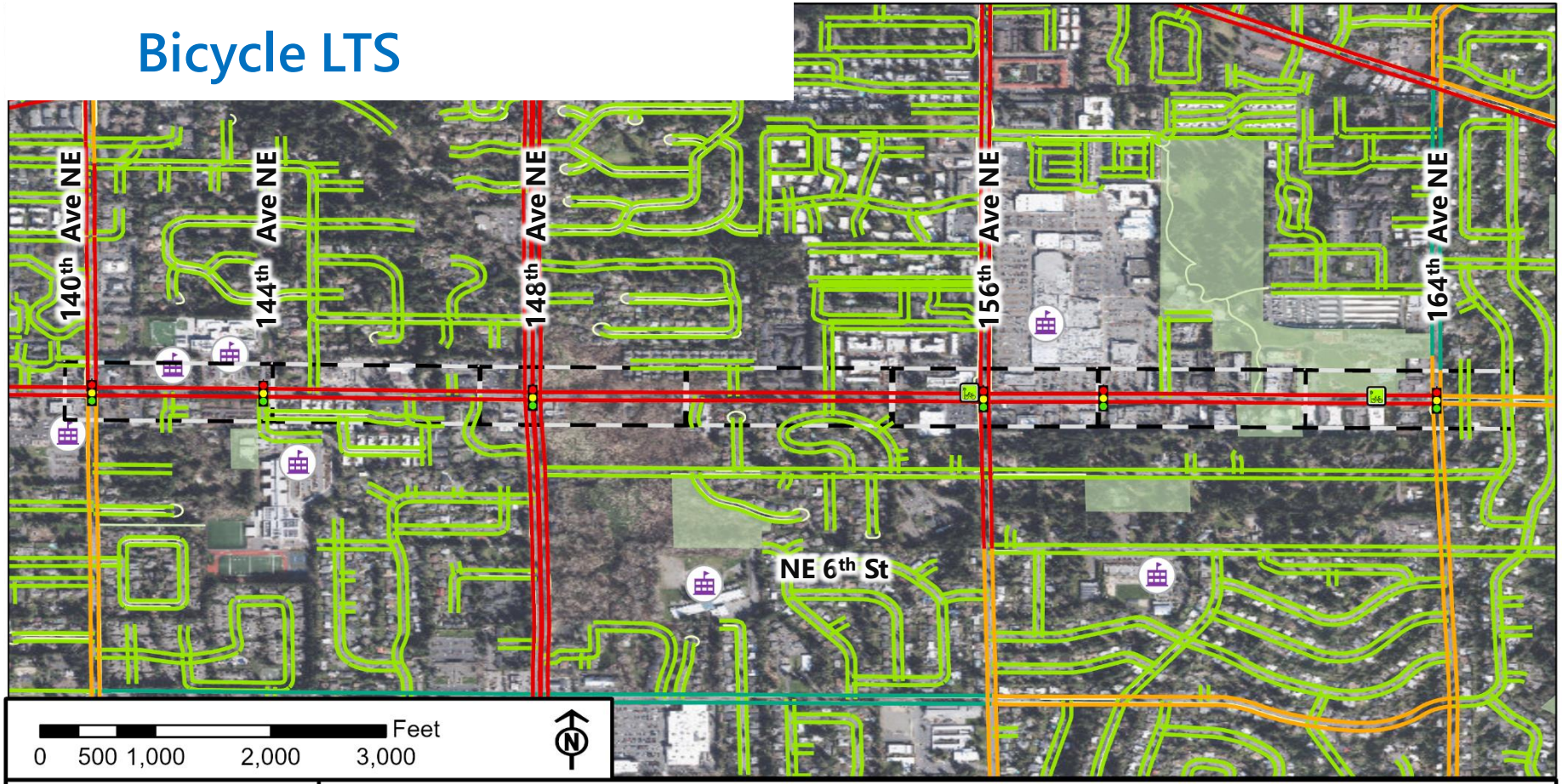


Bike Count - PM

- Easbound
- Southbound
- Westbound
- Northbound
- Bike Hub
- School
- Parks
- Existing Sidewalks

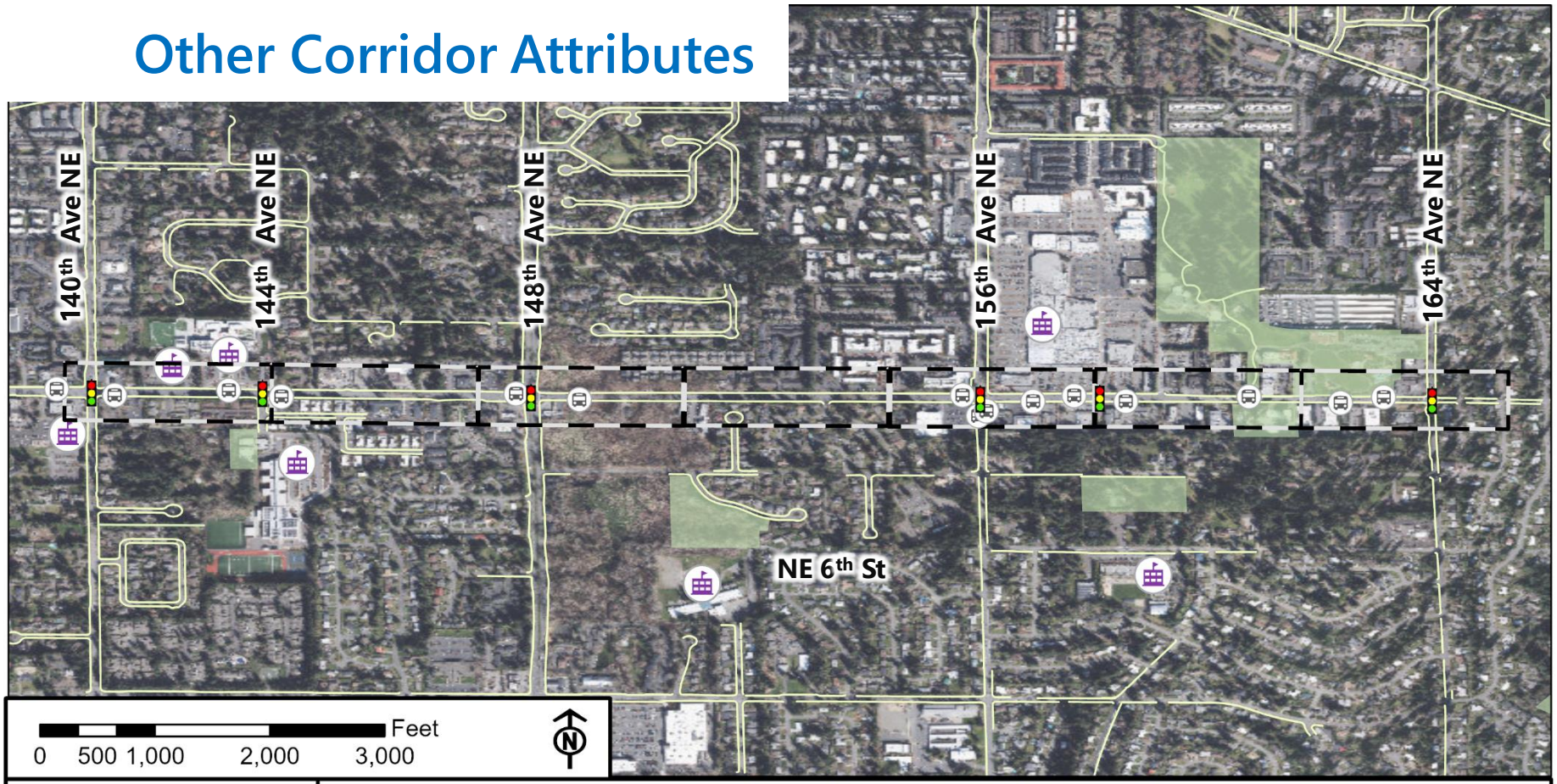
- Bikeway facilities to perpendicular and parallel to NE 8th St
- Facility between 148th and 156th described as shoulder
- Bike lane on Main St, 140th Ave NE
- Shared lanes from Crossroads Park eastward
- Bike parking at two locations (continued program?)
- Most crossings N/S at 140th Ave NE and 164th Ave NE

Bicycle LTS



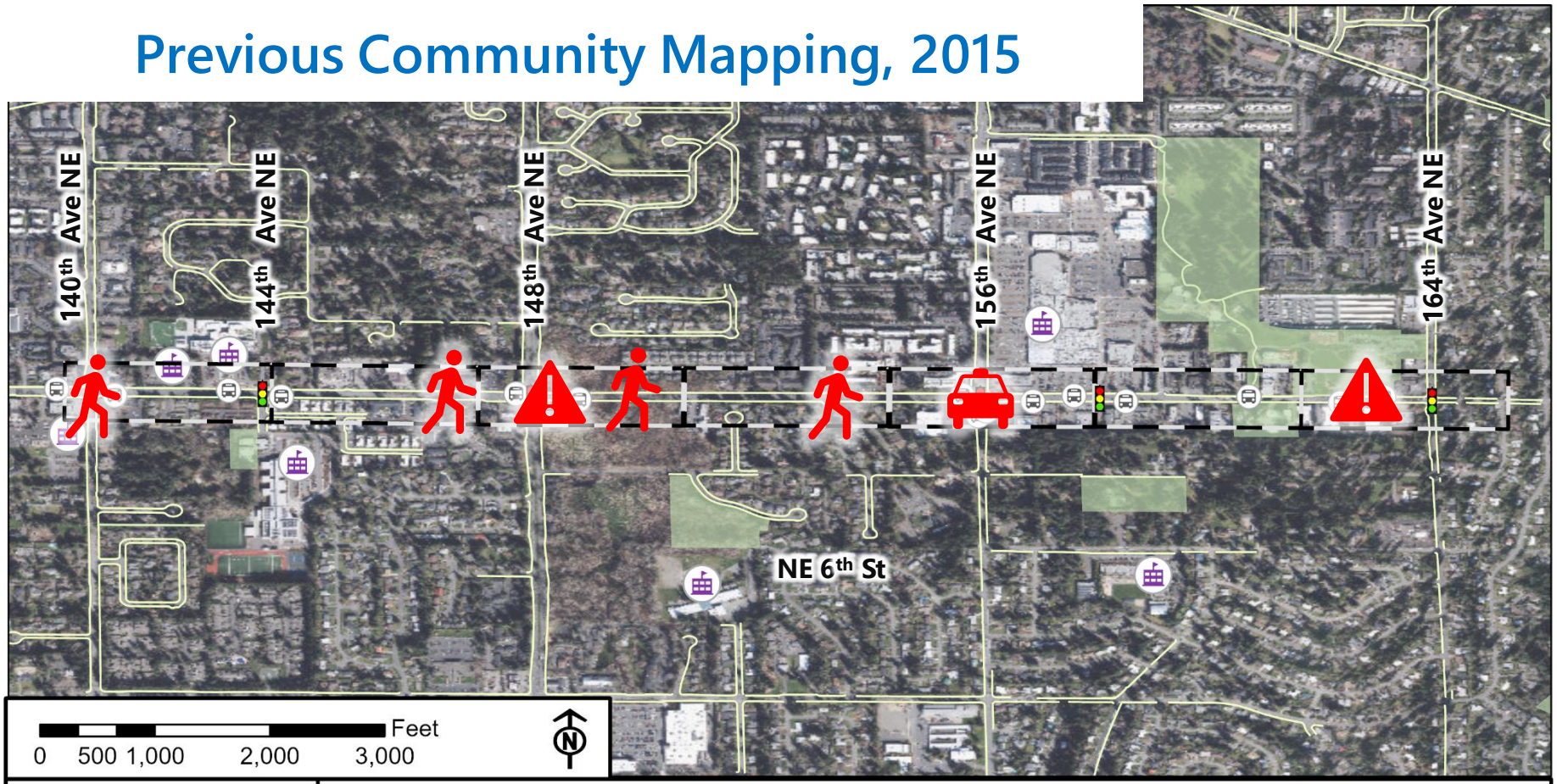
- Higher stress bicycle route along NE 8th St
  - Indicative of lack of dedicated facilities
  - Parallel lower stress routes on residential streets

Other Corridor Attributes



- Signalized intersections every 1000’-2500’
  - Marked crossings with pedestrian signal heads; LPI, APS?
  - Marked midblock crossing with refuge island/RRFB at Crossroads Park
  - City policies related to treatments
- Sidewalks throughout corridor
- Posted speed = 35MPH on western portion, 30MPH from 156th Ave NE eastward. 35.3MPH EB and 36.4MPH WB 85th%

