

East Forest Grove Safety Improvement Plan Appendices

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Forest Grove OR-8 Tualatin Valley Highway Improvement Plan

Technical Memorandum #1: Draft Policy Framework and Constraints Memorandum

This memorandum provides the policy framework and constraints that will guide the development of the Forest Grove OR-8 Tualatin Valley Highway (TV Highway) Improvement Plan. Jacobs prepared this memorandum for the Oregon Department of Transportation (ODOT) and the City of Forest Grove (City), in Washington County, Oregon.

This memorandum provides a summary of the following information:

1. Draft Project Goals and Objectives
2. Relevant Statewide and Local Transportation Policies, Plans, and Laws
3. Relevant Regional Transportation Policies, Plans, and Laws
4. Relevant Design Standards and Potential Exceptions

1. Draft Project Goals and Objectives

Following is a proposed draft set of Goals and Objectives for the OR-8 Tualatin Valley Highway Improvement Plan. It draws from past planning efforts and will be refined over the course of the current planning and outreach efforts for this project to date.

Draft Project Goals

- **Safety for all users** – safety should focus especially on pedestrians and people riding bikes (e.g. Yew Street crossings, cyclists on TV Highway, freight drivers, speeding and collisions, etc.)
- **Equity** – meaningful engagement, process, and outcomes that address the diversity of people and uses of the corridor
- **Improve safe access to transit** (e.g. improve crossings, connections to bicycle system, multiple stops on TV Highway, etc.)
- **Economic development and placemaking** – incremental improvements that lead to a bigger vision for the function the corridor

Draft Project Objectives

- **Prioritize safety improvements**, including short, medium, and long-term
- **Develop an urban gateway concept** to let people know they are entering a unique community that cares
- **Plan for freight** to move safely and conveniently through the corridor (e.g. safe truck access along Yew Street, turning issues, etc.)
- **Engage the community** in convenient and culturally responsive ways
- Create an **implementation plan** to guide phasing of improvements and potential funding sources
- **Develop safe connections to and from transit** along the corridor (e.g. enhanced crossings, bicycle infrastructure improvements, ADA accessible bus stops and sidewalk connections).

2. Relevant Statewide and Local Transportation Policies, Plans, and Laws

A variety of local and state plans and policy documents help guide future development of the OR-8 Tualatin Valley Highway (Pacific Ave / East Baseline) corridor from the Cornelius/Forest Grove city line (approximately S. 1st Ave) to the intersection with OR-47 (Figure 1).

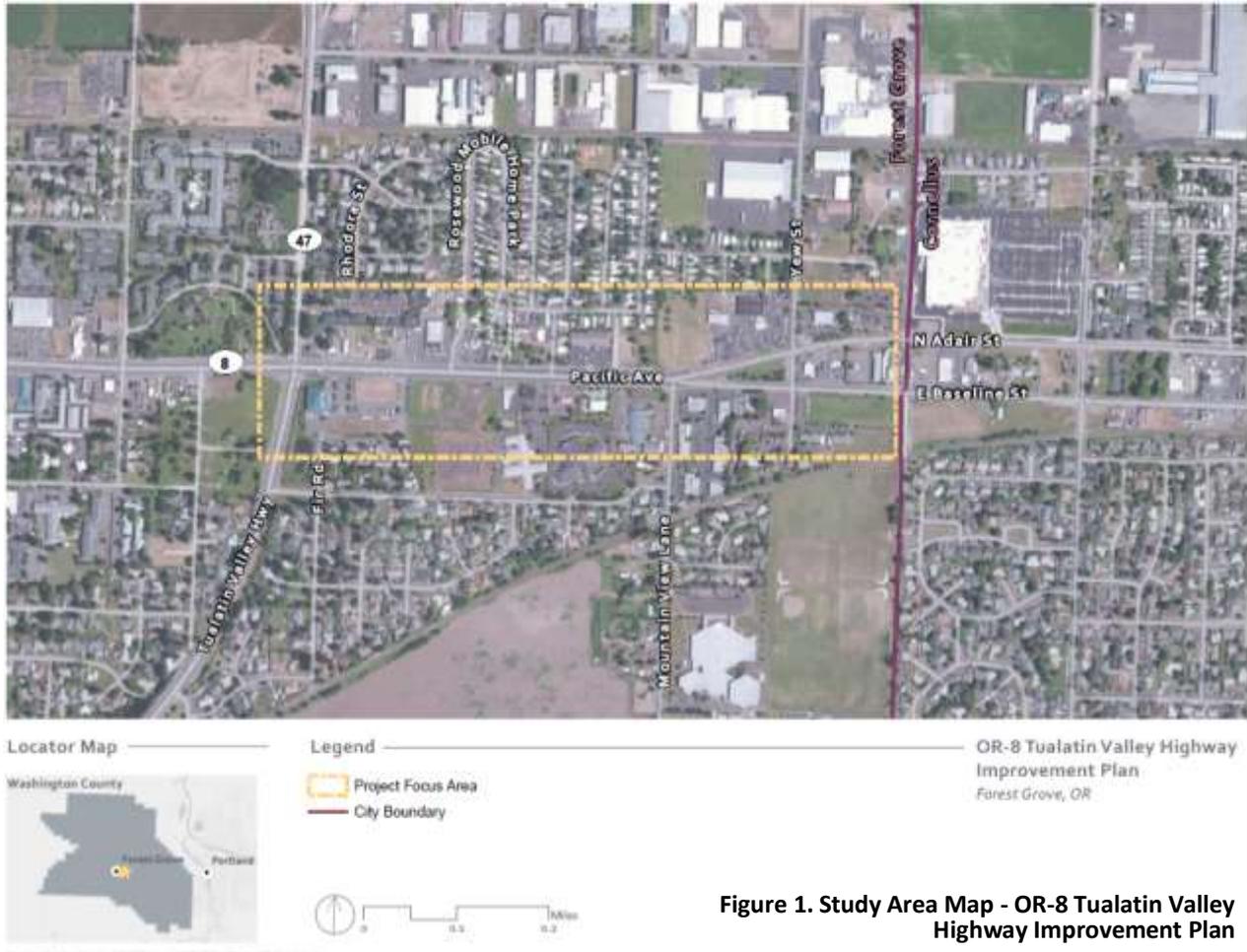


Figure 1. Study Area Map - OR-8 Tualatin Valley Highway Improvement Plan

Function of OR-8 in Study Area

The Federal Highway Administration classifies OR-8 in the study area as an urban principal arterial on the National Highway System, and as part of the national freight network. The Oregon Highway Plan, which establishes the function each highway serves in the state-owned transportation network, classifies OR-8 as a state highway and as an ORS 366.215 reduction review route. Within the community, the highway is seen as a gateway to the city for people travelling from Hillsboro.

Taken together, these classifications designate OR-8 as a route whose primary function is to provide inter-urban and inter-regional mobility, connecting places that are not directly served by an interstate. As a secondary function, OR-8 provides intra-urban and intra-regional trips. In urban areas like Forest

Grove, these designations direct ODOT to minimize interruptions to the flow of traffic to provide safe and efficient, high-speed, continuous-flow traffic operations.

OR-8 is included on the national freight network, which identifies it as an important freight connection. Its status as a reduction review route requires ODOT to follow a formal process involving consultation with freight stakeholders before moving forward with a plan or project that reduces the vertical or horizontal clearance for freight routes.

The following sections summarize important the listed statewide and local policies, plans, and laws that are relevant to this planning effort.

Guiding Statewide Plans and Policies

Several statewide plans supply goals and policies that will guide decisions made in this plan:

- *Oregon Bicycle and Pedestrian Plan* (OBPP, 2016)
- *Oregon Highway Plan* (OHP, most recently amended in 2015)
- *Oregon Public Transportation Plan* (OPTP, 2018)
- *Oregon Transportation Options Plan* (OTOP, 2015)
- *Oregon Transportation Safety Action Plan* (TSAP, 2016)

Oregon Bicycle and Pedestrian Plan (OBPP, 2016)

OBPP Goal 1. Safety: Eliminate pedestrian and bicyclist fatalities and serious injuries and improve the overall sense of safety of those who bike or walk.

To meet this goal, the plan will need to:

- Provide safe and well-design facilities for pedestrians and bicycle users (Policy 1.1).
- Improve pedestrians and bicycle users' perceived safety, comfort, and personal security (1.4, TSAP 3.4).

OBPP Goal 2. Accessibility and Connectivity: Provide a complete bicycling and pedestrian network that reliably and easily connects to destinations and other transportation modes.

To meet this goal, the plan will need to:

- Add active transportation infrastructure and street crossings that fit the unique needs of the nearby land use context (2.3).
- Improve access to transit for people walking and biking, coordinating with transit providers to design facilities and remove physical barriers (2.4).

OBPP Goal 3. Mobility and Efficiency: Improve the mobility and efficiency of the entire transportation system by providing high quality walking and biking options for trips of short and moderate distances. Support the ability of people who bike, walk or use mobility devices to move easily on the system.

To meet this goal, the plan will need to:

- Plan for ease of movement along OR-8 and its connections to local routes, recognizing that people biking and walking are vulnerable users (3.1).
- Integrate pedestrian and bicycle mobility considerations into planning, design, construction, and maintenance (3.2).
- Balance of people walking, biking, and moving freight, looking for opportunities to separate modes without constraining their mobility or accessibility (3.3).

OBPP Goal 5. Equity: Provide opportunities and choices for people of all ages, abilities, races, ethnicities, and incomes in urban, suburban, and rural areas across the state to bike or walk to reach their destinations and to access transportation options, assuring transportation disadvantaged communities are served and included in decision making.

To meet this goal, the plan will need to:

- Study barriers to walking, biking, and transit that transportation disadvantaged communities in this corridor experience (5.2, OPTP 4.3).
- Engage transportation disadvantaged community members in the decision-making process (5.4, OPTP 4.1, OTOP 9.3).
- Build partnerships between ODOT and local jurisdictions to leverage investments and make active transportation connections (5.5).

OBPP Goal 8. Strategic Investment: Recognize Oregon’s strategic investments in walking and biking as crucial components of the transportation system that provide essential options for travel, and can help reduce system costs, and achieve other important benefits.

To meet this goal, the plan will need to:

- Make strategic investments guided by the following priorities (in order): protect the functionality of the existing pedestrian and bicycle system; add critical connections and address safety issues; complete the system; and elaborate the system (8.2).
- Recommend opportunistic strategies for funding biking and walking improvements (8.4).

Oregon Highway Plan (OHP, most recently amended in 2015)

OHP Goal 1. System Definition: To maintain and improve the safe and efficient movement of people and freight, and contribute to the health of Oregon’s local, regional, and statewide economies and livability of its communities.

To meet this goal, the plan will need to:

- Remain consistent with OR-8’s functional classification (Policy 1A).
- Identify transportation investments that coordinate with local land use to maintain highway mobility and safety; foster compact development in the corridor; encourage availability of use of transportation alternatives; and enhance livability and economic competitiveness (1B).
- Recognize and balance freight needs with the needs of other highway users (1C, 4A).
- Avoid degrading OR-8’s performance below state mobility targets (1F).

OHP Goal 2. System Management: To work with local jurisdictions and federal agencies to create an increasingly seamless transportation system with respect to the development, operation, and maintenance of the highway and road system that: Safeguards the state highway system by maintaining functionality and integrity; Ensures that local mobility and accessibility needs are met; and Enhances system efficiency and safety.

To meet this goal, the plan will need to:

- Ensure that residents, businesses, regional and local governments, and state agencies have opportunities to participate in the planning process (2D).
- Maintain or improve safe travel in the study area, with a focus on preventing fatal and severe crashes (2F).

OHP Goal 3. Access Management: To employ access management strategies to ensure safe and efficient highways consistent with their determined function, ensure the statewide movement of goods and services, support economic development, enhance community livability and support planned development patterns, while recognizing the needs of motor vehicles, transit, pedestrians and bicyclists.

To meet this goal, the plan will need to:

- Manage access to OR-8 based on its highway classification, traffic volumes, speed, safety and operational needs (3A).
- Consider and plan for medians to enhance the efficiency and safety of OR-8, while influencing and supporting land use patterns that are consistent with local plans (3B).

[Oregon Public Transportation Plan \(OPTP, 2018\)](#)

OPTP Goal 2. Accessibility and Connectivity: Riders experience user-friendly and convenient public transportation connections to and between services and travel modes in urban, suburban, rural, regional, and interstate areas.

To meet this goal, the plan will need to improve transit access and ease of use by connecting biking and walking facilities to transit stops and stations in the corridor (Policy 2.2).

OPTP Goal 3. Community Livability and Economic Vitality: Public transportation promotes community livability and economic vitality by efficiently and effectively moving people of all ages to and from homes, jobs, businesses, schools and colleges, and other destinations in urban, suburban, and rural areas.

To meet this goal, the plan will need to provide transit access improvements that meet the needs of youth, older adults, and people with disabilities, while using streetscape improvements and urban design to make corridor stops and stations more comfortable and inviting (3.3).

OPTP Goal 6. Safety and Security: Public transportation trips are safe; riders feel safe and secure during their travel. Public transportation contributes to the resilience of Oregon communities.

To meet this goal, this plan will need to:

- Improve multimodal connections and crossings serving transit stops so that they become safer and more user-friendly (6.1).
- Site transit stops and identify amenities to deter unsafe behavior and support rider's safety and security (6.2, TSAP 3.4).
- Reduce potential conflicts and crashes involving transit vehicles and other corridor users (6.5).

[Oregon Transportation Options Plan \(OTOP, 2015\)](#)

OTOP Goal 1. Safety: To provide a safe transportation system through investments in education and training for roadway designers, operators, and users of all modes.

To meet this goal, the plan will need to improve safety and attractiveness of all modal options, incorporating safety considerations throughout the plan (1.1, 1.3).

OTOP Goal 3. Accessibility: Expand the availability, information, and ease of use of transportation options; improving access to employment, daily needs, services, education, and travel to social and recreational opportunities.

To meet this goal, the plan will need to increase access to multiple modes and transportation options so that people may choose to walk, bicycle, take transit, and share rides for a broad range of trips (3.1).

OTOP Goal 5. Health and Environment: To support healthier natural and built environments by developing and promoting transportation options that reduce the environmental impacts of motorized travel and allow more people to incorporate physical activity in their daily lives.

To meet this goal, the plan will need to:

- Emphasize the role of transportation options in enhancing human and environmental health (6.1).
- Improve safe multimodal options for accessing health services in the corridor (6.4).

Oregon Transportation Safety Action Plan (TSAP, 2016)

TSAP Goal 1. Safety Culture: Transform public attitudes to recognize that all transportation system users have responsibility for other people's safety in addition to their own safety while using the transportation system.

To meet this goal, the plan will need to communicate proactively with all corridor users about safety culture (1.1).

TSAP Goal 2. Infrastructure: Develop and improve infrastructure to eliminate fatalities and serious injuries for users of all modes.

To meet this goal, the plan will need to:

- Make data-driven decisions using safety data as a core part of the process (2.1).
- Identify improvements and recommend implementation approaches that will eliminate fatalities and serious injuries for all modal users (2.3).

Guiding Local Plans and Policies

The following local plans supply goals and policies that will guide decisions made in this plan:

- City of Forest Grove Comprehensive Plan – 2014 (FGCP)
- City of Forest Grove Transportation System Plan (TSP)

City of Forest Grove Comprehensive Plan – 2014 (FGCP)

The Forest Grove Comprehensive Plan (FGCP) is the over-arching document that establishes overall policy for land use, transportation, and related issues for the City of Forest Grove. The plan update in 2014 was the first major revision to the plan since the 1980s. The following FGCP goals that most closely address the purpose of the OR-8 Tualatin Valley Highway Improvement Plan are provided below.

FGCP Public Involvement Goal 2.1: Promote the participation of an engaged public and accessible, responsive government.

To meet this goal, the plan will need to:

- Provide opportunities for meaningful community engagement by those most directly affected by project outcomes. Opportunities for engagement should include emerging technologies and platforms to promote and encourage involvement in all phases of the planning process (Policy 2.1.3).

FGCP Community Sustainability Goal 2: Encourage involvement of underrepresented groups in civic affairs.

To meet this goal, the plan will need to:

- Ensure the involvement of underrepresented groups (Policy 2).

FGCP Community Sustainability Goal 6: Foster excellence in the design of public and private development projects to minimize environmental impacts, maximize financial efficiency, optimize social equity and benefits, and improve public health.

To meet this goal, the plan will need to:

- Support transportation connectivity to reduce vehicle miles traveled and encourage bicycling and walking to destinations (Policy 9).

FGCP Community Sustainability Goal 23: Promote a balanced transportation system increasing opportunities for bicycling and walking throughout the community.

To meet this goal, the plan will need to:

- Support transportation connectivity to reduce vehicle miles traveled and encourage bicycling and walking to destinations (Policy 9).

FGCP Transportation Goal 1: Develop and maintain a balanced transportation system that provides travel choices and reduces the number of trips by single occupant vehicle.

To meet this goal, the plan will need to:

- Identify safe and convenient walkways and bikeways serving destinations along the corridor (Policy 1.1).
- Include recommended transportation solutions based on collaboration with Tri Met and other transit providers to provide convenient and accessible public transit service (Policy 1.2).
- Include recommended transportation solutions that support travel options that allow individuals to reduce single occupant vehicle trips (Policy 1.3).

FGCP Transportation Goal 2: Develop and maintain a transportation system that reduces length of travel and limits congestion.

To meet this goal, the plan will need to:

- Maintain traffic flow and mobility on the arterial roadway (Policy 2.2).

FGCP Transportation Goal 3: Develop and maintain a transportation system that is safe.

To meet this goal, the plan will need to:

- Explicitly consider safe and secure routes to school (Policy 3.2).

FGCP Transportation Goal 4: Design and construct transportation facilities in a manner that enhances the livability of Forest Grove.

To meet this goal, the plan will need to:

- Respect the characteristics of surrounding land uses, natural features and other community amenities (Action 4.1.1).
- Propose transportation solutions to increase the health and physical well-being of citizens through walking and bicycling (Policy 4.2).
- Recommend transportation solutions to support a seamless and coordinated transportation system that is barrier-free, provides affordable and equitable access to travel choices and serves

the needs of all people and business including people with low income, children, seniors and people with disabilities (Policy 4.4).

- Consider solutions for pedestrian crossing spacing and landscaping for the arterial corridor in conjunction with Washington County, ODOT and Metro (Action 4.4.1).
- Propose transportation improvements to fully comply with the Americans with Disabilities Act (Action 4.4.2).

FGCP Transportation Goal 5: Promote the development of Forest Grove, the state and the national economy through the efficient movement of people, goods, services, and information in a safe and efficient manner.

To meet this goal, the plan will need to:

- Ensure a safe and efficient freight system that facilitates the movement of goods to, from and through Forest Grove and through the region while minimizing conflicts with other travel modes (Policy 5.1).
- Recommend transportation facilities that support land development that is consistent with the Comprehensive Plan (Policy 5.4).

FGCP Transportation Goal 6: Establish and maintain a context sensitive set of transportation design and development regulations.

To meet this goal, the plan will need to:

- Recommended improvements affecting the street are designed to support their intended users (Policy 6.1).
- Promote context sensitive transportation facility design, which fits the physical context, responds to environmental resources, and maintains safety and mobility (Policy 6.4).

FGCP Transportation Goal 7: Provide a transportation system that meets present needs without compromising the ability of future generations to meet their needs.

To meet this goal, the plan will need to:

- Encourage an energy efficient transportation system (Policy 7.1).
- Increase the use of walking and bicycling for all travel purposes (Policy 7.2).
- Improve and enhance the livability of Forest Grove residents by decreasing reliance on the automobile and increasing other modes to minimize transportation system impacts on the environment (Policy 7.3).

FGCP Transportation Goal 9: Develop a transportation system that is consistent with the City's Comprehensive Plan and adopted state and regional plans.

To meet this goal, the plan will need to:

- Support coordination and cooperation with adjacent jurisdictions and other transportation agencies to develop transportation projects that benefit the City of Forest Grove and the region as a whole (Policy 9.1).
- Be based on collaboration with other jurisdictions and agencies so the transportation system can function as one system (Policy 9.2).
- Consider the state adopted mobility standards for all state facilities, based on the Oregon Highway Plan (Action 9.2.1).
- Provide opportunity for coordination with other jurisdictions and community organizations to develop and distribute transportation related information (Policy 9.3).

- Involve coordination with Tri Met and adjacent jurisdictions to identify existing and future transit related needs (Policy 9.5):
- Ensure transportation solutions for transit rider amenities at transit stops (shelters, lighting, trash cans, route information) are coordinated with Tri Met to provide additional rider amenities (shelters, lighting, trash cans, route information) are consistent with Tri met guidelines (Action 9.5.1).
- Ensure coordinate with ODOT to address improvements to state highways within Forest Grove that will benefit all modes of transportation (Policy 9.7).

FGCP Transportation Goal 10: Efficiently use funding sources to implement transportation system improvement projects recommended in the TSP.

To meet this goal, the plan will need to:

- Result in provision of a cost-effective transportation system where the public, land use development, and users pay their respective share of the systems' costs proportional to their respective demands placed upon the multimodal system (Policy 10.1).
- Identify diverse and stable funding sources to implement recommended projects in a timely fashion (Policy 10.2).
- Identify local street improvement projects that can be funded by the State of Oregon to improve the state highway system (Policy 10.4).
- Identify local street system improvements that are cost-effective in improving state facility conditions (Action 10.4.1).

City of Forest Grove Transportation System Plan (TSP)

The Forest Grove Transportation System Plan (TSP) was updated in 2014 to extend the planning horizon for needed transportation improvements to the Year 2035. The TSP identifies the most valuable transportation system improvements that can be reasonably funded over the next 20 to 25 years. The TSP is a key component of meeting the State of Oregon's Transportation Planning Rule (TPR), which requires the land use planning and transportation planning be integrated and mutually supportive. To the extent to which the OR-8 Tualatin Valley Highway Improvement Plan makes any changes to possible land uses within the planning area, it must evaluate the impacts of these changes on the City's transportation system. The TSP goals that most closely address the purpose of the OR-8 Tualatin Valley Highway Improvement Plan are summarized below.

TSP Goal 1: Develop and maintain a balanced transportation system that provides travel choices and reduces the number of trips by single occupant vehicles.

To meet this goal, the plan will need to:

- Support a network of safe and convenient walkways and bikeways that are integrated with other transportation modes (Policy a.)
- Support collaboration with Tri Met and other transit providers to provide convenient and accessible public transit service (Policy b.)
- Support travel options that allow individuals to reduce single-occupant vehicle trips (Policy c.)

TSP Goal 2: Develop and maintain a transportation system that reduces the length and limits congestion.

To meet this goal, the plan will need to:

- Maintain traffic flow and mobility on arterial and collector roadways (Policy b.)

TSP Goal 3: Develop and maintain a transportation that is safe.

To meet this goal, the plan will need to:

- Support safe and secure routes to schools (Policy b.)
- Ensure all recommended transportation-related improvements will be designed to meet City standards, the Americans with Disabilities Act, and to encourage provisions for bicycling, walking, and transit use.

TSP Goal 4: Design and construct transportation facilities in a manner that enhances the livability of Forest Grove.

To meet this goal, the plan will need to:

- Recommend designs that respect the characteristics of the surrounding land uses, natural features and other community amenities (Policy a.)
- Support solutions that increase the health and physical well-being of citizens by providing safe and convenient opportunities for walking and bicycling (Policy b.)
- Recommend transportation system improvements that support a seamless and coordinated transportation system that is barrier-free, provides affordable and equitable access to travel choices and serves the needs of all people and businesses, including people with low income, children, seniors, and people with disabilities ((Policy d.)

TSP Goal 5: Promote the development of Forest Grove, the state, and the national economy through the efficient movement of people, goods, services, and information in a safe manner.

To meet this goal, the plan will need to:

- Consider freight mobility that promotes a safe and efficient freight system that facilitates the movement of goods to, from, and through Forest Grove and through the region while minimizing conflicts with other travel modes (Policy a.).

TSP Goal 6: Establish and maintain a context sensitive set of transportation and development regulations.

To meet this goal, the plan will need to:

- Recommend transportation improvements to the street system designed to support their intended users (Policy a.)
- Recommend transportation system improvements based on integrating bicycle and pedestrian facilitates in all planning, design, construction and maintenance activities (Policy b.)
- Recommend transportation system improvements to promote context-sensitive transportation facility design, which fits the physical context, responds to environmental resources, and maintains safety and mobility (Policy d.)

TSP Goal 7: Provide a transportation system that meets present needs without compromising the ability of future generations to meet their needs.

To meet this goal, the plan will need to:

- Encourage an energy efficient transportation system (Policy a.)
- Result in improvements to the transportation system that increase the use of walking and bicycling for all travel purposes (Policy b.)
- Support improving and enhancing the livability of Forest Grove residents by decreasing reliance on the automobile and increasing the use of other modes to minimize transportation system impacts on the environment (Policy c.)

- Take into account natural environments in the planning, design, construction and maintenance of the transportation system (Policy d.)

TSP Goal 9: Develop a transportation system that is consistent with the City's Comprehensive Plan and adopted state and regional plans.

To meet this goal, the plan will need to:

- Promote coordination and cooperation with adjacent jurisdictions and other transportation agencies to develop transportation projects that benefit the City of Forest Grove and the region as a whole (Policy a.).
- Support working collaboratively with other jurisdictions and agencies so the transportation system can function as one system (Policy b.)
- Provide opportunities for coordination with other jurisdictions and community organizations to develop and distribute transportation-related information (Policy c.).
- Support coordination with Tri Met and adjacent jurisdictions to identify existing and future transit related needs (policy e.)
- Support coordination with ODOT to address improvements to the state highway within Forest Grove that will benefit all modes of transportation (Policy g.).

TSP Goal 10: Efficiently use funding sources to implement transportation system improvement projects recommended in the TSP.

To meet this goal, the plan will need to:

- Identify diverse and stable funding sources to implement recommended projects in a timely fashion (Policy b.).
- Identify street improvement projects that can be funded by the State of Oregon to improve the state highway system (Policy d.).

In addition to the goals and policies contained in the TSP the TSP also contains performance measure objectives. The plan will also need to support these adopted transportation system performance measure objectives including:

- *Safety*: Reduce fatalities for drivers, walkers, and bikers from existing conditions, Address known deficiencies and high crash areas as high priority projects. Reduce the number of County and State SPIS sites the City.
- *Freight Reliability*: Reduce delays for truck trips on state highways in Forest Grove.
- *Walking, Biking, Transit, Non-SOV*: Implement policies and projects to move towards the regional non-SOV mode share as appropriate for the City (40-45% for areas outside the Forest Grove Town Center).
- *Climate Changes*: Strive to reduce VMT per capita by 10% compared to 2010.

3. Relevant Regional Transportation Policies and Plans

Metro Regional Transportation Plan – 2018 (RTP)

Metro's Regional Transportation Plan (RTP) creates a framework to guide transportation investments throughout the Portland metropolitan region. The plan identifies current and future transportation needs for all modes of travel — motor vehicle, transit, bicycle, and walking — to coordinate and prioritize local, regional, and state investments for the next 25 years. The RTP goals that most closely address the purpose of the OR-8 Tualatin Valley Highway Improvement Plan are summarized below.

RTP Goal 1: Vibrant Communities: Ensure that the Portland Region is a great and affordable place to live, work and play where people can easily and safely reach jobs, schools, shopping, services, and recreational opportunities from their home by walking, biking, transit, shared trip or driving.

To meet this goal, the plan will need to:

- Increase the share of households in walkable, mixed-use areas served by current and planned frequent transit service (Objective 1.2 Walkable Communities).
- Increase the number and variety of community places that households, especially households in historically marginalized communities, can reach within a reasonable travel time for all modes of travel (Objective 1.4 Access to Community Places).

RTP Goal 2: Shared Prosperity: People have access to jobs, goods and services and businesses have access to workers, goods and markets in a diverse, inclusive, innovative, sustainable and strong economy that equitably benefits all the people and business of the greater Portland region.

To meet this goal, the plan will need to:

- Build an integrated system of throughways, arterial streets, freight routes and intermodal facilities, transit services and bicycle and pedestrian facilities, with efficient connections between modes that provide access to jobs, markets and community places within and beyond the region (Objective 2.1 Connected Region).
- Increase access to industry and freight intermodal facilities by a reliable and seamless freight transportation system that includes air cargo, pipeline, trucking, rail, and marine services to facilitate efficient and competitive shipping choices for goods movement in, to and from the region (Objective 2.2 Access to Industry and Freight Intermodal Facilities).
- Attract new businesses and family wage jobs and retain those that are already located in the region while increasing the number and variety of jobs that households can reach within a reasonable travel time (Objective 2.3 Access to Jobs and Talent).

RTP Goal 3: Transportation Choices: People throughout the region have safe, convenient, healthy and affordable options that connect them to jobs, school, services, and community places, support active living and reduce transportation related pollution.

To meet this goal, the plan will need to:

- Plan communities and design and manage the transportation system to increase the proportion of trips made by walking, bicycling, shared rides and use of transit (Objective 3.1 Travel Choices).
- Complete all gaps in regional bicycle and pedestrian networks (Objective 3.2 Active Transportation System Completion).
- Increase household and job access to current and planned frequent transit service (Objective 3.3 Access to Transit).
- Increase household and job access to planned regional bike and walk networks (Objective 3.4 Access to Active Travel Options).