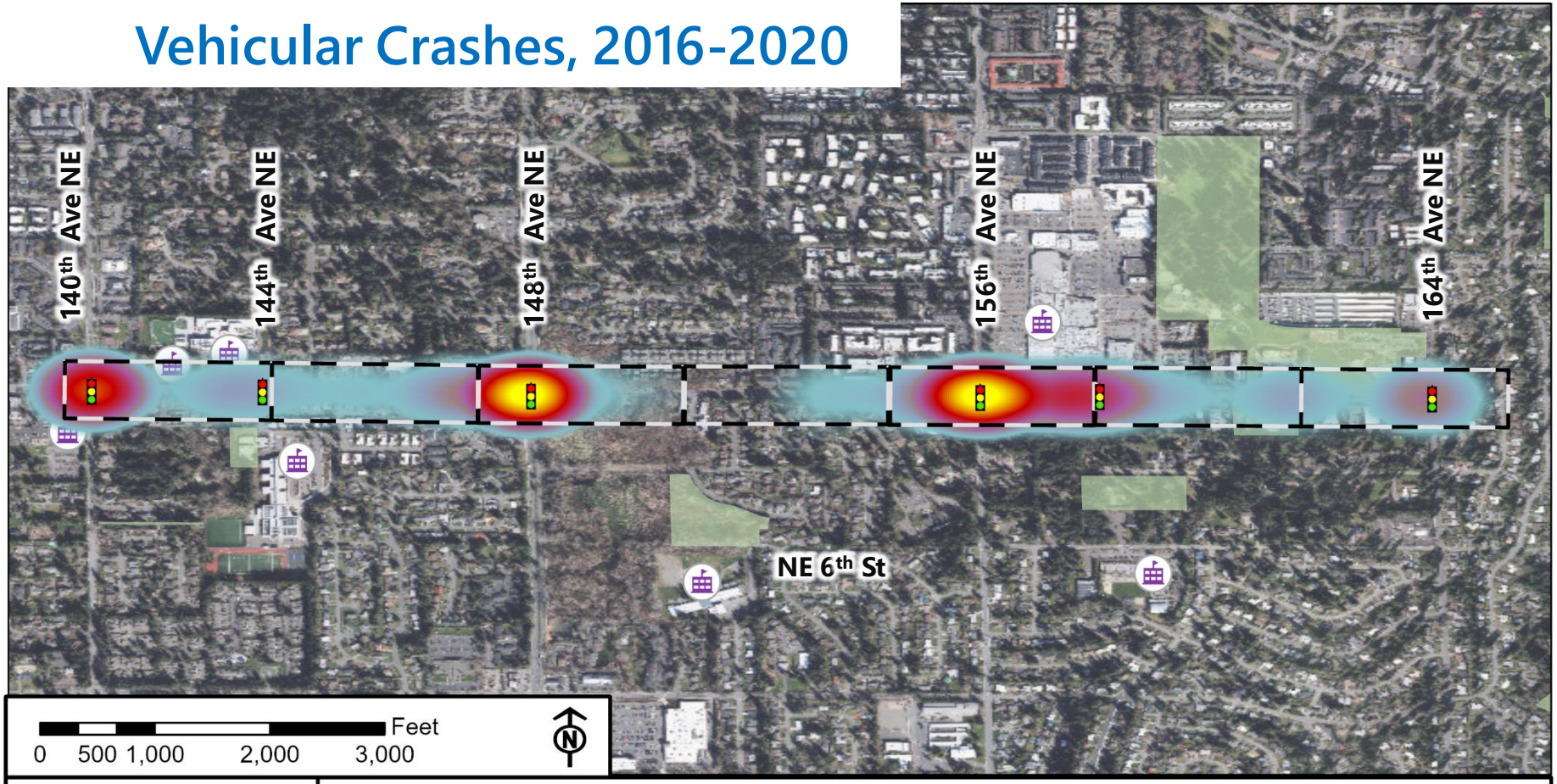
Previous Community Mapping, 2015



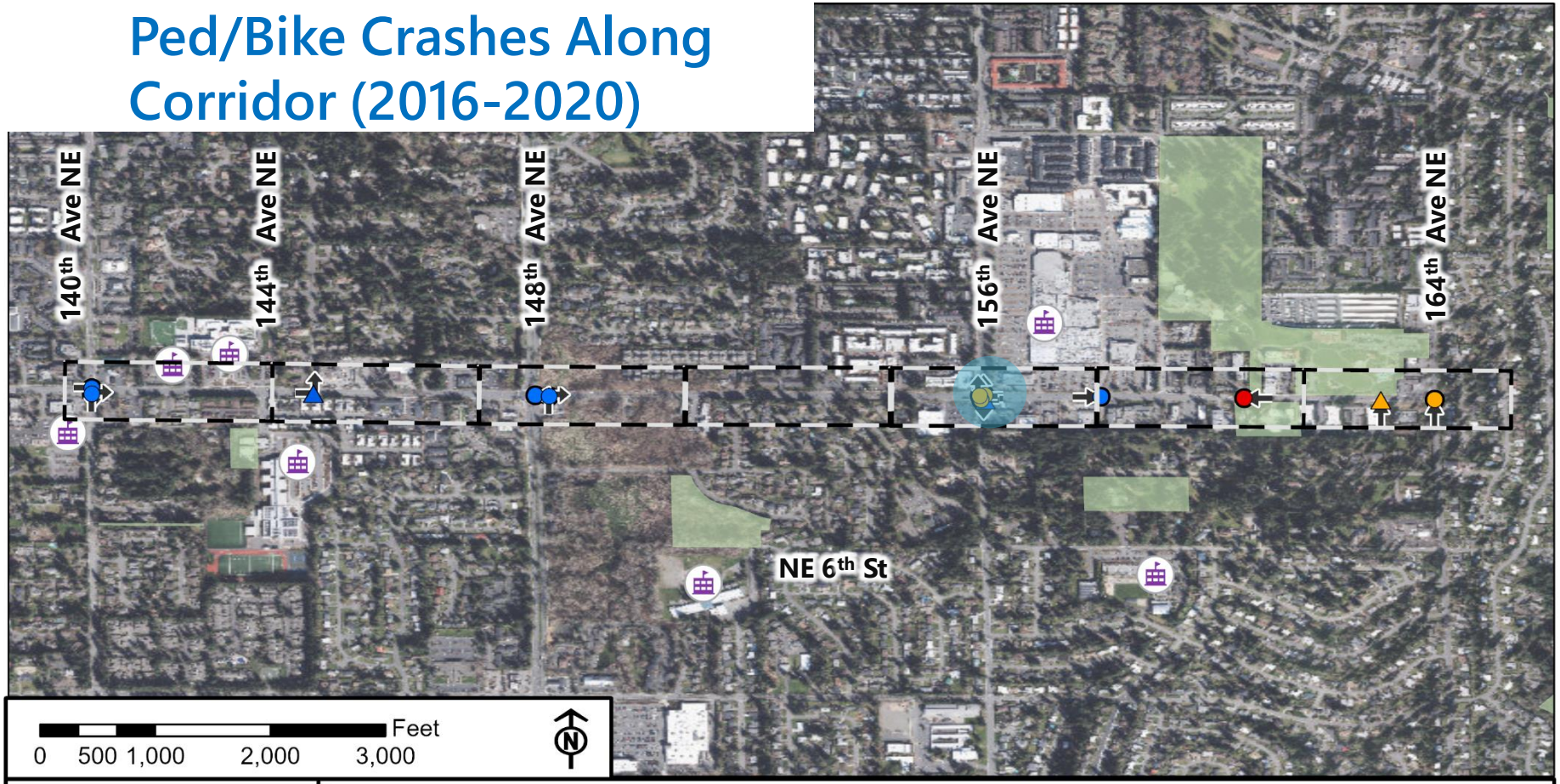
- Narrow sidewalks near 148th Ave and Crossroads Malls to 164th
  - Reported near misses in those areas
- Lack of bicycle facilities noted through, lack of continuity
- Reported unsafe pedestrian behaviors, midblock crossing or entering street against signal
- Reported unsafe motorist behavior at 156th Ave, not yielding to pedestrians and across the crosswalk

Placeholder for Other Relevant Plans

Vehicular Crashes, 2016-2020



Ped/Bike Crashes Along Corridor (2016-2020)



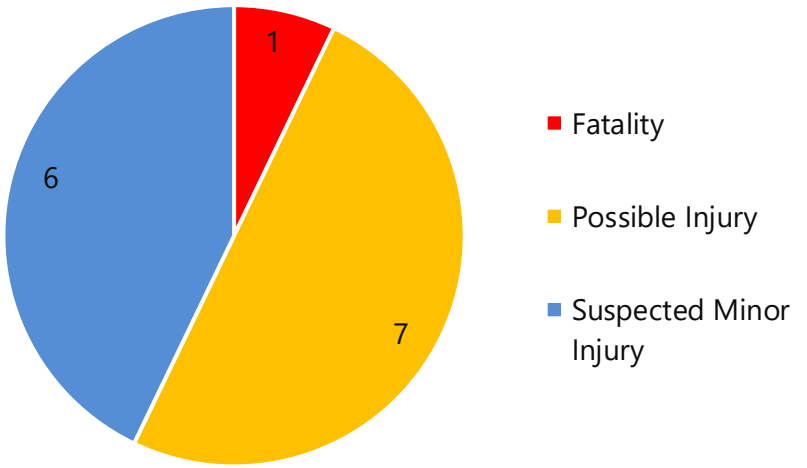
- 14 reported crashes over 5-year period: 1 fatality
- Highest frequency locations: 156th Ave NE, followed by 140th Ave NE and 148th Ave NE
- Most crashes located (11of 14) at or near intersections
  - Turning vehicle crashes most common at intersections

Ped/Bike Crash Summary – 2010-2019

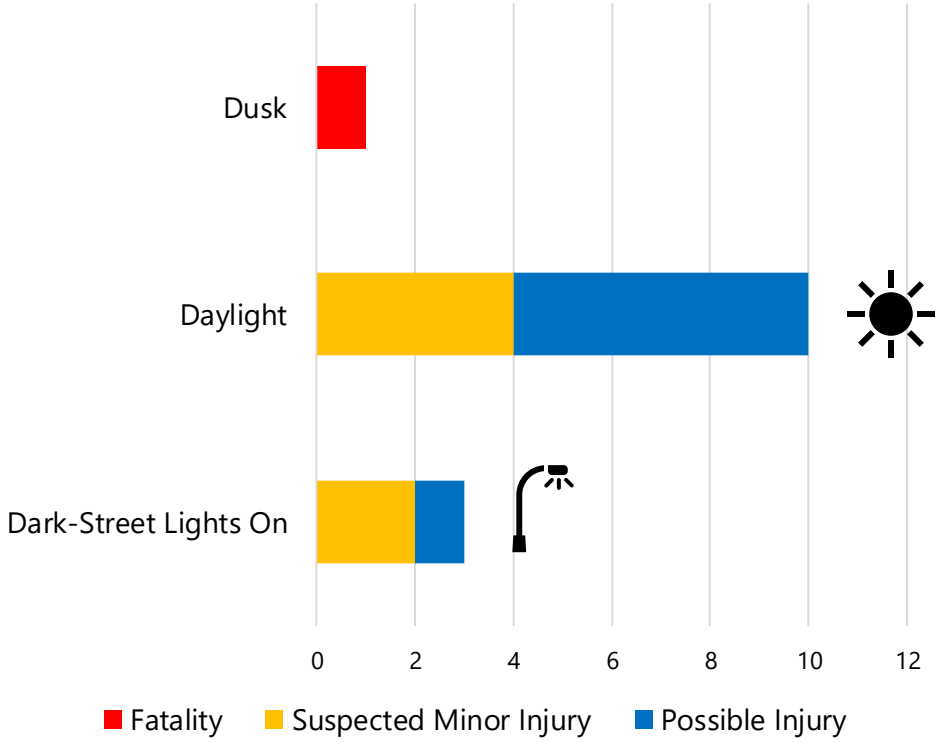
Year	Type		Time of Day			Lighting			Injury Severity			First Vehicle Action			Total
	Pedestrian	Bicycle	AM Peak	PM Peak	Off Peak	Dark-Street Lights On	Daylight	Dusk	Fatality	Possible Injury	Suspected Minor Injury	Going Straight Ahead	Making Left Turn	Making Right Turn	
2016		3	1		2		3			2	1		2	1	3
2017	5			1	4	2	3			3	2	3		2	5
2018	2			2		1	1				2			2	2
2019	1				1		1			1				1	1
2020	2	1	1	1	1		2	1	1	1	1	2	1		3
Total	10	4	2	4	8	3	10	1	1	7	6	5	3	6	14

Pedestrian & Bicycle – Severity and Lighting (2016-2020)

Crashes by Severity



Crash Severity by Lighting Condition



n=14

Collision Type by Location

First Collision Type	At Intersection and Related	Not at Intersection and Not Related	At Driveway	Grand Total
	Crash Location			
Vehicle - Pedalcyclist	3			3
Vehicle Strikes Pedalcyclist			1	1
Vehicle going straight hits pedestrian	3	1	1	5
Vehicle turning left hits pedestrian	1			1
Vehicle turning right hits pedestrian	3		1	4
Grand Total	10	1	3	14

Ped/Bike by MV Contr. Circumstances

Bike/Ped Contributing Circumstance	Did Not Grant R/W to Non-Motorist	Driver Not Distracted	Improper Turn/Merge	Inattention	None	Other Contributing Circ Not Listed	Unknown Distraction	Grand Total
	Motor Vehicle Contributing Circumstance							
Did Not Grant RW to Vehicle						1		1
Disregard Stop and Go Light		1			2			3
Inattention	1							1
None	3		1	2				6
Other Contributing Circ Not Listed	1					1		2
Other Distractions							1	1
Grand Total	5	1	1	2	2	2	1	14

n=14

Break – Be Back at 10:45AM PT

Prompt Lists for “In the—Virtual—Field”

- What do you see?
- Who is travelling along or crossing the roadway(s)?
- Where are people going?
- What stands out to you as potential safety issues?

Location	Physical Environment / Infrastructure					
	Presence/Placement	Quality/Condition	Connectivity/ Consistency	Visibility	Lighting	Transit
Universal Considerations for Study Area	• Do facilities address ped and bike needs, including those with disabilities? • If future changes are proposed to the transportation system or surrounding land use, will those needs still be met?	• Are ped and bike facilities in good condition and accommodate users with disabilities?	• Are safe, continuous, and convenient ped and bike routes provided throughout the study area?	• Do obstructions block the view of roadway users? • What obstructions block the view of pedestrian and bicycle facilities (e.g., crosswalks, traffic control devices, signs)? • Does the sun create visibility issues at certain times of day?	• Are ped and bike facilities well-lit? • Can peds and bikes be seen by motorists during dark conditions?	• How does transit infrastructure interact with ped and bike facilities?
Along Street (including driveways)	• How are peds and bikes accommodated on both sides of the road? • Are facilities shared, separate, or buffered? • What is the comfort level for users? • Are ped and bike facilities appropriate for the adjacent land use? • Do parked vehicles obstruct ped paths? • Does parking adversely affect bike safety?	• Are the bike/ped facilities in good condition and well-maintained? • Are there obstacles (e.g. utility poles or signs) in the middle of the sidewalk? • Are the sidewalks wide enough for two people to walk together? • Does vegetation or debris infringe on pedestrian or bicyclists facilities? • Is the pavement free of obstacles (e.g., potholes, drainage grates, longitudinal joints)?	• How are peds accommodated at driveways/ access points? • Are ped walkways continuous? • Are bike routes continuous?	• Are there obstructions blocking the driver's view of peds and bikes? • Are driveways designed with peds and bikes in mind (e.g., less driveway density, access management, proper signage, pavement markings, etc.)?	• Are sidewalks and bicycle facilities adequately lit?	• Are there sufficient boarding areas (5 feet along curb, 8 feet perpendicular to curb line) and visibility at transit stops? • Do ped and bike facilities connect to transit stops?

Location	Physical Environment / Infrastructure					
	Presence/Placement	Quality/Condition	Connectivity/ Consistency	Visibility	Lighting	Transit
Mid-Block Crossing (marked)	• Are there crossing enhancements? • What are the distances between the mid-block crossing and other marked crosswalks?	• Are signs and pavement markings in good condition and visible/legible?	• Does this crossing lead to/from a ped/bike generator?	• Are there obstructions blocking the view of signs or pavement markings? • Do horizontal or vertical curves impede adequate sight distance between drivers and peds/bikes?	• Are pedestrian crossings adequately lit?	• Is there a transit stop located mid-block? • Are transit users crossing mid-block to get to/from the transit stop?
Observed Mid-Block Crossings (unmarked)	• Are crossings isolated or a frequent route used by pedestrians or bicyclists?	N/A	• How far is it to the nearest controlled crossing? • Why are peds/ bikes crossing mid-block and not at the closest marked crossing? • Are there generators that lead to pedestrians and bicyclists crossing mid-block?	• Are there obstructions blocking the view of pedestrians and bicyclists?	• Does this section of roadway have lights?	• Are mid-block crossings occurring near transit stops?

Location	Physical Environment / Infrastructure					
	Presence/Placement	Quality/Condition	Connectivity/ Consistency	Visibility	Lighting	Transit
Intersections	• How are peds and bikes accommodated (e.g., accessible ped signal, bike box, high-vis crosswalks, bike signal)? • What intersection characteristics increase/decrease ped and bike safety (e.g., channelized right turns, large cub radii, wide crossing distances, right-turn-on-red)?	• How many legs have a crosswalk and what is the condition? • Are ped push buttons accessible, with a locator tone, properly located and connected to the walkway, and functioning correctly? • Are curb ramps in good condition and ADA-compliant for each crosswalk or does a single curb ramp serve both crosswalks?	• Are intersection enhancements to signs, pavement markings, and signals consistent across intersections in the study area? • Do crosswalks line up with sidewalks?	• Can peds, bikes, and drivers see each other at all intersection legs? • Are there utility poles, signs or other objects blocking the view of traffic? • Do skewed intersections direct drivers' focus away from peds?	• Is the lighting adequate at all corners of the intersection?	• Do ped and bike facilities connect to transit stops? • Are transit stops on the near or far side of the intersection?
Shared Use Paths and Grade-Separated Crossings	• Do bicyclists have adequate space to ride comfortably (e.g., horizontal and vertical clearance at tunnels and bridges, construction zones, guardrails, fences)? • Do pedestrians have sufficient width to walk comfortably and is access to the facility accessible to individuals with disabilities?	• Does the condition of the facility promote personal safety? • What material is the structure (freeze/thaw)? • Are the grades and cross slopes accessible to individuals with disabilities? • Is there adequate drainage? • Does wildlife affect comfort levels? • Are sideslopes adequate for bicycles to return to the roadway in the event of a lane departure? • Are facilities properly maintained (free of vegetation, snow)?	• Are bike facility transition areas designed appropriately with logical termini or do they end abruptly, potentially contributing to sudden and difficult merges, uncontrolled crossings, or behaviors such as wrong-way riding? • How is access provided to destinations if grade-separated? • Is the facility connected to other ped facilities in the area?	• Does poor visibility compromise personal safety? • Does the speed of users affect their ability to see and react to shared use path connections?	• Is adequate lighting provided?	• Are connections to transit provided?