RTP Goal 4: Reliability and Efficiency: The transportation system is managed and optimized to ease congestion, and people and businesses are able to safely, reliably and efficiently reach their destinations by a variety of travel options.

To meet this goal, the plan will need to:

- Maintain reasonable person-trip and freight mobility and reliable travel times for all modes in the region's mobility corridors, consistent with the designated modal functions of each facility and planned transit service within the corridor (Objective 4.1 Regional Mobility).

RTP Goal 5: Safety and Security: People's lives are saved, crashes are avoided, and people and goods are safe and secure when traveling in the region.

To meet this goal, the plan will need to:

- Eliminate fatal and severe injury crashes for all modes of travel (Objective 5.1 Transportation Safety).

RTP Goal 7: Healthy People: People enjoy safe, comfortable and convenient travel options that support active living and increased physical activity, and transportation-related pollution that negatively impacts public health are minimized.

To meet this goal, the plan will need to:

- Improve public health by providing safe, comfortable and convenient transportation options that support active living and physical activity to meet daily needs and access services (Objective 7.1 Active Living).
- Minimize noise and other transportation related pollution health impacts (Objective 7.2 Pollution Impacts).
- Reduce transportation-related air pollutants, including and air toxics emissions (Objective 7.3 Clean Air).

RTP Goal 8: Climate Leadership: The health and prosperity of people living in the greater Portland region are improved and the impacts of climate change are minimized as a result of reducing transportation-related greenhouse gas emissions.

To meet this goal, the plan will need to:

- Implement policies, investments and actions identified in the adopted Climate Smart Strategy, including coordinating land use and transportation; making transit convenient, frequent, accessible and affordable; making biking and walking safe and convenient; and managing parking and travel demand (Objective 8.1 Climate Smart Strategy Implementation).

RTP Goal 9: Equitable Transportation: The transportation-related disparities and barriers experienced by historically marginalized communities, particularly communities of color, are eliminated.

To meet this goal, the plan will need to:

- Eliminate disparities related to access, safety, affordability and health outcomes experienced by people of color and other historically marginalized communities (Objective 9.1 Transportation Equity).
- Eliminate barriers that people of color, low income people, youth, older adults, people with disabilities and other historically marginalized communities face to meeting their travel needs (Objective 9.2 Barrier Free Transportation).

RTP Goal 11: Transparency and Accountability: Regional transportation decisions are open and transparent and distribute the benefits and burdens of our investments in an equitable manner.

To meet this goal, the plan will need to:

- Engage more and a wider diversity people in providing input at all levels of decision making for developing and implementing the plan, particularly people of color, English language learners,

people with low income and other historically marginalized communities (Objective 11.1 Meaningful Public Stakeholder Engagement).

- Make transportation investment decisions using a performance-based planning approach that is aligned with the RTP goals and supported by meaningful public engagement, multimodal data and analysis (Objective 11.2 Performance-Based Planning).

Improve coordination and cooperation among the owners and operators of the region's transportation system (Objective 11.3 Coordination and Cooperation).

TriMet's Pedestrian Network Analysis Report – 2011

TriMet's Pedestrian Network Analysis Report assesses the availability of pedestrian amenities, such as sidewalks and crosswalks, near high-ridership transit stops throughout the region. Locations with a significant concentration of high-ridership transit stops, a relatively high density and mix of land uses, and an observed deficiency of pedestrian facilities, were advanced as "focus areas" for further site study and consideration of solutions. The Report establishes ten recommendations of what to include in local TSP's, but these are also applicable to other planning efforts. Below is a summary of the recommendations.

Pedestrian Network Analysis Report Recommendation 1: Word choice

- Avoid calling walking, bicycling, and transit "alternative" modes. They are used by almost everyone and promote health, save money, avoid congestion, and reduce oil dependence. *Instead simply say "walking, bicycling and taking transit." Walking should also be understood to always include people using mobility devices.*

Pedestrian Network Analysis Report Recommendation 2: The quality of pedestrian/bicycle facility and transit service matters

- The existence of a 6-foot-wide, curb-tight sidewalk may make a street somewhat safer for a pedestrian, but it is not a place where people want to walk when it is next to traffic. To encourage more trips by walking, bicycling, and taking transit, go beyond minimum design standards (or update those standards) for walking and bicycling facilities, and focus development and investments in key corridors where you want to see more frequent transit service, bicycling, and pedestrian trips. *Long-term success requires complete facilities that feel safe and allow many people to choose walking, bicycling or taking transit.*

Pedestrian Network Analysis Report Recommendation 3: Analysis

- Data collection and system analysis for walking, bicycling, and transit require explicit and rigorous methods just as motor vehicles do. GIS tools are available, like ESRI's ArcGIS network analyst, Transpo Group's Viacity tool, Criterion's Index tool, etc. Metro is developing better tools for modeling bicycle use. *Collect data that help identify meaningful and complete pedestrian, bicycle and transit needs.*

Pedestrian Network Analysis Report Recommendation 4: Prioritize specific locations and areas where people walk, bicycle, and take transit.

- Develop a list of pedestrian and bicycling projects, based on where it is most important for more people to be able to access specific places by walking, cycling or transit. This could be a main street, medical facilities, jobsites or many others. Then identify investments that will increase comfort and safety for walking, bicycling and taking transit to and from those areas. In the long-term, this will be better for travel demand and for livability, saving money and avoiding negative

impacts of continually widening roadways and intersections. Pedestrian and bicycle infrastructure costs are very low compared to roadways, but the pedestrian and bicycle network needs are substantial in every jurisdiction. *Therefore, it is most cost-effective and efficient to make improvements where they are most needed and most effective at achieving policy goals.*

- TriMet can supply data on transit ridership and the methodology, data and results of the Pedestrian Network Analysis to assist with this.

Pedestrian Network Analysis Report Recommendation 5: Match funding sources with types of projects

- Project lists should recognize jurisdiction and which entities are responsible for making desired improvements. The plan can be a starting point for determining whether service changes can be made, but TriMet bears the responsibility for funding transit operations. *Plans should be transparent and identify the responsible entity. They should also identify at a concept level what steps would be necessary to implement the plans.*

Pedestrian Network Analysis Report Recommendation 6: Match ability with responsibility

- Project lists should recognize jurisdiction and which entities are responsible for making desired improvements. A plan may envision a new transit line or more service on an existing line, but TriMet bears the ultimate responsibility for funding transit operations. *Plans should be transparent and identify the responsible entity and identify at a concept level what steps would be necessary to implement the plans.*

Pedestrian Network Analysis Report Recommendation 7: Tie city or county's transit vision to actions, programs, and investments needed to make it feasible

- When transit needs are stated in a plan, include what is needed to support this type of service, e.g. proximity of X number of households and/or Y number of jobs to transit stops, streetscape and sidewalk investments, managed parking, etc. Include operating and capital costs associated with the type of service desired, so desires are tied to costs, especially if it isn't directly in the city/county's control.
 - TriMet will assist in developing service cost estimates as necessary.

Pedestrian Network Analysis Report Recommendation 8: Unbundle pedestrian and cycling needs from larger road projects

- Pedestrian or bicycle improvements made now deliver substantial benefits immediately, even if long-term future plans may include roadway widening that could require rebuilding some of the improvements. *Stand-alone pedestrian and bicycling projects are cost-effective and provide substantial benefits in the near term.*

Pedestrian Network Analysis Report Recommendation 9: Strongly encourage broad participation

- *Invite a broad base of representatives to help shape the plan.* Jurisdictions and individuals may choose not to accept the invitation but inviting participation will give your plan the best chance of meeting many needs and maximizing benefits. Consider including TriMet (or other transit agencies if applicable), Metro, local land use staff, parks/trail districts, TMAs, public health departments, housing authorities, economic development agencies, school districts and major employers. Ensure there is representation from communities of color and people of all income levels. TriMet will do the best it can to be an active participant.

Pedestrian Network Analysis Report Recommendation 10: Conduct field visits and safety audits of select corridors on foot and bicycle

- Computer modeling and GIS analysis can't give a full understanding of the needs of pedestrians and cyclists, particularly of all ages and abilities. Roadways are all generally built to basic quality standards, and therefore engineers and planners can focus on things like capacity and function. But with walking and bicycling, there is not yet consistent basic quality and safety. Assess the facility on foot or bicycle with the engineers and planners who will be helping identify priorities. Conduct 3-4 pedestrian safety audits and incorporate the results in the analysis. This will greatly improve the detail and completeness of the needs identification and the scope, as well as the effectiveness, of proposed projects.

4. Relevant Design Standards and Potential Exceptions, Statewide Land Use Goals

Statewide Potential Exceptions – 2012 ODOT Highway Design Manual

There is potential for this project to apply for a roadway design exception per ODOT standards. The below sections highlight key aspects of ODOT's Design Exception Process (Chapter 14) that might be potentially relevant to this plan.

1. Justification of Design Exceptions (14.1.1)

Project Development Projects (14.1.1.1)

Exceptions to design standards should be first discussed at project scoping, project team meetings, or during reconnaissance studies. When enough data is available, agreement on standards and from which standards to request exceptions should be reached at these meetings. Requests for design exception require justification. Some considerations which may cause a request for an exception to the design standards are listed below:

- Excessive construction cost or cost/benefit
- Compatibility with adjacent sections
- No plans for improvement of adjacent sections in the foreseeable future
- Proposed improvements or changes in standards for the highway corridor
- Preservation of historic property or scenic value
- Additional right of way requirements
- Environmental impacts
- Low crash history and/or crash potential
- Low traffic volumes

Simply making a request for a design exception is not assurance that the request will be granted. Therefore, early submittal of the request is paramount to a smooth design process. Design Exceptions shall be submitted prior to or at the Design Acceptance Package (DAP) milestone.

Planning Projects (14.1.1.2)

Design exceptions to standards may be needed for planning studies. Transportation System Plans, Refinement Plans, Facility Plans, Transportation Growth Management studies, Access Management Plans, or Corridor Plans should not be adopted with nonstandard highway features unless a Design

Exception has been approved by the State Traffic-Roadway Engineer or the State Traffic-Roadway Engineer has indicated in writing that one would likely be approved.

For a project that may be constructed within five years, the planner or project leader in charge of the planning project should contact the Region Roadway Manager to assist in putting together the design exception request. The design exception request should be processed in the same manner as a project development design exception, which is listed in Section 14.3.

For projects that may be constructed within five to ten years, the design exceptions should be identified and the State Traffic-Roadway Engineer should give a written indication that a design exception is warranted and would probably be approved.

For projects anticipated beyond 10 years to construction consultation with Roadway Engineering Unit staff in Technical Services about non-standard items should be made, but no formal action is required on these types of projects. Non-standard design items should not be shown on plans or maps when the project is more than ten years to construction. A change of context can occur such that proposed justification would no longer be valid at the time of construction.

Design Exceptions for Local Agency Projects (14.1.1.3)

For all projects on State Highways or NHS roads, any design element that does not meet HDM or AASHTO standards respectively must be justified and documented by means of a design exception. Generally, ODOT is the agency with authority to approve design exceptions; and FHWA also needs to review and approve design exceptions for all projects subject to Full Federal Oversight. However, the local government may process and approve design exceptions in the following cases.

Federally Funded Certified Local Agency Projects on Local Agency Jurisdiction Roads (14.1.1.3.1)

Certified local agencies approve design exceptions on federally-funded projects, except those on bridges and state highways. The ODOT Regional Local Agency Liaison uses an established audit process for Certified Local Agencies to ensure consistent design quality.

Federally Funded Non-Certified Local Agency Projects on Local Agency Jurisdiction Roads (14.1.1.3.1)

For all federally-funded projects on NHS and non-NHS local agency jurisdiction roads, contract plans and design exceptions are processed through the ODOT Regional Local Agency Liaison who then reviews with the Region Tech Center to ensure consistent design quality

Non-Federally Funded Projects on NHS Agency Jurisdiction Roads (14.1.1.3.1)

For non-federally funded projects on local agency jurisdiction NHS roads, certified and noncertified local agencies may process and approve design exceptions, and ODOT ensures design quality by means of an audit process. The contract plans and design exceptions for all non-federally funded projects on local agency jurisdiction NHS roads are provided to the ODOT Technical Services Roadway Engineering Unit either on a project by project or annual basis. In addition, a list of all projects is to be submitted on an annual basis. Some of these projects are then selected for review. ODOT works with FHWA and local governments to correct any issues as needed. See Appendix Q for information on roles and responsibilities and lane width requirements.

2. Informational Needs (14.2)

Prior to submitting a request for a design exception, a sufficient amount of information gathering and design work is required to justify the design exception. Again, the purpose of design exceptions is to determine that a professional engineering decision has been justified and documented involving

engineering standards and practices in constrained locations. The information required includes the following items:

Roadside Inventory (14.2.1)

A roadside inventory is typically completed as part of project information gathering. The roadside inventory provides valuable information on existing roadside features and can be used to help justify design exceptions. Identification of roadside appurtenances, both man-made and natural, that are not crash worthy is important to the overall safety of the facility. While the item may not be removed with the current project, the man-made items are placed into the database and scheduled for upgrade. Particularly barrier systems that are in place and were developed prior to NCHRP – Report 230 crash criteria need to be inventoried for replacement. Roadside Inventory information is outlined in Chapter 11.

Local Plan Coordination (14.2.2)

Due to the constrained environment of urban areas, design exceptions are frequently required on downtown urban projects. In these urban environments there may be transportation system plan elements or goals that relate to the roadway design. The design exception justification process should take into consideration local planning efforts. For example, local plans for projects such as Transportation System Plans (TSP) may provide a context for the future highway corridor that can be used in looking at non-standard roadway elements. The local plan vision should be in alignment with the vision of the statewide transportation system. As projects are developed, these assumptions must be reevaluated in light of the current context of the developed highway and can be used in the design exception process if appropriate.

Traffic and Crash Analysis (14.2.3)

A traffic analysis is required. The level of information and analysis will need to be sufficient to assure that the proposed design exception will not significantly affect safety. Generally the traffic analysis required for the specific project type will be sufficient to evaluate the merits of proposed design exceptions. However, in some situations, additional analysis and detail may be required such as:

- Long term (20 year) volume/capacity and operational analysis.
- Vehicle classifications.
- Peak hour and daily turning movements.
- Detailed operational analysis (i.e., intersection, interchange, weaving, etc.).
- Other analyses as deemed necessary for the particular action.

Proper designs on all projects should always consider the crash potential and history, and its relationship to the improvements proposed. Generally, the crash analysis required for the specific project type is sufficient to evaluate the potential ramifications of a particular design exception. However, in some situations, more detailed analysis is required. This could include a more detailed review of crash history over a longer time frame, greater research into cause and effect, and even discussing existing safety deficiencies with local emergency provider agencies such as state police, local police, county sheriff and local fire officials. The proposed design exception needs to be evaluated to document the potential impacts to the safety of the highway users. Various predictive models are available to assist the designer analyzing multiple combinations of cross sectional elements. Making an incremental increase in safety predictions can be included in the justification for a design exception.

Crash data should include:

- Number and type of crashes.
- Crash rate and comparison to the average rate for that type of facility.
- The Safety Priority Index System (SPIS) sites and their ranking.

Impacts and Right of Way (14.2.4)

The design should be completed to a sufficient degree to determine with reasonable certainty what the potential impacts are if the proposed exception is not approved. These impacts could include residential displacement, commercial displacement, and environmental impacts to wetlands, streams, historic properties, 4f and 6f resources, threatened and endangered habitat, etc. Other impacts could require additional right of way. Community goals and livability impacts should also be determined where applicable as well as impacts from planning and policy documents such as the Oregon Highway Plan. Generally, to determine these levels of impacts, the design should be developed to concept level plans. This generally is sufficient to determine approximate right of way footprints for the specific project.

Costs (14.2.5)

The design should be completed to sufficient detail to estimate project costs with and without the proposed design exception(s) being approved. The cost information can also be used to calculate approximate cost/benefit ratios related to the proposed design exception. Cost is not the only justification for approving design exceptions. Other items include compatibility with other sections, environmental impacts, additional right of way and other items listed in Section 14.1.1. Costs to improve the deficiency while not meeting full design standards should be considered and evaluated, if appropriate.

Incremental Improvements (14.2.6)

While not meeting full standards, the design engineer can use a lower cost solution as an incremental step to address legitimate safety concerns. Multiple alternatives should be assessed using various techniques including the use of prediction models. Lower cost treatments such as rumble strips or signs have a proven record of offering a reduced level of crashes when implemented at strategic locations. Incremental improvements are to be recited in the design exception request as either justification or mitigation as an improvement based outcome for inclusion in the project.

Proposed Mitigation (14.2.7)

The project team should evaluate potential mitigation measures that could be implemented as part of the project that could offset the potential safety reductions of the proposed design exception. Mitigation actions can range from very small and inexpensive to large scale options. Each design team will need to evaluate, on a project by project basis, if cost effective mitigation strategies are to be included as part of the design exception request. Each project team should use the creative abilities of the team members to strategize the range of potential mitigation measures. Identifying standard practice mitigation items (replaced striping, replacing signs, etc) in the design exception under the category of proposed mitigation needs to be separated from the enhanced mitigation items that are included in the project (upgraded striping, new signs, new rumble strips, etc.)

3. Steps for Design Exception (14.3)

General (14.3.1)

In order to obtain timely State Traffic-Roadway Engineer and FHWA approvals, design exception requests should be recommended by the Region Roadway Manager and Area Manager (or equivalent) and forwarded to the State Traffic-Roadway Engineer as soon as the need is identified. Design Exceptions shall be submitted prior to or at the Design Acceptance Package (DAP) milestone. For design exceptions critical to the project design, approval should be obtained as early as possible. Requests for

design exceptions must be accompanied by justification documentation and should include mitigation. Processing of exceptions to design standards will be undertaken as soon as agreement is reached in the Region.

Local Agency project design exceptions not on a State Highway follow a slightly different process. Although the approval of design exceptions is under the authority of the State Traffic-Roadway Engineer, the intervening steps between the request and approval may differ from the standard design exception process. Designers involved in local agency contracts should contact the Local Government Section Manager and review the Local Area Governments (LAG) manual for processing design exceptions on local agency projects.

Requests for exceptions to design standards with justification and mitigation shall be submitted to the State Traffic-Roadway Engineer and approved prior to or at the DAP milestone and prior to incorporation of design features into project plans and/or other documents.

Design Exception Procedures (14.3.2)

- **Step 1:** Project Teams determine justification for design exception(s) at scoping, prospectus, design phases, or planning process.
- **Step 2:** Roadway Designer prepares design exception with supporting justification with review from Region Roadway Manager. If the Designer is the Engineer of Record, the Designer stamps the design exception request and signs the “Prepared By” line, otherwise the Engineer of Record stamps and signs the exception request. Consultation with Technical Service’s Roadway Engineering staff is encouraged during the preparation of the request.
- **Step 3:** The program manager is the ODOT Area Manager, District Manager, BDU Manager, Private Public Partnerships Manager, or the Local Government Unit. The program manager reviews request and consults with Engineer of Record to assure that the request accurately describes the conditions that warrant a design exception. The Program Manager then signs the design exception request on the “Concurred by” line and forwards to the ODOT Region Technical Center Manager or the Region Roadway Manager.
- **Step 4:** The ODOT Region Technical Center Manager or the Region Roadway Manager reviews the request and consults with the engineer of record and other applicable groups in Region, such as Traffic or Safety. The Region Technical Center Manager or the Region Roadway Manager signs the design exception if they concur with the request. NOTE: Design exceptions formally obtained in writing during the Planning, Environmental or Survey phases need not be requested again.
- **Step 5:** The Design Exception is forwarded to the State Traffic-Roadway Engineer in Technical Services. On Full Federal Oversight (FFO) projects and projects on the Interstate Highway System, the State Traffic-Roadway Engineer submits the request letter to FHWA for exceptions on nonconforming geometric standards. The Design Exception is assigned to a member of the Design Exception Review team for review and a formal recommendation is prepared by the member. This team meets twice monthly to review exceptions and discuss the merits of all Design Exceptions. Informal reviews are completed as required based upon the complexity of the project
- **Step 6:** The State Traffic-Roadway Engineer reviews the design exception request and recommendation from the Design Exception Review team. The State Traffic-Roadway Engineer signs and stamps the request if sufficiently justified.

- **Step 7:** The State Traffic-Roadway Engineer receives FHWA approval (if necessary) for design exceptions and forwards copy to the signers of the Design Exception. The State Traffic-Roadway Engineer maintains the original request in approved design exception file.
- **Step 8:** Where agreement between the Region Technical Center Manager and the State Traffic-Roadway Engineer cannot be reached, the State Traffic-Roadway Engineer forwards the request to the Technical Services Manager/Chief Engineer. The Technical Services Manager/Chief Engineer makes the final decision on approval or denial of the design exception request.

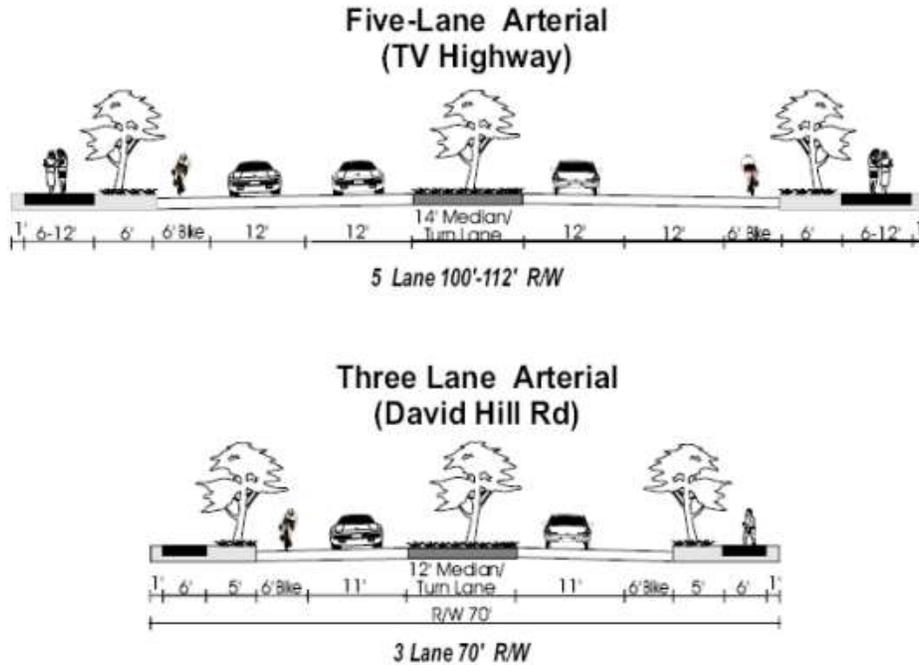
Forest Grove Transportation System Plan (TSP)

The sections below highlight transportation design aspects that are outlined within the Forest Grove TSP.

Roadway Design Characteristics (8.6)

TV Highway, within the project area, is classified as an urban principal arterial. Forest Grove's TSP provides roadway design guidelines for arterials. Figure 8-2 (from the Forest Grove TSP) provides a sample cross-section for arterials that includes TV Highway.

Figure 8-2. Sample Street Cross Sections for Arterials



Criteria	5 Lane Arterial	3 Lane Arterial
Vehicle Lane Widths:	11-14 ft.	11-12 ft.
On Street Parking:	None	None
Bicycle Lanes:	5-6 ft.	5-6 ft.
Sidewalks:	6-12 ft.	5-8 ft.
Landscape Strips:	0-8 ft.	0-8 ft.
Medians/Turn Lane Widths:	12-14 ft.	12-14 ft.
Neighborhood Traffic Management:	Not Appropriate	Not Appropriate

Green Streets

Forest Grove’s TSP also provides guidance on ‘green street’ roadway design characteristics. The concept is to incorporate rain water management with environmentally sound street design to help protect streams and wildlife habitat. Green streets enhance street right-of-way areas and provide increased landscaping and safety and attractiveness for pedestrians. Green streets are not based on functional class and may not be suitable in every circumstance. Figure 8-1 (from the Forest Grove TSP) highlights different green street design elements/techniques.

Table 8-1. Green Street Design Elements

Element	Application	How It Works
Rainwater Harvesting	Capture and re-use stormwater runoff for landscape irrigation.	Stormwater is conveyed to storage facilities and collected during the wet season for use during the dry season.
Permeable Paving	Replace most of the impermeable surfaces in the right-of-way with permeable materials, such as permeable pavement, concrete, or paving blocks.	The permeable materials allow water infiltration through the surface to the subgrade.
Bio-retention	Above ground or subgrade containers are used to promote infiltration and evapotranspiration of stormwater.	Engineered or amended soils can be used to promote this process.
Bio-swales	Subgrade channels with vegetation used to convey and treat stormwater.	Vegetation is used to control flow velocities and settle pollutants.

Regional Transportation Functional Plan (RTFP)

The Regional Transportation Functional Plan connects regional transportation policies to local communities and everyday lives. In result, cities are to implement the RTFP into local transportation plans and projects, to achieve local aspirations and the 2040 Growth Concept.

Street System Design (3.08.110)

1. To ensure that new street construction and re-construction projects are designed to improve safety, support adjacent land use and balance the needs of all users, including bicyclists, transit vehicles, motorists, freight delivery vehicles and pedestrians of all ages and abilities, city and county street design regulations shall allow implementation of:
 1. Complete street designs as set forth in *Creating Livable Streets: Street Design Guidelines for 2040* (2nd Edition, 2002), or similar resources consistent with regional street design policies;
 2. Green street designs as set forth in *Green Streets: Innovative Solutions for Stormwater and Street Crossings* (2002) and *Trees for Green Streets: An Illustrated Guide* (2002) or similar resources consistent with federal regulations for stream protection; and
 3. Transit-supportive street designs that facilitate existing and planned transit service pursuant subsection 3.08.120B of the RTFP.

2. City and county local street design regulations shall allow implementation of:
 1. Pavement widths of less than 28 feet from curb-face to curb-face;
 2. Sidewalk widths that include at least five feet of pedestrian through zones;
 3. Landscaped pedestrian buffer strips, or paved furnishing zones of at least five feet, that include street trees;
 4. Traffic calming devices, such as speed bumps and cushions, woonerfs and chicanes, to discourage traffic infiltration and excessive speeds;
 5. Short and direct right-of-way routes and shared-use paths to connect residences with commercial services, parks, schools, hospitals, institutions, transit corridors, regional trails and other neighborhood activity centers;

6. Opportunities to extend streets in an incremental fashion, including posted notification on streets to be extended.
3. To improve connectivity of the region's arterial system and support walking, bicycling and access to transit, each city and county shall incorporate a network of major arterial streets at one-mile spacing and minor arterial streets or collector streets at half-mile spacing.
4. To protect the capacity, function and safe operation of existing and planned state highway interchanges or planned improvements to interchanges, cities and counties shall, to the extent feasible, restrict driveway and street access in the vicinity of interchange ramp terminals, consistent with Oregon Highway Plan Access Management Standards, and accommodate local circulation on the local system to improve safety and minimize congestion and conflicts in the interchange area. Public street connections, consistent with regional street design and spacing standards in this section, shall be encouraged and shall supersede this access restriction, though such access may be limited to right-in/right-out or other appropriate configuration in the vicinity of interchange ramp terminals. Multimodal street design features including pedestrian crossings and on-street parking shall be allowed where appropriate.

Transit System Design (3.08.120)

Providers of public transit service shall consider and document the needs of youth, seniors, people with disabilities and environmental justice populations, including minorities and low-income families, when planning levels of service, transit facilities and hours of operation.

Pedestrian System Design (3.08.130)

City and county land use regulations shall require new development to provide on-site streets and accessways that offer reasonably direct routes for pedestrian travel.

Bicycle System Design (3.08.140)

The Bicycle System Design policy within the RTFP refer to the design objectives in the context of a city or county TSP. While this plan is not a TSP update, the below objectives are still relevant to the OR-8 Tualatin Valley Highway Improvement Plan. They include:

1. An inventory of existing facilities that identifies gaps and deficiencies in the bicycle system;
2. An evaluation of needs for bicycle access to transit and essential destinations, including direct, comfortable and safe bicycle routes and secure bicycle parking, considering TriMet Bicycle Parking Guidelines.
3. Improvements to the bicycle system that will help the city or county achieve the regional Non-SOV modal targets in Table 3.08-1 and other targets established pursuant to section 3.08.230;
4. Provision for bikeways along arterials, collectors and local streets, and bicycle parking in centers, at major transit stops shown in Figure 2.15 in the RTP, park-and-ride lots and associated with institutional uses;
5. Provision for safe crossing of streets and controlled bicycle crossings on major arterials.

Freight System Design (3.08.150)

The Freight System Design policy within the RTFP refer to the design objectives in the context of a city or county TSP. While this plan is not a TSP update, the below objectives are still relevant to the OR-8 Tualatin Valley Highway Improvement Plan. They include:

1. An inventory of existing facilities that identifies gaps and deficiencies in the freight system;

2. An evaluation of freight access to freight intermodal facilities, employment and industrial areas and commercial districts; and
3. Improvements to the freight system that will help the city or county increase reliability of freight movement, reduce freight delay and achieve the targets established pursuant to section 3.08.230 of the RTFP.