Location	Traffic Control Devices		
	Signs and pavement markings	Signals	Compliance?
Universal Considerations for Study Area	• Are signs and pavement markings for pedestrian and bicycle facilities present and effective?	• Are pedestrians and bicyclists accommodated at signals through adequate signal timing and phasing? • Are pedestrian push buttons accessible, with a locator tone, properly located and connected to the walkway, and functioning correctly?	• Do motorists, pedestrians, and bicyclists follow traffic laws?
Along Street (including driveways)	• Are bicycle pavement markings adequate?	N/A	N/A
Mid-Block Crossing (marked)	• Are crossing points for pedestrians properly signed and/or marked? Are curb ramps provided? • Are there signage enhancements for the crossing, such as RRFBs or flashing beacons?	• Are there any devices (i.e., PHB or signalization) to control the crossings? • If so, are pedestrian push buttons accessible, with a locator tone, properly located and connected to the walkway, and functioning correctly?	• Are drivers, pedestrians, and bicyclists compliant with traffic control devices? • Are drivers yielding to pedestrians? • Are bicyclists yielding to pedestrians?
Intersections	• Is paint on stop bars and crosswalks worn, or are signs worn, missing, or damaged? • Are there sign or pavement marking enhancements?	• How long is the pedestrian or bicycle signal? Is there enough time to cross? • Is there a pedestrian countdown and/or bicycle signal? • Do pedestrians and bicyclists use push buttons to actuate a crossing? • Is there a leading pedestrian interval (LPI)? Is it accessible to pedestrians with vision disabilities? Are bikes allowed to utilize the early start? • Are there restrictions on turning-movements, like no right-turn-on-red? • How long do pedestrians have to wait in between signals? • Do vehicles have protected or permitted left-turn control?	• Are drivers, pedestrians, and bicyclists compliant with traffic control devices? • Are drivers yielding to pedestrians (especially at right-turn)? • Are bicyclists yielding to pedestrians?
Shared Use Paths and Grade-Separated Crossings	• Do signs provide wayfinding or advance warning of at-grade intersections?	N/A	N/A

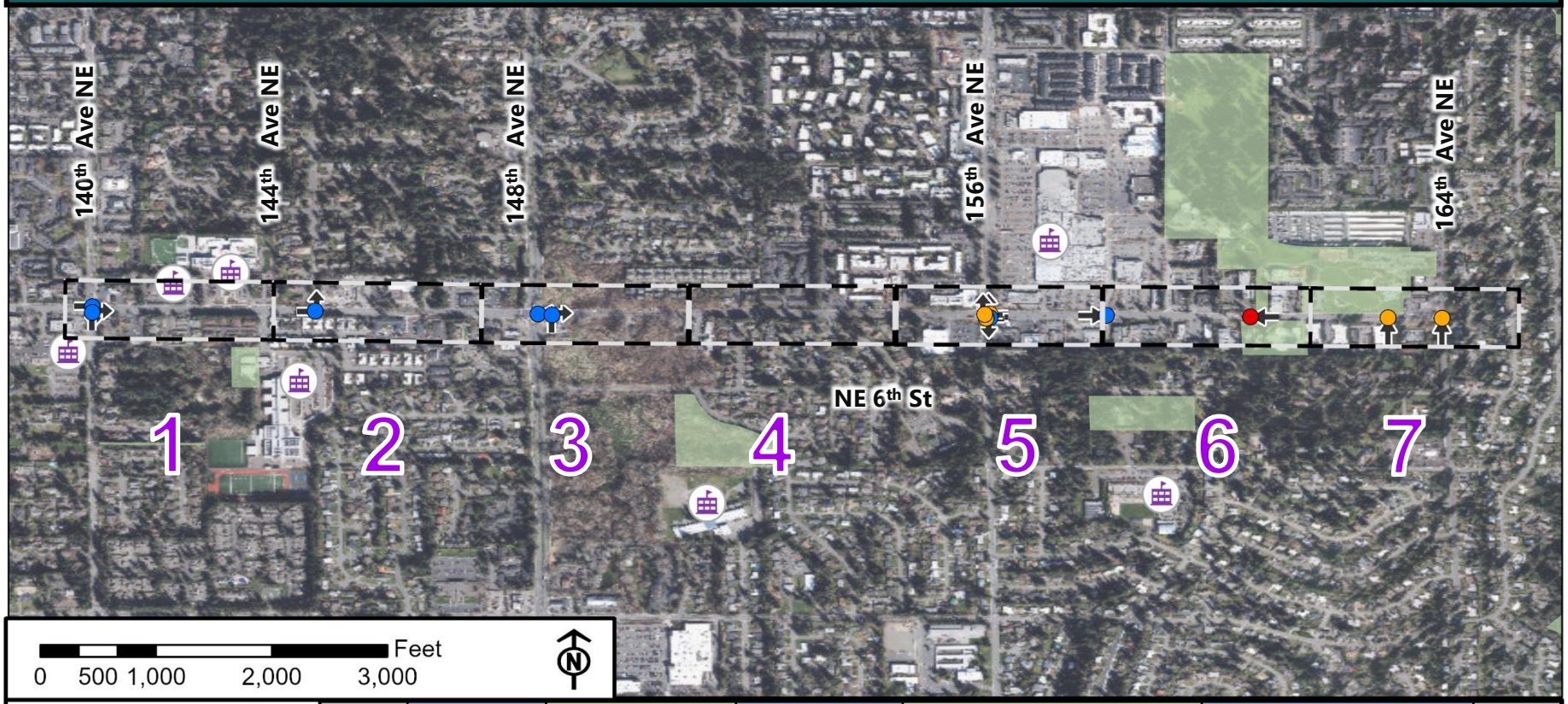
Location	Operations / Interactions / Behaviors		
	Characteristics	Mode Behavior	Interactions of Modes
Universal Considerations for Study Area	• Are design, posted, and operating traffic speeds compatible with pedestrian and bicyclist safety? • Is the safety of children in school zones adequately considered?	• Do pedestrians or motorists regularly misuse or ignore pedestrian facilities? • Are drivers, pedestrians, and bicyclists behaving in a safe, compliant manner? • Are behaviors systemic across the network or at isolated locations?	• Do roadway users look/scan for other travel modes? • Are drivers and bicyclists yielding to pedestrians at crossings? • Do drivers allow extra space or reduce speeds when overtaking or driving near bicyclists? • How do pedestrians and bicyclists interact with transit facilities?
Along Street (including driveways)	• Do scooters, bicycles, skateboards, or non-motorized vehicles create hazards for pedestrians (e.g., operating or parking on sidewalk)? • Are vehicles traveling at appropriate speeds?	• If available, are bicyclists using their dedicated facilities?	• Are drivers yielding to pedestrians at driveways? • Are there conflicts between bicycles and pedestrians on sidewalks?
Mid-Block Crossing (marked)	• What are vehicle speeds? • What are traffic volumes?	• Are people using the mid-block crossing? • Are drivers yielding to pedestrians or bicyclists in the crosswalk?	• Are the physical environment and traffic control devices adequate for a safe crossing?
Observed Mid-Block Crossings (uncontrolled)	• What are vehicle speeds?	• Are pedestrians and bicyclists waiting for gaps?	• Are drivers expecting crossing pedestrians or bicyclists?
Intersections	• What are vehicle speeds? • What are vehicle, pedestrian, and bicycle volumes at the intersection?	• Are drivers stopping in the crosswalk? • Are pedestrians crossing with or against the pedestrian signal, if present? • Do pedestrians and bicyclists use push buttons to actuate a crossing?	• Is it clear between roadway users who has the right-of-way and is there compliance? • Do drivers yield to pedestrians and bicyclists when turning right or left?
Shared Use Paths and Grade-Separated Crossings	• Is there a mix of grade-separated and at-grade crossings?	• Do pedestrians walk in a way that blocks the path for other users? • Are bicyclist speeds too fast for conditions? • Does a mix of grade-separated and at-grade intersections influence behavior (e.g., higher speeds, less expectancy of crossing conflicts)?	• Are there pavement markings that separate users? How are such separations communicated to pedestrians with vision disabilities? • What are the levels of comfort for users?

Field Visit Guidance

Observe and record what you see for physical elements and behaviors that may affect pedestrian safety along Louisiana Ave:

- ❑ Presence and continuity of facilities (ped and transit)
  - ❑ Sidewalks
  - ❑ Curb ramps
  - ❑ Bus stop
  - ❑ Bus stop shelter
  - ❑ Paved trail
  - ❑ Informal paths (e.g. "goat paths")
- ❑ Quality of facilities (ped and transit)
- ❑ Overhead lighting
- ❑ Visibility of expected pedestrians
- ❑ Driveways and other conflicts
- ❑ Signs
- ❑ Pavement markings
- ❑ Signals: pedestrian signals and phase timing
- ❑ Destinations (e.g. businesses, schools, recreation, homes)
- ❑ Observed traffic behaviors, including speeding, turning movements, and gaps in traffic
- ❑ Observed pedestrian behaviors (travel and crossings)

Map Segments – *NE 8th St*



Pedestrian and Bicycle Crashes (2016-2020)

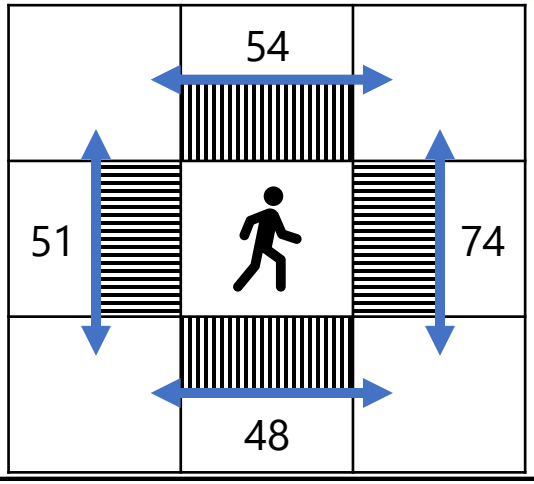
- Fatal
- Suspected Serious Injury
- Suspected Minor Injury
- Possible Injury
- No Apparent Injury
- School
- Parks

Year	Type		Time of Day			Lighting			Injury Severity			First Vehicle Action			Total
	Pedestrian	Bicycle	AM Peak	PM Peak	Off Peak	Dark-Street Lights On	Daylight	Dusk	Fatality	Possible Injury	Suspected Minor Injury	Going Straight Ahead	Making Left Turn	Making Right Turn	
2016		3	1		2		3			2	1		2	1	3
2017	5			1	4	2	3			3	2	3		2	5
2018	2			2		1	1				2			2	2
2019	1				1		1			1				1	1
2020	2	1	1	1	1		2	1	1	1	1	2	1		3
Total	10	4	2	4	8	3	10	1	1	7	6	5	3	6	14

Segment 1 – *140th Ave NE to West of 143rd Ave*

Pedestrian and Bicycle Crashes (2016-2020)

- Fatal
- Suspected Serious Injury
- Suspected Minor Injury
- Possible Injury
- No Apparent Injury
- Pedestrian
- Bicycle
- School
- Street Light
- Transit Stop
- Bike Hub
- RSA Corridor Map Segment



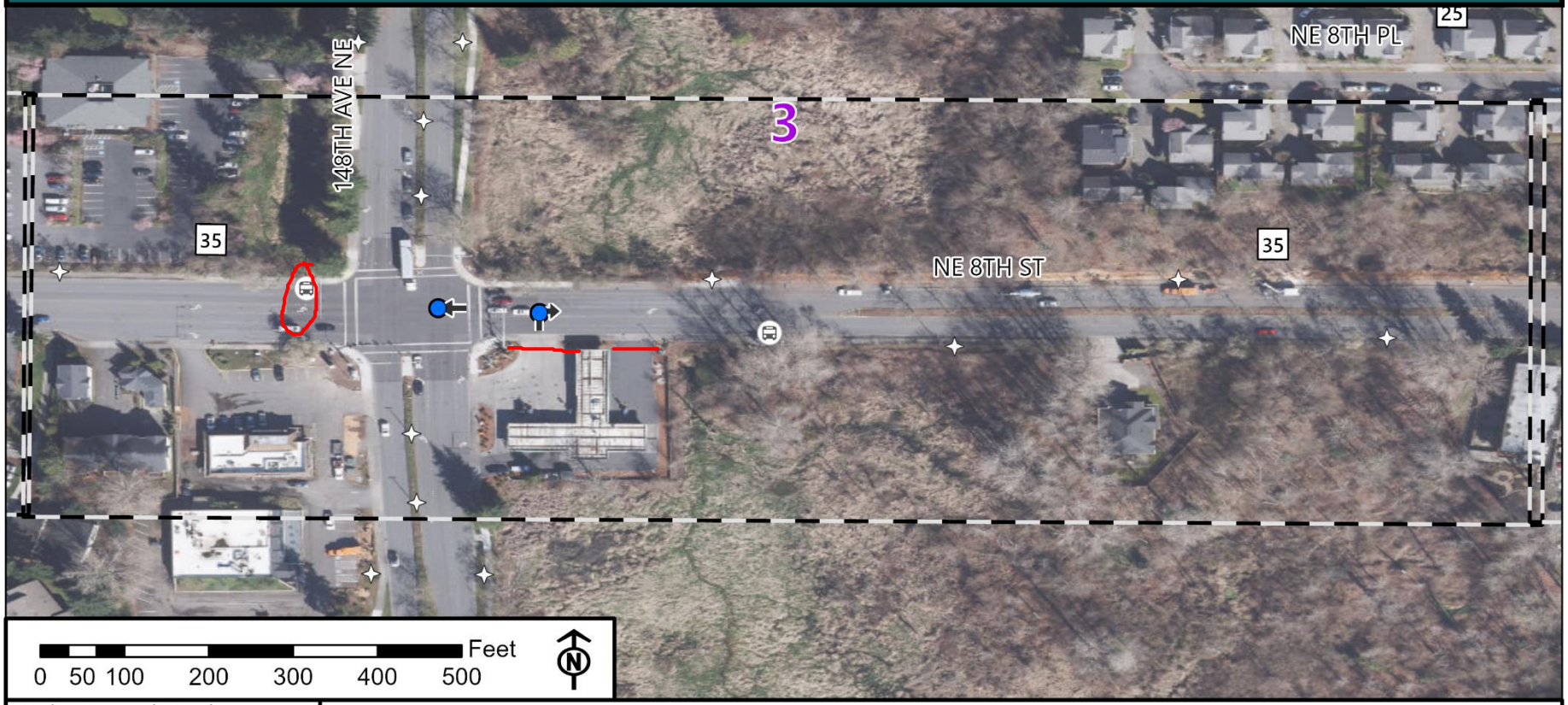
Segment 2 – *143rd Ave NE to 147th Pl NE*

Pedestrian and Bicycle Crashes (2016-2020)

- Fatal
- Suspected Serious Injury
- Suspected Minor Injury
- Possible Injury
- No Apparent Injury
- Pedestrian
- Bicycle
- School
- Street Light
- Transit Stop
- Bike Hub
- RSA Corridor Map Segment

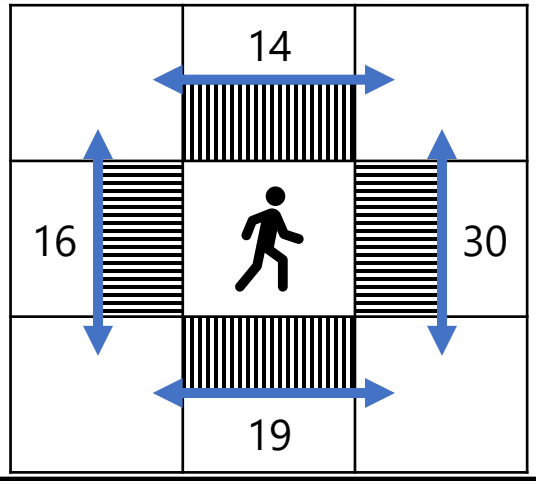
Field Notes

Segment 3 – *147th Pl NE to West of 151st Pl NE*



Pedestrian and Bicycle Crashes (2016-2020)

- Fatal
- Suspected Serious Injury
- Suspected Minor Injury
- Possible Injury
- No Apparent Injury
- Pedestrian
- Bicycle
- School
- Street Light
- Transit Stop
- Bike Hub
- RSA Corridor Map Segment



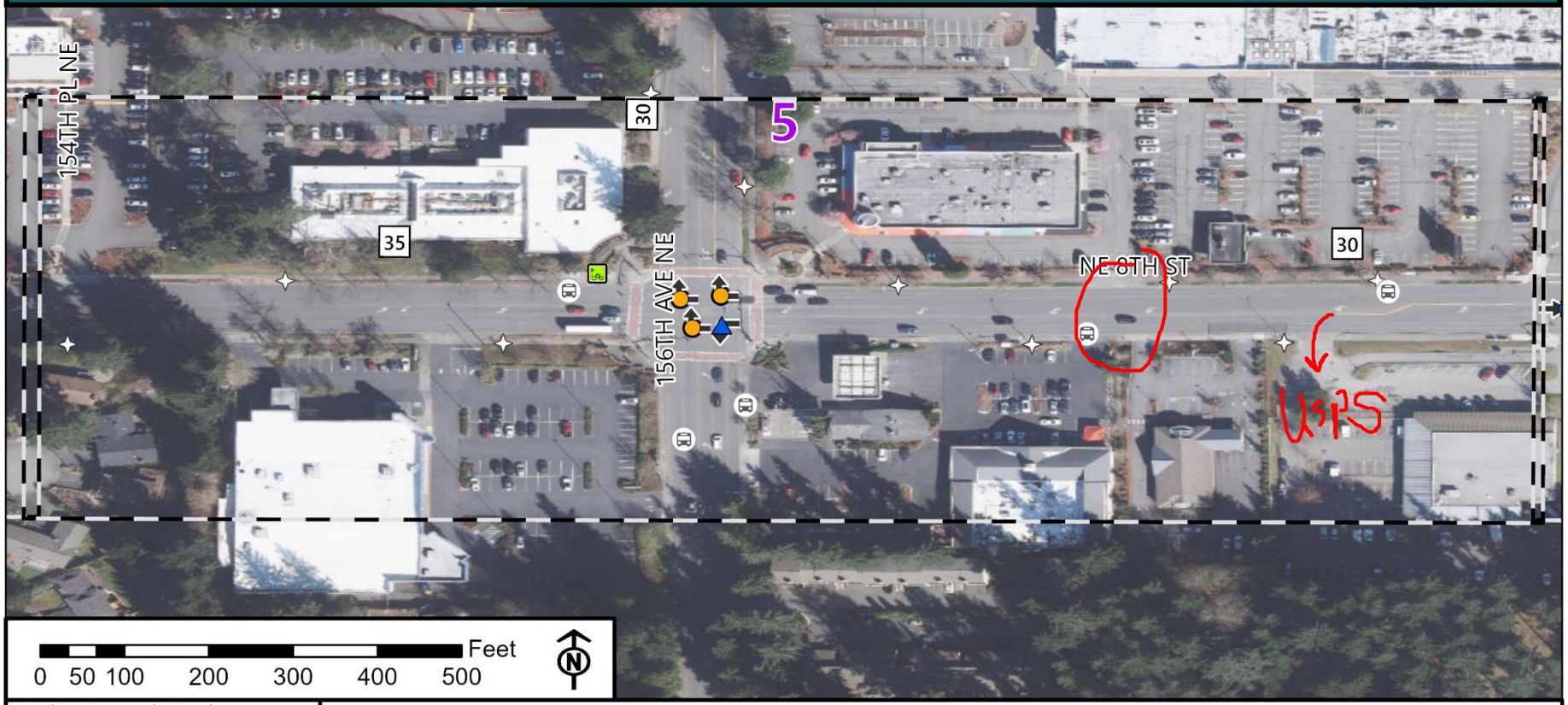
Segment 4 – *151st Pl NE to West of 156th Ave NE*