Potential Exceptions

Regional Transportation Functional Plan (RTFP)

Exception from Compliance

A city or county may seek exception from compliance with a requirement of the RTFP by filing an application on a form provided by the Metro Chief Operating Officer (COO). Upon receipt of an application, the COO shall notify the city or county, ODOT and those persons who request notification of requests for exceptions. Any person may file a written comment in support of or opposition to the exception.

The COO may grant an exception if:

1. It is not possible to achieve the requirement due to topographic or other physical constraints or an existing development pattern;
2. This exception and likely similar exceptions will not render the objective of the requirement unachievable region-wide;
3. The exception will not reduce the ability of another city or county to comply with the requirement; and
4. The city or county has adopted other measures more appropriate for the city or county.

Exemptions

A city or county may seek an exemption from the requirements of the RTFP. Upon receipt of a request, the COO shall notify the city or county, the Department of Land Conservation and Development (DLCD), ODOT and those persons who request notification of applications for exemptions. Any person may file a written comment in support of or opposition to the exemption.

The COO may grant an exemption from some or all requirements if:

1. The city or county's transportation system is generally adequate to meet transportation needs;
2. Little population or employment growth is expected over the period of the exemption;
3. The exemption would not make it more difficult to accommodate regional or state transportation needs; and
4. The exemption would not make it more difficult to achieve the performance objectives set forth in section 3.08.010A.



East Forest Grove Safety Improvement Plan Technical Memorandum #2: Evaluation and Prioritization Criteria

This memorandum provides qualitative and quantitative evaluation criteria to assess and prioritize potential improvements and design options for the East Forest Grove Safety Improvement Plan. Jacobs prepared this memorandum for the Oregon Department of Transportation (ODOT) and the City of Forest Grove (City), in Washington County, Oregon.

Introduction

The East Forest Grove Safety Improvement Plan aims to improve safety and comfort for people traveling and visiting TV Highway from the eastern edge of Forest Grove (approximately 1st Ave) through the intersection with OR-47. The Plan will recommend project and program alternatives to achieve four goals of: safety (especially for pedestrians and people on bikes), transit access, equity, and economic development.

This memo defines criteria that will allow the project team to evaluate which alternatives to include in the plan. Later, the criteria will help ODOT and Forest Grove decide which projects to prioritize, taking into account the efficacy of the investment, equity, financing potential, and political feasibility. Criteria are designed to reflect Forest Grove's communities' vision for this segment of TV Highway, as outlined by the project goals.

Goals

Criteria derive from the project goals. Each criterion helps to achieve at least one goal. The project team developed goals based on historical context and community feedback with guidance from the Technical Advisory Committee (TAC). The plan has four goals that address safety, transit, equity, economic development, and placemaking.

Draft Project Goals

Goal 1: Safety for all users, especially pedestrians and people on bikes

Improving safety is fundamental to the East Forest Grove Safety Plan. Safety is important for everyone on the road, and especially the most vulnerable: people walking, rolling, and biking. Safe and comfortable facilities for pedestrians and cyclists improve mobility for everyone while also helping to establish a sense of community.

Goal 2: Increase transit mode share by improving safe access to transit

Transit provides transportation options to many people, including underserved populations. People reach transit in a variety of ways, such as walking, biking, or in a car. This project aims to make it easier and safer to access the buses and shuttle services that operate in the project area.

Goal 3: Promote equitable outcomes

The East Forest Grove Safety Plan acknowledges the inequitable distributions of burdens and opportunities stemming from generations of past planning. This Plan resolves to rebalance these distributions for underserved populations by reducing safety hazards and pollution while simultaneously improving mobility and access to opportunity. The planning process will rely on community involvement that intentionally engages a diversity of community members, focusing especially on communities of color, people with low incomes, people with disabilities, and people have low English proficiency.

Goal 4: Economic development and placemaking

This segment of TV Highway is an important corridor for people traveling through to other local and regional destinations. The Plan aims to make this segment more of a destination by improving the streetscape and adding elements to define its character. This will promote economic development and help to establish a sense of place.

Additional Themes

Funding and Political Feasibility

Integral to achieving project goals is the reasonable likelihood or feasibility for an improvement action to be implemented. This is highly influenced by the investment's financial liability and political feasibility, each of which are integrated into the evaluation criteria. A proposed investment that is lower cost would rate more favorably than would an investment that is higher cost if the benefits of each option are comparable. Similarly, a proposed investment that has an existing funding source would have an advantage over one that would need to rely on new funding or financing. Investments that have strong political support are preferred to those that are controversial or lack political backing.

Local, Regional, and State Plans and Policies

All potential investments must be consistent with local, regional, and state plans and policies. These criteria consider the land use and transportation planning context and the optimal function of the roadway for all users.

East Forest Grove Safety Improvement Plan

Evaluation and Prioritization Criteria

The project team, in coordination with the Technical Advisory Committee (TAC), developed criteria for ODOT and the City of Forest Grove to use to evaluate and prioritize potential improvement actions. Criteria include both quantitative and qualitative measures. The criteria are organized under six categories, organized by project goals and other key themes.

- 1** **Goal 1:** Increase active transportation mode share by improving safety for all users, especially the most vulnerable
- 2** **Goal 2:** Improve transit mode share by improving access to transit
- 3** **Goal 3:** Promote equitable outcomes
- 4** **Goal 4:** Promote economic development and placemaking
- 5** Funding and political feasibility
- 6** Implement local, regional, and state policies

1 Goal 1: Increase active transportation mode share by improving safety for all users, especially the most vulnerable

1.1 Improve safety for all users

- Solution reduces the risk of crashes at locations with a history of fatal crashes, severe injury crashes, or other crashes involving people walking, rolling, biking, or using transit
- Solution reduces the risk of crashes at other locations where the community reports crashes or near misses involving people walking, rolling, biking, or taking transit
- Solution reduces conflict points between motorized vehicles and people walking, rolling, biking, or using transit
- Solution reduces motorized vehicle travel speeds
- Solution increases visibility for people walking, rolling, biking, and using transit, and increases visibility of non-motorists

1.2 Improve comfort, connectivity, and accessibility for people walking/rolling

- Solution increases availability of protected or enhanced ADA-compliant crossings every 530 feet or less
- Solution reduces distances to cross the streetSolution completes the network of ADA-accessible walkways within the project area
- Solution increases width of buffered separation/protection from motorized vehicles for people walking/rolling
- Solution provides streetscape amenities for people walking/rolling, including benches, trash receptacles, signs, landscaping
- Solution improves walking/rolling access to destinations within the project area
- Solution supports walking and bicycling as the most convenient choice for trips less than 3 miles

1.3 Improve comfort, connectivity, and accessibility for people biking

- Solution increases separation/protection for people biking
- Solution clarifies mixing zones for people biking and people driving, particularly at and through intersections
- Solution helps complete the network of bikeways on the corridor
- Solution provides streetscape amenities for people biking
- Solution improves biking access to destinations in the corridor

2 Goal 2: Increase transit mode share by improving access to transit

2.1 Improve safe access to transit stops

- Solution provides ADA accessible walking access to transit stops
- Solution provides bike connections and access to transit stops
- Solution reduces distance or increase ease of access between transit stops and key destinations in the project area
- Solution reduces conflict points between vehicles, buses, people walking/rolling, and people biking at transit stops

2.2 Improve security and comfort at transit stops

- Solution provides secure bike parking at or near transit stops
- Solution provides pedestrian-scale lighting at transit stops
- Solution provides amenities or streetscape improvements at transit stops
- Solution increases separation/protection from motor vehicles for people waiting at transit stops

2.3 Improve transit service

- Solution improves transit reliability and/or travel time
- Solution improves connection between transportation services (for example, TriMet, Ride Connection, school bus, car share, bike and scooter share)

3 Goal 3: Promote equitable outcomes

3.1 Improve safety of transportation options for historically underserved communities

- Solution incorporates improvements to walking, rolling, biking, or transit that communities have requested
- Solution increases safe access to transportation options for people of all ages and abilities
- Solution provides information about transportation or wayfinding in English and Spanish

3.2 Improve access to corridor places that matter to historically underserved communities

- Solution increases access to/from residential areas
- Solution increases access to/from destinations within or near the project area

3.3 Reduce negative environmental impacts on historically underserved communities

- Solution reduces negative impacts to air quality, water quality, runoff, and noise pollution from motor vehicles and other elements of the transportation system

4 Goal 4: Promote economic development and placemaking

4.1 Create a sense of place and community in the corridor

- Solution establishes a welcoming corridor as a gateway experience for people visiting or traveling through Forest Grove
- Solution increases opportunity for interactions among people that encourage them to visit and stay
- Solution reinforces visual elements that establish a unique identifying character for the area reflective of Forest Grove's communities and local context

4.2 Increase safe and comfortable access to destinations in the corridor

- Solution reduces the negative impacts of car parking on people walking, rolling, biking, and taking transit, including obstructed sightlines, car door conflicts in the bike lane, and blocked bus stops
- Solution reduces potential conflicts at driveways and private roads for all travelers
- Solution clarifies locations where motor vehicle deliveries and pick-ups/drop-offs can safely occur

5 Verify feasibility

5.1 Verify public funding feasibility

- One or more existing and eligible public funding sources could support implementation
- Solution could likely be implemented through available public funding

5.2 Leverage public private partnerships

- Solution could be constructed as a condition of development/redevelopment
- Solution has the support of adjacent businesses or private property owners
- Other private funding is or could be made available

5.3 Verify support

- Solution has political champion(s) for prioritization and implementation
- Solution has support or concurrence from all jurisdictions and public agencies involved

6 Implement local, regional, and state plans and policies

6.1 Further local, regional, and state transportation goals and objectives

- Solution implements a project identified in the local or regional transportation system plans
- Solution advances context sensitive design and ODOT's Urban Design Initiative

6.2 Support roadway function

- Solution is consistent with established street classifications
- Solution does not degrade roadway capacity
- Solution improves throughput of people

6.3 Reduce the transportation system's contribution to the climate crisis

- Solution reduces greenhouse gas emissions to meet or exceed state and regional goals



EAST FOREST GROVE SAFETY IMPROVEMENT PLAN

TECHNICAL MEMORANDUM #3

DATE: November 15, 2019
 TO: Project Team
 FROM: Brian Chandler, Kamilah Buker, Reah Flisakowski | DKS
 SUBJECT: Revised Forest Grove OR-8 Improvement Plan: Safety Audit and Evaluation

P#19122-000

This memorandum provides the findings of the transportation safety evaluation conducted within Forest Grove along Oregon Route 8 (OR-8) from S 1st Avenue to Oregon Route 47 (OR-47).

INTRODUCTION

OR-8 is an east-west arterial that connects the west side of Portland to several communities to its west, including Beaverton, Hillsboro, Cornelius, Forest Grove, and unincorporated Washington County areas.

OR-8 within the study area has a posted speed of 40 mph and a cross-sectional width of approximately 84 ft (curb to curb) with two through lanes in each direction and a two-way left-turn lane in the middle. At the couplet the cross-section of each section is approximately 40 ft. Each lane is 12 feet wide within the study intersection. Designated crossings exist at the intersection of OR-8 and OR-47, and the intersection of OR-8 and Mountain View Lane, but there are no marked pedestrian crossings between these two intersections – a distance of more than 2,000 ft.

The study corridor includes public transportation via GroveLink, which connects to TriMet's line 57 and Ride Connection's WestLink. The GroveLink bus serves a greater part of the city to help link residents with downtown locales and adjacent transportation services. There are nine transit stops on the corridor, each of which generates pedestrian traffic on OR-8.

Bicycle lanes are marked along OR-8 in the study area, but the lane widths vary. During the 6-year study period, six bicycle-involved crashes occurred.

This safety study focuses on the segment of OR-8 within Forest Grove from S 1st Avenue to OR-47. On the east end of the study, OR-8 splits into two one-way couplets – W Baseline Street for eastbound traffic and Adair Avenue for westbound traffic. Between Mountain View Lane and OR-47, OR-8 is named Pacific Avenue and Tualatin Valley (TV) Highway.

Oregon DOT and the City of Forest Grove have identified potential safety concerns along this corridor and at intersections, especially related to pedestrians and bicyclists. The study team analyzed safety-related data and conducted a field visit to assess current safety conditions. Figure 1 shows the safety study extents.

SUMMARY OF FINDINGS

Key findings from the safety analysis of the study include the following:

- Between 2012 and 2017, along the OR-8 corridor, 244 crashes were reported. One crash resulted in a fatality, and seven included serious injuries.
- Observed crashes in the study area were higher than would be expected on a similar facility (per Highway Safety Manual methodology) and higher than the statewide average.
- More than 73% of collisions (180 of 244) occurred at intersections.
- Crash types vary, but the majority were rear-end, turning movement, or angle crashes.
- One fatal crash occurred along OR-8 between Mountain View Lane and OR-47. The fatality involved a pedestrian.
- There were five pedestrian crashes and six bicycle crashes within the study area.
- All four of the study intersections were flagged as safety focus locations and were found to be top 10% SPIS sites.
- Bicycle facilities are narrower than 6 ft from Yew St to OR-47.
- Portions of the study corridor do not include sidewalks, and some other portions have sidewalks that do not meet the current standard (6-12 ft wide with a 6 ft buffer between the street and sidewalk).

East Forest Grove Safety Improvement Plan

PLANNING A SAFER COMMERCIAL CORRIDOR FOR FOREST GROVE



Figure 1. OR-8 Forest Grove safety study area

FIELD SAFETY ASSESSMENT

A field visit was conducted at the study area.¹ Facilities for all modes of travel were evaluated to determine the potential safety opportunities.

Sight Distance Limitations

Sight Distance is defined as the distance a motorist can see an approaching vehicle, typically from a perpendicular leg of an intersection or driveway. Motorists see each other across the sight distance triangle, a shape created by placing a point at the driver's eye, the object that driver is attempting to see (in this case, an approaching vehicle from the right or left), and the potential point of conflict if both vehicles were to arrive at the intersection at the same time. Several items can obstruct the view of one or more drivers, including utility equipment, signs (traffic or private), buildings, parked cars, or vegetation.

Along OR-8 in the study area, the study team identified two locations where sight distance could be obscured by on-premise signing.

- Southbound motorists at 2nd St (just west of the Best Western) entrance of the Rose Grove Mobile Home Community have limited sight distance looking to their left (east) due to vegetation and the Rose Grove on-premise sign (see Figure 2).
- Northbound drivers at Yew St and the westbound one-way couplet (the north side) of OR-8 have limited sight distance due to vegetation and an on-premise, on-wheels Forest Grove Auto Detail sign. This issue is exacerbated due to the horizontal curve for OR-8 motorists approaching the intersection (see Figure 3)..

Solutions to sight distance obstructions may include removing the obstructions from the sight distance triangle to provide drivers the ability to make a better decision about entering the roadway.



Figure 2. OR-8/2nd St intersection



Figure 3. OR-8/Yew St intersection (northbound approach)

¹ A field visit to the study area was conducted on Thursday, September 26th, 2019, from 9:00am to 12:00pm.

Access Management

Access Management is generally defined as the management of vehicular access points to property adjacent to public roadways. Access Management includes several techniques to promote safe and efficient use of the roadway network like access spacing, turning lanes, median treatments, and right-of-way management.

OR-8 in the study area includes a high number of access points, some of which are quite wide. Wide driveways can lead to conflicts between vehicles and crossing pedestrians and bicyclists, and in some cases lead to confusion between vehicles as well.² Along the segment portion of OR-8 between the intersection of OR-47 and Mountain View Lane, there are about six accesses with an average spacing of 364 feet in the eastbound direction and approximately 13 accesses with an average spacing of 160 feet in the westbound direction.

Pedestrian Facilities

At both signalized intersections, marked crosswalks exist and designated pedestrian crossings are provided within the signal timing. However, at the intersection of OR-8 and OR-47, each movement includes a channelized right turn lane for motor vehicles. These vehicles do not stop at the signal, they yield based on conflicting travel. Therefore, pedestrians must cross these lanes to reach the designated crossing area by waiting for the appropriate gap in traffic flow. Figure 4 shows an example of this.



Figure 4. Channelized right turn and pedestrian crossings at OR-8/OR-47

At the intersections of OR-8 and Yew Street (in both directions), marked crosswalks do not exist. However, at the northern intersection, curb ramps do exist allowing pedestrians to cross during the appropriate gaps in traffic.

Sidewalks were found to be in good condition with no major gaps along OR-8 between OR-47 and Mountain View Lane. From Mountain View Lane to Yew Street (motor vehicles traveling in the eastbound direction) sidewalks do exist on the south side of the road, but not the north. From Yew Street to 1st Street, sidewalks exist on the north side of the roadway. However, there is no direct pedestrian path on the south side, nor a

² Only 2016 and 2017 data included a code to identify driveway-related crashes. During these 2 years, 11 of the 92 reported crashes were identified as occurring at a Driveway or Alley.

marked crosswalk for pedestrian to cross to the sidewalk. The sidewalk converts to a separate pedestrian path approximately 30 feet south of OR-8 at this location, then meets back up to the roadway near 1st Street. Figure 5 shows an example of the sidewalk conditions along OR-8 (left), and Figure 6 shows the route from Yew Street to 1st Street along OR-8.



Figure 5. Sidewalk conditions, 700 ft west of the OR-8/Mountain View Ln intersection



Figure 6. Pedestrian path between Yew St to 1st St along the south side of OR-8

One exception to the sidewalk conditions is along the north side of the road in front of the ReStore property (just east of the OR-8 / C-and-D-Row entrance). At this location, as illustrated in Figure 7, pedestrians in wheelchairs and bicyclists traveling westbound on the sidewalk are forced to enter the roadway to navigate this section.



Figure 7. Gap in sidewalk facilities along north side of OR-8 at ReStore, 880 ft east of the OR-47 intersection

Some segments of OR-8 in the study area include very wide driveways that can cause conflicts when pedestrians and bicyclists are crossing the driveway while a motor vehicle driver enters or exits the property. Furthermore, some portions of the sidewalks are obstructed by objects such as sign poles, utility poles, fire hydrants, etc. Figure 8 shows an example of a sidewalk obstacle.



Figure 8. Sidewalk obstructions, OR-8 north couplet, 600 ft east of Mountain View Ln intersection

From Mountain View Lane to Yew Street (motor vehicles traveling in the westbound direction) sidewalks do not exist on either side of the road (Figure 9). A similar condition of no sidewalk exists near the automobile detail shop; pedestrians use the business's driveway to walk to a dirt path along the fence (see Figure 10).



Figure 9. Sidewalk conditions along Westbound OR-8 at Yew St



Figure 10. Unofficial Path used by Pedestrians, OR-8 north couplet, 200 ft east of Yew St

Within the study area, there are only two marked pedestrian crossing areas: intersection of OR-8 / OR-47, and the intersection of OR-8 / Mountain View Lane. The study team observed several people crossing OR-8 near Yew Street heading to and from the transit stops on both sides of the road (see Figure 11). The study area includes the following unmarked-but-legal crossings at Yew St and S 1st Ave. There are no legal crossings between the OR-47 intersection and the Mountain View Lane intersection.



Figure 11. Pedestrians crossing OR-8 near transit stops at Yew St

At some locations the crosswalk pavement markings may require maintenance. For example, the northbound right turn at OR-8 / OR-47 crosswalk marking has been worn down (see Figure 12).



Figure 12. Pavement marking at OR-8/OR-47 intersection

ADA compliant ramps exist at all the designated crossings and at OR-8 and Yew Street (westbound). However, most major driveways, and accesses between OR-8 and OR-47 do not provide ADA compliant ramps. Furthermore, the intersection of OR-8 and Yew Street (eastbound) also does not include ADA compliant ramps. Consideration for ADA compliance should be made in the future.

Bicycle Facilities

Along OR-8, there are continuous bike lanes throughout the entire study area on both sides of the roadway. The width of the bike lanes varies along the corridor from about 5 to 8 ft. The standard bike lane width in Forest Grove is six feet. There are bike lanes along OR-47 in both directions north of OR-8. However, south of the intersection of OR-8 / OR-47, there are no designated bike lanes on OR-47.

Figures 13 and 14 show examples of the bicycle facilities along OR-8, including pavement edge drop-off concerns for westbound OR-8 east of Mountain View Lane.



Figure 13. Bicycle lane approaching OR-8/OR-47 intersection



Figure 14. Bicycle lane and pavement edge drop-off, OR-8 approaching Mountain View Ln.

Storm drains within the bicycle lane on OR-8 are covered with grates that may catch bicycle tires (see Figure 15). In this figure the inlet has sunken below the level of the pavement. In this case, the Oregon Highway Design Manual, Appendix L, provides guidance for addressing drainage grate issues related to bicyclist needs.³

³ Appendix L, Bicycle and Pedestrian Design Guide, https://www.oregon.gov/ODOT/Engineering/Documents/RoadwayEng/HDM_L-Bike-Ped-Guide.pdf



Figure 15. Drainage grate within OR-8 Bicycle Lane, 670 ft west of Mountain View Ln

Pedestrian and Bicycle Safety Risk Analyses: Facility Inventory

To better understand bicycle and pedestrian travel needs on existing ODOT highway systems, the region developed the Active Transportation Needs Inventory.⁴ Figure 16 shows the bicycle facility data results, and Figure 17 illustrates the pedestrian facility data results. As can be seen in the figures below, portions of OR-8 within the study area were found to have substandard sidewalks (compared to the standard 6 to 12-foot width and 6-foot buffer) or no sidewalk at all.

⁴ <https://www.oregon.gov/odot/projects/pages/project-details.aspx?project=ATNI>

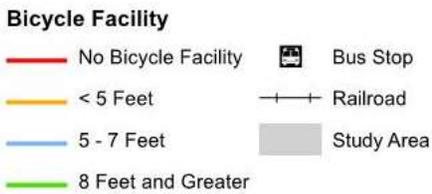
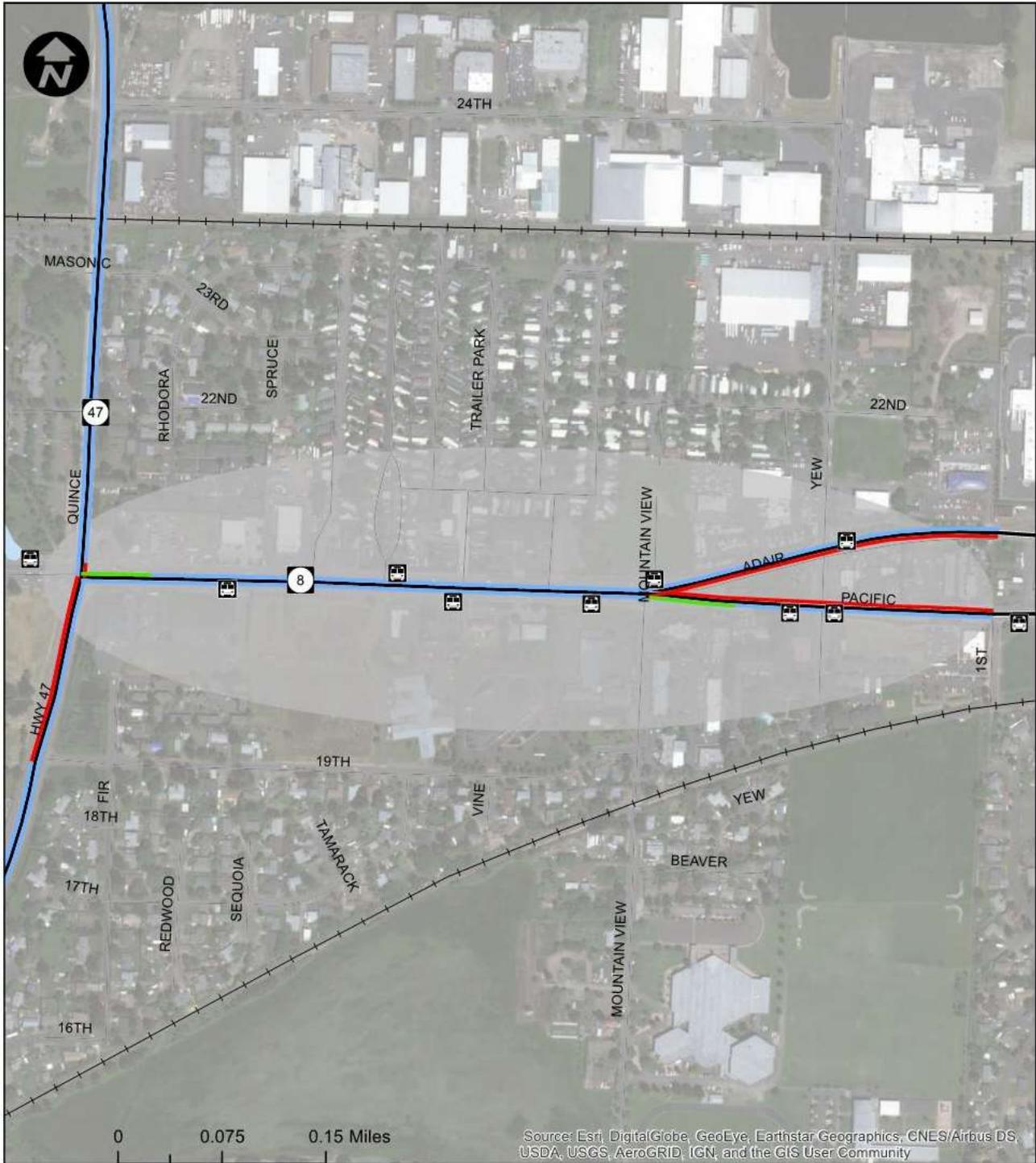
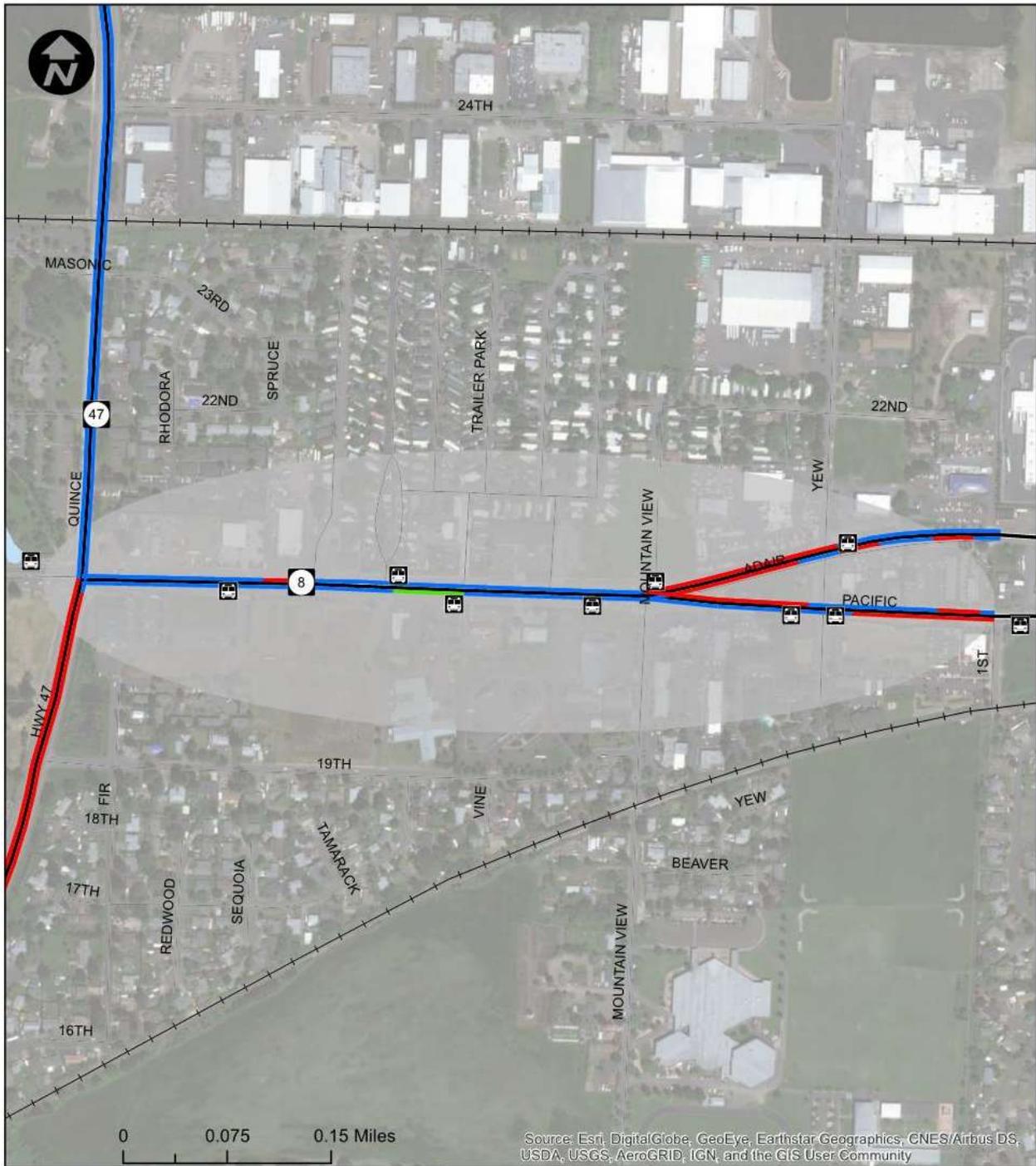


Figure 16. Bicycle facilities, OR-8, Forest Grove



Sidewalk Facilities

- No Sidewalk
- < 5 Feet
- 5 - 7 Feet
- 8 Feet and Greater
- Bus Stop
- Railroad
- Study Area

Figure 17. Pedestrian facilities, OR-8, Forest Grove

SAFETY ANALYSIS

The project team conducted a comprehensive safety analysis of the OR-8 study corridor using crash data from 2012 to 2017 obtained from ODOT’s Crash Analysis and Reporting Unit. The following sections summarize the key findings related to crash trends and identification of high-crash locations (referenced below as safety focus areas). The crash trends are discussed in terms of crash frequency, crash type, crash location, and crash severity.