Pedestrian and Bicycle Crashes (2016-2020)

- Fatal
- Suspected Serious Injury
- Suspected Minor Injury
- Possible Injury
- No Apparent Injury
- Pedestrian
- Bicycle
- School
- Street Light
- Transit Stop
- Bike Hub
- RSA Corridor Map Segment

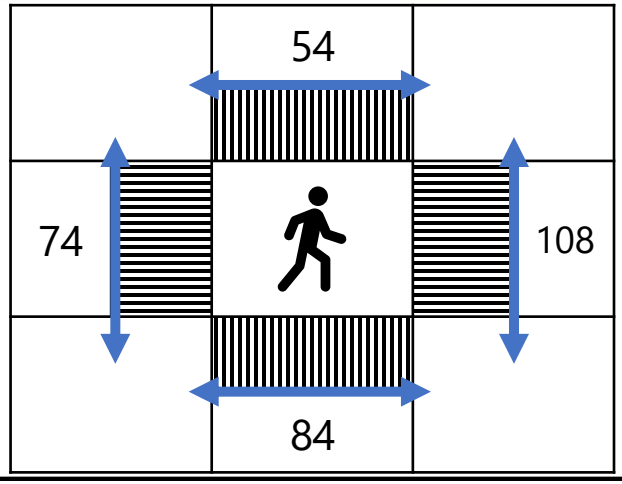
Field Notes

Segment 5 – *156th Ave NE to 158th Pl NE*



Pedestrian and Bicycle Crashes (2016-2020)

- Fatal
- Suspected Serious Injury
- Suspected Minor Injury
- Possible Injury
- No Apparent Injury
- Pedestrian
- Bicycle
- School
- Street Light
- Transit Stop
- Bike Hub
- RSA Corridor Map Segment



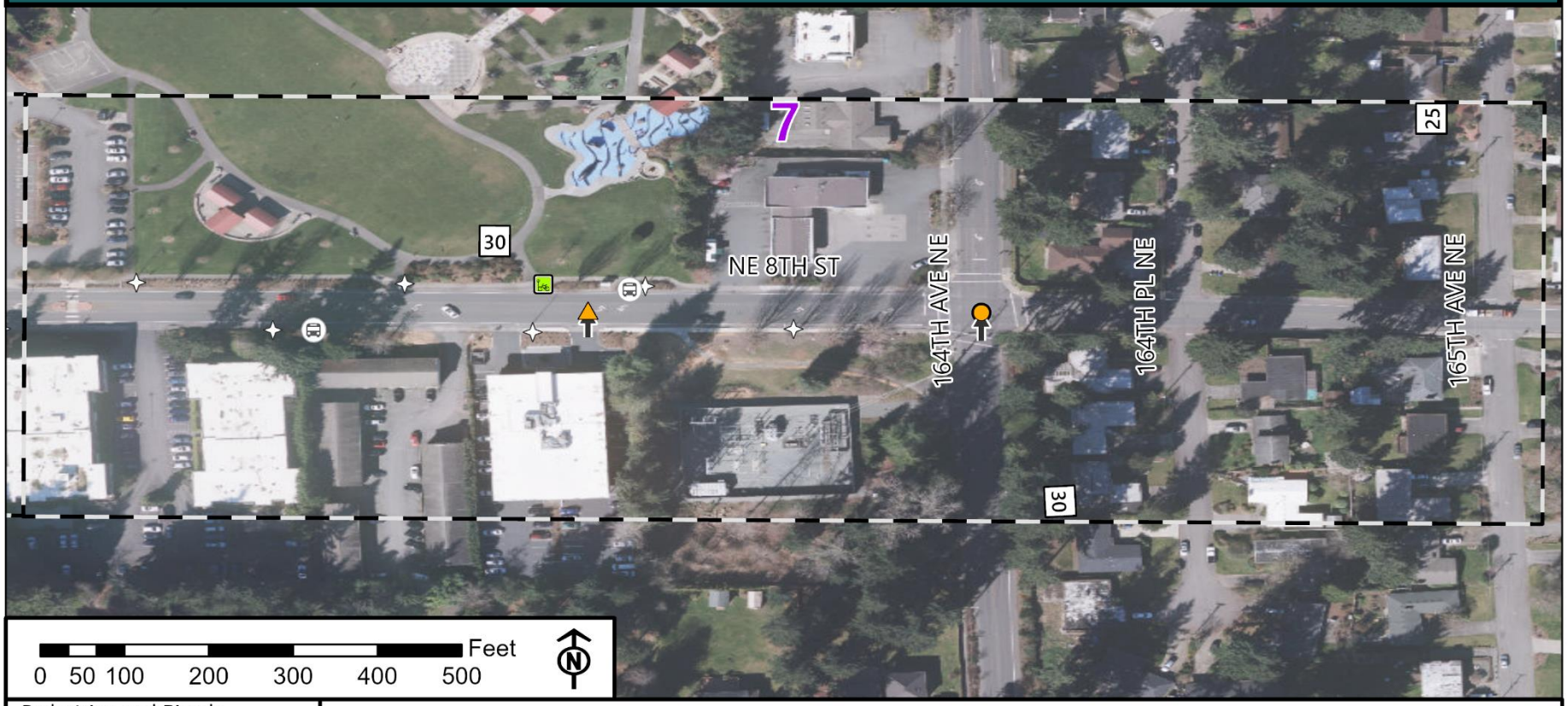
Segment 6 – *158th Pl NE to Crossroads Park*

Pedestrian and Bicycle Crashes (2016-2020)

- Fatal
- Suspected Serious Injury
- Suspected Minor Injury
- Possible Injury
- No Apparent Injury
- Pedestrian
- Bicycle
- School
- Street Light
- Transit Stop
- Bike Hub
- RSA Corridor Map Segment

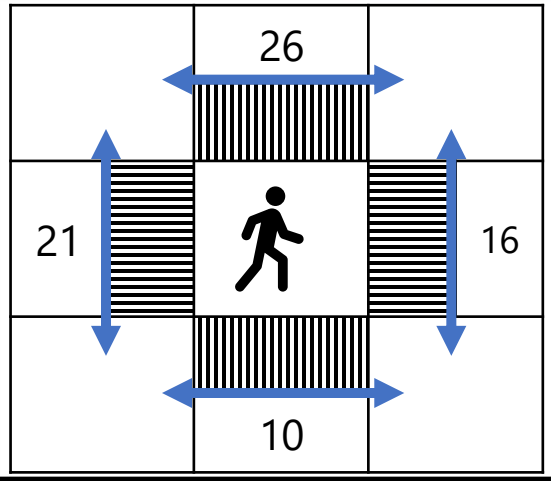
Field Notes

Segment 7 – *Crossroads Park to 164th Pl NE*



Pedestrian and Bicycle Crashes (2016-2020)

- Fatal
- Suspected Serious Injury
- Suspected Minor Injury
- Possible Injury
- No Apparent Injury
- Pedestrian
- Bicycle
- School
- Street Light
- Transit Stop
- Bike Hub
- RSA Corridor Map Segment



NE 8th St Pedestrian Road Safety Assessment – Day 2

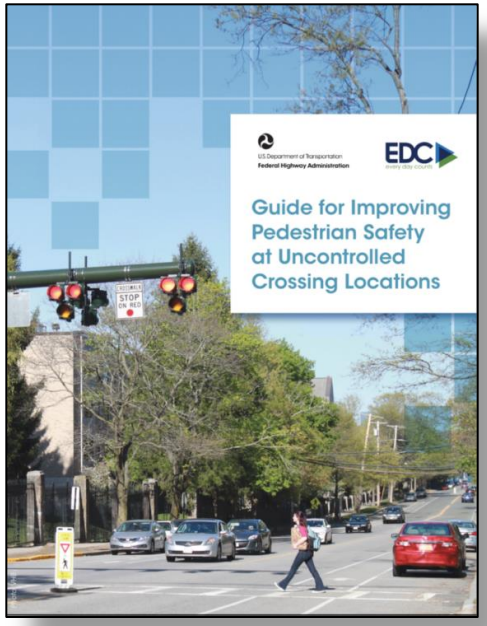
March 25-26, 2021

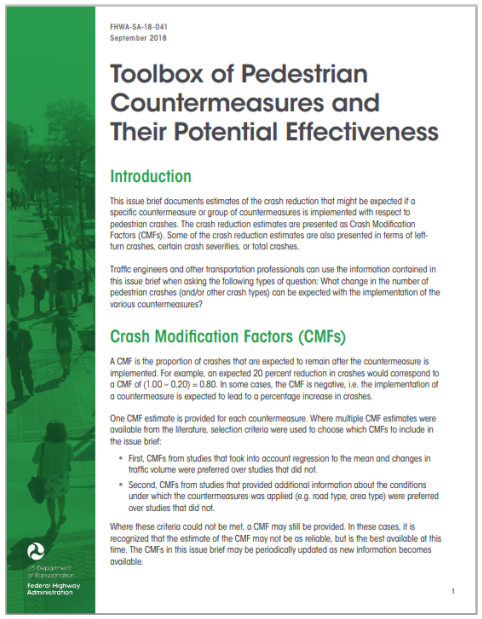
Agenda – Day 2

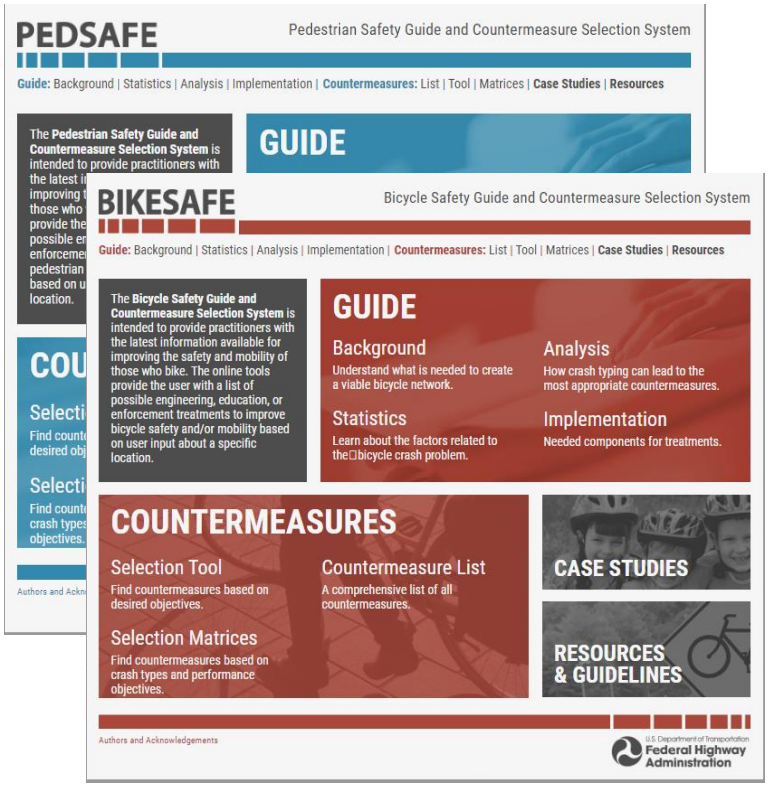
8:00–10:00 AM	**Review field and nighttime data gathering** • Summarize issues corridor-wide • Summarize issues and observations by segments • Discuss STEP-relevant countermeasures
10–10:15 AM	*Break as needed*
10:15—1:00 PM	**Finalize the potential countermeasures for each of the issues**

Countermeasures

Resources for Countermeasure Selection







Spectacular Seven

- Crosswalk Visibility Enhancements
- Raised Crosswalks
- Pedestrian Refuge Island
- RRFB
- PHB
- Road Diets
- LPI

Table 1. Application of pedestrian crash countermeasures by roadway feature.

Roadway Configuration	Posted Speed Limit and AADT								
	Vehicle AADT <9,000			Vehicle AADT 9,000–15,000			Vehicle AADT >15,000		
	≤30 mph	35 mph	≥40 mph	≤30 mph	35 mph	≥40 mph	≤30 mph	35 mph	≥40 mph
2 lanes (1 lane in each direction)	● 2 ○ 4 5 6	● ○ 5 6 7 ○ 9	○ ○ 5 6 ● ○ 9	● ○ 4 5 6	● ○ 5 6 7 ○ 9	○ ○ 5 6 ● ○ 9	● ○ 4 5 6	○ ○ 5 6 7 ○ 9	○ ○ 5 6 ● ○ 9
3 lanes with raised median (1 lane in each direction)	● 2 3 ○ 4 5	● ● 5 ○ 7 ○ 9	○ ● 5 ○ ● ○ 9	○ ○ 3 4 5 ○ 7 ○ 9	○ ● 5 ○ ● ○ 9	○ ● 5 ○ ● ○ 9	○ ● 4 5 ○ 7 ○ 9	○ ● 5 ○ ● ○ 9	○ ● 5 ○ ● ○ 9
3 lanes w/o raised median (1 lane in each direction with a two-way left-turn lane)	● 2 3 ○ 4 5 6 7 ○ 9	● ● 5 6 7 ○ 9	○ ● 5 6 ○ ○ 9	○ ○ 3 4 5 6 7 ○ 9	○ ● 5 6 ● ○ 9	○ ● 5 6 ○ ○ 9	○ ● 4 5 6 7 ○ 9	○ ● 5 6 ○ ○ 9	○ ● 5 6 ○ ○ 9
4+ lanes with raised median (2 or more lanes in each direction)	● ● ● ○ 5 ○ 7 8 9	● ● 5 ○ 7 8 9	○ ● 5 ○ ○ 8 9	○ ● 5 ○ 7 8 9	○ ● 5 ○ ● 8 9	○ ● 5 ○ ○ 8 9	○ ● 5 ○ ● 8 9	○ ● 5 ○ ○ 8 9	○ ● 5 ○ ○ 8 9
4+ lanes w/o raised median (2 or more lanes in each direction)	● ● ● ○ 5 6 7 8 9	○ ● 5 6 7 8 9	○ ● 5 6 ○ 8 9	○ ● 5 6 7 8 9	○ ● 5 6 ● 8 9	○ ● 5 6 ○ 8 9	○ ● 5 6 ● 8 9	○ ● 5 6 ○ 8 9	○ ● 5 6 ○ 8 9

Given the set of conditions in a cell,

- # Signifies that the countermeasure is a candidate treatment at a marked uncontrolled crossing location.
- ● Signifies that the countermeasure should always be considered, but not mandated or required, based upon engineering judgment at a marked uncontrolled crossing location.
- ○ Signifies that crosswalk visibility enhancements should always occur in conjunction with other identified countermeasures.*

The absence of a number signifies that the countermeasure is generally not an appropriate treatment, but exceptions may be considered following engineering judgment.