Table 1 provides a summary of performance measures used for the safety analysis.

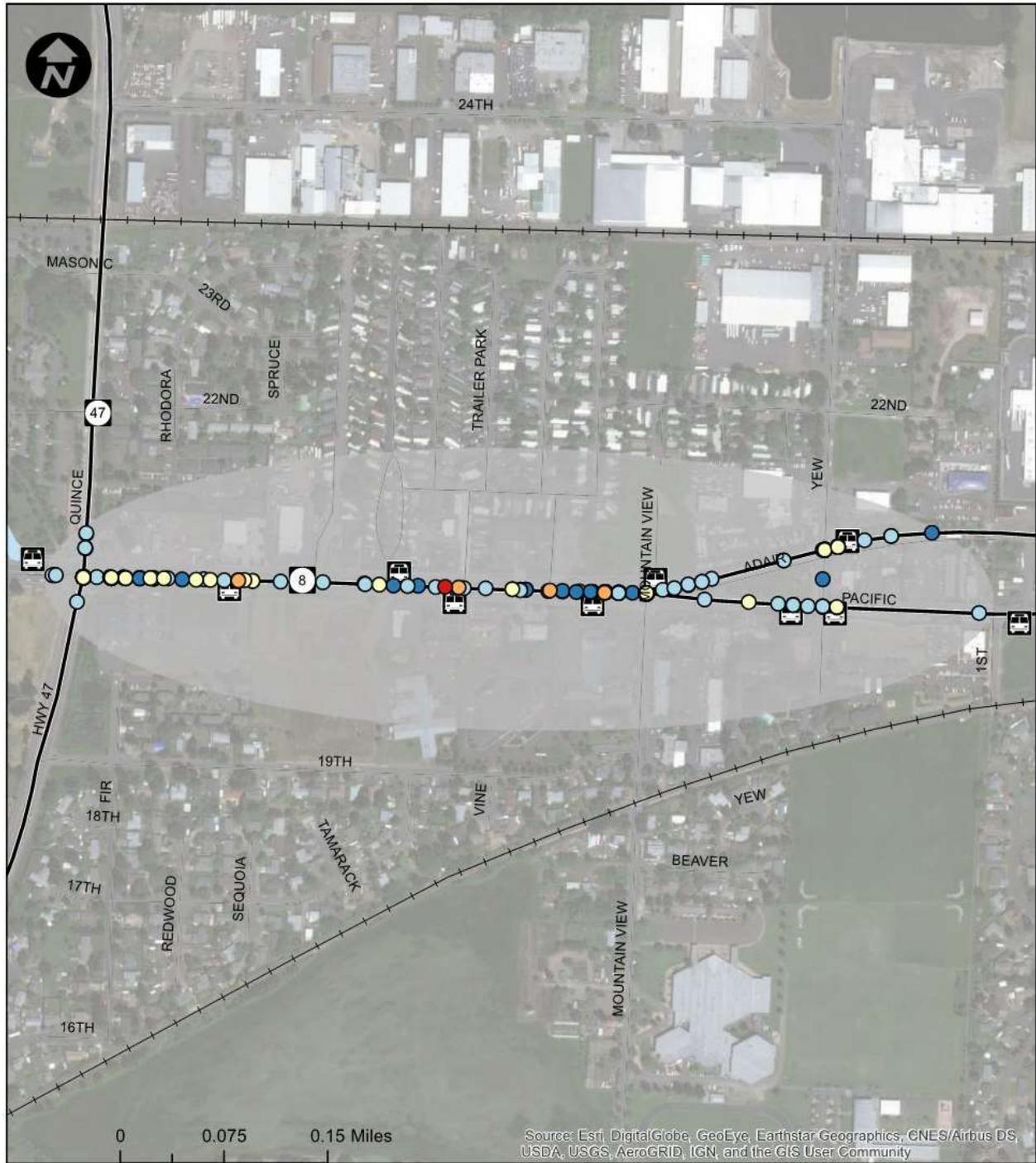
Table 1: Safety analysis performance measures

Performance Measures	Used in this study?
Intersection Crash Rate Analysis	
Observed crash rate (MEV)	Yes
Critical crash rate (MEV)	Yes
Statewide mean crash rate (MEV)	Yes
90th percentile crash rate (MEV)	Yes
Excess proportion of specific crash types	No ⁵
Highway Segment Crash Rate Analysis	
Observed crash rate (MVM)	Yes
Statewide average crash rate (MVM)	Yes
Safety Priority Index System (SPIS)	
Ratings among top 10%	Yes
Predictive Crash Analysis	
Expected crash frequency (intersections)	Yes
Expected crash frequency (segments)	Yes

Crash Trends

Over the 6-year period analyzed (2012-2017), 244 crashes occurred within the study area along OR-8 (Pacific Avenue/Tualatin Valley Highway) between OR-47 and S 1st Avenue. Of these, 180 occurred at intersections and the remaining 64 crashes occurred on segments. Crashes in the study corridor are mapped in Figure 18. Breakdowns of crash types and severities are provided in Figures 19 and 20. A series of “zoomed in” crash maps are available in Appendix A.

⁵ For this study, there are not five intersections with the same reference population within the study area; therefore, there are no flagged intersections for excess proportions analysis.



- Crash Severity**
- Fatal
 - Serious
 - Moderate
 - Minor
 - Property Damage Only
- Bus Stop
 - Railroad
 - Study Area

Figure 18. Study corridor crashes, OR-8, 2012-2017

More than half of the crashes were rear-end types, followed by turning and angle crashes as the next most common (see Figure 19). Of the rear-end collisions, all were identified as the driver failing to avoid the vehicle ahead (following too closely). More than half of the turning movement crashes involved drivers failing to yield the right-of-way, while about a quarter of the turning crashes were caused by drivers performing improper turns. Most angle crashes involved drivers failing to yield the right-of-way. However, a few angle crashes involved a driver passing a stop sign or red flasher.

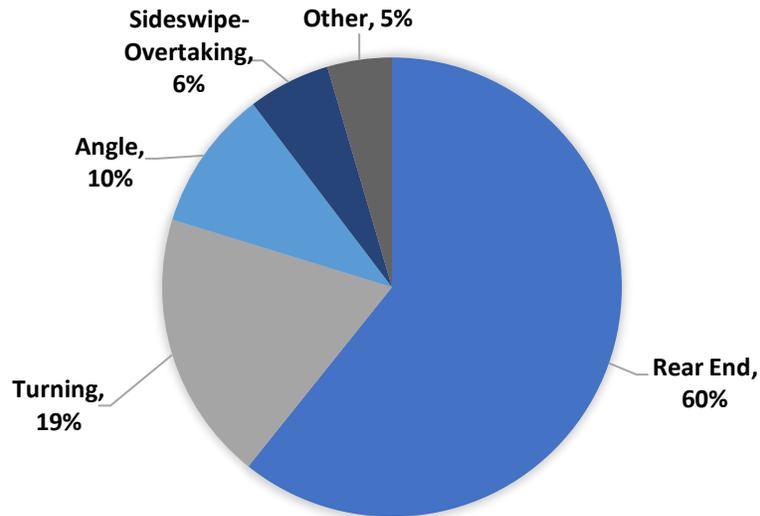


Figure 19. OR-8 crash types (2012-2017)

As shown in Figure 20, most crashes resulted in only property damage or minor injuries. Seven resulted in a serious injury. Property damage only (PDO) crashes are typically self-reported in Oregon (i.e., law enforcement officers to not respond to complete a collision report); therefore, the study team assumes the number of unreported PDO crashes is relatively high.

One crash resulted in a fatality. It occurred along the segment portions of OR-8 near 2nd Street . The fatality involved a pedestrian in a wheelchair who was identified as “illegally in the roadway”. The crash occurred at dawn on a rainy day. The pedestrian was attempting to cross the street at a location where the nearest protected crossing was at least 600 feet away. Furthermore, no ADA compliant curb ramps exist along that portion of the corridor.

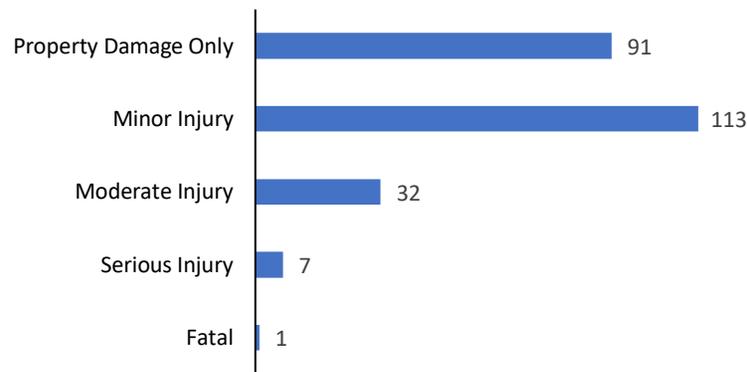


Figure 20. OR-8 crash severities

Bicycle- and Pedestrian-Involved Crashes

Bicycle- and pedestrian-involved crashes along the corridor are shown in Figure 21. There were five crashes involving people on bicycles and six crashes involving pedestrians. Bicycle-involved crashes included three moderate injuries at the OR-8 and OR-47 intersection, one at the OR-8 and Mountain View Lane intersection, and one on the segment portion between the two intersections. Furthermore, two minor injury bicycle crashes occurred near the intersection of OR-8 and Mountain View Lane. Almost all reported bicycle crashes during the study period occurred during the daytime with either clear or cloudy weather. One bicycle crash occurred on a rainy day. Four of the five bicyclist-involved crashes were caused by the driver failing to yield the right-of-way while one was caused by the bicyclist disregarding the traffic control device, striking the vehicle, and falling from their bicycle.

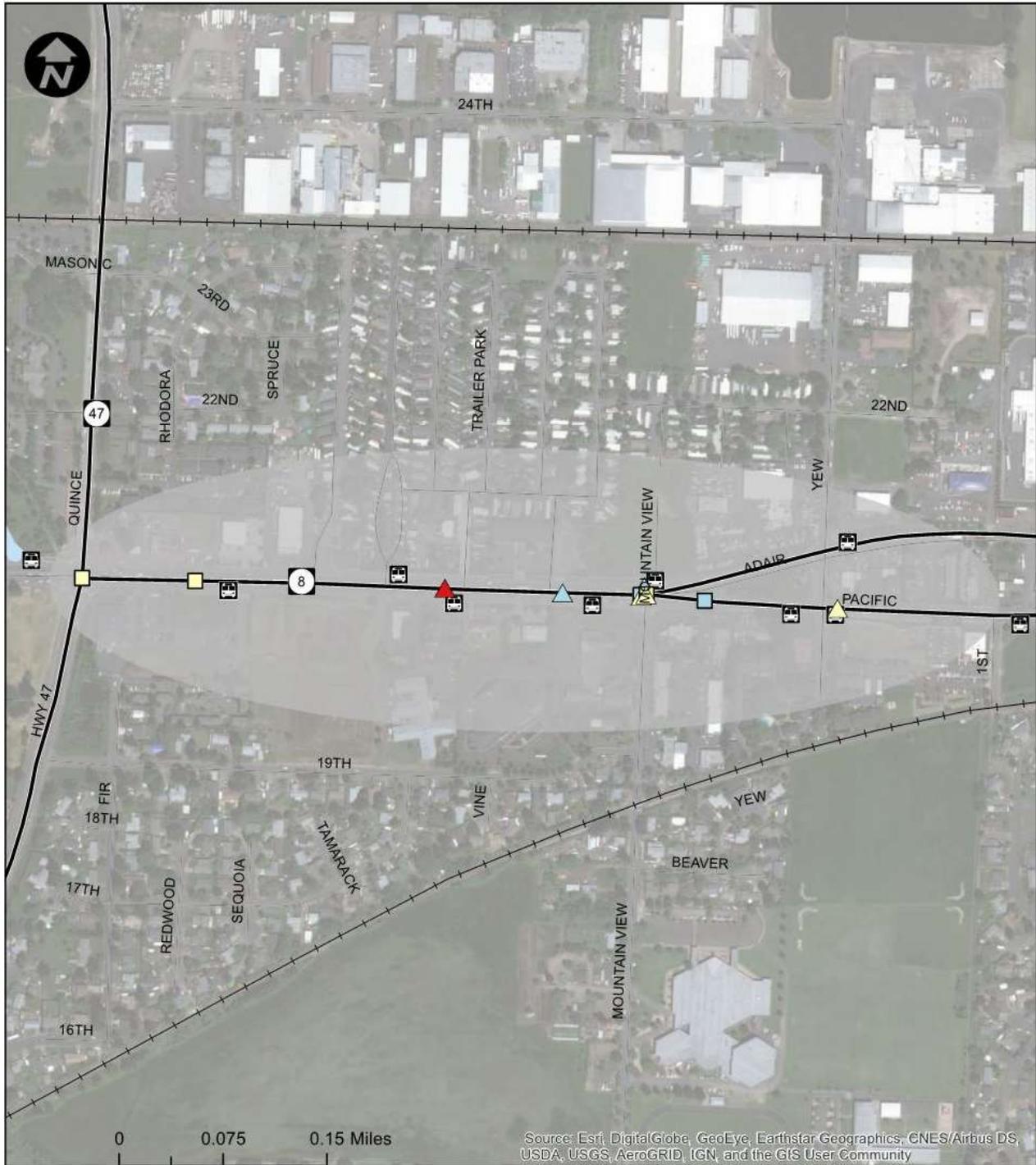
The six reported pedestrian-involved crashes included one fatality (discussed previously), three moderate injuries and two minor injuries at or near the intersection of Mountain View Lane / OR-8. One of the moderate injury crashes occurred at OR-8 / Yew Street (eastbound). All pedestrian crashes occurred on rainy days at dawn or during the daytime. Four of the pedestrian-involved crashes were caused by the driver failing to yield the right-of-way, while the remaining two were caused by the pedestrian illegally in the roadway.

Dark Crashes

Of the 244 crashes identified as part of this study, 57 occurred at dusk, dawn, or dark conditions (including dark with streetlights and dark with no streetlights). Of these dark crashes, 33 resulted in a person or persons being injured or killed. Nearly half (47%) occurred between 5pm and 7pm. More than 40% occurred in wet pavement conditions.

OR-8 includes standard roadway illumination at intersections and along the roadway, but the route does not appear to include pedestrian-scale illumination. Figure 22 shows the location of dusk/dawn/dark crashes in the study area and the current location of roadway lighting.

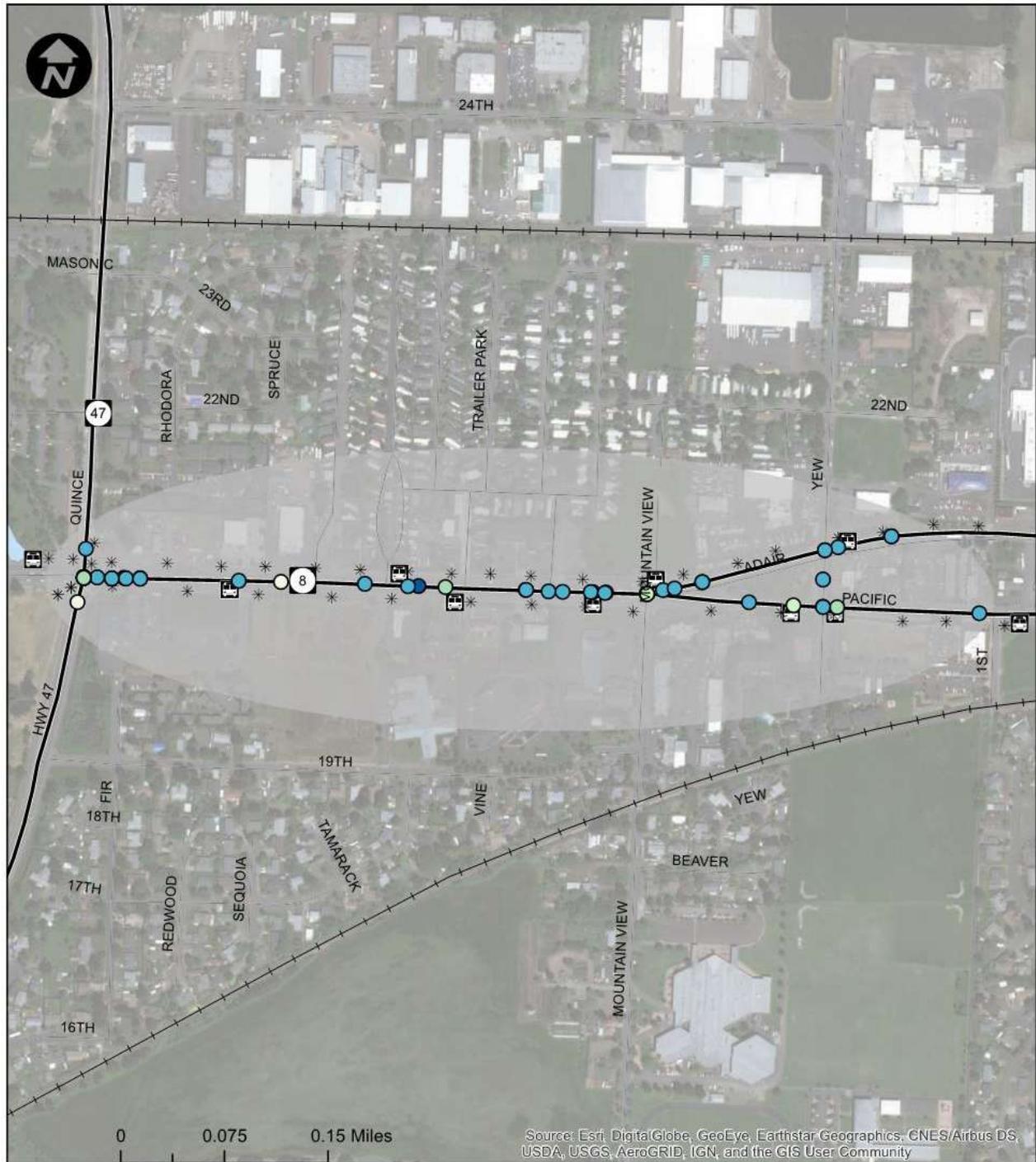
OR-47/OR-8 Intersection Lighting. At the signalized intersection of OR-47 and OR-8, intersection lighting was upgraded in 2017. However, this lighting design focused primarily on illumination for motor vehicle users of the facility, not for crossing pedestrians and bicyclists. Lighting focused on the middle of the intersection creates dark spots in other areas, including the southwest and southeast crosswalks where pedestrian and bicyclists may cross the right turn lanes. This introduces potential conflicts between vehicles and pedestrians and bicyclists, though no reported crashes were identified at these locations in dark conditions during the study period.



Pedestrian and Bicycle Crash Severity

- ▲ Pedestrian Crash - Fatal
- ▲ Pedestrian Crash - Moderate
- ▲ Pedestrian Crash - Minor
- Bicycle Crash - Moderate
- Bicycle Crash - Minor
- ⊠ Bus Stop
- +— Railroad
- Study Area

Figure 21. OR-8 study corridor crashes involving pedestrians and bicyclists



Lighting Condition Crashes

- Darkness - with no street lights
- Darkness - with street lights
- Dawn
- Dusk
- * Street Lights
- Bus Stops
- +— Railroad
- Study Area

Figure 22. Crashes in dark, dusk, and dawn conditions. Location of street lights.

Crash Rate Analysis

Crash rate analysis was completed for each study intersection and segment along OR-8, with the results compared to rates observed for similar facilities to identify where the frequency of crashes occurring may be higher than should be expected. Intersections and segments were flagged as safety focus locations if observed crash rates surpassed the accepted rates described below.

Intersection Crash Rate Analysis

The observed crash rate for intersections is a function of the number of crashes and the annual average daily traffic (AADT). Each intersection is grouped into a reference population based on intersection control. The crash rates (crashes per million entering vehicles) for each intersection were compared to two different standards:

1. A critical crash rate, which compares performance to other similar intersections being studied in the project area, and
2. A 90th percentile crash rate, which is based on similar intersections throughout the state (obtained from ODOT's Analysis Procedures Manual Exhibit 4-1).

Table 2 shows the crash rates for each study intersection where crashes were recorded. Intersections that have observed crash rates greater than either the critical or 90th percentile crash rate were flagged as safety focus areas for further consideration. Full calculations are provided in the appendix.

Table 2: Intersection crash rates on OR-8* (2012-2017)

Int. No.	Intersection Name	Safety Focus Area	Observed Crash Rate	Oregon Critical Crash Rate	Oregon 90 th Percentile Crash Rate
1	OR-8 / OR-47	Yes	0.881	0.599	0.860
2	OR-8 / Mountain View Ln	Yes	0.685	0.389	0.509
3	OR-8 / Yew St (WB)	Yes	1.074	0.331	0.408
4	OR-8 / Yew St (EB)	Yes	0.342	0.336	0.408

*Crash rates are crashes per million vehicles entering the intersection.

All four major intersections along the corridor were flagged as safety focus areas. The intersections of OR-8 / Yew Street (in both directions) are one-way intersections. Oregon critical crash rates used to compare the Yew St intersections – which are assuming two-way travel on the major street – are skewed higher than a similar one-way street intersection would indicate.

Excess Proportion of Specific Crash Types Analysis

The excess proportion of specific crash types analysis looks at the proportion of crash types (e.g., rear-end, backing, angle, etc.) for each intersection and compares it with the average for the reference population to determine if certain types of crashes are more prevalent than should be expected. According to the ODOT Analysis Procedures Manual, a reference population must contain at least five intersections to be valid. Furthermore, at least two crashes of the same type are necessary to calculate the excess proportion for that intersection.⁶ Crash types with an excess proportion greater than 0.1 could then be flagged further analysis.

⁶ ODOT Analysis Procedures Manual Version 2

For this study, there are not five intersections with the same reference population within the study area; therefore, there are no flagged intersections for this analysis.

Segment Crash Rate Analysis

In addition to individual intersections, crash rates for segments of OR-8 were analyzed to identify potential problem areas of the corridor. The 2017 ODOT State Highway Crash Book provided pre-defined highway segments and crash rates from Mountain View Lane to OR-47 and the east City Limits to Mountain View Lane. Crash rates experienced for each of the last reported five years (between 2013-2017) were compared against the statewide average crash rate for similar facilities using Crash Rate Table II in the Crash Book.

This analysis led to the flagging of two segments as safety focus areas for further investigation and potential mitigation through alternatives considered (see Table 3). This included the segment of OR-8 from Mountain View Lane to OR-47 and the segment of OR-8 from the east City Limit to Mountain View Lane (westbound direction).

Table 3: Segment crash rates*

Start Milepoint	End Milepoint	Segment Name	Safety Focus Area	Area Type	Observed Crash Rate	Statewide Average Crash Rate
17.22	17.48	City Limits to Mountain View Ln (WB)	Yes	Urban City	6.70	3.00
17.22	17.48	City Limits to Mountain View Ln (EB)	No	Urban City	2.62	3.00
17.48	17.88	Mountain View Ln to OR-47	Yes	Urban City	3.65	3.00

*Crash rates are crashes per million vehicle-miles traveled.

A region-wide safety assessment was recently completed for the ODOT All Roads Transportation Safety (ARTS) Program,⁷ which identified regional safety needs (hot spots and systemic) for further safety focus. The OR-8 study area did not rank among the top safety concerns in Region 1 due to observed safety needs (i.e., frequency and severity of crashes) in other communities in the region.

Safety Priority Index System

The Safety Priority Index System (SPIS) provides another method for identifying potential safety problems and crash patterns on state highways. The SPIS is a scoring system developed by ODOT that considers crash rates, severities, and frequencies over the most recent 3 years. The highest rated sites are considered for potential safety improvements.

The 2017 SPIS ratings for OR-8 were obtained from ODOT to screen for locations with SPIS ratings among the state's top 10%. Four intersections in the study area -- OR-8 / OR-47, OR-8 / Mountain View Lane, and both OR-8 / Yew Street intersections -- were found to be rated among the state's top 10% SPIS sites and have been flagged as safety focus areas. No segments within the study corridor were rated among the State's top 10%.

⁷ ODOT All Roads Transportation Safety (ARTS) Program – Hot Spot Report, Prepared by DKS Associates, May 2015.

Highway Safety Manual Predictive Method

The Highway Safety Manual (HSM), published in 2010, is the first national resource that provides quantitative information and methods to evaluate the safety performance of roadways. The predictive method, Part C within the HSM, estimates the expected crash frequency (for existing conditions) and the net change in expected crash frequency (for alternatives evaluation) on a facility, segment, or at an intersection using a combination of site characteristics and historical crash data. The expected crash frequency is calculated using a Safety Performance Function (SPF), which is a regression equation developed for a specific type of facility using a national database of information. Each SPF was then adjusted to account for specific site characteristics using Crash Modification Factors (CMFs).⁸ For alternatives where ODOT-approved countermeasures were not available, a CMF from the HSM Part D or from the CMF Clearinghouse was used.^{9,10} The SPF also includes a calibration factor based on regional conditions in Oregon.

The Oregon HSM Spreadsheet for Urban and Suburban arterials, provided by ODOT, was used to conduct all the HSM analyses and countermeasure investigations. The output of the Oregon HSM Spreadsheets was the expected number of crashes per year for the entire study site, including sub-segments and intersections. The expected number of crashes for each study site was used to evaluate the relative safety performance of the site.

Local Calibration Factors

The SPFs and CMFs used in the HSM were derived from a national database of roadways and intersections. As such, the equations need to be calibrated to local conditions to account for differences in driver behavior, weather, and crash reporting thresholds, among other factors. Previous research efforts have developed a set of recommended calibration factors for the State of Oregon, which are outlined the APM. For Urban and Suburban Arterials intersections, the calibration factors are 0.35, 0.45, 0.73, and 1.05, for 3-leg minor stop, 4-leg minor stop, 3-leg signalized, and 4-leg signalized intersections, respectively. For Urban and Suburban Arterial segments, the calibration factors are 0.64, 0.63, and 0.64, for 4-lane divided, 4-lane undivided, and 5-lane with two-way-left-turn-lane (TWLTL).

Limitations and Assumptions

The research used to develop CMFs/CRFs varies greatly in terms of data quality and analytical procedures. Countermeasures will refer to the CRFs in the All Roads Transportation Study (ARTS) CRF list and appendix as a first source.¹¹ If a desired countermeasure is not found, then a CMF may be selected from the FHWA CMF Clearinghouse if it has a rating of at least three stars and is based on assumptions that are consistent with the project area. A star-rating is applied to each CMF that indicates the quality of the study that produced the CMF, where five stars indicates the highest or most reliable rating. The CMFs that are integrated into the HSM Smart Spreadsheets all have star ratings of three or higher. To maintain consistency, only CMFs with three or more stars will be selected for countermeasures investigated in this analysis that are not included in the Smart Spreadsheets. All CMFs are limited to a certain range of values depending on the dataset that was used to develop them.

⁸ Though CMFs are typically referred to during treatment selection, the same values are also used to ensure existing conditions are used correctly. For example, a standard SPF will assume 12 ft travel lanes; for segments with other lane widths, the calculation must be modified using a CMF for existing conditions with other lane widths. CMFs provide the values needed for this modification.

⁹ Analysis Procedures Manual Version 2

¹⁰ <http://www.cmfclearinghouse.org/>

¹¹ <http://www.oregon.gov/ODOT/Engineering/Pages/ARTS.aspx>

Analysis Results

The following sections summarize the HSM predictive analysis results for the study area. A comparison of the observed average number of crashes per year (2012-2017) with the expected number of crashes per year (using the HSM analysis methods under existing conditions) gives a sense of relative safety performance of the study site. Another measure of safety performance is the Excess Expected Crash Frequency, which is the difference between the predicted crash frequency (derived from an SPF) and the expected crash frequency (weighted with observed crash history using the EB method).¹² Table 4 summarizes the historical, predicted, and expected crash frequency for each site by crash severity (fatal and injury, property damage only, and total crashes). The current addition of the HSM does not include methodology for one-way arterials. Therefore, this analysis could not be performed for the segments included in the couplet.

Table 4: Summary of observed, predicted, and expected crash frequencies on OR-8

Study Site	Observed Crashes per Year (2012-2017)			Predicted Crashes per Year ¹³			Expected Crashes per Year ¹⁴			Excess Expected Crash Frequency (Total)
	Fatal and Injury	Property Damage Only	Total	Fatal and Injury	Property Damage Only	Total	Fatal and Injury	Property Damage Only	Total	
Segment										
OR-8 from OR-47 to Mountain View Ln (MP 17.48 to MP 17.88)	3.2	5.7	8.9	1.6	4.7	6.3	2.2	5.7	7.9	1.6
Intersection										
OR-8 / OR- 47	9.0	4.8	13.8	1.6	3.1	4.7	3.6	6.8	10.4	5.8
OR-8 / Mountain View Ln	4.2	3.3	7.5	1.1	2.1	3.2	1.8	3.3	5.1	1.9
OR-8 / Yew St (WB)	4.0	2.7	6.7	1.1	2.1	3.2	1.8	3.3	5.1	1.9
OR-8 / Yew St (EB)	0.7	1.3	2.0	1.1	2.1	3.2	0.9	1.7	2.6	-0.5

As shown in Table 4, the combined segments in the study corridor experienced a higher number of observed reported crashes than the HSM's expected value and one more crash resulting in a fatality/injury than expected. The following three intersections along the corridor experienced more crashes than expected and more crashes resulting in a fatality/injury than expected:

- OR-8 / OR-47

¹² More details can be found in the Appendix: Predictive Methodology Summary Tables

¹³ Predicted crashes are calculated using roadway conditions and traffic volumes, but not observed crash history.