1. High-visibility crosswalk markings, parking restrictions on crosswalk approach, adequate nighttime lighting levels, and crossing warning sign
2. Raised crosswalk
3. Advance Yield Here To (Stop Here For) Pedestrians sign and yield (stop) line
4. In-Street Pedestrian Crossing sign
5. Curb extension
6. Pedestrian refuge island
7. Rectangular Rapid-Flashing Beacon (RRFB)**
8. Road Diet
9. Pedestrian Hybrid Beacon (PHB)**

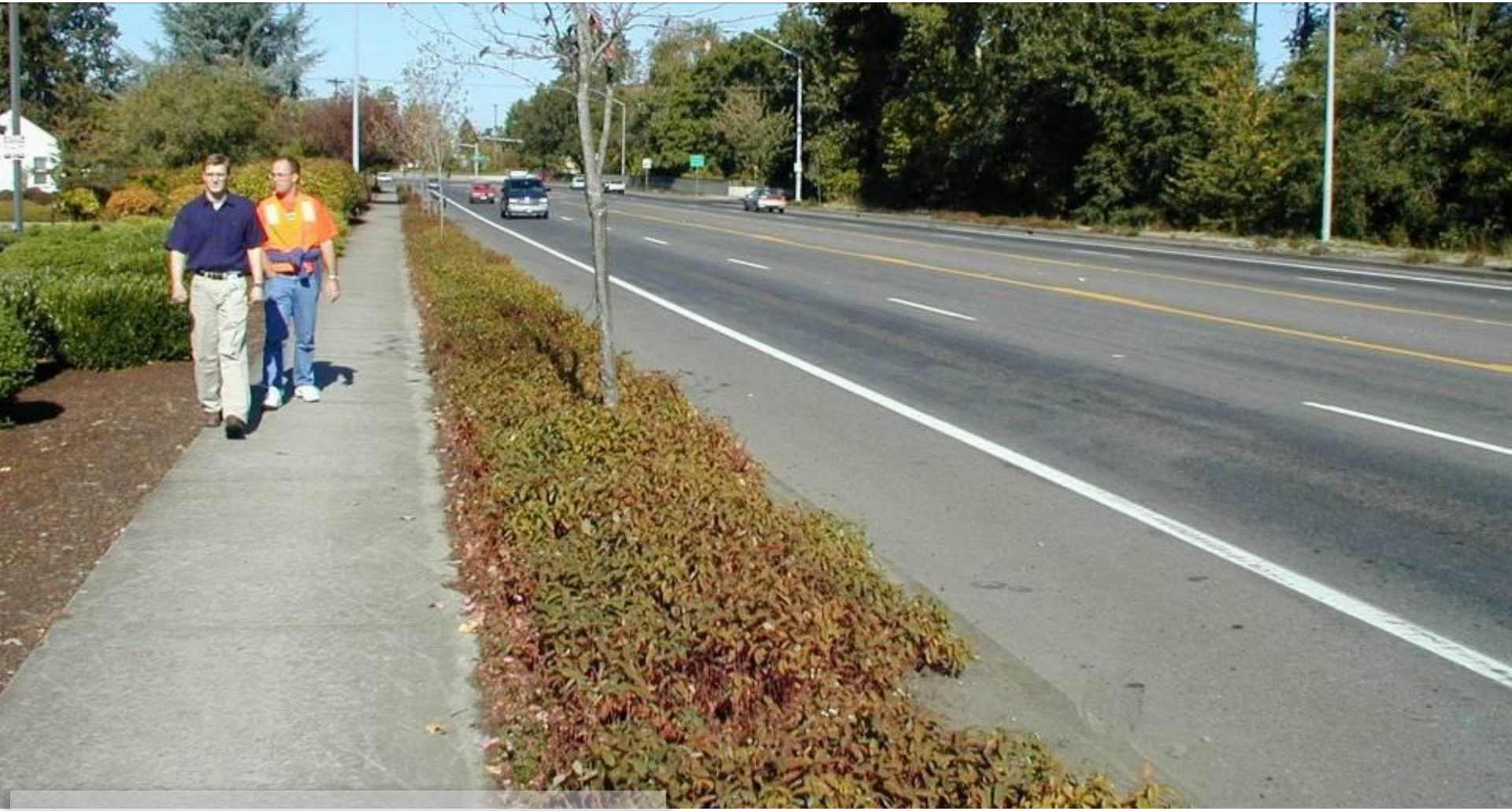
*Refer to Chapter 4, 'Using Table 1 and Table 2 to Select Countermeasures,' for more information about using multiple countermeasures.

**The PHB and RRFB are not both installed at the same crossing location.

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					

Urban/suburban Environments: Sidewalks



88% Reduction in Pedestrian Crashes

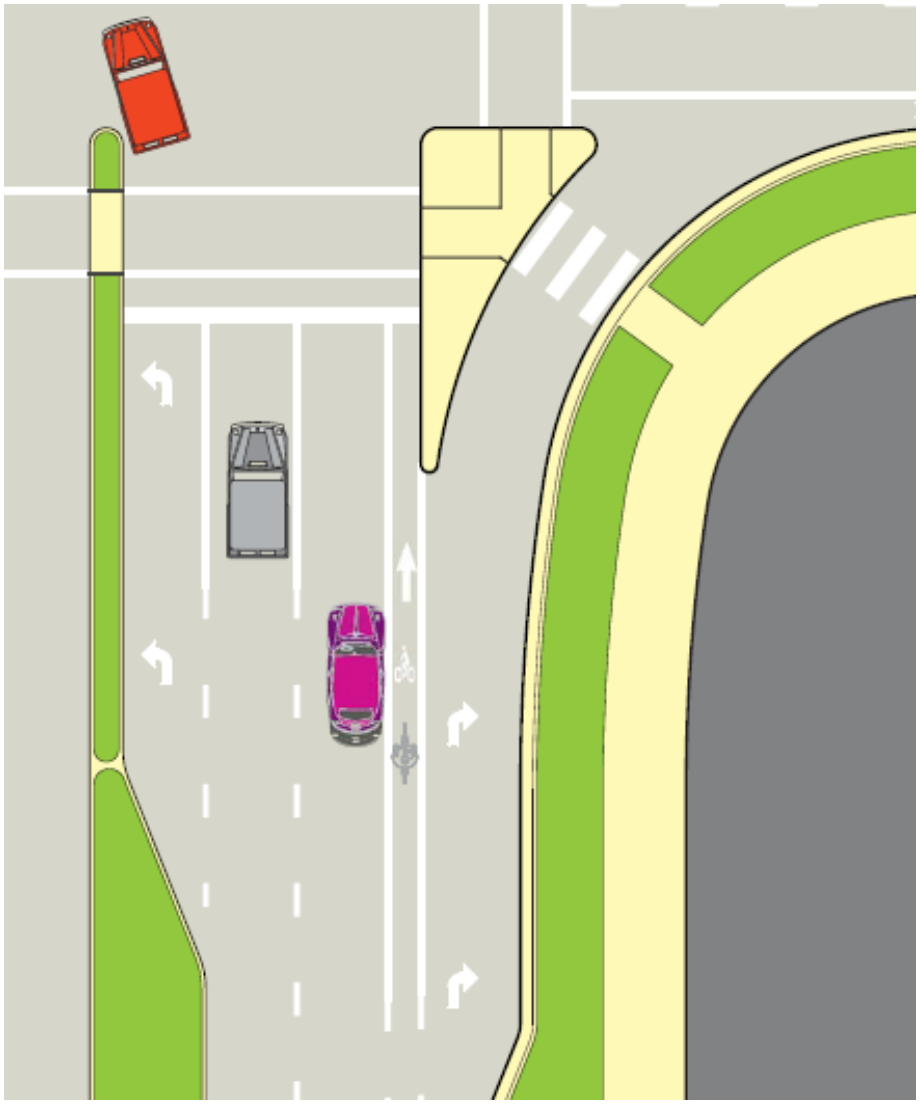
Reduce/Condense Access Points

Separated sidewalk keeps sidewalk level at driveways

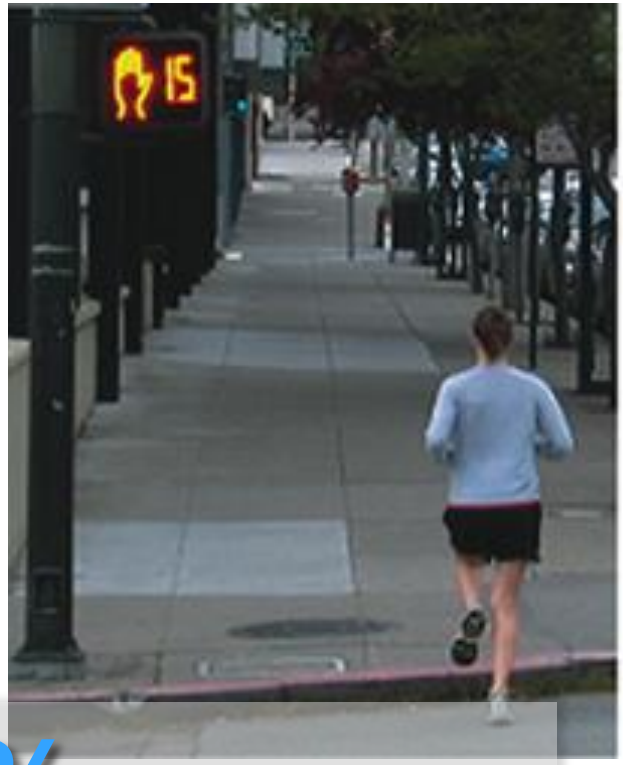
Islands at Intersections

Benefits:

- *Separate conflicts and decision points*
- *Reduce crossing distance*
- *Improve signal timing*
- *Reduce crashes*



Pedestrian Countdown Signal



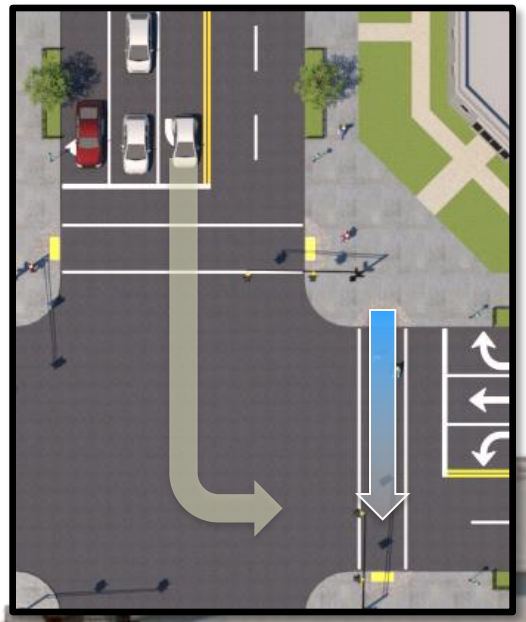
25% Reduction in Pedestrian Crashes

Use Short Signal Cycle Length

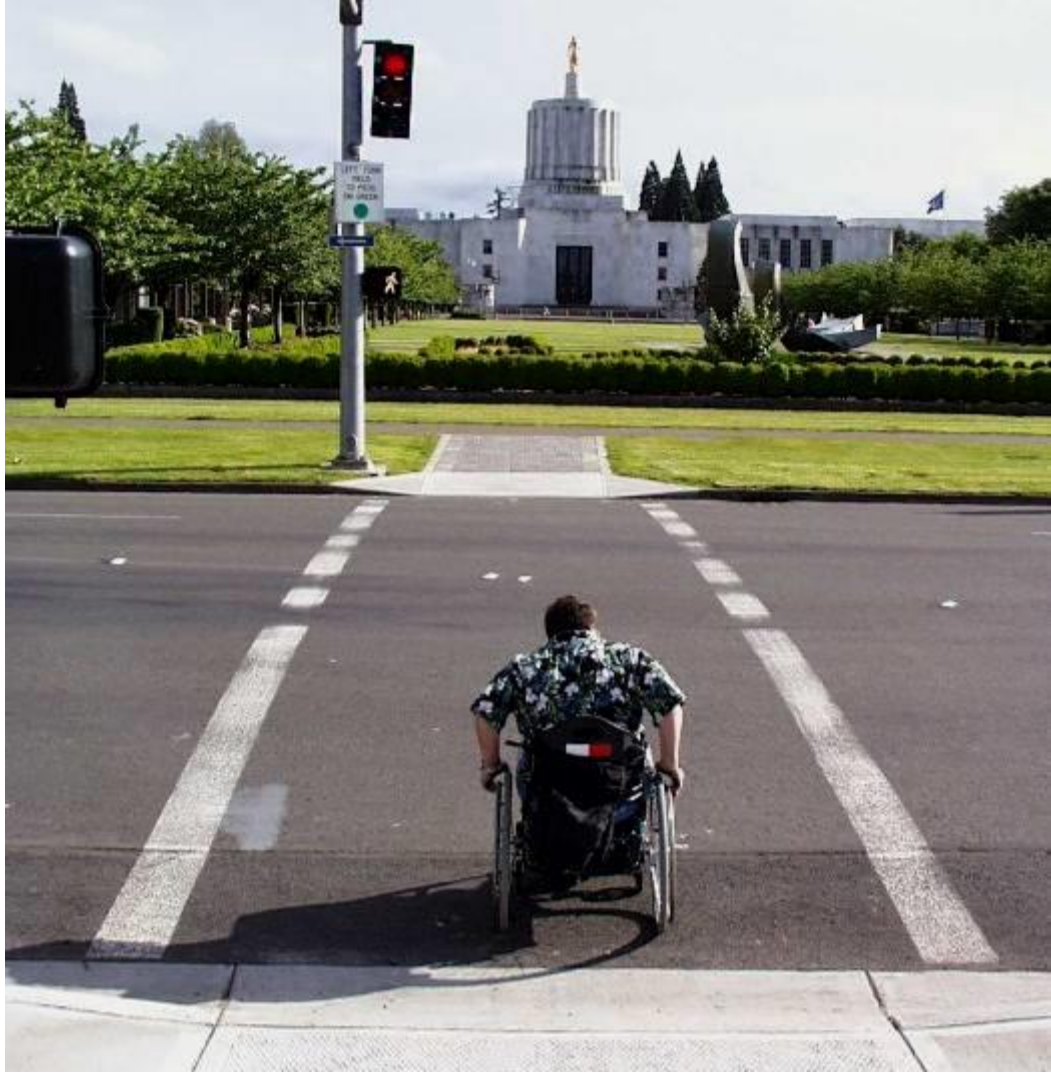
Long wait causes stacking: pedestrians wait in street, or don’t wait and cross against the signal

Leading Pedestrian Interval

3+ Second
Advance Start



13% Reduction
in Pedestrian Crashes



Leading Pedestrian Interval

WALK comes on 3 seconds prior to the vehicular green; pedestrians can enter crosswalk before turning vehicles arrive there.


Oberlin
Clark
Bank of America

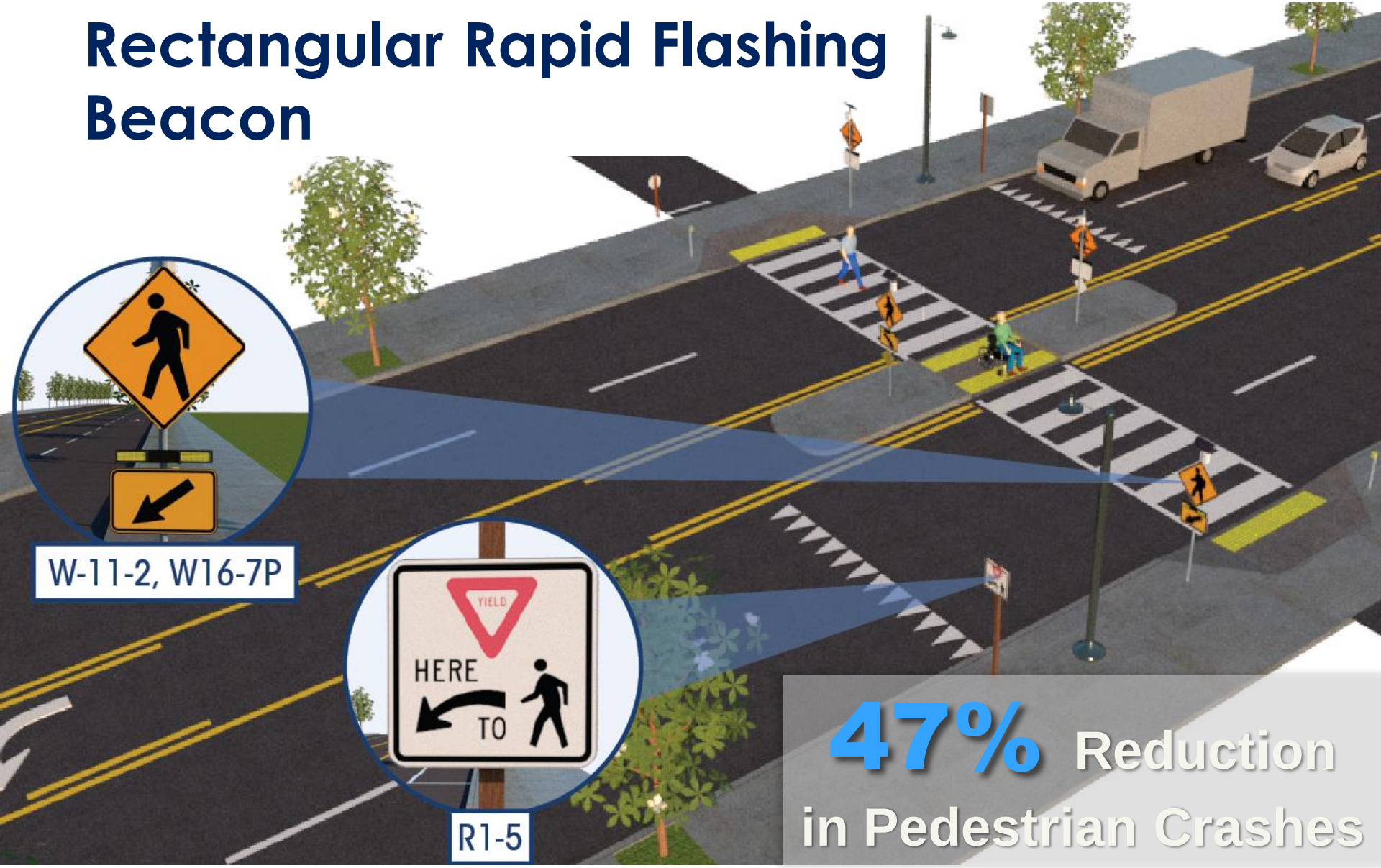
Exclusive Pedestrian Phase (Barnes Dance)

34% Reduction in Pedestrian Crashes

Exclusive pedestrian phase increases safety but increases delay for all including pedestrians


COMMERCE
ONE WAY

Rectangular Rapid Flashing Beacon



Rectangular Rapid Flash LED Beacon

- Studies indicate motorist yield rates increased from about 20% to 80%
- Higher yielding rates sustained even after two years of operation and no identifiable negative effects
  - St. Petersburg FL research report 2008

Rectangular Rapid Flashing Beacon
New IA-21

U.S. Department of Transportation
Federal Highway Administration

Memorandum

Correction issued 3/21/2018

Subject: **INFORMATION:** MUTCD – Interim Approval for Optional Use of Pedestrian-Actuated Rectangular Rapid-Flashing Beacons at Uncontrolled Marked Crosswalks (IA-21)

Date: MAR 20 2018

From: Martin C. Knopp
Associate Administrator for Operations

In Reply Refer To: HOTO-1

To: Federal Lands Highway Division Directors
Division Administrators

https://mutcd.fhwa.dot.gov/res-interim_approvals.htm#valid09

Figure 1. Example of an RRFB dark (left) and illuminated during the flash period (center and right) mounted with W11-2 sign and W16-7P plaque at an uncontrolled marked crosswalk.