¹⁴ Expected crashes statistically combine predicted and observed crash frequency to calculate the estimated number of crashes that will occur in the future if conditions do not change.

- OR-8 / Mountain View Lane
- OR-8 / Yew Street (in the westbound direction)

Overall, the corridor experienced about eight crashes more per year than expected. As can be seen in Table 4, there is a positive excess expected crash frequency for the study segment, and the intersections of OR-8 / OR-47, OR-8 / Mountain View Lane, and OR-8 / Yew Street (in the westbound direction), which means that the segment and intersections experienced more observed crashes than would be predicted for a facility with similar characteristics. As can be seen in Table 4, there is a positive excess expected crash frequency for the corridor and most of the intersections, which means that the corridor experienced more crashes than was predicted for a facility with similar characteristics. More crashes are expected than were predicted (excess expected crash frequency).

NEXT STEPS

To more clearly identify safety deficiencies and needs on OR-8 within the study area, a Safety Assessment workshop will be coordinated with the Agency, City, and Technical Advisory Committee (TAC) representatives. The workshop will help to identify potential safety investments to address the safety issues within the study area. Furthermore, the potential opportunities for gateway and green street design improvements will be evaluated.

APPENDIX A: CRASH MAPS



Figure 23. OR-8, Forest Grove, West Section of Study Area

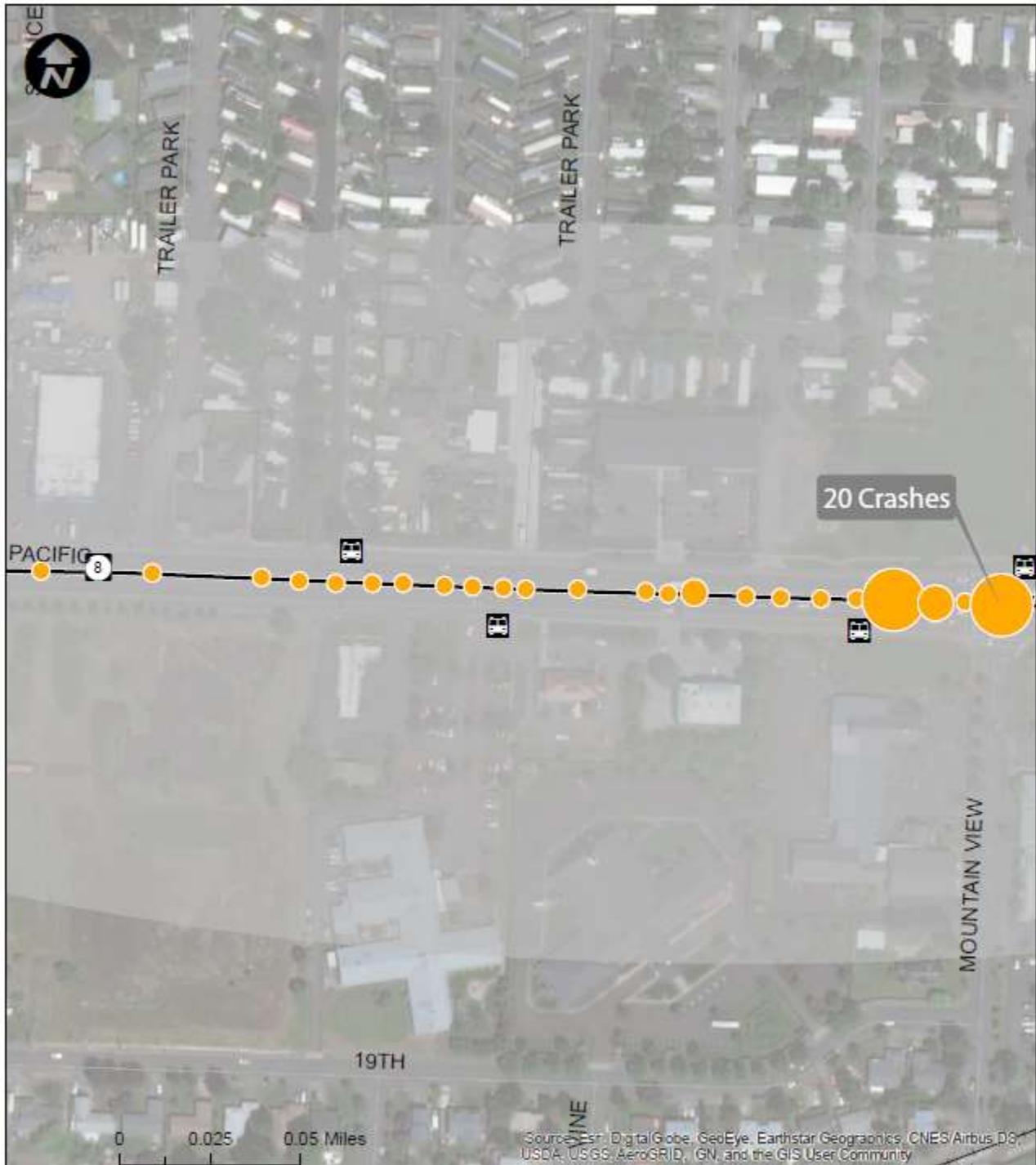
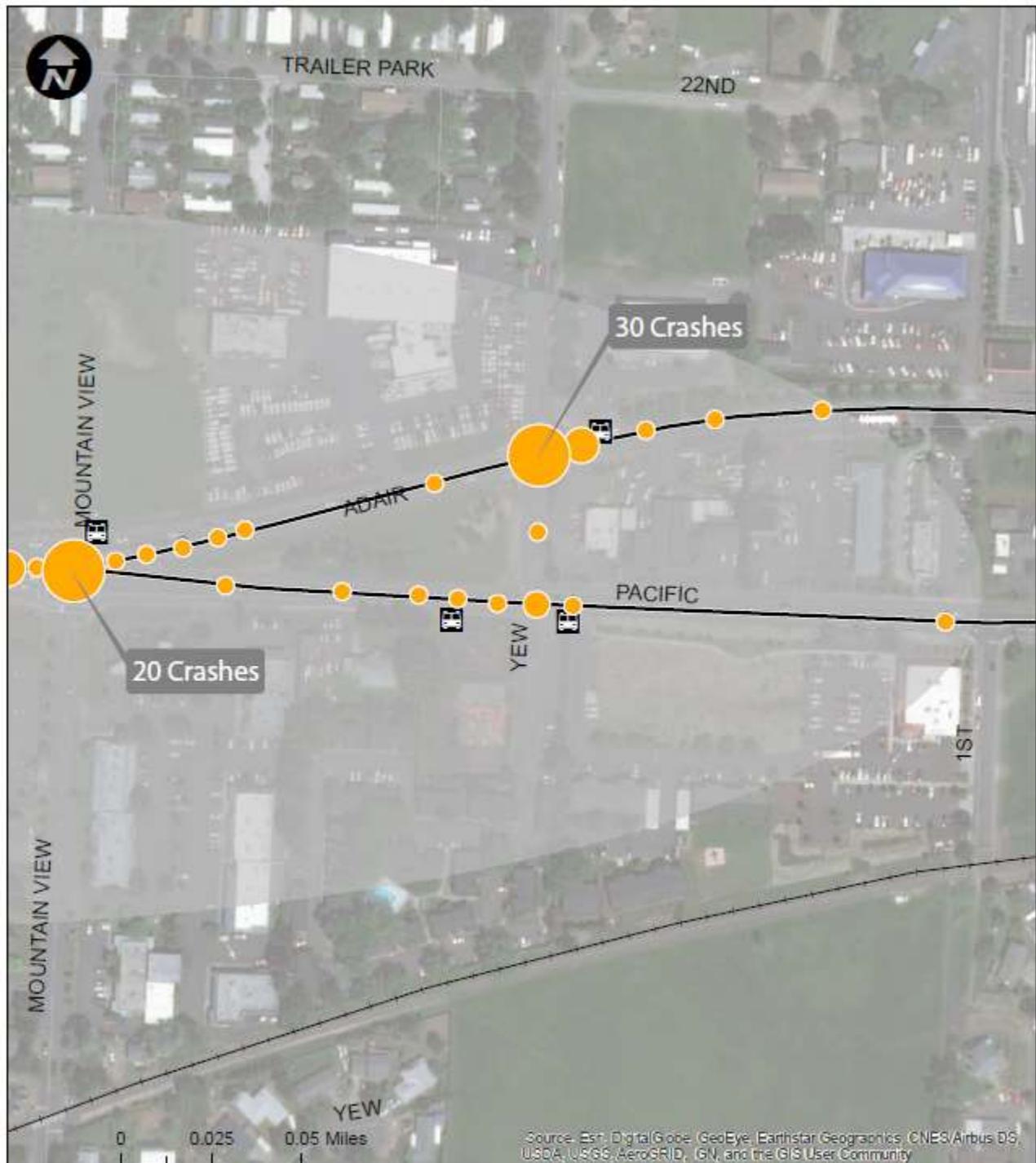


Figure 24. OR-8, Forest Grove, Center Section of Study Area



Crash Frequency

- 1-3 Crashes
- 4-6 Crashes
- 7-9 Crashes
- >10 Crashes
- Bus Stop
- Railroad
- Study Area

Figure 25. OR-8, Forest Grove, East Section of Study Area

TECHNICAL MEMORANDUM #4

DATE: March 13, 2020

TO: Project Team

FROM: Brian Chandler, Kamilah Buker, Reah Flisakowski | DKS

SUBJECT: Revised Forest Grove OR-8 Improvement Plan: Needs and Solutions Analysis

The purpose of this memorandum is to describe the needs and preliminary solutions identified for OR-8 in Forest Grove. This safety study focuses on the segment of OR-8 within Forest Grove from S 1st Avenue to OR-47/Quince. On the east end of the study, OR-8 splits into a couplet – W Baseline Street for eastbound traffic and Adair Avenue for westbound traffic.

These preliminary solutions are intended to address the safety deficiencies identified in the Safety Audit and Evaluation Memorandum¹ and at the Safety Assessment Workshop². A summary of input received at the Safety Assessment Workshop can be found in the appendix.

Safety Needs Identified

The Safety Audit and Evaluation (Technical Memorandum #3, or TM3) identified safety needs based on historical crash data, community feedback, and a field safety assessment conducted within the study area. The findings and needs identified in the memo were then presented and expanded upon at the Safety Assessment Workshop. This workshop was held in November 2019 and attended by representatives from the City of Forest Grove planning department, engineering division, police department, and fire department; Forest Grove School District; Centro Cultural; ODOT; TriMet; Ride Connection; City of Cornelius; Washington County; Metro; and the consultant team.

The key findings developed from the workshop highlighted the need to focus safety strategies on vulnerable users - those people who are walking, biking, riding motorcycles, using wheelchairs, etc. Priority locations include those where vulnerable users are likely to travel (such as schools, commercial zones, and transit stops, including school bus stops) and locations that pose significant risk to vulnerable users (including high volume and high-speed roadways with local access but lack of pedestrian facilities like sidewalks or crosswalks). Table 1 below summarizes the identified safety needs and deficiencies by location.

Preliminary Countermeasures

For this study, preliminary safety strategies were identified using the Highway Safety Manual (HSM). The HSM, published in 2010, is the first national resource that provides quantitative information and methods to evaluate the safety performance of roadways. The purpose of the HSM is to provide the state of the practice information and proven analysis tools for crash frequency prediction as of the publication date. The HSM will facilitate integrating quantitative crash frequency and severity performance measures into roadway planning, design, operations, and maintenance decisions. The HSM also includes a set of research-based safety countermeasures recommended for agencies to reduce the number, type, and/or severity of future collisions.

¹ Forest Grove OR-8 Improvement Plan: Safety Audit and Evaluation, DKS Associates, November 2019.

² Safety Assessment Workshop with Agency, City, and TAC Representatives, November 2019.

Where HSM-based treatments were not available, the study team used the Federal Highway Administration’s Crash Modification Factors Clearinghouse, another source of safety treatment descriptions, use cases, and Crash Modification Factors (CMFs). The Clearinghouse is continuously updated with the latest research.³ Table 1 summarizes the possible safety solutions related to each of the identified needs and deficiencies.

Table 1: Safety Needs and Preliminary Safety Countermeasures

No.	Needs and Deficiency Identified	Location	Possible Countermeasures
1	Gaps in sidewalk network	<ul style="list-style-type: none"> • OR-8 near Rose Grove MHP, C and D Row entrance • OR-8 (east of Mountain View Lane to the city limit) • OR-47 south of the OR-8/OR-47 intersection (immediately south of the study corridor) 	Construct sidewalks to infill gaps per ODOT standard ⁴ and comply with ADA.
2	Sidewalks are narrow or obstructed	<ul style="list-style-type: none"> • OR-8 east of Rose Grove MHP, A and B Row entrance • OR-8 near the First Community Credit Union 	Remove or relocate obstructions when possible; widen sidewalks to comply with ADA where obstruction cannot be removed.
3	Lack of ADA accessibility facilities	<ul style="list-style-type: none"> • Most driveways (e.g., private and commercial driveways, other entrances) along OR-8 between OR-47 and Mountain View Lane, and OR-8/Yew Street (south) • ADA non-compliant facilities at public approaches 	Reconstruct all curb ramps and intersections to meet ADA standards (“concrete dustpan” design preferred).
4	Pedestrians must cross 5 lanes of general purpose traffic and 2 bicycle lanes (up to 85 ft)	<ul style="list-style-type: none"> • Segment between the intersections of OR-8/OR-47 and OR-8/Mountain View Lane. 	Add median treatment, such as median refuge islands, bulb-outs, and transit islands, that provides pedestrian refuge while crossing.
5	Limited marked pedestrian crossing opportunities along OR-8	<ul style="list-style-type: none"> • Four marked crosswalks within study area are located at the intersections of OR-8/OR-47 and OR-8/Mountain View Lane 	<ul style="list-style-type: none"> • Provide safe pedestrian crossings with enhanced treatments (marked crosswalks, pedestrian hybrid beacon, and/or RRFBs with median refuge) at multiple locations: <ul style="list-style-type: none"> ○ Near Rose Grove ○ Near Autozone ○ At Yew Street
6	Absence of pedestrian scale lighting at intersections	<ul style="list-style-type: none"> • At OR-8/OR-47 and along OR-8 within the study area 	Incorporate lighting at the intersections of OR-8/OR-47 and OR-8/Mountain View Lane, including slip lanes, and along OR-8 for pedestrians.

³ Highway Safety Manual 1st Edition. American Association of State Highway and Transportation Officials (AASHTO), Washington, DC, 2010.

⁴ ODOT’s Highway Design Manual

No.	Needs and Deficiency Identified	Location	Possible Countermeasures
7	Gaps in bicycle network (including obstacles such as storm water drainage grates located in the bicycle lane)	<ul style="list-style-type: none"> No bicycle facilities on OR-47 south of the OR-8/OR-47 intersection (immediately south of the study corridor) Drainage grates in the bike lane along OR-8 at multiple locations. 	Complete bicycle lanes and install bike-friendly drainage grates.
8	Bicycle facilities (striped bike lane without painted buffer or physical separation) do not meet ODOT HDM or Blueprint for Urban Design guidance for a high volume and high-speed facility	<ul style="list-style-type: none"> Entire study corridor 	Construct buffered or protected bike lanes throughout the study corridor consistent with ODOT HDM/BUD.
9	OR-8/OR-47 includes multimodal conflict points with limited visibility and protection for people walking and biking	<ul style="list-style-type: none"> Intersection of OR-8 and OR-47 	<ul style="list-style-type: none"> Redesign slip lanes for pedestrian safety and/or install pedestrian activated signals at slip lanes. Add pedestrian scale illumination. Update signal timing to include bicycle and pedestrian lead intervals and/or separate phases. Install bike boxes, including consideration of two-stage turn queue boxes for bicyclists.⁵ Install physically separated or buffered bike lanes.
10	Access management along OR-8 (several driveways along OR-8 make left-turn maneuvers challenging for people driving and uncomfortable for people walking and biking)	<ul style="list-style-type: none"> OR-8 between OR-47 and Mountain View Lane 	<ul style="list-style-type: none"> Consolidate driveways, evaluate reducing the number of conflicts by restricting driveways into right-in, right-out only, and allow U-turns at signalized intersections. Through redevelopment, require cross-over easements to facilitate shared access, reduce the number of driveways to OR-8, and better connect local streets.
11	On-property signage and vegetation could block side street and driveway sight distance and visibility.	<ul style="list-style-type: none"> Entrance of the Rose Grove Mobile Home Community has potential sight distance blocked by on-premise sign. OR-8/Yew Street (north), looking east, signs on private property cause some sight distance blockage. 	Trim shrubs and move signs.

⁵ Two-Stage Turn Queue Boxes, NACTO Urban Bikeway Design Guide. <https://nacto.org/publication/urban-bikeway-design-guide/intersection-treatments/two-stage-turn-queue-boxes/>

No.	Needs and Deficiency Identified	Location	Possible Countermeasures
12	Bus stops lacking pedestrian crossings and ADA compliant curb ramps (mid-block and/or intersection corners)	<ul style="list-style-type: none"> All bus stops within the study corridor 	Add marked ADA-compliant crossings near bus stops or relocate bus stops to be closer to marked crossings; ensure stops provide ADA compliant landings and accessible sidewalk connections to nearest crossing and broader sidewalk network.
13	Bus stop locations become conflict points between motor vehicles and people biking when buses enter the bike lanes or motorists turn into accesses adjacent to bus stops, increasing the risk of potential collisions	<ul style="list-style-type: none"> Bus stop located just east of OR-8/OR-47 near Pink Spoon (eastbound direction) Bus stops located at W Baseline Street/Yew Street and N Adair Street/Yew Street 	<ul style="list-style-type: none"> Relocate bus stops to be adjacent to intersections. Consider pros and cons of bus pull out lane and in-lane boarding for safety and operations. Redesign bus stops near OR-8/OR-47 (south side) and Yew Street intersections to better accommodate people biking.
14	High vehicle operating speeds on OR-8 and associated high crash history	<ul style="list-style-type: none"> Entire study corridor 	<ul style="list-style-type: none"> Design for target speed of 30-35 mph. With the emphasis on transit and the mix of residences and schools, 30 mph is more appropriate. Reduce width of general-purpose lanes and center turn lanes. Add vegetation alongside the roadway where there is open land. Add segments of planted medians where center turn lane does not serve accesses. Reduce turning radius at intersections, especially OR-47, and redesign truck aprons to encourage slower speeds. Improve gateway planting and signage to parcel at center of couplet between Mountain View Lane and Yew Street. Increase signalized intersections/pedestrian crossings.
15	Opportunity to enhance pedestrian protection and visibility at signalized intersections	<ul style="list-style-type: none"> OR-8/OR-47 and OR-8/Mountain View Lane 	<ul style="list-style-type: none"> Update signal timing to provide a leading pedestrian interval at OR-8/Mountain View Lane. Update signal timing to consider protected pedestrian crossing phase at OR-8/OR-47, including slip lanes.

No.	Needs and Deficiency Identified	Location	Possible Countermeasures
16	Peds and vehicles are not finding gaps in mainline traffic to cross safely	<ul style="list-style-type: none"> • Intersections of W Baseline Street/Yew Street and N Adair Street/Yew Street 	<p>Conduct signal Warrant Analysis at OR-8/Yew Street.</p> <ul style="list-style-type: none"> • If signal warrants are met, add signals at W Baseline Street/Yew Street and N Adair Street/Yew Street. • If signal warrants are not met, restrict Yew Street north of Adair Avenue to right-in/right-out and install U-turn permitted signage at OR-8 westbound/Mountain View Lane. Add RRFBs at OR-8/Yew Street.
17	Discourage wrong way traffic	<ul style="list-style-type: none"> • OR-8/1st Avenue 	Paint right turn only diverter at 1st Avenue to discourage wrong way traffic
18	Motorists use wide bike lane segments for on-street parking	<ul style="list-style-type: none"> • OR-8 eastbound to east of Mountain View Lane 	Redesign bike facilities to prevent driver confusion, consider adding “No Parking” sign.
19	Obstructions (signs, trash cans, etc.) placed in bike lane	<ul style="list-style-type: none"> • OR-8 eastbound to east of Mountain View Lane, OR-8 westbound to the west of Mountain View Lane 	Remove/relocate obstructions
20	School bus stop needed	<ul style="list-style-type: none"> • Near OR-8/Mountain View Lane 	Add school bus stop near OR-8/Mountain View Lane

To better understand the potential safety effects of the possible countermeasures, Crash Modification Factors (CMFs) were evaluated. A CMF is multiplied by the anticipated frequency of future crashes to calculate a modified frequency of the base condition changes (e.g., a safety treatment is implemented). For example, a high-visibility crosswalk has a CMF of 0.60. Thus, if a location suffered 10 vehicle/pedestrian collisions in the past 5 years, installing this crosswalk would result in an estimated future of $(10 \text{ crashes}) \times (0.6 \text{ CMF}) = 6$ crashes in the next 5-year period. A CMF of 0.60 equates to a 40% reduction in crashes (commonly referred to as a 40% Crash Reduction Factor).

Countermeasures and their CMFs were selected from the following sources:

- Preferred: ODOT-approved set of countermeasures and Crash Reduction Factors that have been used in support of the State’s Roads Transportation Safety (ARTS) Program.⁶
- The HSM Part D, which provides a list and description of research-supported safety treatments, the crashes those treatments address, and an estimated CMF.
- Federal Highway Administration CMF Clearinghouse that includes new research and an assessment of research quality through a star-rating system.^{7,8}

⁶ ODOT ARTS website. <https://www.oregon.gov/ODOT/Engineering/Pages/ARTS.aspx>. In situations where an ODOT Crash Reduction Factor is not available and one of the other resources is used, submit a “Request to Add New Crash Reduction Factor” from this website.

⁷ Analysis Procedures Manual Version 2

⁸ FHWA Crash Modification Factors Clearinghouse. <http://www.cmfclearinghouse.org/>

- National Cooperative Highway Research Program (NCHRP), part of the Transportation Research Board (TRB), In particular, NCHRP Research Report 841, *Development of Crash Modification Factors for Uncontrolled Pedestrian Crossing Treatments* (2017) provides new pedestrian-focused CMFs that are applicable to this study.

Table 2: Preliminary Safety Strategies

No.	Possible Countermeasures	Crash Modification Factor (CMF) ⁹	Details
1	Construct sidewalks to infill gaps per ODOT standard, follow ADA guidelines where appropriate	0.41	Vehicle/pedestrian crashes. ¹⁰
2	Remove or relocate obstructions when possible and widen sidewalks where cross section allows	NA	NA
3	Reconstruct all curb ramps and intersections to meet ADA standards	NA	NA
4	Add median treatment such as a median refuge island that provides pedestrian refuge	0.74	Vehicle/pedestrian crashes. ¹¹
5	<ul style="list-style-type: none"> • Add multiple new high visibility crosswalks or RRFBs <ul style="list-style-type: none"> ○ Near Rose Grove ○ Near Autozone 	0.60 (marked crosswalk)	Vehicle/pedestrian crashes. ¹²
		0.53 (RRFB)	Vehicle/pedestrian crashes. ¹³
6	Incorporate lighting at the intersection of OR-8/OR-47 and along OR-8 for pedestrians	0.58	Dark conditions, vehicle/pedestrian crashes. ¹⁴
7	Complete bicycle lanes and install bike-friendly drains	0.41	Vehicle/pedestrian crashes. ¹⁵
8	Construct buffered or protected bike lanes throughout the study corridor	NA	NA
9	<ul style="list-style-type: none"> • Redesign slip lanes for pedestrian safety • Add pedestrian scale illumination • Update signal timing to include bicycle and pedestrian phases • Install bike boxes • Install physically separated or buffered bike lanes 	0.87	Vehicle/pedestrian crashes (lead pedestrian interval). ¹⁶

⁹ CMFs referenced in this table were accessed on February 24, 2020.

¹⁰ <http://www.cmfclearinghouse.org/detail.cfm?facid=9240>

¹¹ <http://www.cmfclearinghouse.org/detail.cfm?facid=8800>

¹² <http://www.cmfclearinghouse.org/detail.cfm?facid=4123>

¹³ NCHRP 841. <http://www.trb.org/NCHRP/Blurbs/175381.aspx>

¹⁴ <http://www.cmfclearinghouse.org/detail.cfm?facid=436>

¹⁵ <http://www.cmfclearinghouse.org/detail.cfm?facid=4103>

¹⁶ <http://www.cmfclearinghouse.org/detail.cfm?facid=9916>

No.	Possible Countermeasures	Crash Modification Factor (CMF) ⁹	Details
10	Close or combine driveways, convert select driveways into right-in, right-out only, and allow U-Turns	0.80	All crash types (replace direct left-turn with right-turn/U-turn). ¹⁷ Driveways: reduction in crashes to be calculated based on the change in driveway density from X to Y ¹⁸
11	Trim shrubs and move signs	0.53	Injury crashes at intersections/entrances (increased triangle sight distance). ¹⁹
12	Add marked crossings near bus stops (ADA compliant)	0.60	Vehicle/pedestrian crashes. ²⁰
13	<ul style="list-style-type: none"> Relocate bus stops to be adjacent to intersections Add bus pull out lane wherever possible Redesign bus stops near OR-8/OR-47 and Yew Street intersections 	NA	NA
14	<ul style="list-style-type: none"> Narrow general-purpose lanes and center turn lanes Add vegetation alongside the roadway where there is open land Tighten turning radius at intersections, especially OR-47 	Varies 0.56	Injury crashes reduced as a function of lane narrowing from X to Y ²¹ All crash types (change right-turn lane geometry to increase line of sight at the intersection level) ²²
15	<ul style="list-style-type: none"> Update signal timing to include protected pedestrian crossings at OR-8/OR-47 Update signal timing to provide a leading pedestrian interval at OR-8/Mountain View Lane 	0.87	Vehicle/pedestrian crashes (lead pedestrian interval). ¹²
16	Conduct signal Warrant Analysis at OR-8/Yew Street	0.66	All crash types (install a traffic signal). ²³
17	Paint right turn only diverter at 1st Avenue to discourage counter-flow traffic	NA	NA
18	Add no parking signs	NA	NA
19	Remove or relocate obstructions	NA	NA
20	Add school bus stop near OR-8/Mountain View Lane	NA	NA

Initial Safety Project List

Based on the preliminary strategy development, the project team has developed an initial project list to address each of the deficiencies identified. The project list includes a summary of the risks/considerations associated with each project, and user safety benefits for the project. Table 3 shows the initial project list.

¹⁷ <http://www.cmfclearinghouse.org/detail.cfm?facid=351>

¹⁸ <http://www.cmfclearinghouse.org/detail.cfm?facid=2248>

¹⁹ <http://www.cmfclearinghouse.org/detail.cfm?facid=307>

²⁰ <http://www.cmfclearinghouse.org/detail.cfm?facid=4123>

²¹ http://www.cmfclearinghouse.org/study_detail.cfm?stid=341

²² <http://www.cmfclearinghouse.org/detail.cfm?facid=8496>

²³ <http://www.cmfclearinghouse.org/detail.cfm?facid=5525>

Table 3: Initial Project List

Project	Risks and Considerations	Safety Benefit
Reduce the width of general-purpose lanes and center turn lanes; restripe and provide pedestrian protection (e.g., median islands, bulb-outs)	Pavement resurfacing required, which may trigger ADA improvements, plus potential signal heads and loop detector relocation	All users Reduces pedestrian crossing distance and vehicle speeds
Buffered bike lanes; 2-3-foot buffer striped with plastic bollards (a separated/protected bikeway may also be considered)	Pavement grind and overlay required if accompanied by general purpose lane reduction Future maintenance	Bicyclists, pedestrians Provides separation between vehicles and cyclists Provides additional buffer for pedestrians
Pedestrian-scale lighting (roadway lighting at intersections and along the corridor that also illuminates pedestrian realm)	Roadway lighting analysis should be conducted to identify all potential lighting needs along the study corridor, which could be a significant investment.	All users Reduces dark conditions; improves visibility of pedestrians and bicyclists; improves sense of personal security for people walking and biking
Low vegetation plantings (up to 4 feet in height) adjacent to right of way	Future maintenance	All users Acts to slow vehicle traffic while maintaining available sight distance
Complete sidewalk gaps where there are curbs already and where there are ADA/sidewalk barriers		Pedestrians, transit users, including people in wheelchairs and other mobility devices. Increases pedestrian visibility and ADA accessibility
Install concrete or painted right turn only diverter at 1st Avenue to discourage wrong-way traffic	Future maintenance	Autos Reduces vehicle conflicts
Leading pedestrian signal phase at the intersections of OR-8/Mountain View Lane and at OR-8/OR-47		Pedestrians, transit users Increases pedestrian visibility in crossing
Bike boxes and two-stage left turn queue boxes at the intersection of OR-8/OR-47		Bicyclists Increases cyclist visibility at intersection
Speed feedback (i.e., "Your Speed Is") signs		All users Increases driver speed limit compliance
Automated enforcement of red light running at signalized intersections	Operating the program and citations; Future maintenance	All users

Project	Risks and Considerations	Safety Benefit
Reduce the turning radius for motor vehicles in slip lanes at OR-8/OR-47 with structural modifications		Pedestrians, transit users, bicyclists
Allow eastbound and westbound U-turns at Mountain View Lane for personal vehicles only (not for large trucks)	Evaluate potential impact to vehicle operations and freight access	All users Mitigates reduction in vehicle access from raised center medians
Pedestrian crossings at Rose Grove. Median traffic separator with island, with access management process (alternative to signals)	If signal warrant is not met	Pedestrians, transit users, bicyclists Allows two-stage crossing, increases user visibility
Intermittent median traffic separator with left turn lanes at major entrances	Increase vehicle out of direction travel and reduced access to fronting properties Potential opposition from business/property owners	All users Reduces conflicts, especially angle crashes
Traffic signals at Yew Street intersections	If signal warrant is met	Pedestrians, transit users, bicyclists Provides control and protection at intersection
RRFB at Yew Street, both legs (alternative to traffic signals)	If signal warrant is not met	Pedestrians, transit users, bicyclists Increases pedestrian visibility in crossing
Pedestrian crossing near Autozone with median traffic separator with island, with access management (alternative to signals)	If signal warrant is not met	All users Increases pedestrian visibility in crossing and reduces vehicle conflicts
TriMet transit stop amenities and stop relocation	Consider sight lines and mode interactions with stop relocations Consider placement relevant to key corridor origins/destinations	Transit users Encourages use of pedestrian crossings
Permanent school bus drop-off location near Mountain View Lane	Consider sight lines and impact to vehicle operations	Transit users
Gateway: new "Welcome to Forest Grove" sign and plantings within couplet triangle		All users Increases driver awareness of entering multimodal corridor
Bike signals and phasing at OR-8/OR-47	Evaluate potential impact to vehicle operations	Bicyclists Increases cyclist visibility at intersection

Project	Risks and Considerations	Safety Benefit
Allow U-turns at OR-8/OR-47 for personal vehicles only, no large trucks	Coordinate with bus stop relocation (currently in front of Ace Hardware)	All users Mitigates reduction in vehicle access from raised center medians
Access management along the full corridor with alternate routes	Increase vehicle out of direction travel and reduced access to fronting properties There is not a complete network of alternate routes	All users Reduces conflicts between all modes
Redesign slip lanes at OR-8/OR-47 for pedestrian safety	Evaluate bus, bicycle and turning vehicle interactions	Pedestrians, transit users, bicyclists Increases pedestrian visibility in crossing
Complete sidewalk gaps	Roadway drainage may be affected	Pedestrians, transit users Increases pedestrian visibility and ADA accessibility
Pedestrian and ADA-accessible pathway to business door from the street/sidewalk	Private property coordination	Pedestrians, transit users, bicyclists Increases pedestrian visibility and ADA accessibility
Holladay Street Extension from N 4 th Street to Yew Street to expand the street network of alternate routes	Private property coordination and acquisition costs;	Industrial vehicles traveling in and through the area north of the OR-8 corridor Pedestrians, transit users, bicyclists along the corridor contending with fewer heavy vehicles traveling the area

ODOT Design Exceptions and Concurrence Process

All design concepts should follow the guidelines set forth in the Blueprint for Urban Design (BUD) manual.²⁴ ODOT discussions with City of Forest Grove and members of the Project Technical Advisory Committee led to concurrence that this section of OR-8 most closely matches the Commercial Corridor context, with some Urban Mix characteristics, particularly with the prominence of residences and schools in the corridor. The basis for this assessment is as follows:

- Medium to large building setbacks, with most frontages dominated by off-street parking. Where newer buildings front the sidewalk, most orient their entrances to parking/driveways at building side or rear. Consistent with Commercial Corridor, with some areas of Urban Mix.
- Very few buildings provide front door that can be accessed from sidewalks via a pedestrian path. Consistent with Commercial Corridor.

²⁴ Blueprint for Urban Design, ODOT, January 2020.

- Most uses are commercial, institutional, or industrial, but there are significant residential areas at the Forest Place Apartments, Rose Grove manufactured homes, and behind other non-residential uses. Characteristics of both Commercial Corridor and Urban Mix.
- Most sites have very low building coverage adjacent to right-of-way. Some newer developments locate buildings near sidewalk. Consistent with Commercial Corridor, with some areas of Urban Mix.
- Parking is largely off-street and in front of buildings along right of way. Some newer developments locate parking to the side or back of buildings. Consistent with Commercial Corridor, with some areas of Urban Mix.
- Blocks are very large, with long spaces between public street connections.
- While zoning and code allow uses and development styles consistent with Urban Mix, they do not restrict or disincentivize uses and development styles consistent with Commercial Corridor. There are not regulatory pressures that would change the characteristics of the corridor to more closely resemble Urban Mix.

Recommended target speed for Commercial Corridors is 30-35 mph, with 25-30 mph recommended for Urban Mix. Given the emphasis on transit and prevalence of residences and schools in the study area, 30 mph is advisable.

If the guidelines cannot be met, a design exception will be required. The BUD provides a Design Concurrence Document for reference.

Potential ODOT Design Exceptions. Based on the projects listed above, the following ODOT design exceptions may need to be considered.

- Lane width – narrowing the general-purpose lanes may require a design exception if proposed lane widths are less than 11 feet. Recommended lane widths for both Commercial Corridor and Urban Mix are 11-12 feet, which is in line with project recommendations.
- Median width – the likelihood of a median width design exception will depend on which countermeasures are applied:
 - Sidewalks added or widened.
 - Buffered bike lanes added.
 - Lanes narrowed.

East Forest Grove Safety Improvement Plan Technical Memorandum #5: Potential Improvements and Design Concepts

Introduction

This memorandum describes a recommended list of potential improvements and design concepts for the East Forest Grove Safety Improvement Plan. The Plan focuses on the segment of OR-8 within Forest Grove from S 1st Avenue to OR-47/Quince. Improvements and design concepts are collectively referred to as *project concepts* in this memo.

The project team developed these project concepts to address safety concerns identified in Technical Memorandum #4: Needs and Solutions Analysis. Project concepts will be further refined with upcoming public and stakeholder involvement.

Safety Needs

Technical Memorandum #4 (TM4) described a set of safety needs originating from Technical Memorandum #3: Safety Audit and Evaluation and refined in the Safety Assessment Workshop. TM4 highlighted the need to focus strategies on vulnerable road users, including people that walk, bike, and use mobility devices. TM4 prioritized locations that pose significant risk to vulnerable road users, such as high-volume, high-speed roadways, and locations where vulnerable road users are likely to travel, such as transit stops, schools, and commercial areas.

TM4 listed 21 safety needs with locations and possible countermeasures. TM4 also listed the potential safety benefits of countermeasures using crash modification factors (CMFs). Finally, TM4 described an Initial Project List to address the safety needs.

Identified issues (from TM4):

- Gaps in sidewalk network
- Sidewalks are narrow or obstructed
- Lack of ADA accessibility facilities
- Pedestrian crossing distances are very long
- Limited OR-8 crossing opportunities
- Insufficient pedestrian scale lighting
- Gaps in bicycle network (including obstacles such as drains located in the bicycle path)

- Bicycle facilities (striped bike lane without painted buffer or physical separation) insufficient given that OR-8 is a high volume and high-speed facility
- OR-8/OR-47 multimodal improvements needed (e.g. right-turn slip lanes are unsafe to pedestrians, bicycle facilities are absent, insufficient lighting, etc.)
- Access management along OR-8 (several driveways along OR-8 make left-turn maneuvers difficult and unsafe for people biking)
- Sight distance limitations; limited visibility
- Bus stops lacking pedestrian crossings and ADA compliant curb ramps (mid-block and/or intersection corners)
- Bus stop locations become conflict points between motor vehicles and bicyclists when buses enter the bike lanes or motorists turn into accesses adjacent to bus stops, increasing the risk of potential collisions.
- High vehicle speeds on OR-8
- Lack of strong pedestrian protection and visibility at signalized intersections based on current signal devices and timing
- Difficult for pedestrians to cross and for side street traffic to enter the roadway
- Discourage counterflow traffic
- Motorists use wide bike lane segments for on-street parking
- Obstructions (signs, trash cans, etc.) placed in bike lane
- School bus stop needed

Project Concepts

The project team developed this list of project concepts based on identified needs and input from the public and stakeholders. The Initial Project List was included in TM4 and was further refined by the technical advisory committee. These project concepts are still high level and require further planning and engineering development.

Estimated project cost

Costs are planning-level estimates and divided into four categories:

\$\$\$	less than \$0.5 million
\$\$\$\$	\$0.5 - \$2 million
\$\$\$\$	\$2 - \$5 million
\$\$\$\$	more than \$5 million

Additional cost considerations are noted with the project concept.

Estimated project phasing timeline

Project phasing timelines are planning-level estimates and are divided into three categories:



Project can be implemented in less than two years.



Project can be implemented in more than two years or with full build out.



Project to be implemented with future development, redevelopment, or infill.

Priority projects

The project management team (PMT) chose four high priority projects based on need, community input, and professional expertise. These four projects are indicated with a star:



PMT Priority (top four projects)

Seven members of the technical advisory committee (TAC) independently selected their highest priority projects. Most members chose 5 to 7 priority projects, one member chose 12. These were tallied and categorized, and are indicated with chevrons:



TAC Top Priority (5-6 votes, includes three projects)



TAC High Priority (3-4 votes, includes six projects)



TAC Priority (1-2 votes, includes nine projects)

Project List

Full Corridor

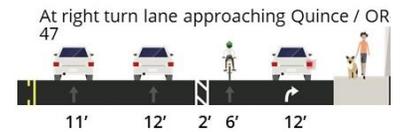
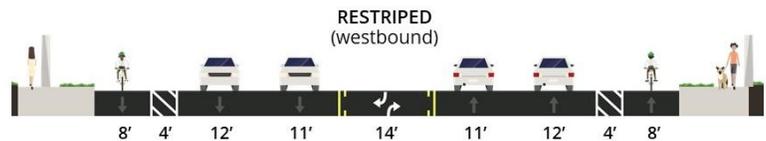
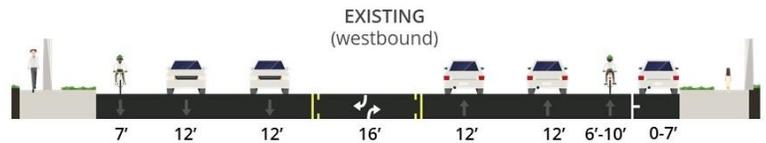
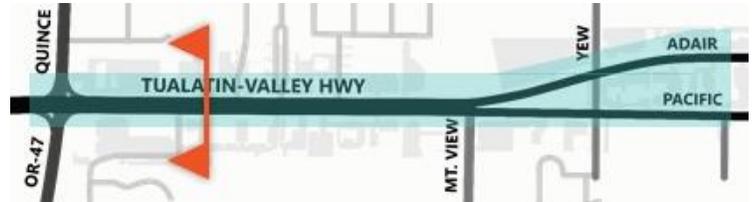
F1: Restripe with narrower general purpose and center turn lanes.



Replace existing street striping with narrower travel and center turn lanes to encourage slower driving speeds and accommodate safer bike lanes. Extends the full corridor.

Considerations:

- A grind and overlay requires rebuilding all non-compliant ADA ramps.
- Stripe ghosting in the buffered area is acceptable; ghosting anywhere else requires a grind and overlay.
- Maintain parking at the east end of the corridor on Pacific/Baseline.
- Will this require ADA upgrades at private driveway crossings?



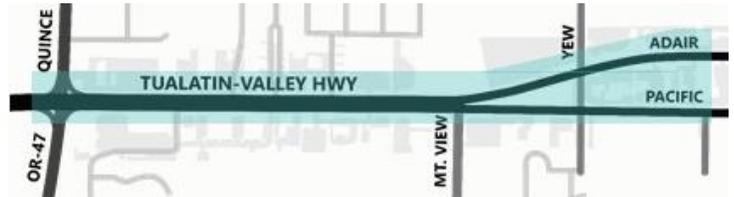
F2a: Separated or raised bike lane.



Separate or raise the bike lane to provide a safer, more comfortable facility for people to bike that is separated from vehicles.

Considerations:

- Coordinate with the many driveways and accesses along the corridor.



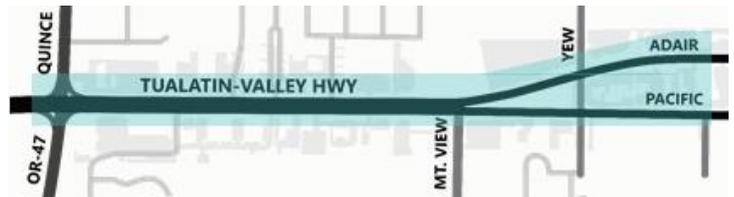
F2b: Add plastic bollards to striped buffered area.



Plastic bollards reinforce a buffered bike lane with visual and physical separation from vehicle traffic.

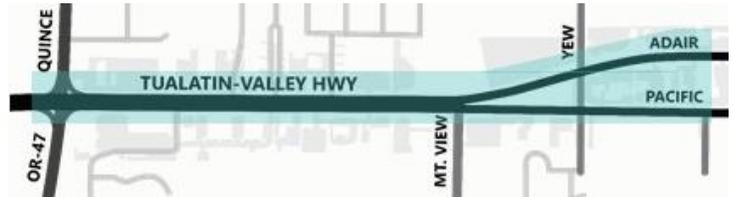
Considerations:

- Will need a design that prioritizes safety of bicyclists at intersections, driveways, and other vehicle access points along the corridor.



F3: Add low vegetation plantings adjacent to roadway.

Vegetation adjacent to the roadway helps collect stormwater runoff, creates visual friction to encourage slower driving, and aesthetically improves the corridor. Vegetation is low to the ground to maintain sightlines. Implemented with other improvement projects and new development.



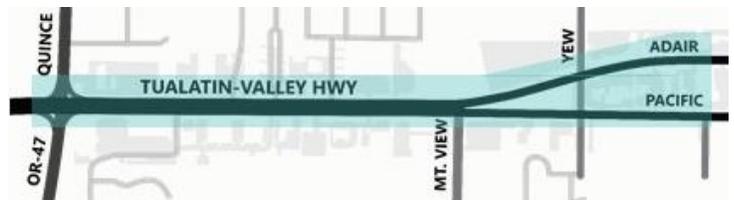
F4: Add pedestrian-scale lighting.



New lamps illuminate the pedestrian realm, making the sidewalk more comfortable for people walking and pedestrians easier to see. Lamps add aesthetic value to the sidewalk.

Considerations:

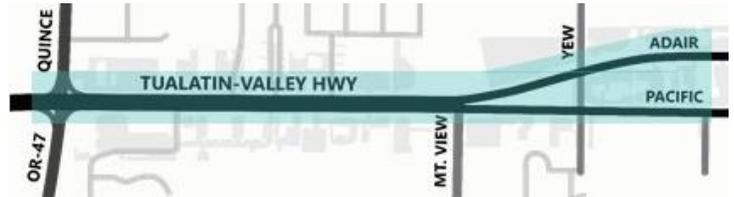
- Lights are spaced 80'-100'.
- Cost estimate includes new sidewalk.



F5: Temporary travel speed monitor and red light camera enforcement.



Temporary speed cameras and red light cameras address community concerns about a lack of traffic enforcement. Using cameras instead of human patrol officers to enforce traffic laws reduces the potential for bias.



Access Management

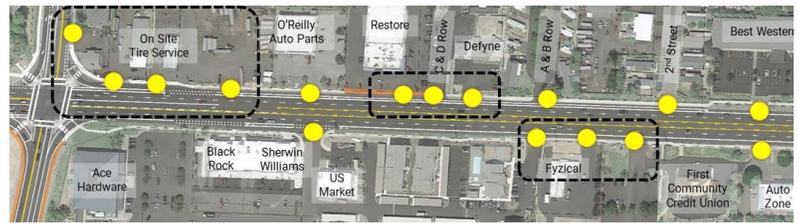
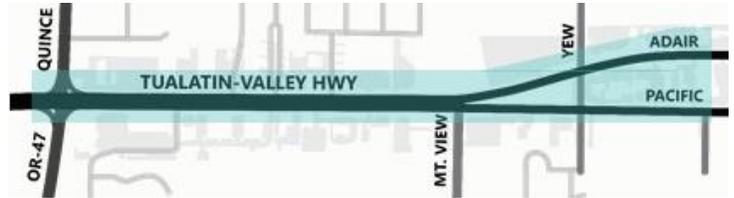
A1: Access management along full corridor.

The corridor has a lot of driveways that create conflict points by encroaching on bike and pedestrian facilities, by allowing uncontrolled vehicle turns on and off the highway, and by encouraging left turns across the highway.

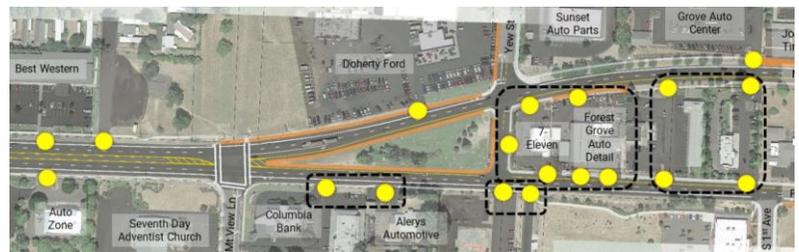
This project concept will coordinate with businesses and property owners to reduce conflict points from driveways and vehicle access points. Driveways serving the same or adjacent parking areas can be consolidated, and specific locations will be refined in conversation with property owners. Center medians may also be used to restrict left turns, and specific locations will be determined with property and business owners.

Considerations:

- Maintain business and property access.
- Coordinate with future development.



← West



- Driveway / vehicle access
- ⊞ Group of driveways / accesses that serve adjacent parking areas

East →

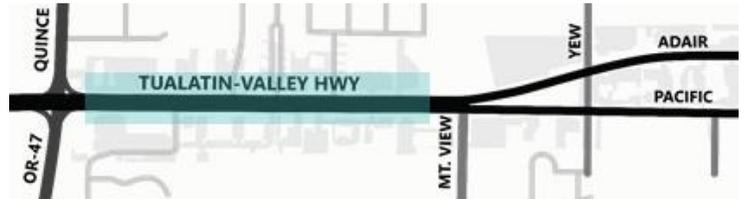
A2: Median traffic separator that provides pedestrian refuge.



A median traffic separator in place of the center turn lane can create a protected space for pedestrian crossings. It can provide a space for landscaping to aesthetically improve the corridor and collect stormwater. It can also be positioned to restrict left turns.

Considerations:

- Coordinate with pedestrian crossings.
- Coordinate with adjacent land uses for access management.



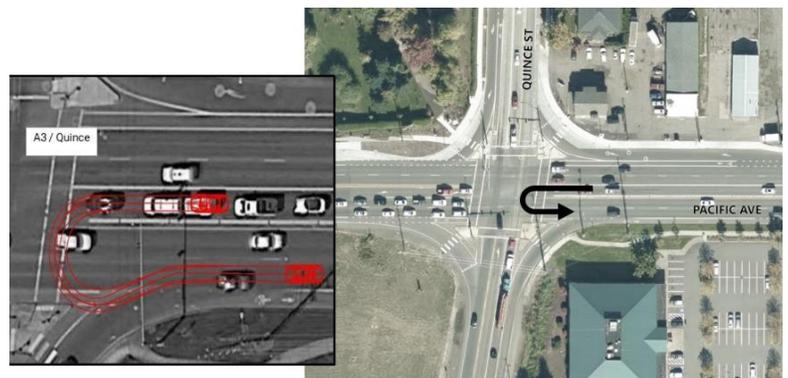
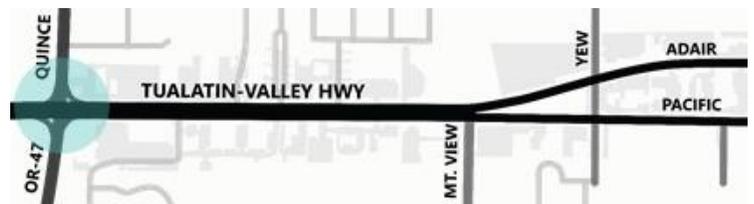
A3: Allow west to eastbound U-turns at Quince for cars.



This allows westbound vehicles access to businesses and residences on the south side of OR-8 without needing to make a left turn.

Considerations:

- Will likely require modifying the southeast curb island to accommodate the turning radius.
- Allow for personal vehicles only.
- Coordinate with eastbound bus stop relocation.



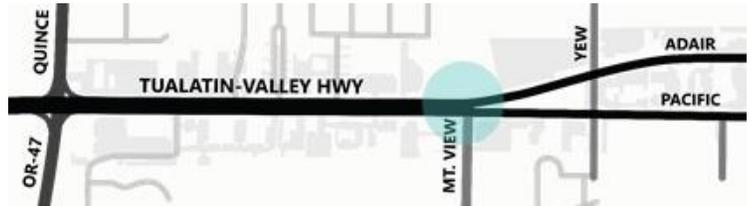
A4: Allow east to westbound U-turns at Mountain View.



This allows eastbound vehicles access to businesses and residences on the north side of OR-8 without needing to make a left turn.

Considerations:

- Will likely require a longer mast arm to accommodate the center turn lane. This will likely trigger ADA upgrades.
- Allow for personal vehicles only.



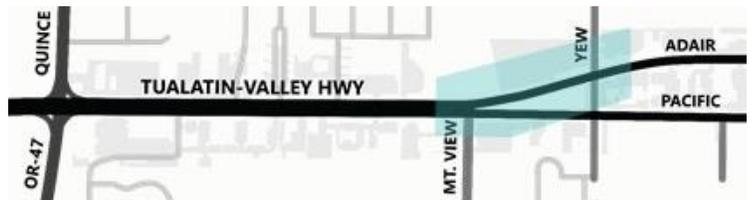
A5: Right turn restriction at Yew and allow west to eastbound U-turns for cars at Mountain View.



This intersection at Yew has seen a high number of crashes from southbound motor vehicles attempting to cross OR-8. This quick treatment restricts this movement by requiring personal vehicles to turn right.

Considerations:

- Coordinate with freight movement and future extension of N Holladay St.



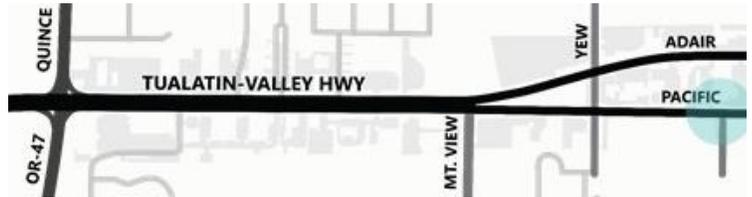
A6: Install right-turn only painted diverter at 1st Ave to discourage counter-flow traffic.



A painted diverter makes a stronger suggestion to drivers to only turn right onto OR-8, instead of driving against traffic to access the driveway northwest of the intersection.

Considerations:

- Coordinate with City of Cornelius's planned future pedestrian path and crossing.



Sidewalk

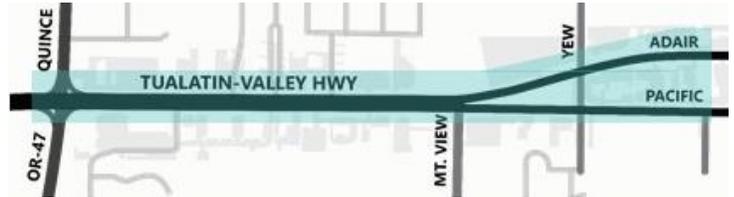
S1: Complete sidewalk network (fill all gaps).



Completing the sidewalk network with modern, ADA-accessible pedestrian facilities will allow people of all ages and abilities to move through the corridor safely.

Considerations:

- The couplet triangle between Adair and Pacific (north side of Pacific and south side of Adair) is unlikely to get sidewalks because it currently has no destinations.



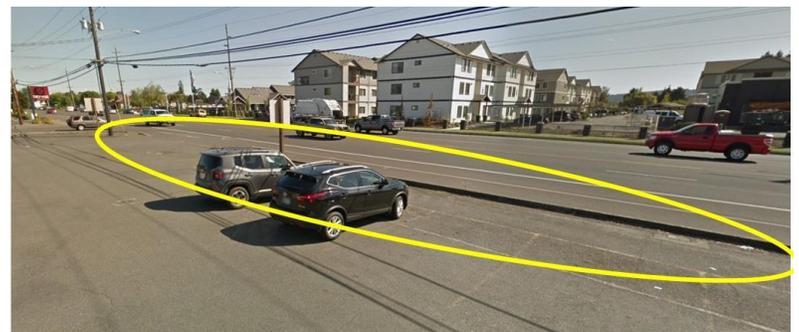
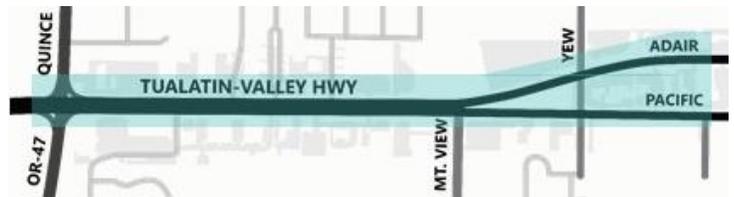
Sidewalk Facilities

- No Sidewalk
- < 5 Feet
- 5 - 7 Feet
- 8 Feet and Greater
- Bus Stop
- Railroad
- Study Area

S2: Complete sidewalk gaps at locations that already have curbs or where there are accessibility barriers.



Key areas of the pedestrian network lack accessible facilities or lack pedestrian facilities altogether. This project prioritizes these locations to make quick improvements.



Habitat ReStore front parking lot

Pedestrian Crossing

C1a: 3 Location Option Protected mid-block crossings with median and illumination.

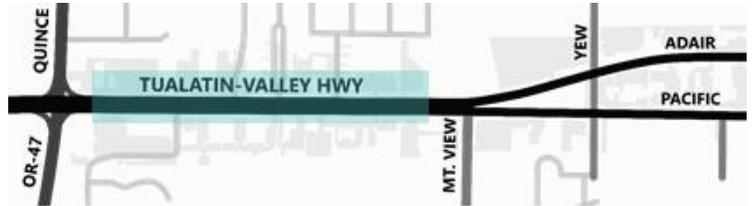


A span of over 2,000 feet separates the two pedestrian crossings Quince and Mountain View. This project creates three pedestrian crossings in that span, each separated by a distance of about 500 feet.

Crossings may be included with new intersection signals or standalone, signalized with actuated pedestrian signals, hybrid beacons, or rapid flash beacons. When possible, signals are timed with other signals in the corridor. Crossings will have pedestrian-scale illumination. Curb extensions will shorten crossing distances and improve visibility. Pedestrian refuge islands will provide safe places for people to wait between signal phases.

Considerations:

- Coordinate crossing locations with important destinations, adjacent land uses, and vehicle sight lines.
- Coordinate with TriMet stop relocations



SW Barbur and 13th

Example of a rapid flash beacon



E Burnside and 30th

Example of a hybrid beacon

C1b: 2 Location Option
Protected mid-block crossings
with median and illumination.

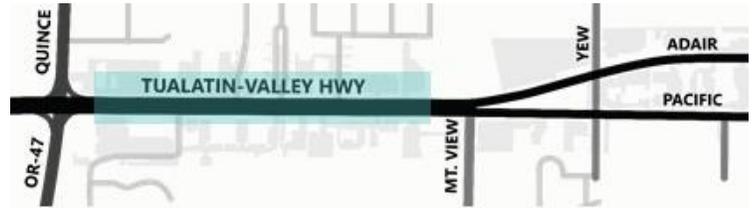


A span of over 2,000 feet separates the two pedestrian crossings Quince and Mountain View. This project creates two pedestrian crossings in that span, each separated by a distance of about 700 feet.

Crossings may be included with new intersection signals or standalone, signalized with actuated pedestrian signals, hybrid beacons, or rapid flash beacons. When possible, signals are timed with other signals in the corridor. Crossings will have pedestrian-scale illumination. Curb extensions will shorten crossing distances and improve visibility. Pedestrian refuge islands will provide safe places for people to wait between signal phases.

Considerations:

- Coordinate crossing locations with important destinations, adjacent land uses, and vehicle sight lines.
- Coordinate with TriMet stop relocations



Example of a rapid flash beacon



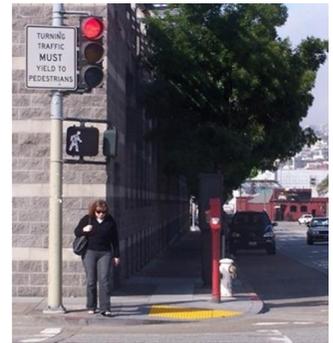
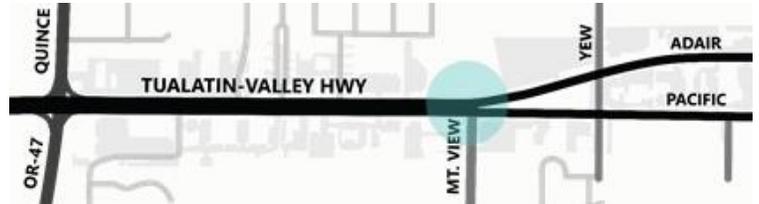
Example of a hybrid beacon

Signals

M1: Leading pedestrian interval and pedestrian phase at Mountain View.