- Must request and receive permission to use this new Interim Approval (1A-21) even if prior approval had been given for Interim Approval 1A-11
- A State may request Interim Approval for all jurisdictions in that State.

Interim Approval – Allowable Uses

- Function as **pedestrian-actuated conspicuity enhancement**
- Shall only be used to supplement post-mounted Pedestrian, School, Trail Crossing warning sign with diagonal downward arrow, plaque, or overhead-mounted warning sign located at or immediately adjacent to an uncontrolled marked crosswalk
- If deemed necessary by the engineer, in event of sight distance, additional RRFB may be installed in advance of crosswalk. Shall supplement not replace.

St. Petersburg FL

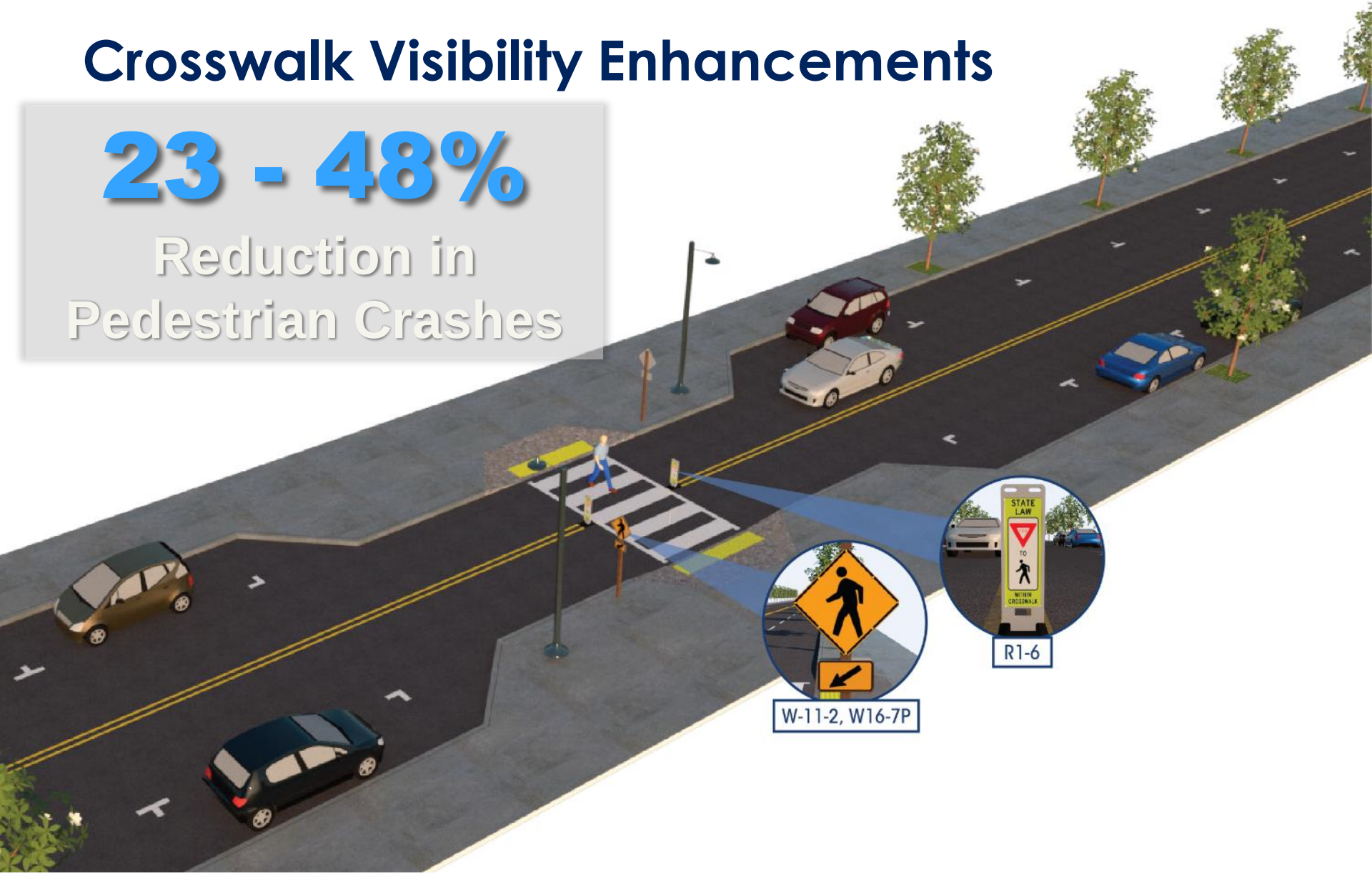
IA-21 3.a For any approach two RRFB required, One on right-hand and one on left-hand of roadway. If divided highway left-hand should be installed on median if practical rather than far left-hand.

RRFB Video IA-21Flash Pattern

Crosswalk Visibility Enhancements

23 - 48%

Reduction in Pedestrian Crashes



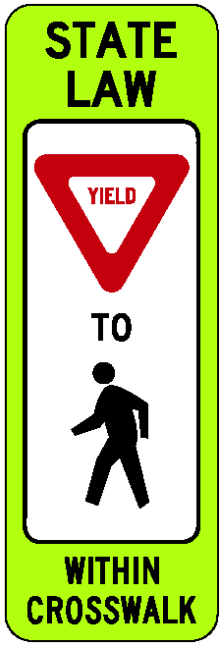
Crosswalk Visibility Enhancements
High Visibility Crosswalk

What Pedestrians See

Photo Source all 4: Michael Ronkin

What Drivers See

In-street pedestrian crossing signs



R1-6

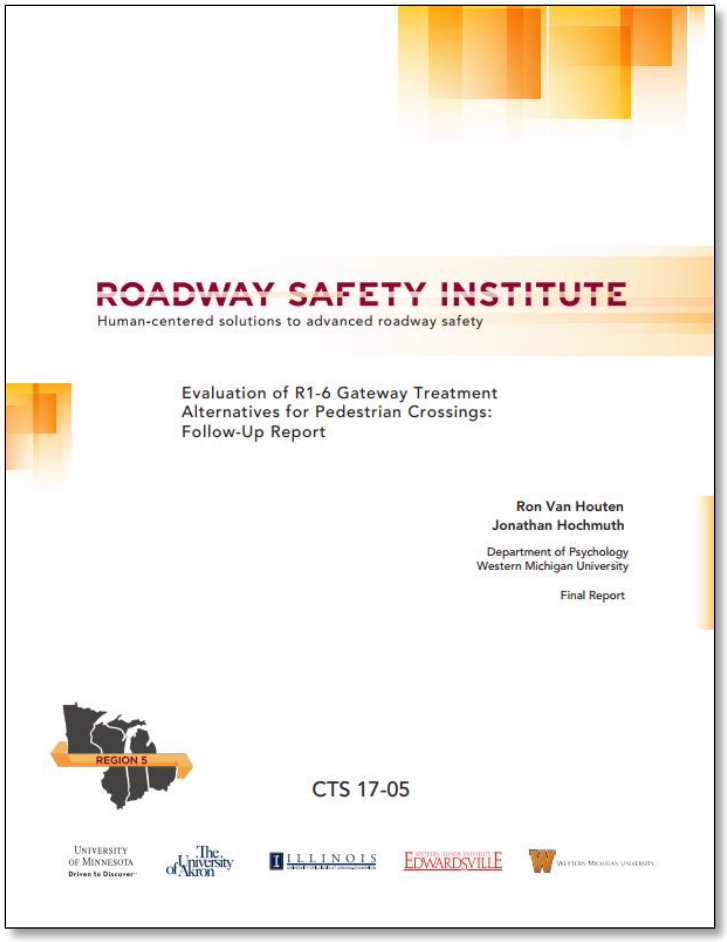
R1-6a

MUTCD signs

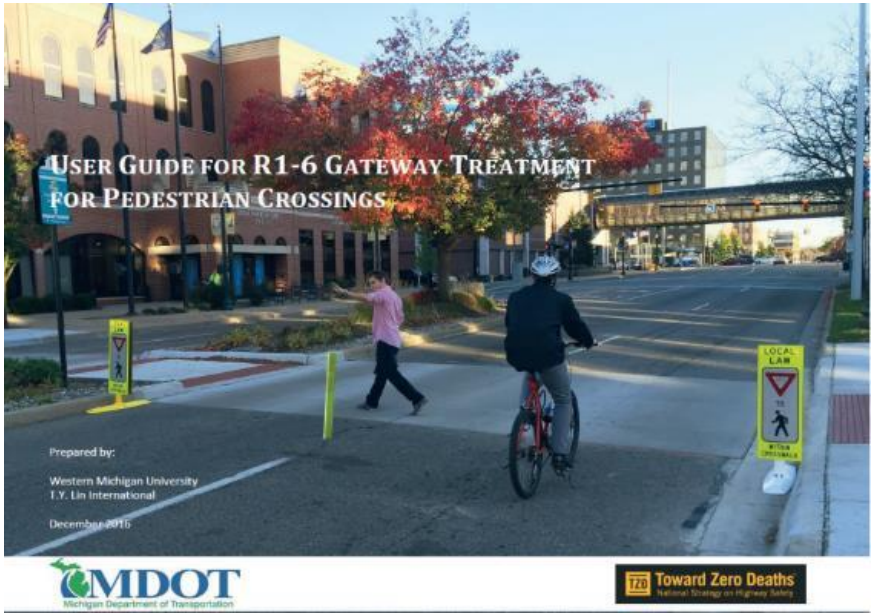
Yield or Stop depends on state law

2009 MUTCD Section 2B.12 and Figure 2B-2

In Street Gateway Treatment



https://conservancy.umn.edu/bitstream/handle/11299/189957/CTS%2017-05.pdf?sequence=1&isAllowed=y



https://mdotcf.state.mi.us/public/tands/Details_Web/mdot_user_guide_gateway_treatment.pdf

Gateway Treatment, Three–Lane Configuration Without Refuge Island	
Travel Lanes **Passing/Turn Lanes**	2 1
R1-6 Signs	4
Flexible Delineators	0
Yielding Compliance	Between 60% and 90% compliance rate if speed limit is 30mph or less for ADT up to 25,000. If the speed limit is 35 mph expect similar results if ADT is 12,000 or less. UNKNOWN above 12,000 ADT.
Approximate Cost	$1,200 for materials 20-minute installation 8 minutes to remove for winter 8 minutes to reinstall in spring

Figure 6a

General Description:

Note: By installing the gateway on the near side of the intersection, both crosswalks are covered with only four signs. Data show that a gateway at the near side crosswalk continues to be effective for the far side of the intersection, as the motorist on the far side has already passed through a gateway on the near side.

The signs on the curb side in the gutter pan would have a better chance of survival if they are moved placed between 3 and 50 feet in Advance of the crosswalk markings. This would reduce the chance of the sign being struck by a turning vehicle. Figure 6b shows a typical installation.

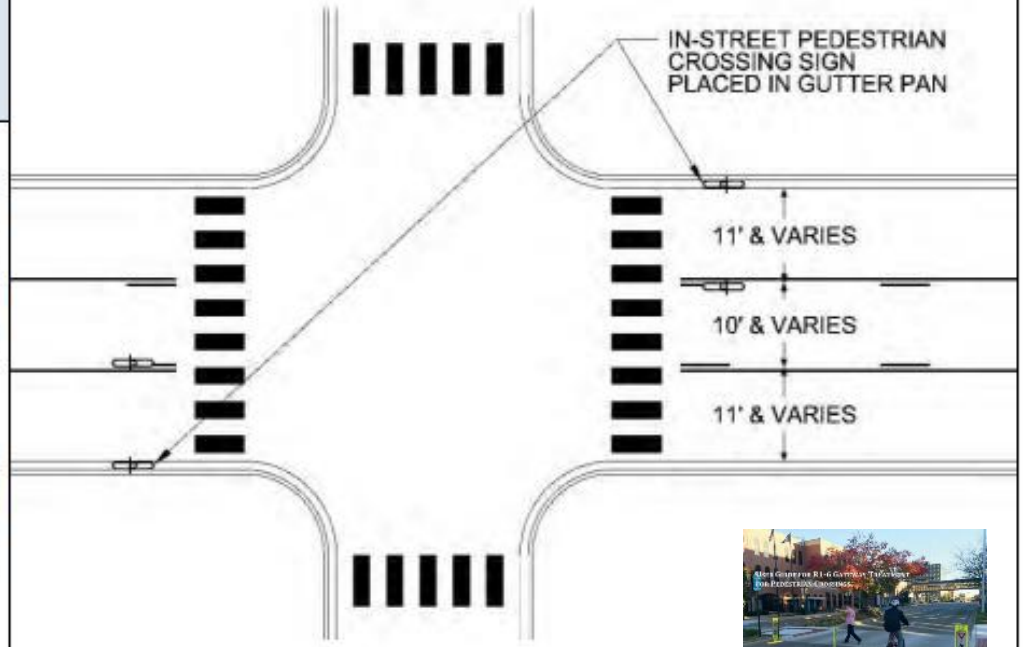
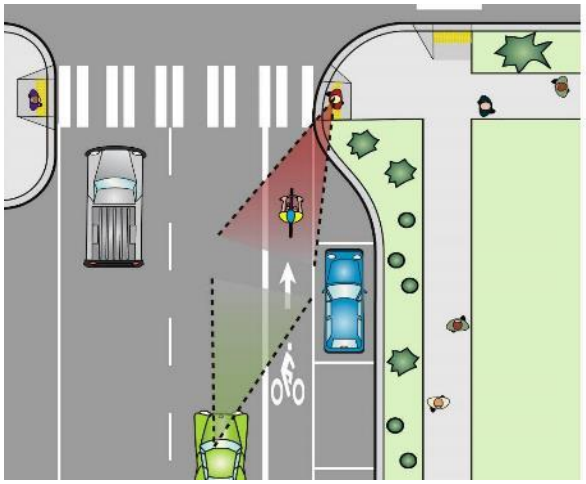


Figure 6b

Crosswalk Visibility Enhancements
Pedestrian Crossing signs

2009 MUTCD Sec. 2C.50 & Fig. 2C-11

Crosswalk Visibility Enhancements
Curb Extensions



Advance Signage and Markings

R1-5

R1-5a

(Use where local law says yield to pedestrians)

R1-5b

R1-5c

(Use where local law says stop for pedestrians)

MUTCD Sec. 2B.11 and Figure 2B-2

- Advance yield line & sign
- Consider double white lines for no passing

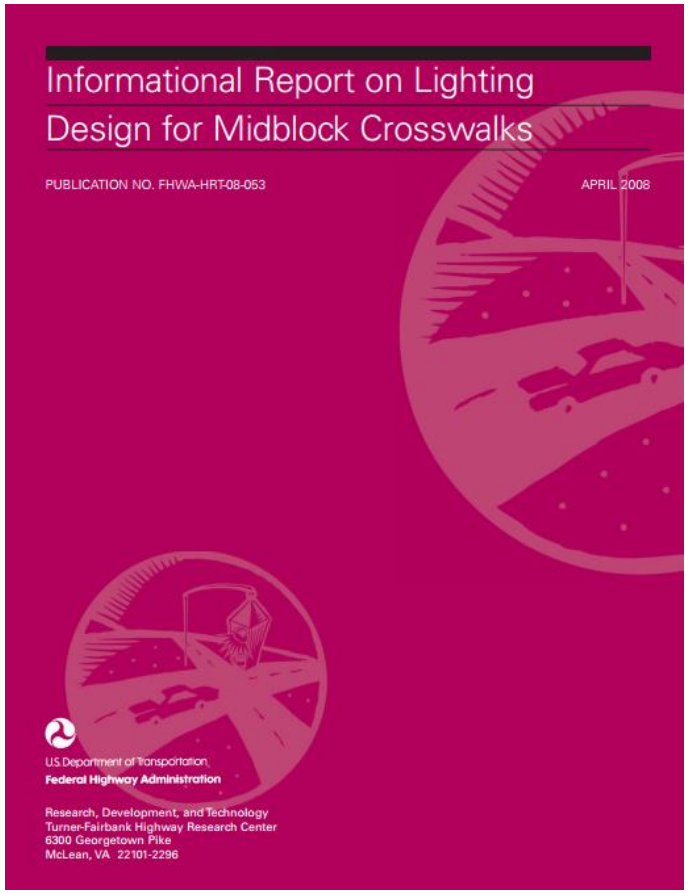
2009 MUTCD Section 3B.16 and Figure 3B-17