The pedestrian signal to cross TV Highway at Mountain View Lane shares a phase with the turn signals for people driving north from Mountain View Lane, creating a conflict between pedestrians and drivers. This project adjusts the default signal phase timing to give pedestrians a 3 to 7 second head start before giving drivers a green light. This makes pedestrians more visible and reinforces their right of way. This project also adjusts the pedestrian-actuated crossing phase so that all vehicles are given a red light while the walk signal is on.



Q1: Redesign slip lanes at Quince for pedestrian safety.

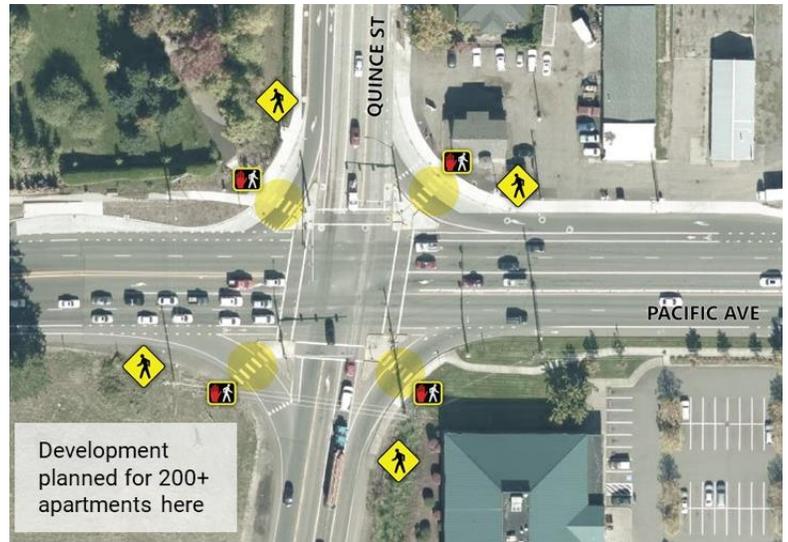
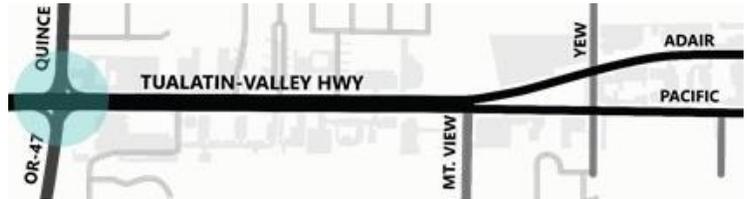


This project adds pedestrian improvements to the right-turn slip lanes at the intersection of Quince Street and Pacific Avenue to make crossing easier, safer, and more comfortable.

Slip lanes will be signalized to allow time for pedestrians to safely cross. Signals will include a leading pedestrian interval to give people crossing a head start and making pedestrians more visible to turning vehicles. Signs will alert drivers in advance of the intersection to the presence of pedestrians. Pedestrian-scale lighting will improve pedestrians' ability to see and be seen.

Considerations:

- Requires new signal equipment and may require ADA upgrades.



-  Signalize crossings with leading pedestrian interval
-  Illumination at crossings
-  Signs to alert drivers in advance of the turn

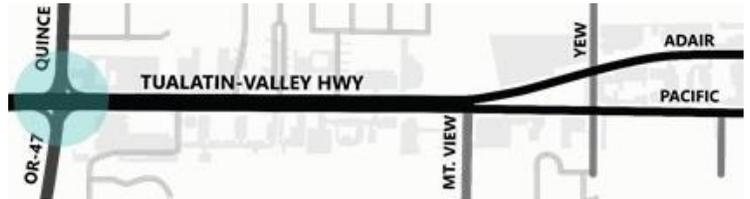
Q2: Tighten turning radius of slip lanes at Quince.



A wide turning radius encourages drivers to maintain high speeds across the pedestrian crossing as they make right turns. This project tightens the turning radii with mountable curbs constructed from contrasting materials, providing physical and visual cues for drivers to slow down.

Considerations:

- Coordinate with signage along the approaches alerting drivers of a pedestrian crossing at the intersection.



Q3: Two-stage left turn bike boxes at Quince.

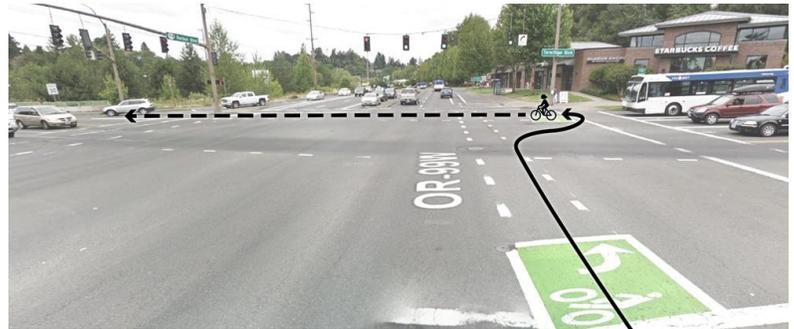
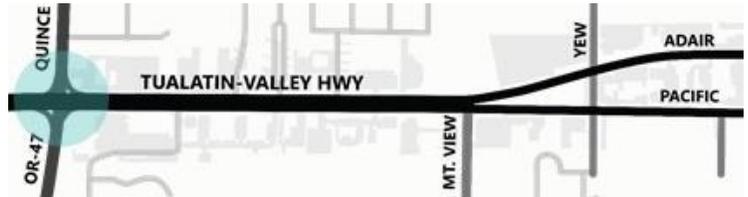


The corridor has few places for people biking to cross safely. Also, the volume of large, fast-moving vehicles can make it hard for drivers to see people biking. This project paints bike boxes that enable two-stage (Copenhagen) left turns at Quince for people biking.

These bike boxes make left turns easier for people biking, they make people biking more visible by putting them in front of cars, and they tell drivers that people biking have a right to be on the road.

Considerations:

- Ensure there is adequate space for these with required turning radii.



Q4: Bike boxes at Quince.

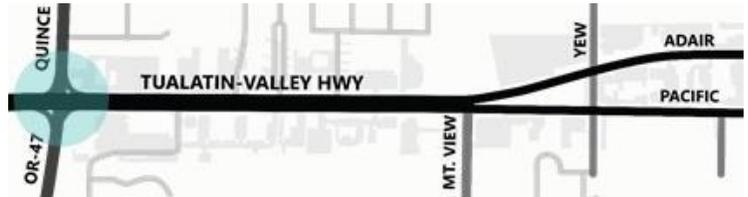


The corridor has few places for people biking to cross safely. Additionally, the volume of large, fast-moving vehicles can make it hard to see people biking. This project paints bike boxes that enable two-stage (Copenhagen) left turns at Quince for people biking.

Bike boxes make people biking more visible by putting them in front of cars, and they tell drivers that people biking have a right to be on the road. Bike boxes also allow two-stage left turns by providing space for a cyclist to pull in and wait for the next signal phase. Bike lanes leading to the bike boxes can also be painted green, with skip striping in the right-turn conflict zone, to make the bike facility more visible to drivers.

Considerations:

- Requires moving signal loops.



Y1a: Signals at Yew intersections.

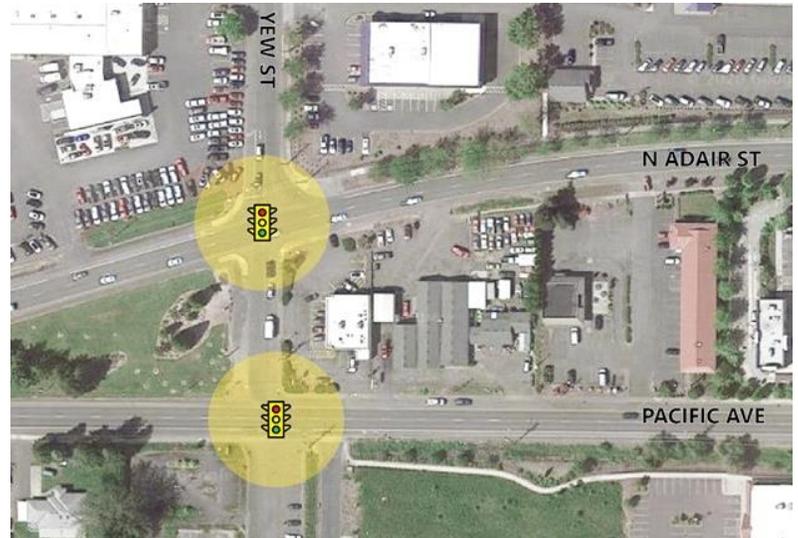
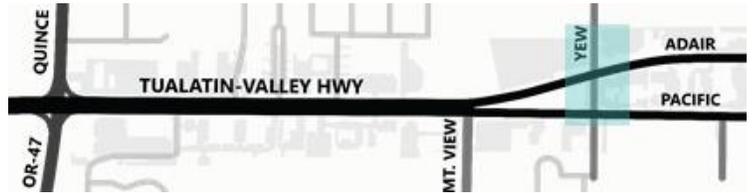


Yew Street is an important connection from TV Highway to points north. The intersections Yew Street makes with the TV Highway couplet has seen a recent spike in crashes. This project adds signals at the intersections of Yew Street with N Adair Street and Pacific Avenue.

Signalizing these intersections will help control traffic to provide safe vehicle movement and pedestrian crossings. New signals will include pedestrian facilities, including pedestrian-actuated signals, pedestrian-scale lighting, and curb extensions. Signals can be timed with other signals in the corridor to encourage safe travel speeds.

Considerations:

- Coordinate with freight movement and future extension of N Holladay St.



Y1b: Pedestrian-activated crossings at Yew intersections.

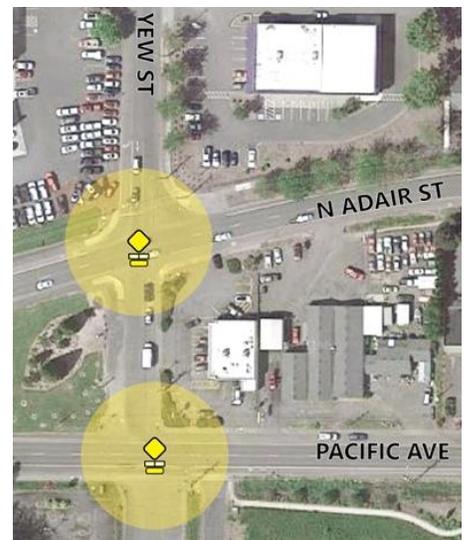
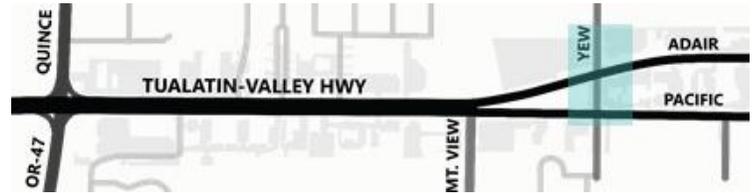


Yew Street is an important connection from TV Highway to points north. The intersections Yew Street makes with the TV Highway couplet has seen a recent spike in crashes. This project creates signalized pedestrian crossings at both N Adair Street and Pacific Avenue.

Crossings may be signalized with actuated pedestrian signals, hybrid beacons, or rapid flash beacons. When possible, signals are timed with other signals in the corridor. Crossings will have pedestrian-scale illumination. Curb extensions will shorten crossing distances and improve visibility.

Considerations:

- Coordinate with planned extension of N Holladay St and freight movement on Yew St.



Transit / Bus

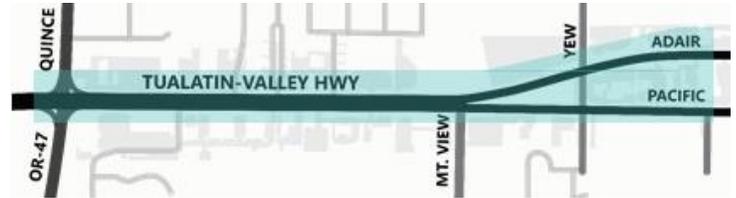
T1: TriMet station amenities and stop relocation.



Many of the bus stops along the corridor are little more than a post with a nearby concrete pad. This project relocates transit stops in the corridor concurrent with sidewalk and crossing improvements. It also improves stops with facilities such as a shelter, bench, and waste can.

Considerations:

- Consider sight lines and interactions with other road users.
- Coordinate with new pedestrian crossings, new developments, and other planned improvements.



T2: Redesign bus pull out and right turn lane at Black Rock / Sherwin Williams.

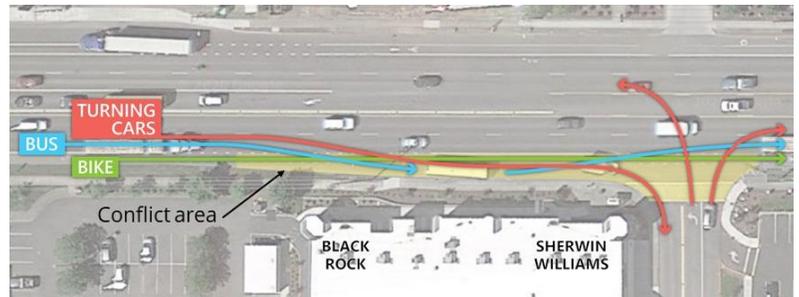
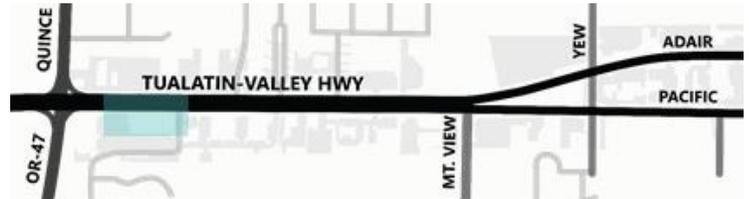


The existing bus stop just east of Quince is shared with a right-turn lane to access the adjacent commercial area. This can be confusing for drivers and can create conflicts between cars, buses, and — because it crosses the bike lane twice — bikes.

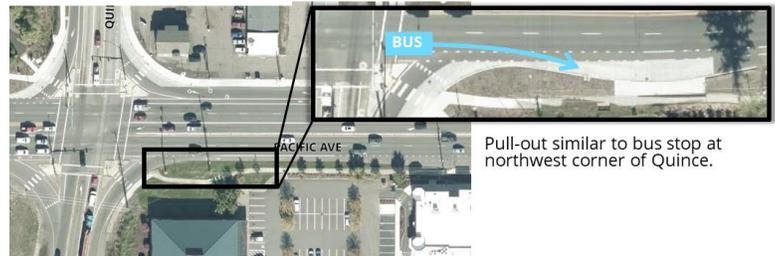
This project reorganizes the traffic pattern while also improving striping and signs to reduce conflicts. The project may relocate the bus stop; moving it further west toward Quince will remove transit from the conflict area.

Considerations:

- Consider sight lines and interactions with other road users.
- Coordinate with new pedestrian crossings, new developments, and other planned improvements.



Existing conditions



Potential redesign concept

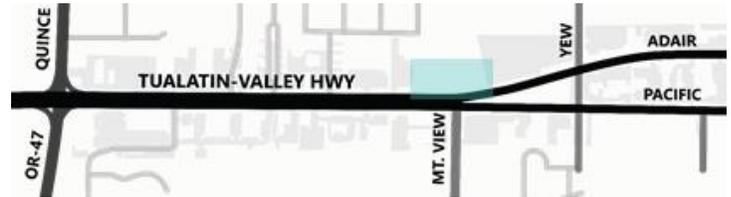
T3: Permanent bus (school and transit) pull out location directly west of Mountain View.



This project creates a space for transit riders and neighborhood school children to safely gather, board, and depart the bus away from TV Highway.

Considerations:

- Likely to require relocating overhead electric infrastructure and new stormwater infrastructure.
- Consider sight lines and interactions with other road users.
- Coordinate with new pedestrian crossings, new developments, and other planned improvements.

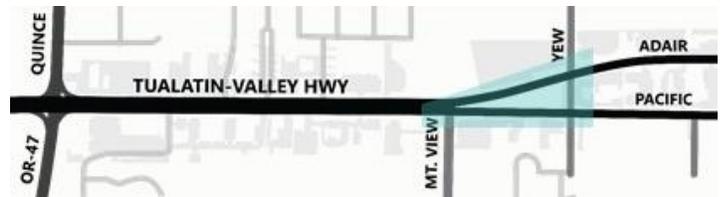


Gateway / Placemaking

G1: New "Welcome to Forest Grove" sign and plantings in couplet triangle.



This project creates an updated and welcoming gateway into Forest Grove. The signage and greenery indicate to travelers that they are entering a community that cares. This can be a new welcome sign to update the existing. By engaging neighboring communities, this project can reinforce local pride and reflect local values.





Safety Issues and Project Concepts

Table 1 lists the safety issues identified in TM4 and the project concepts that address each issue. Many project concepts address multiple safety issues. Those that address the most safety issues are expected to bring more benefits to the corridor.

These project concepts address four or more safety issues:

- S1: Complete sidewalk network (fill all gaps including ADA)
- S2: Fill sidewalk gaps in places that already have curbs or where there are accessibility barriers
- C1a: 3 locations: Protected midblock crossing with median and illumination
- C1b: 2 locations: Protected midblock crossing with median and illumination
- Y1a: Signals at Yew intersections
- Y1b: Pedestrian-activated crossings at Yew intersections

Table 1: Identified Safety Issues and Related Project Concepts

Identified Safety Issues	Related Project Concepts
1 Gaps in sidewalk network	S1: Complete sidewalk network (fill all gaps including ADA) S2: Fill sidewalk gaps in places that already have curbs or where there are accessibility barriers
2 Sidewalks are narrow or obstructed	S1: Complete sidewalk network (fill all gaps including ADA) S2: Fill sidewalk gaps in places that already have curbs or where there are accessibility barriers
3 Lack of ADA accessibility facilities	S1: Complete sidewalk network (fill all gaps including ADA) S2: Fill sidewalk gaps in places that already have curbs or where there are accessibility barriers C1a: 3 locations: Protected midblock crossing with median and illumination C1b: 2 locations: Protected midblock crossing with median and illumination Y1a: Signals at Yew intersections Y1b: Pedestrian-activated crossings at Yew intersections
4 Pedestrians must cross 5 lanes of general purpose traffic and 2 bicycle lanes (up to 85 ft)	A2: Median traffic separator that provides pedestrian refuge C1a: 3 locations: Protected midblock crossing with median and illumination C1b: 2 locations: Protected midblock crossing with median and illumination

Identified Safety Issues	Related Project Concepts
<p>5 Limited marked pedestrian crossing opportunities along OR-8</p>	<p>C1a: 3 locations: Protected midblock crossing with median and illumination</p> <p>C1b: 2 locations: Protected midblock crossing with median and illumination</p> <p>M1: Leading pedestrian interval and pedestrian phase at Mountain View</p> <p>Q1: Redesign slip lanes at Quince for pedestrian safety</p> <p>Y1a: Signals at Yew intersections</p> <p>Y1b: Pedestrian-activated crossings at Yew intersections</p>
<p>6 Absence of pedestrian scale lighting at intersections</p>	<p>F4: Add pedestrian-scale lighting</p> <p>C1a: 3 locations: Protected midblock crossing with median and illumination</p> <p>C1b: 2 locations: Protected midblock crossing with median and illumination</p> <p>Q1: Redesign slip lanes at Quince for pedestrian safety</p> <p>Y1a: Signals at Yew intersections</p> <p>Y1b: Pedestrian-activated crossings at Yew intersections</p>
<p>7 Gaps in bicycle network (including obstacles such as storm water drainage grates located in the bicycle path)</p>	<p>F1: Restripe with narrower general purpose and center turn lanes</p> <p>F2a: Separated or raised bike lane</p>
<p>8 Bicycle facilities (striped bike lane without painted buffer or physical separation) do not meet ODOT HDM or Blueprint for Urban Design guidance for a high volume and high-speed facility</p>	<p>F1: Restripe with narrower general purpose and center turn lanes</p> <p>F2a: Separated or raised bike lane</p> <p>F2b: Add plastic bollards to striped buffered area</p>
<p>9 OR-8/OR-47 includes multimodal conflict points with limited visibility and protection for people walking and biking</p>	<p>Q1: Redesign slip lanes at Quince for pedestrian safety</p> <p>Q2: Tighten turning radius of slip lanes at Quince</p> <p>Q3: Two-stage left turn bike boxes (Copenhagen left)</p> <p>Q4: Bike boxes at Quince</p>

Identified Safety Issues	Related Project Concepts
<p>10 Access management along OR-8 (several driveways along OR-8 make left-turn maneuvers challenging)</p>	<p>A1: Access management along full corridor A2: Median traffic separator that provides pedestrian refuge A3: Allow u-turns at Quince for cars A4: Allow east to westbound u-turns at Mountain View A5: Right turn restriction at Yew and allow west to eastbound u-turns for cars at Mountain View A6: Paint right-turn only "pork chop" at 1st Ave to discourage counter-flow traffic</p>
<p>11 On-property signing could block side street and driveway sight distance for those entering OR-8.</p>	<p>A1: Access management along full corridor</p>
<p>12 Bus stops lacking pedestrian crossings and ADA compliant curb ramps (mid-block and/or intersection corners)</p>	<p>S1: Complete sidewalk network (fill all gaps including ADA) S2: Fill sidewalk gaps in places that already have curbs or where there are accessibility barriers T1: TriMet station amenities and stop relocation</p>
<p>13 Bus stop locations become conflict points between motor vehicles and people biking when buses enter the bike lanes or motorists turn into accesses adjacent to bus stops, increasing the risk of potential collisions</p>	<p>T1: TriMet station amenities and stop relocation T2: Redesign bus pull out and right turn lane at Black Rock/Sherwin Williams T3: Permanent bus (school and transit) pull out location directly west of Mountain View</p>
<p>14 High vehicle speeds on OR-8</p>	<p>F1: Restripe with narrower general purpose and center turn lanes F3: Low vegetation plantings adjacent to roadway F5: Temporary travel speed monitor and red light camera enforcement Q2: Tighten turning radius of slip lanes at Quince</p>
<p>15 Opportunity to enhance pedestrian protection and visibility at signalized intersections based on current signal devices and timing</p>	<p>M1: Leading pedestrian interval and pedestrian phase at Mountain View Q1: Redesign slip lanes at Quince for pedestrian safety</p>

Identified Safety Issues	Related Project Concepts
16 Peds and vehicles are not finding gaps in mainline traffic to cross safely	C1a: 3 locations: Protected midblock crossing with median and illumination C1b: 2 locations: Protected midblock crossing with median and illumination Y1a: Signals at Yew intersections Y1b: Pedestrian-activated crossings at Yew intersections
17 Discourage wrong way traffic	A6: Install right-turn only painted diverter at 1st Ave to discourage wrong ways traffic
18 Motorists use wide bike lane segments for on-street parking	F2a: Separated or raised bike lane F2b: Add plastic bollards to striped buffered area
19 Obstructions (signs, trash cans, etc.) placed in bike lane	F1: Restripe with narrower general purpose and center turn lanes F2a: Separated or raised bike lane
20 School bus stop needed	T3: Permanent bus (school and transit) pull out location directly west of Mountain View

Next Steps

The next steps for developing the East Forest Grove Safety Improvement Plan will focus on further developing these project concepts through public outreach. The project team will share these concepts with neighboring property owners, businesses, and residents, through a combination of canvassing and appearances at community events. This outreach will be used to:

- Discover and project concepts missing from the list.
- Get feedback on the concepts.
- Prioritize the concepts.

This feedback will inform future refinement and phasing recommendations.

East Forest Grove Safety Improvement Plan

Summer 2019 Outreach Summary

Outreach Overview

ODOT and the City of Forest Grove kicked off outreach for the East Forest Grove Safety Improvement Plan in summer 2019 by participating in a variety of well-attended community events. The project aims to address safety, active transportation, access to transit, and streetscape design on Oregon Route 8: Tualatin Valley Highway (OR 8) in Forest Grove. Public feedback is essential to develop project concepts and a final plan that reflect the concerns and ideas for improvement of those that use the roadway.



Between August and September 2019, the project team staffed seven community events in Forest Grove and nearby Cornelius. Over the course of these events a total of 242 people were engaged on the project, and many provided written and verbal feedback on ways to address the project's goals.

Events Overview

Staff from ODOT, City of Forest Grove, Jacobs, Centro Cultural, and JLA Public Involvement provided project-related information and asked for feedback at the following events:

- **Forest Grove Farmers Market** – August 14, 2019 (54 people engaged)
- **Taquiza** – August 16, 2019 (20 people engaged)
- **First Wednesday** – September 4, 2019 (72 people engaged)
- **El Grito** – September 14, 2019 (15 people engaged)
- **Forest Grove's Annual Corn Roast** – September 21, 2019 (80 people engaged)
- **Centro Cultural Community Focus Group** – September 21, 2019 (11 people engaged)
- **Edad de Oro, Centro Cultural's Senior Group** – October 3, 2019 (12 people engaged)

Event participants could provide feedback in a variety of ways at each event, including comment forms, a pre-stamped postcard, and a comment map. Community members were also encouraged to provide comment on the project website if they were unable to speak with staff at the events.

Spanish-Language Events

Forest Grove is a diverse community and engaging with Spanish-speaking community members is a crucial step in the outreach process. As part of the summer outreach, staff participated at Taquiza and El Grito (details above) which were attended by many Latinx and Hispanic

community members. These events were hosted by Centro Cultural, a trusted community-based organization located in neighboring Cornelius, OR.

Centro Cultural hosted two focus groups with members of the Latino community. The first focus group took place on September 21st. Participants expressed similar concerns to those noted below. However, there were additional suggestions:

- The city is growing. We need more pedestrian crossings, and signals with sound for those who are visually impaired.
- Bilingual information on traffic signals would be very helpful.
- More lights, particularly for the evening and winter time.
- Re-think the yellow arrow on 47 and Pacific. Drivers are impatient and traffic cameras should be installed.

The second focus group included members of Edad de Oro, the senior program here at Centro Cultural, which serves the elderly members of the Latino community. Again, comments were similar to those we had previously heard at the tabling events and the first focus group. All participants, except one, use bus line 57 to get to Centro. Their concern is the lack of pedestrian crossings throughout TV Highway, and also they pointed out the impatience of bus drivers with our elderly.

Feedback Highlights

Over the course of each event, several themes began to develop. There were specific areas of the roadway that the public felt warranted special attention as well as comprehensive issues that needed to be addressed. The most common comment themes included:

- There's a demand for increased pedestrian access throughout the roadway (36 comments).
- It's challenging to cross or drive at the Yew Street intersection (21 comments).
- There's a need for safer crossing near transit stops (17 comments).
- It's challenging to cross or drive at the intersection of OR 47 and OR 8 (14 comments).
- The Rose Grove Mobile Home Community needs safer pedestrian access (12 comments).

The following list summarizes comments by theme.

Pedestrian Crossings

- More comments focused on pedestrian crossings than any other issue.
- The road is wide and takes a long time to cross.
- There's poor visibility of pedestrians for drivers at night.
- More marked pedestrian crossings are requested.
 - Drivers are worried about pedestrians walking into the road without a marked crossing.
- Pedestrians must travel far out of their way to get to a marked crossing. [This is especially pronounced at the Rose Grove Community, where the nearest crossing is over 1,000 feet away. To reach the bus stop immediately across the street from their community, people must walk or roll 2,000 feet out of direction.]Some commenters requested full

signalized crossings, some requested flashing yellow beacons, and some requested that an elevated crossing be built over the roadway.

- Several locations were identified for additional crossings:
 - A and B Row (at Rose Grove, bus stops, commercial area)
 - Yew St (to access 7-Eleven, bus stops)
 - C and D Row (Restore)
 - 2nd St (Best Western)
 - Near each bus stop (With PedPDX, Portland recently adopted a policy of providing a marked crossing within 100' of all transit stops)
- Other comments focused on the lack of safety at existing crossings.
 - Mountain View Lane: a pedestrian was struck by a left turning driver.
 - Mountain View Lane: the crossing phase is at the same time as the left turn phase, leading to automobile / pedestrian conflict.

Pedestrian Facilities

- Pedestrian access along the roadway, in the form of sidewalks, lighting, and protection from passing cars, was a common issue brought up at each event.
- Other common pedestrian facilities comments:
 - An overall lack of sidewalks and/ or several sidewalk gaps throughout the roadway.
 - High speed traffic making pedestrians feel unsafe.
 - Lots of cars turning into/out of driveways.
 - Not ADA accessible throughout.
 - Roadway and pedestrian areas don't look nice.
 - The road is poorly lit.

Traffic Signals

- Many comments suggested additional traffic signals, specifically at these locations:
 - A and B Row (Rose Grove).
 - Yew Street (7-Eleven).
 - 2nd Street (Best Western).
 - Restore/O'Reilly.
- Others discussed adapting the signal timing:
 - Give the bus priority.
 - Time lights to reduce driving speed.
- Several commenters said the section where OR 8 becomes a single road (at the couplet) should allow a U-turn.