Crosswalk Visibility Enhancements
Crosswalk Lighting


Photo source: Youtube screen capture SWARCO

- CRF 42% to 59%
  - Lighting at intersections
  - 4 star rating
  - Vehicle/ped crashes

Informational Report on Lighting Design for Midblock Crosswalks



https://www.fhwa.dot.gov/publications/research/safety/08053/

- Vertical illuminance of 20 Lx in the crosswalk, measured at a height 5 ft from the road surface, provided adequate detection distances in most circumstances

Lighting Over Crosswalks

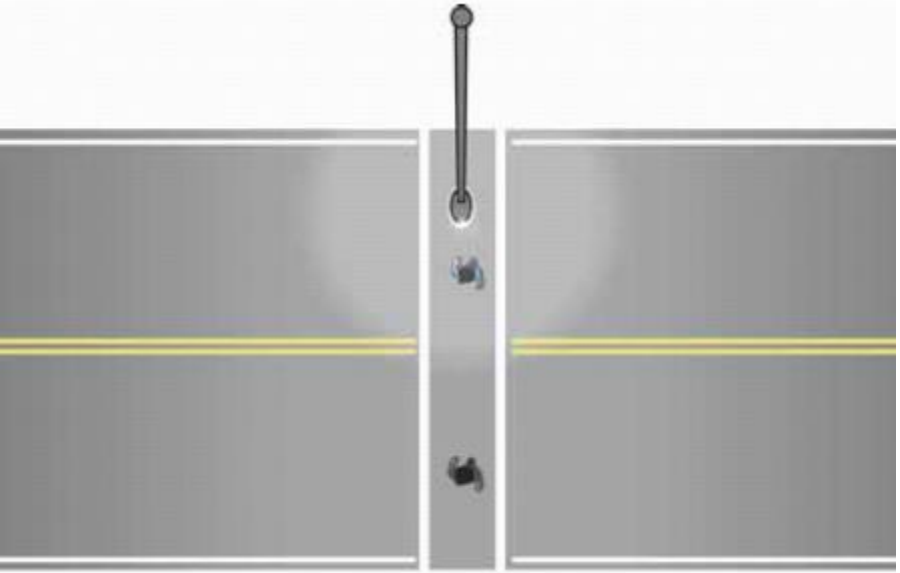


Fig 11. Traditional midblock crosswalk lighting layout

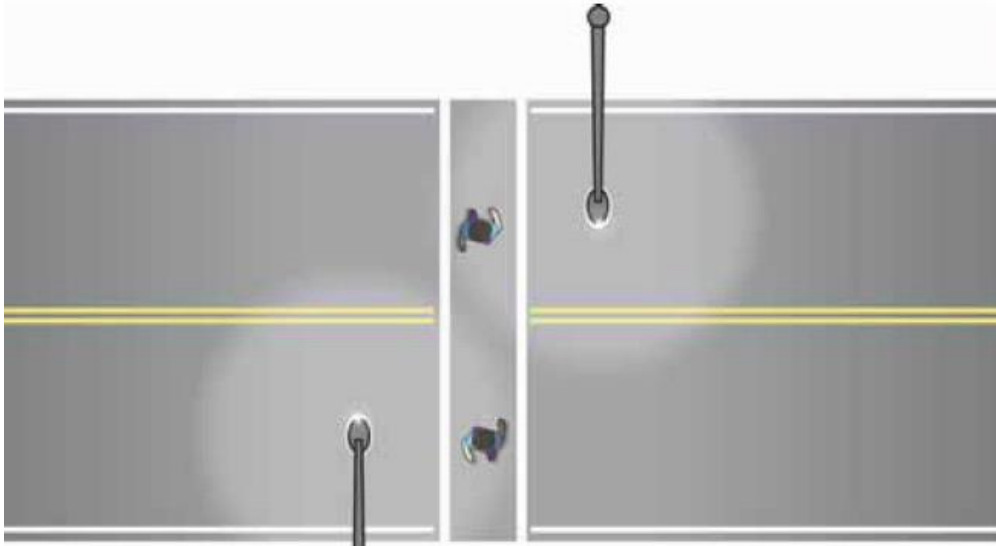
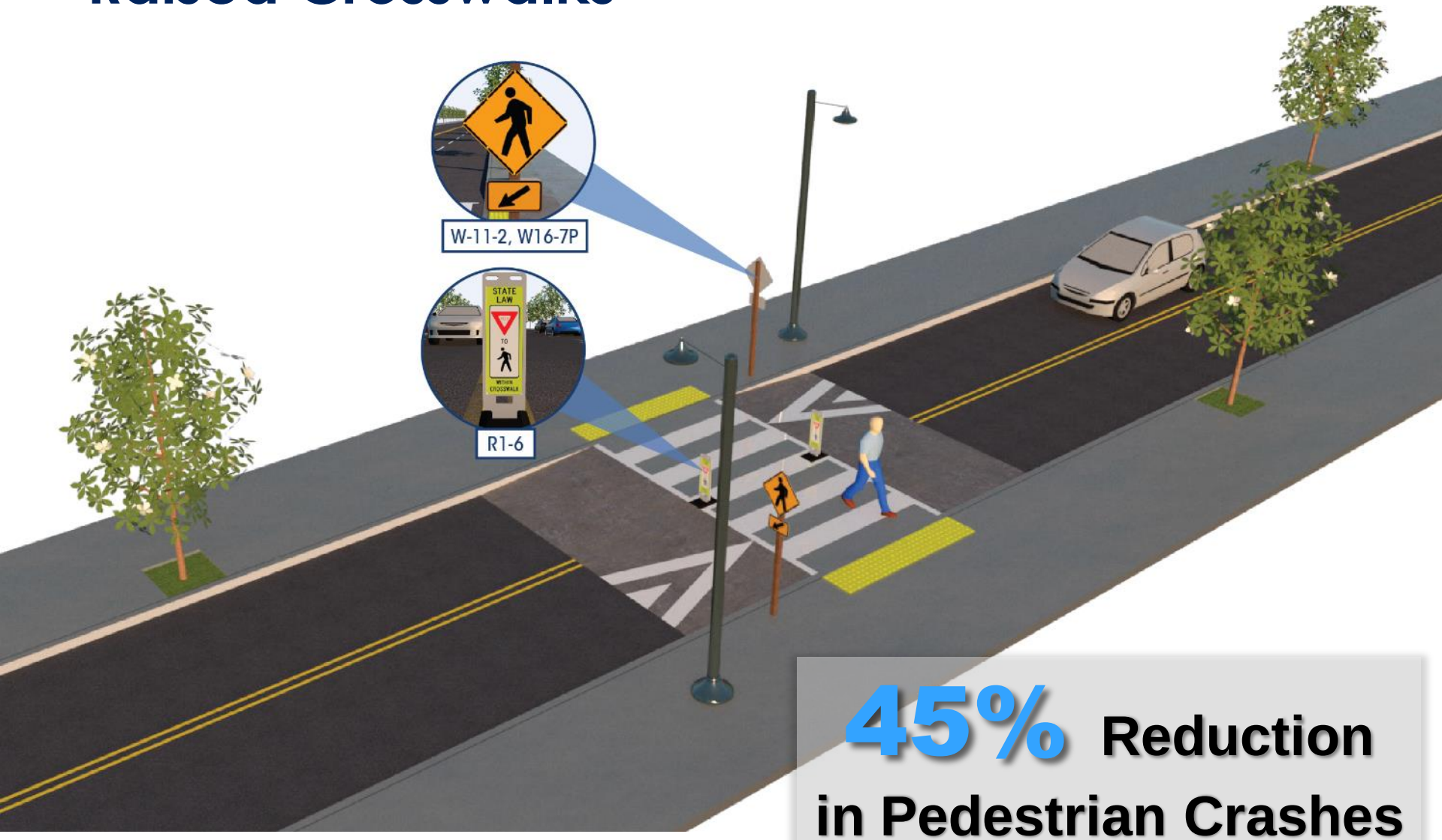


Fig 12. New design for midblock crosswalk lighting layout

Recommended lighting level: 20 lux at 5’ above pavement

Raised Crosswalks



45% Reduction in Pedestrian Crashes

Raised Crosswalks

- Typically installed on 2-lane or 3-lane roads
- Speed limits of 30 mph or less
- AADT below about 9,000
- May be candidate treatment for side streets

Photo Source: SRTS Guide


TRAIL X-ING
Burke-Gilman Trail
BUMP
BIKE SALE

Considerations

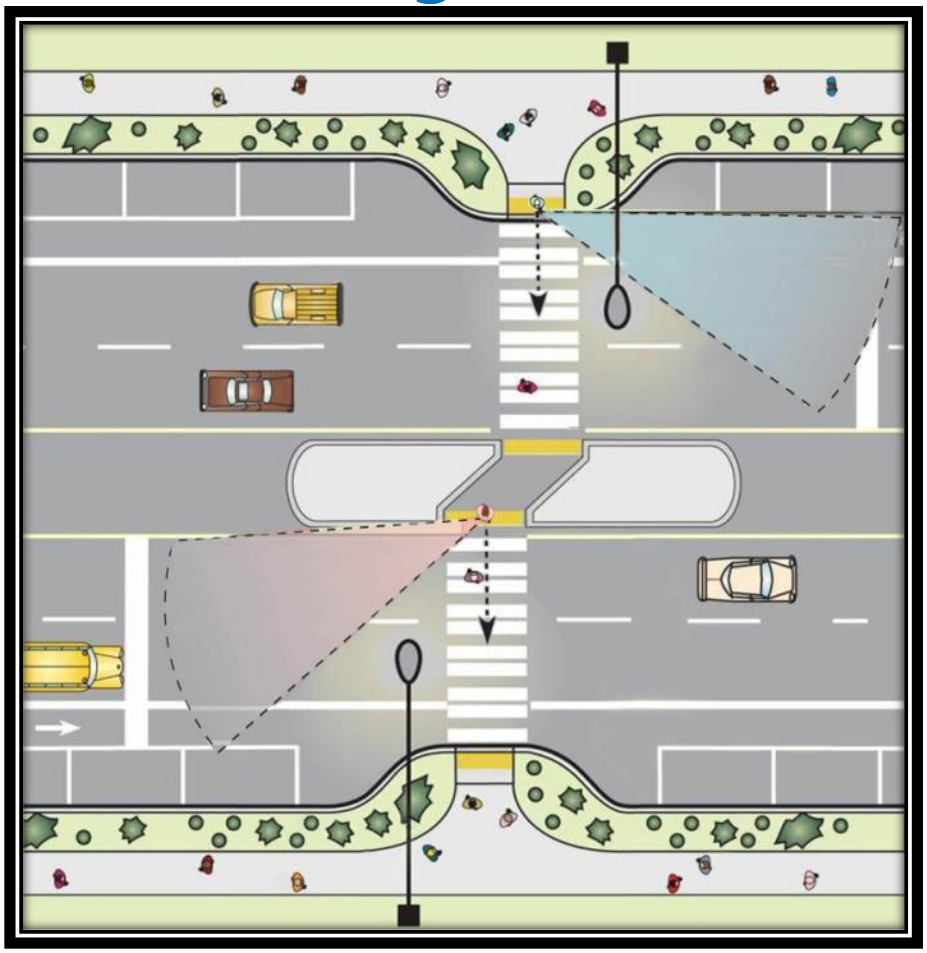
- Bus route
- EMS
- Snow Plowing
- Drainage
- ADA
- Curves or steep roadway grades

Figure 3.14.6. Raised Crosswalk with Bicycle Lane
(Source: Scott Batson)

Figure 3.14.4. Raised Crosswalk at Intersection
(Source: City of Cambridge, Massachusetts)

Pedestrian Refuge Islands

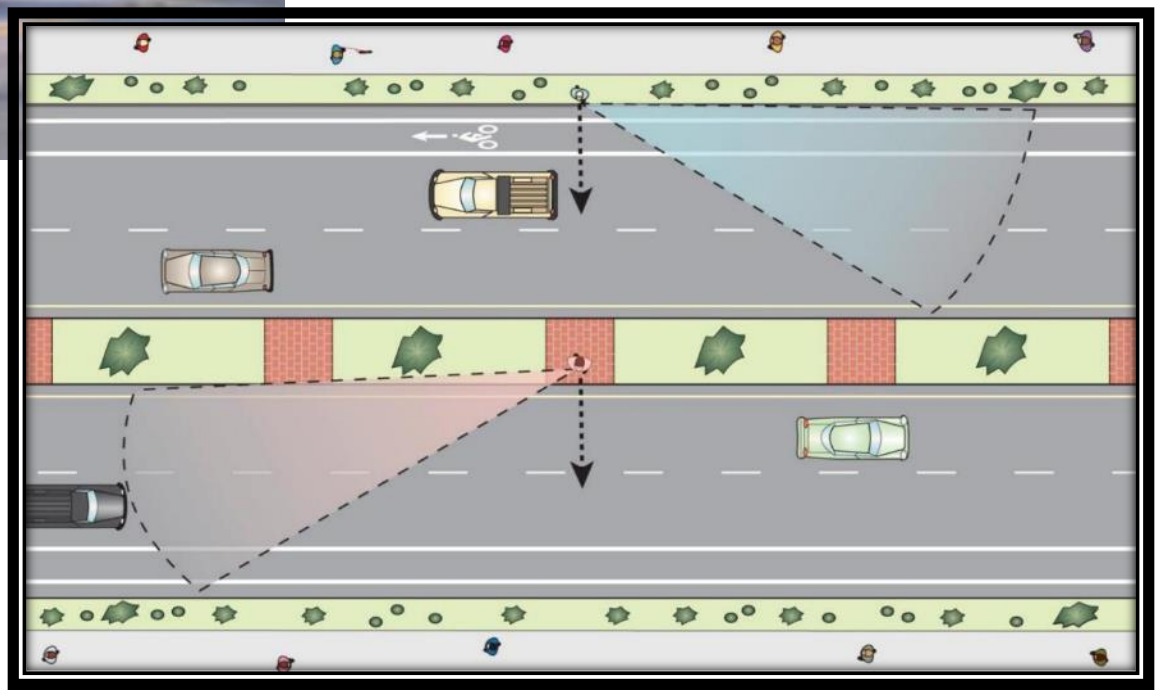
Raised median- Breaks complex crossing into two simpler crossings



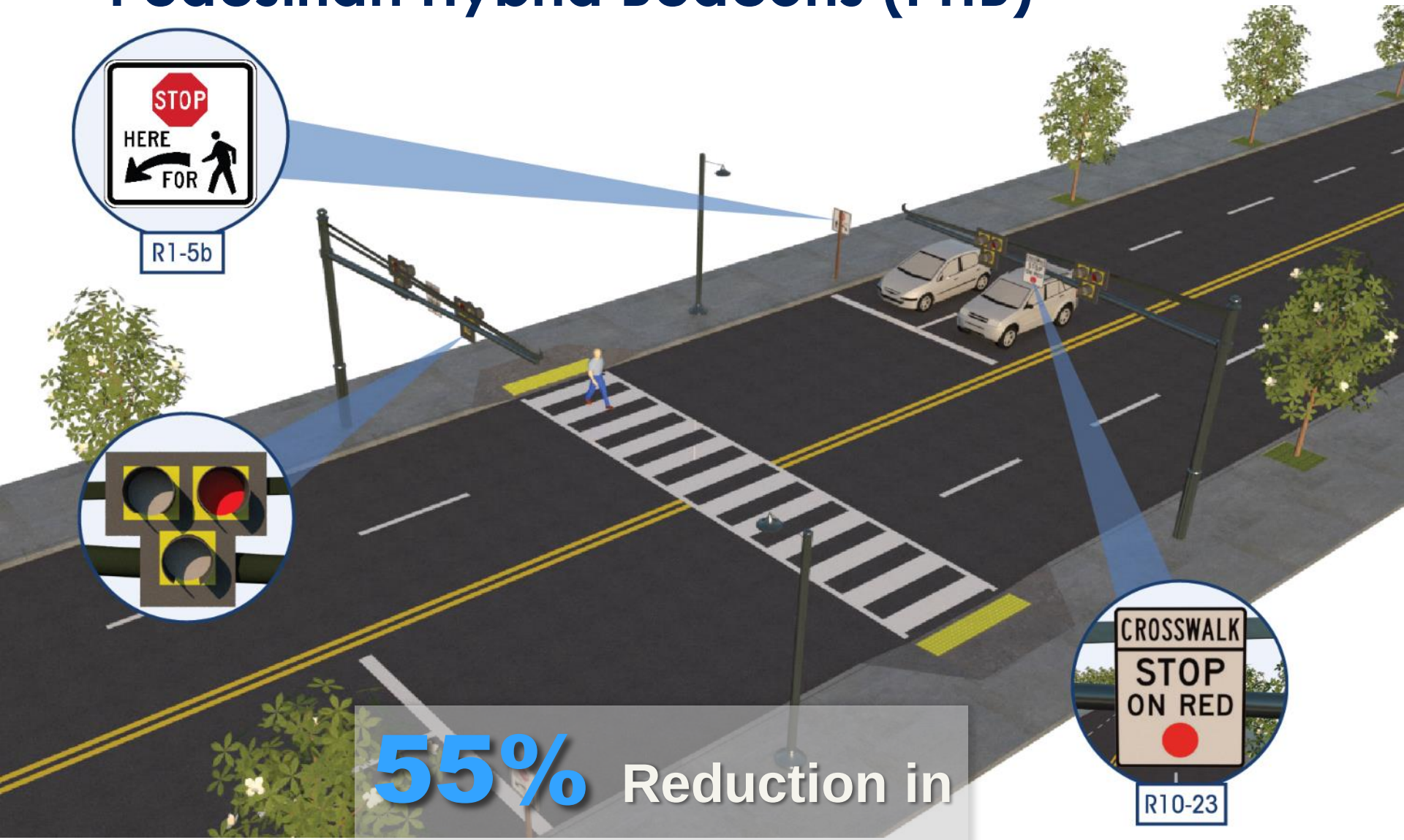
CRF: 39% unmarked crosswalks (uncontrolled)

CRF: 46% marked crosswalks (uncontrolled)

Continuous Raised Median



Pedestrian Hybrid Beacons (PHB)



Pedestrian Hybrid Beacons (PHB)

1

Blank for drivers

2

Flashing yellow

3

Steady yellow

4

Steady red

5

Wig-Wag

Return to 1

2009 MUTCD mandated sign

Standard:

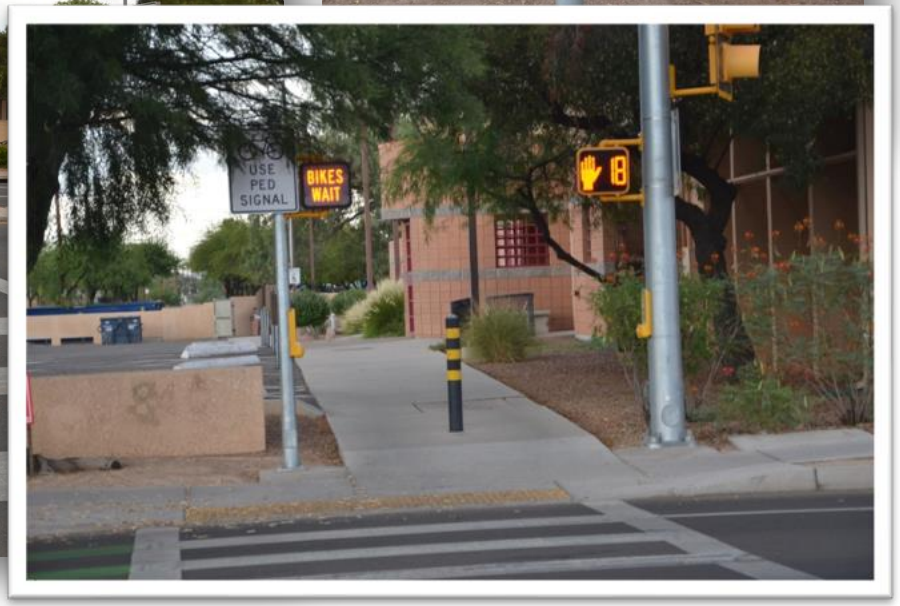
A CROSSWALK STOP ON RED (symbolic circular red) (R10-23) sign shall be mounted adjacent to a PHB face on each major street approach.

Option:

State MUTCD's may allow other appropriate MUTCD approved ped, bike or school crossing signs

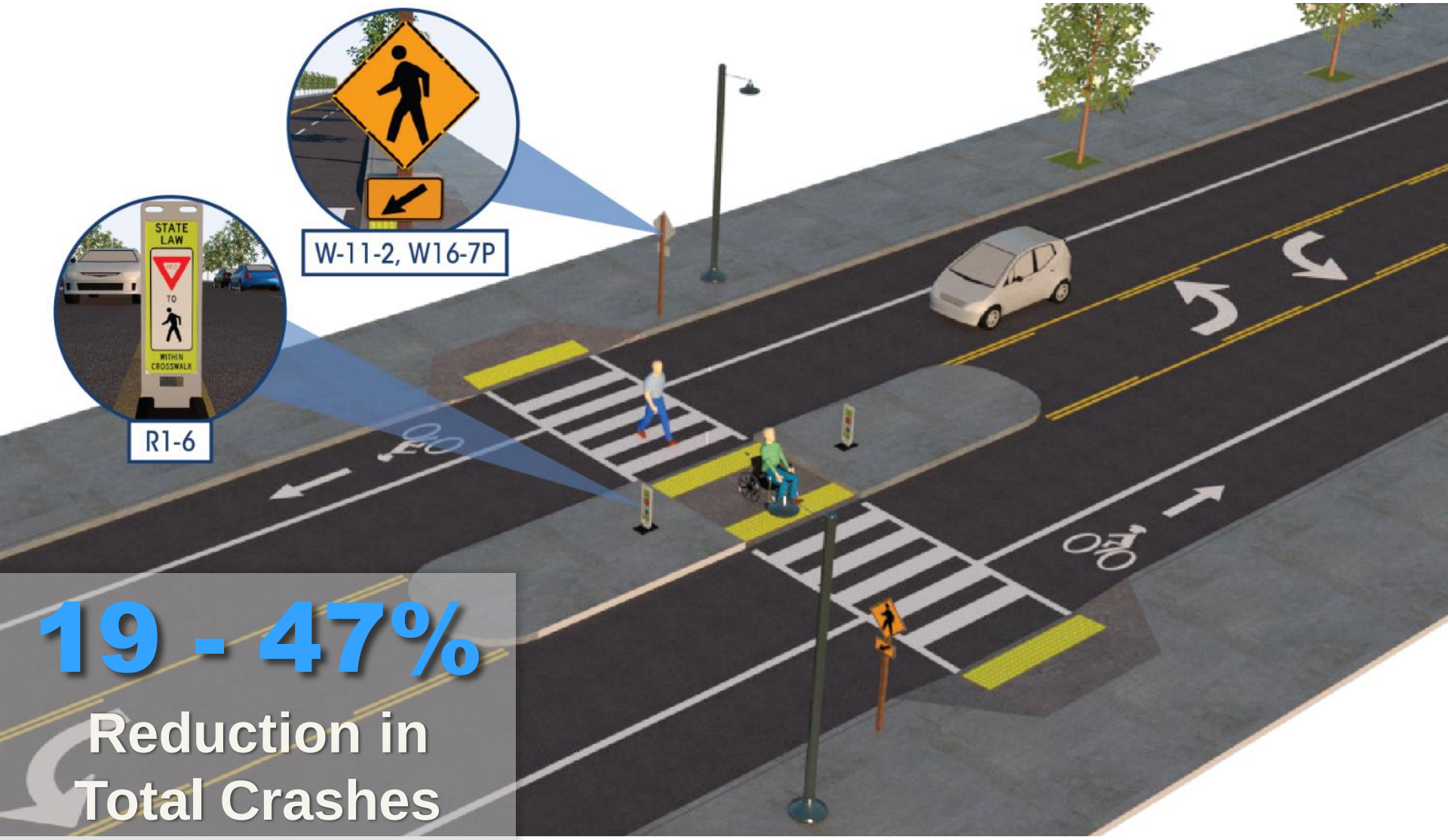
Bike “Hawk” PHB

- First installation Tucson, AZ
- “BIKES WAIT”/”BIKES OK”



Road Diet: Before

Road Diet: After



19 - 47%

Reduction in Total Crashes

Road Diet / Roadway Reconfiguration

- Reduce crossing distance
- Eliminate /reduce “multiple threat” crash types
- Install crossing island to cross in 2 simple steps

Road Diets

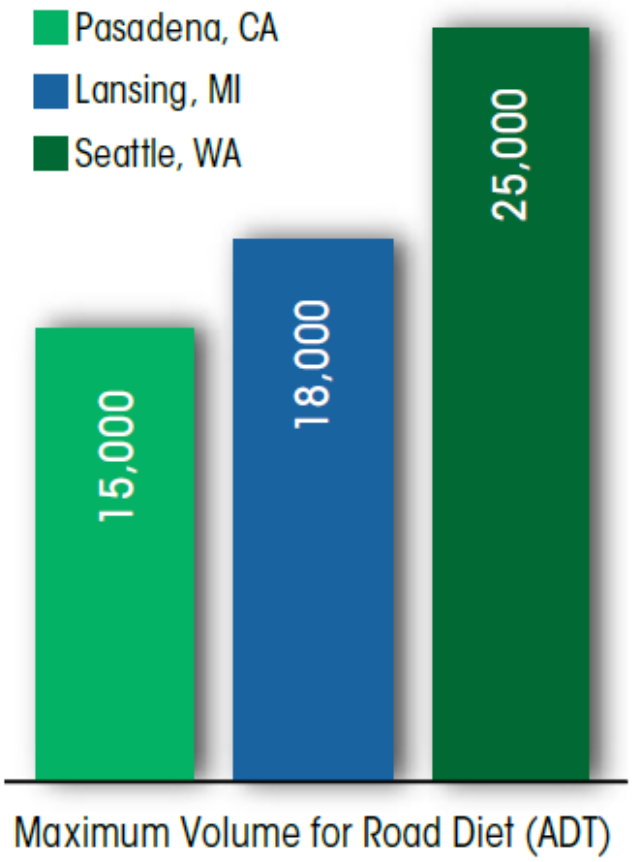


Figure 12. Road Diet Implementation Maximum Volume Thresholds by Agency

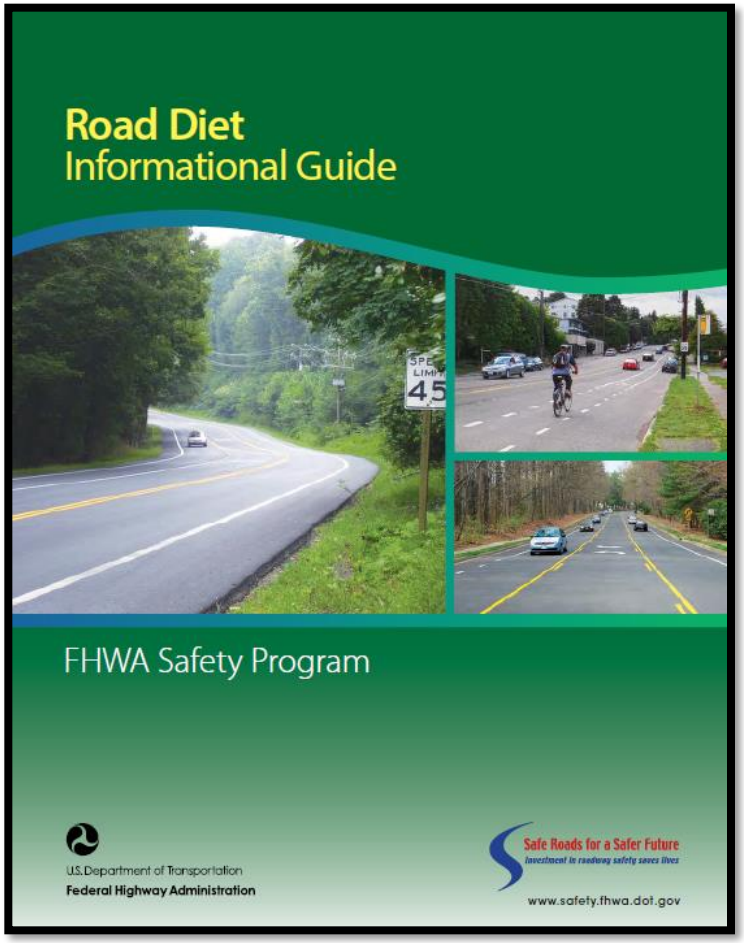
Considerations

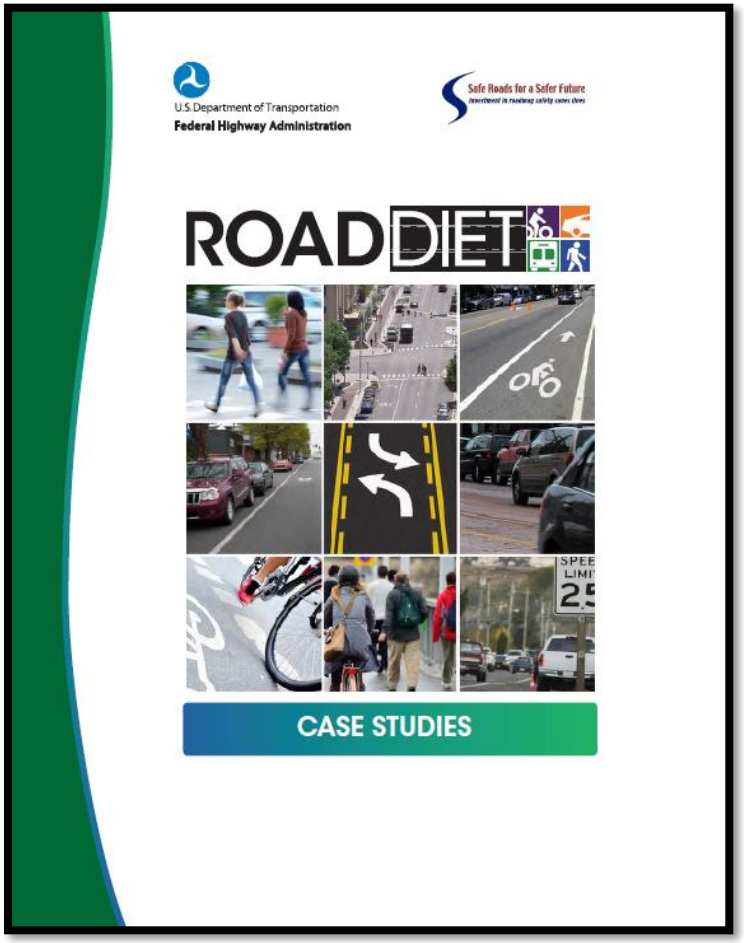
- Safety
- Operations
  - Peak Hour
- Design
  - Signalized Intersection Adjustments
- Resurfacing
- Context Sensitive Solutions/Complete Streets

Road Diet / Roadway Reconfiguration

- Reduce top end travel speeds
- Buffer sidewalk from travel lanes (parking or bike lane)
- Reclaim street space for “higher and better use” than moving peak hour traffic

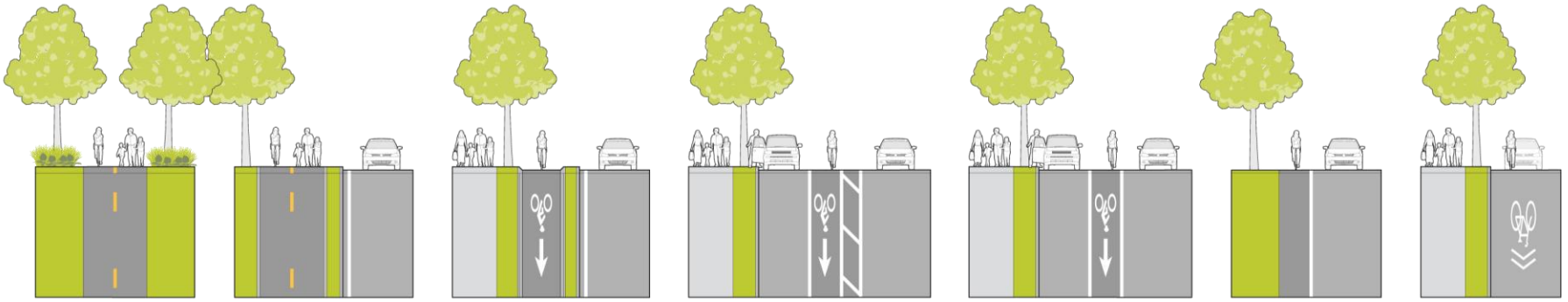
Road Diet Informational Guide & Road Diet Case Studies





https://www.fhwa.dot.gov/innovation/everydaycounts/edc-3/roaddiets.cfm

https://safety.fhwa.dot.gov/road_diets/



+ **SEPARATION FROM TRAFFIC** −

Inputs for the Report

- ~~Identify Safety issues~~
- Consider potential countermeasures
- Prioritize locations (quick build, mid-term 2-5 year, longer term 5+ year)
- Agency and leader role

Site Observations

What did you see?

Who was travelling along or crossing the roadway(s)?

Where were people going?

Are conditions likely to change along the sites? If so, how?

What are the better existing design features or design elements for pedestrian/bicycle safety at the sites?

What safety issues did you observe?

Do you need additional information?

Chapter 2:
Bikeway Selection Process

- Policy
- Planning
- Selection
- Design