Intersection at OR 47

- It is difficult for people to travel through for all modes.
- For people walking, drivers turning often don't look for pedestrians or stop for them.
- For people driving, it is hard to see pedestrians, especially when turning.
 - The right turn from OR 47 northbound to OR 8 eastbound is particularly difficult.
- Trucks heading north on OR 47 have been seen running the red light because their speed is not low enough for them to stop in time.
- People on bikes feel vulnerable and unseen.
- The signal timing is too long.

Yew Street

- Commenters identified this as one of the most problematic sections in the project area.
- Yew Street should be right turn only.
- No through traffic should be allowed to cross OR 8 on Yew Street; there should be a traffic barrier.
- People go the wrong way down the one-way here (east on OR 8) to get into the shopping area.
- There is a need for a traffic light at Yew Street.
- This area needs a dedicated crosswalk.
- The bus stop needs to be moved.

Bicycle Facilities

- It feels unsafe with five lanes of fast-moving traffic.
- Many comments describe how it is unpleasant to bike on the corridor, including saying that it's not fun and people wouldn't let their kids ride on it.
- It's impossible for people on bikes to turn left.
- Drivers don't notice bikes.
- The bus blocks the bike lane.
- People with mobility devices (wheel and power chairs) use the bike lanes because the sidewalks are not continuous or accessible.

Driving

- Many comments expressed the difficulty of making left turns.
- There's poor visibility for people driving to see people walking or biking.
- The turn lane and bus pullout just east of OR 47 is complex.
- Cars drive too fast.
- Traffic signals are timed to encourage speeding.
- Yew Street (southbound) should be right turn only.
- There are frequent crashes at 7-Eleven, Best Western, and Restore.

Transit

- Give buses signal priority.
- Improve bus stops so they are ADA accessible, including paving the gravel bus stops.
- Create pedestrian crossings near each bus stop.
- Move some bus stops to align more with existing crossings.

Map Comments

(Location of comment in parenthesis)

Farmers Market – August 14, 2019

- Wonky trying to pay attention to light and pedestrians at the same time. (OR 47 and OR 8 intersection)
- Longer timing for green turn light on OR 47 and OR8. (OR 47 and OR8)
- Tried to walk to McMenamins from Old-Town Area and it wasn't pleasant - we need more sidewalks. (Stretch of road from Oldtown area to McMenamins)
- Lit crosswalks.
- Bike lanes.
- Turn signal OR 47 and OR 8 going north. (OR 47 and OR 8)
- Traffic light on OR8 and Oak St. (OR8 and Oak St)
- Connect 19th from Oak St to Poplar St to OR 47. (19th from Oak St to Poplar St to OR 47)
- Hard to negotiate right turn from OR47 to OR8. (OR 47 to OR8)
- Improve the right turn signal from OR 47 to OR 8 - Takes too long to be able to go and is difficult to pay attention to light and pedestrians. (OR 47 to OR 8)
- Longer left turn signal from OR 8 onto OR 47. (OR 8 onto OR 47)
- Center lane OR8 - difficult at times eastbound turn into ReStore when West bound traffic driving center lane all the way to OR 47. (OR8 turn into ReStore)
- Need more crossings for Rose Grove Park housing. (Rose Grove Park)
- Intersection near Yew St with Adair Ave and Pacific Ave needs light and crosswalks - seen a lot of close calls. (Intersection near Yew St with Adair Ave and Pacific Ave)
- Need more bike boxes. (between OR 47and OR 8)
- Accidents – cars and bikes get tunnel vision and don't watch out. (Intersection between OR 47 and OR 8)
- People use CTR lane as queue for northbound lane. (OR 8)
- Drivers do not stop for pedestrians at right turn. (OR 8)

First Wednesday – September 4, 2019

- Lots of foot traffic, including kids. (near Fir Rd)
- Log trucks blow red enough speed transition. (near Fir Rd)
- Left out of Ace are hard. (Ace hardware parking lot)
- Power chairs use bike lanes as 2-way. (OR 8)
- Turn lane and bus pullout = Complex. (OR 8)
- More activity in this area. (OR 8 bus stops)
- Complicated turns and too many lefts. (OR 8)
- A lot of cars turning in/onto of driveways. (OR 8)
- High pedestrian crossings near Restore. (ReStore)
- I don't cross until I have eye contact.
- Need a light here. (A and B row)

APPENDIX G



- ADA sidewalks needed. (A and B row)
- Pedestrian crossing for transit. (Bus stop 3900 Block OR 8)
- Long distance and time to cross. (Bus stop 3900 Block OR 8)
- Impossible for bikes to go left. (Near Best Western)
- Not pleasant to walk due to fast drivers and narrow sidewalks/buffer. (Near Best Western)
- School bus stop (W/R) Just east of Best Western. (Just E of Best Western)
- Drivers don't stop close calls for people walking. (Near OR 8 and 1st street)
- Dangerous to make lefts (near bus stop 3900 block OR 8)
- Difficult to turn left onto TV Hwy e.g. Auto Zone. (Near Auto Zone)
- Pedestrian struck by NB left turn driver. (Intersection OR 8 and Mountain View Lane)
- Need to make sure there are sidewalks going to cross walks. (Mountain View Lane)
- North-south crosswalks at same time as northbound left. (Near Adair Ave)
- Poor visibility for cars turning to see people. (near 4th street and 22nd Ave)
- Wrecks near Doherty Ford.
- Add signals/pedestrian crossings. (Adair Ave)
- Heavy foot traffic. (Near Welcome to Forest Grove sign)
- Need to make sure there are sidewalks going to cross walks. (Near Intersection Adair Ave and Mountain View Lane)
- TV Hwy/Yew St. is a problem area for crossing for access. (Yew St. and OR 8)
- Need better traffic control. (Near the 711)
- People want to cross and need a light. (Near 711)
- Reduce speed. (near Yew St, N Adair St, OR 8)
- Hot mess.
- Bus Stop has people crossing. (OR 8 and Yew St bus stop)
- Lighted crosswalk. (near W Baseline St.)
- Truck parking along street. (Near Taco Bell)
- More traffic accidents. (Near Walmart)
- Can 19th take some of the accesses? (19th Ave)
- Apartment complex cars park on 19th and Tamarack. (19th and Tamarack)
- Scared to turn left over all the lanes.
- Not a nice place to walk.
- Drivers don't notice the bikes.
- Drivers don't stop for old people or kids.
- Not safe to walk.
- Poor visibility of pedestrians crossing at night.
- Cultural norms are to cross anywhere in Mexico.
- Get bus out of bike travel lane.
- Pedestrians cross everywhere.
- Cars end up faced off in center lane.
- "Suicide lane" is just that.
- We don't bike there because it's a disaster.
- Bus needs green priority.
- I wouldn't walk or let my kids bike.

APPENDIX G



- Need more safe places to cross.
- No shade.
- Noisy and we can't cross.
- Too many cars.
- Doesn't look nice.
- Unsafe drivers on Hawthorne have near misses with pedestrians and bikes.
- Maple and OR 47 should be 45 MPH.
- Lots of low-income retirement people without cars.

Corn Roast – September 21, 2019

- Backs up with traffic at peak times. (OR 47 as it intersects with OR 8)
- Camera here for speeding and running red lights. (Intersection of OR 47 and OR 8)
- Crossings here. (Next to ReStore)
- People crossing to reach bus. (A and B row)
- RR FBs! (Forest Grove Mobile Home Community)
- Covered sky-crossing. (A and B row across OR 8)
- Protected sky-bridge. (A and B row across OR 8)
- Add safe pedestrian crossings. (A and B Row across OR 8)
- Bus stop here; kids cross TV HWY. (East side of Best Western)
- Bus stops in road. (East side of Best Western)
- Lighted crosswalk. (Intersection of Mountain View Lane and OR 8)
- More time for pedestrians to cross. (Intersection of Mountain View Lane and OR 8)
- Allow more cross time for pedestrians. (Intersection of Mountain View Lane and OR 8)
- People crossing. (Yew St)
- Yew Street should be right turn only 1/3. (Yew Street onto OR 8)
- No crossing traffic, needs to be a barrier 2/3. (Yew street onto OR 8 North/South)
- Allow U-turn where OR 8 comes together after Yew 3/3. (OR 8 at Welcome to Forest Grove sign)
- Need a traffic light at Yew. (Yew Street and OR 8)
- Move bus stop it's too dangerous here. (Yew Street Bus stop)
- Terrifying. (Yew street and OR 8)
- Traffic light here. (Yew Street and OR 8)
- Safe crossing for peds in front of 711. (Yew Street 711)
- Dedicated crosswalk and move bus stop to crosswalk. (Yew Street and OR 8)
- Trees blocking signs. (Near Taco Bell on OR 8 at city limits to the east)
- It's busy here. (OR 8 at city limit to the east)
- Left turns here are difficult and risky. (OR 8 Eastbound to Best Western)
- Conflict point: bikes and bus stops. (Bus stop across OR 8 from A and B Row)
- Protected bike lanes.
- People walking stop in median.
- Median placement issues.
- Light timing needs to be better, and there should be better flow of traffic.
- Surveillance cameras throughout.
- Protected sidewalks and bike lanes are necessary.

- Protected bike lanes.
- BRT on TV Hwy with a lot of bike capacity.
- Sidewalks throughout.
- Add/maintain green space.
- More parking space.
- Better lighting needed especially around bus stops.
- Tree canopy.

General Comments to Staff

Farmers Market – August 14, 2019

- Light on 47th and Martin Rd
- Lighting overhead - specifically B-street and OR 47
- Access from Cornelius to FG needs to be better.
- I think it is pretty well developed already.
- Lights are timed for a higher speed limit than posted limit, which pushes people to speed.
- Cars are going too fast and pedestrians step into the street and it is too dangerous.
- More crosswalks for the community on the North side of the street.
- People on busses are dropped off on wrong side of the road when they are going to shops or the pharmacy and cross rather than wait on the bus to come around to the right side of the road or hike up to a crosswalk.
- Flashing crosswalks to alert traffic to pedestrians - rather than a stoplight.
- Need crossings for the mobile home area.
- Too many bus stops on this road have gravel areas which makes it hard for people that roll.
- More frequent lights
- Crossing OR 47 is difficult too.

First Wednesday – September 4, 2019

- Multimodal lanes - dedicated to different modes of transportation
- Yew Street and 711 - Flashing Pedestrian Crossing needed
- Keep 30 mph up till 711 before 40 mph.
- In favor of a roundabout
- Getting around cars parked on street
- Hot mess at 711
- Overpass crosswalks - or more crosswalks
- Not a lot of shade - bike/walk
- Worried how people cross with wheelchairs
- Put in all ADA accessible sidewalks
- Elms to Bi-Mart needs more lighting
- More bike/wheelchair safety at intersections
- Increase capacity - more people need to slow down and look
- No crossings, we need more

- Flashing light
- Flag in bucket crossings
- South side needs walkways
- Long walk
- Realign entrances and lights rather than existing entrances
- Flashing yellow around Yew Street
- Flashing yellows
- Yew Street is a mess
- People just popping up in the road
- People get off the bus and run across the street.

Annual Corn Roast – September 21, 2019

- People crossing at Yew Street/Left Turns
- Mobile homes trying to reach bus
- Roundabouts and 30 mph speed limit
- Speed limit signs on Porter Road
- Dashed turn lane so people don't wait in travel lane to turn
People turning out of 711 going wrong way on 1-way street to turn into shopping center next door

Community Focus Group – September 21, 2019

- Sometimes, drivers don't stop for pedestrians in intersections, or they don't wait for pedestrians to make it across the road.
- Sidewalks in bad conditions or non-existent
- No pedestrian crossings between 47 and Mountain View
- It feels unsafe. Drivers sometimes don't respect pedestrians nor people riding bikes.
- Keep lines on road visible.
- Yellow arrow in traffic light on 47 and Pacific is dangerous. Too much traffic
- More lights
- More police presence to enforce speed limit laws
- Add cameras to control speed
- Lights next to sidewalks so drivers keep an eye on their space
- Can one's culture explain the informality of some pedestrians?
 - It is not cultural. I was taught to use pedestrian crossings since I was a kid.
 - I have seen different kinds of people crossing the streets without using pedestrian crossings. It does not apply only to Latinos. We use pedestrian crossings when they exist.
 - I have always used the pedestrian crossings when they are available. Back in my country, I used these crossings or "pasarelas" (narrow pedestrian bridge above road). I also teach my daughters to use them.
 - Most people cross the street where it is easier and faster. Some of us come from small towns where streets are narrow, drivers drive slower, and there are not many cars.

- The fact is that people cross the street in the middle of the road because they see the opportunity to save time. There could be bilingual information, and also service for the blind so they could hear and cross the road safely.

Edad de Oro, Centro Cultural's Senior Group – October 3, 2019

- Comments were similar to those we had previously heard at the tabling events and the first focus group.
- All participants, except one, use bus line 57 to get to Centro.
- Their concern is the lack of pedestrian crossings throughout TV Highway.
- They pointed out the impatience of bus drivers with our elderly.

Comment Forms

Two comment forms were completed and returned to staff at the events.

1) Farmers Market – August 14, 2019

What challenges do you face when walking, rolling, biking or taking transit on TV Highway in Forest Grove?

- Sidewalks end sometimes, causes people to cross T Hwy unsafely - Also need lighted crosswalk like is in the aloha/Beaverton area on Hwy 8

How can we make TV Highway more inviting?

- More beautifying foliage - regular street sweeping - safer and more frequent crosswalks (dedicated)

Primary way of getting around?

- Walk; Car

What brings you to this part of TV Highway?

- I live near here; I work near here

How many school-aged children live with you?

- 0

What is your race/ethnicity?

- White

2) First Wednesday – September 4, 2019

What challenges do you face when walking, rolling, biking or taking transit on TV Highway in Forest Grove?

APPENDIX G



- Hwy too wide with 5 + lanes for safe pedestrian crossing. Too long signal at Quince. Should be a 2 way-complete.

How can we make TV Highway more inviting?

- Time lights, reduce speed.

Primary way of getting around?

- Walk ; Car

What brings you to this part of TV Highway?

- I visit businesses near here

How many school-aged children live with you?

- 0

What is your race/ethnicity?

- White

What is your age?

- 55-74

Returned Postcard Comments

- Crossing HWY 47 at Maple, Elm, B Streets. Speed limits on 47 are now too high. Need traffic circles or lights at these intersections. Elm St. especially due to the new ATS Pioneer Park that is being developed at the Alvin Thompson Smith house, on Elm St.
- Lights on TV that never been put in - move them by resale store & entrance to mobile estates Restore is planning to sale land behind store - make an entrance there - at least cars will stop - slow down for apartments across from them - will help out Ace.
- I am disabled and use both a walker or a mobility scooter. I do not drive, I use public transportation. When I am left off the bus, some stops are into bike lanes or gravel or next to railways. There are many places where there is no sidewalk at all - I walk in bike lane (or roll) and are too much in traffic.
- Crossing HWY 8 (WB) at Yew and Hwy 8 (EB) at Yew. There needs to be a flashing yellow pedestrian light.
- I'm very concerned with the intersections of HWY 47 and Fernhill Road around 47 and B Street. Both in Forest Grove. Since the speed limit on 47 slows to 25 in Gaston, Yamhill and Carleton, I don't understand why it can drop to 30-35 at B street. Better yet, we need a roundabout at B and Fernhill. Thank you. P.S. B and Fernhill traffic also makes the wait long to enter 47. Hence the high incidence of wrecks.

Online Comment Forms

1)

What challenges do you face when walking, rolling, biking or taking transit on TV Highway in Forest Grove?

- Two issues. City code removed bicycle from the definition of vehicle. The police follow the city's code of not the Oregon Vehicle ORS, s Bicycle's are not vehicles so you are not traffic and the bike lanes are turned into locations for trash cans. Safe Routes is a joke if the bike is not a vehicle this also forces people in wheelchairs to play dodge with traffic. The police and city Council all permit Pacific University to drive golf carts in the bike lanes.

How can we make TV Highway more inviting?

- Big problem the center continues turning lane is dead space. Highway 8 at the west end has a section where the bike lane is less than a foot because of that.

Primary way of getting around?

- Bike; E-bike recumbent mobile device.

What brings you to this part of TV Highway?

- I live near here

How many school-aged children live with you?

- 0

What is your race/ethnicity?

- Other/Prefer to self-describe: A person with disabilities who rides a e-bicycle recumbent and a tandem recumbent.

What is your age?

- 55-74

2)

What challenges do you face when walking, rolling, biking or taking transit on TV Highway in Forest Grove?

- missing sidewalks.

How can we make TV Highway more inviting?

- It was mentioned a few weeks ago that there will be a four way stop intersection at David Hill Rd and Thatcher Rd. Then the flashing pedestrian cross walk signal would be moved to a much needed spot. How about putting the signal on Yew St, West bound lanes. This may make pedestrian crossing a little safer.

Primary way of getting around?

- Walk ; Car

What brings you to this part of TV Highway?

- I live near here; I visit businesses near here; Other (please specify): family lives in Forest Grove

How many school-aged children live with you?

- 0

What is your race/ethnicity?

- White

What is your age?

- 55-74

3)

What challenges do you face when walking, rolling, biking or taking transit on TV Highway in Forest Grove?

- Major difficulties around the Bimart area and east of there to Cornelius. We need safe ways for people to cross the street around bimart. Also dedicated bike lanes would be great as there is a lot of very local traffic that should be bikeable, but it doesn't feel safe.

How can we make TV Highway more inviting?

- Protected bike lanes, maybe side street access to main businesses? Protected turning options. A way to cross near bimart (pedestrian overpass? Would have to be scooter accessible).

Primary way of getting around?

- Car

What brings you to this part of TV Highway?

- I live near here; I visit businesses near here

How many school-aged children live with you?

- 0

What is your race/ethnicity?

- White

What is your age?

- 35-54

4)

What challenges do you face when walking, rolling, biking or taking transit on TV Highway in Forest Grove?

- I would like to have an off TV Highway method of bicycling from Forest Grove to Hillsboro, to take the Max. The method would be along the old railroad tracks that terminate near Pacific University.

How can we make TV Highway more inviting?

- Use timed light signals the reduce the stop and go of traffic. There are sections of lights that do this, it just needs to be extended the whole way. More often street sweeping of the TVH shoulders will reduce flat tires.

Primary way of getting around?

- Bike; Bus; Car

What brings you to this part of TV Highway?

- I live near here

How many school-aged children live with you?

- 1

What is your race/ethnicity?

- White

What is your age?

- 55-74

5)

What challenges do you face when walking, rolling, biking or taking transit on TV Highway in Forest Grove?

- Crossing TV Hwy near Restore store. Trying to get across the hwy from the trailer court to the mall or a bus stop or the opposite is dangerous.

How can we make TV Highway more inviting?

- Inviting to do what? Drive on, park on, cross over to? Or something else. Question makes no sense.

Primary way of getting around?

- Car

What brings you to this part of TV Highway?

- I live near here

How many school-aged children live with you?

- 0

What is your race/ethnicity?

- White

What is your age?

- 55-74

6)

What challenges do you face when walking, rolling, biking or taking transit on TV Highway in Forest Grove?

- Wider sidewalks; benches at mediums and bus stops; properly delineated bike lanes;

How can we make TV Highway more inviting?

- Beautification of the corridor like street lamps and flower beds.

Primary way of getting around?

- Car

What brings you to this part of TV Highway?

- I live near here; I work near here

How many school-aged children live with you?

- 0

What is your race/ethnicity?

- Hispanic/Latino/a/x
- White

What is your age?

- 35-54

APPENDIX G



7)

What challenges do you face when walking, rolling, biking or taking transit on TV Highway in Forest Grove?

- none.

How can we make TV Highway more inviting?

- [Respondent skipped this question]

Primary way of getting around?

- Car

What brings you to this part of TV Highway?

- I visit businesses near here

How many school-aged children live with you?

- 0

What is your race/ethnicity?

- White

What is your age?

- 18-34

EAST FOREST GROVE SAFETY IMPROVEMENT PLAN

JULY 2021 OUTREACH SUMMARY

SURVEY

The East Forest Grove Safety Improvement Plan Survey presented the Forest Grove community with 10 project ideas to review. Participants were asked to provide feedback on each improvement idea and then select their top three improvement priorities. The survey is a summary of responses received between July 31 and September 20, 2021. During this time period, 362 participants completed the survey.

Key Takeaways

- The project recommendations that received the strongest support include adding **signals at Yew Street intersections**, adding **missing sidewalks** and **better lighting**. These ideas were also selected as the top three priorities for the community.
- While there is strong support for signals at Yew Street intersections, there was the widest variety of responses about how to do it. Many provided very specific feedback indicating this is a problem that is on the community's mind but there may be a need for additional education and messaging when a preferred alternative is selected.
- The community is mixed in its support for recommendations to reduce the speed limit and to create tighter turns at Quince. Additional education and messaging might be needed if these ideas move forward.
- There is strong support for the project and a strong desire for increased safety in the project corridor.

See the end of this report for survey respondent summary graphs.

Reducing the Speed Limit

Responses were almost equally divided between yes (40%) and no (40%). Including people responding yes with small changes, the total yes was 54%.

- Concern that without additional traffic enforcement (passive or active), reducing the speed limit by 5 mph won't make a difference.
 - *Example comment: "Just lowering the limit will not help unless it is enforced and the roads have traffic calming measures to make motorists more aware of their speed."*
- Desire for consistent traffic speeds throughout the area.
 - *Example comment: "Consistent speed limit on hwy 8 through Cornelius and Forest Grove."*

Signals at Yew Street Intersections

Strong support – 76% of responses selected "yes."

- Public responses included many detailed suggestions for how to improve this intersection, and several mentioned roundabouts. These intersections are a top priority for the community.
- *Example comment: "There have been too many accidents here, also for many of the factory workers it costs them a lot to be given the chance to cross the road safely. Nobody gives them the right of way and the cars that want to cross that intersection last a long time."*

Mid-block Crossings

Strong support – 62% of responses selected “yes.”

- Support depends on quantity – most want all three, some want just one or two.
- Those who strongly support would like to see increased visibility and safety: flashing lights, good lighting, sheltered pedestrian islands, etc.
- Recommendation for additional outreach to communities with disabilities.

Separated or Raised Bike Lanes

Majority support – 58% of responses selected “yes.”

- Concern about using funding for a small number of cyclists who use the road.
 - *Example comment: “I don’t see a lot of bicycles on TV Hwy - don’t want to spend a fortune of my tax \$\$ on something not widely used... now it could be bike riders aren’t using it when I’m there or would use it more if it was safer...”*
- Need for better education for bike users on how to use the bike lanes properly (i.e. reduce bikes riding on sidewalks), etc.
 - *Example comment: “The bicyclists I see usually use sidewalks and veer into traffic lanes, largely ignoring the bike lanes. Better training and laws for bicyclists would be more effective.”*

Adding Missing Sidewalks

Very strong support – 86% of responses selected “yes.”

- Desire to see all sidewalk additions, including in locations between Pacific and Adair.
 - *Example comment: “I would also consider sidewalks even on the two locations listed as having no destination. Sidewalks offer safe places for pedestrians to get from A to B safely even in the absence of a destinations between A and B.”*

Driveway Access

Strong support – 62% of responses selected “yes.”

- Desire to see turn or refuge lanes for safer access in and out of driveways.
 - *Example comment: “I support medians with turn lanes, not shared driveways.”*

Median Traffic Separators in Crosswalks

Strong support - 63% of responses selected “yes.”

- Concerns about removing left turns.
 - *Example comment: “Providing left turn access in a controlled area is safer for everyone, allowing entry into businesses will make the difference between survival or failure of the business.”*
- Support for creating an attractive way to calm traffic.
 - *Example comment: “These types of structural changes will do more to calm traffic than lowering the speed limit. Plus, they’ll make the corridor a tiny bit more walkable and attractive, especially if they include landscaping.”*
- Don’t spend money on “aesthetics”.
 - *Example comment: “I’m not big on aesthetics so spending a bunch of money to make things look pretty doesn’t make good fiscal sense. The road is already there.”*

Lighting

Very strong support - 83% of responses selected “yes.”

- Quality of lighting matters – support for eco-friendly, bird-friendly and not contributing to more light pollution/over-lighting the area.
 - *Example comment: “I am for 100% LED streetlights which are more efficient, brighter, and reduce light pollution reflecting back up into the atmosphere.”*

TriMet Stops

Strong support – 72% of responses selected “yes.”

- Strong desire for buses to not delay traffic while making stops.
 - *Example comment: “Design the stops so the bus is completely off the highway when stopping for loading and unloading passengers.”*
- While there is general support for garbage cans at TriMet stops, there are concerns about maintenance.
 - *Example comment: “Add garbage cans at stops. Even if one person drives the route daily dumping them it is better than the alternative.”*
- Desire for rider safety at bus stops.
 - *Example comment: “It would also be important to have lighting for the early morning or at night. It would be good if they could activate a button, a type of traffic light when there is someone at the stop they can put a button with a green light so the bus can stop or save time.”*

Tighter Turns at Quince

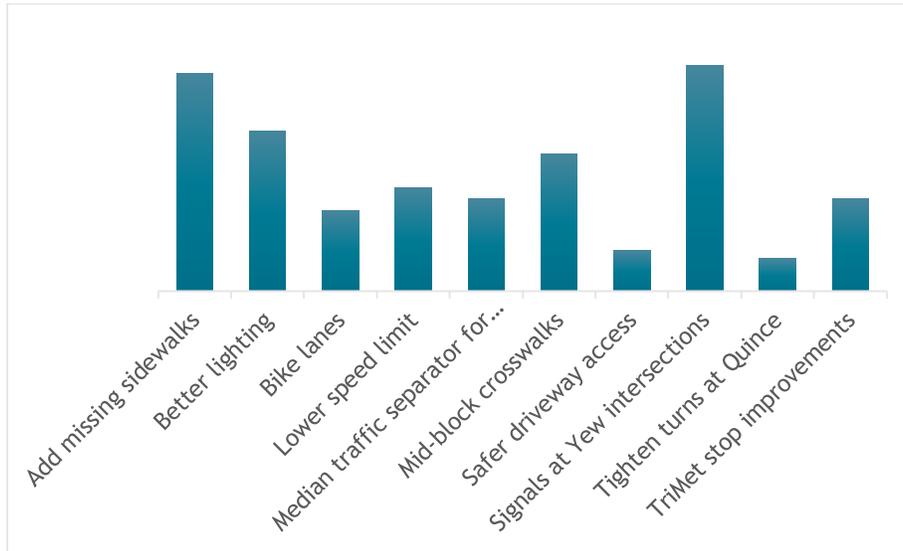
Responses were almost equally divided between yes (48%) and no (42%).

- Concern about freight safety with tighter turns.
 - *Example comment: “It should be restrictive but not enough to cause commercial vehicle damage.”*
- Concern about additional construction at this intersection after the most recent construction project.
 - *Example comment: “We just got done dealing with major improvements at that intersection! Add signage but leave the intersection alone.”*

Improvement Ideas Prioritized

Responders were asked to pick their top three priorities. The following chart is an aggregate of all data.

The top recommended improvements include adding signals at Yew Street intersections, better lighting, missing sidewalks, and mid-block crosswalks.



Additional open-ended comments

These comments were wide-ranging and many of them reiterated previous points about the ten improvement ideas. Many comments were about other areas outside of the project corridor, particularly on Highway 47 and Cornelius Pass Road. Several expressed support for the project and reiterated the need for increased bike and pedestrian safety.

Example comments:

- *“It is difficult to choose priorities (above) as all these things that address non motor vehicle access and safety have been given minimal attention compared to ‘moving cars and trucks’ by WA County. Glad to see this survey addressing these important concerns.”*
- *“This has been a serious safety hazard for years. Thank you for helping make the changes we need.”*
- *“All of these things are needed. It is very unsafe to walk.”*
- *“I am a handicapped person, so any type of safety and/or lighting improvements will benefit me and my other handicapped and elderly brethren a lot and is much appreciated.”*

BUSINESS OUTREACH

The business canvas interview comprised of interviewing 17 businesses along the OR-8 corridor. This process served to hear from the community about notable traffic and pedestrian dangers, in addition to building awareness of and seeking feedback for proposed project improvements. These surveys were conducted through in-person canvassing with the option of leaving paper surveys to engage in minimal contact with the canvassers if desired.

Overall, common traffic problems leading to a dangerous environment for both vehicles and pedestrians were attributed to **low signage, poor lighting, and lacking pedestrian infrastructure**. Recommended interventions included improved vehicle signage, better pedestrian-scale lighting, completion of the sidewalk network, and an increased number of mid-block crosswalks. Suggestions to generally improve traffic included repainting medians, widening lanes, and fixing potholes.

The following locations were commonly mentioned most in need of safety improvements:

- Pacific Avenue and Quince/OR-47
- Pacific Avenue and Yew
- Pacific Avenue and Quince Street
- Streets leading into Cornelius

The intersection of **Pacific Avenue/OR-8 and Quince/OR-47** was the most mentioned location throughout the canvassing outreach experience. Businesses repeatedly stated the pedestrian environment was extremely unsafe, largely due to low walkability, poor lighting, and speeding traffic. Businesses recommended an increase in visible signage to indicate that cars must yield to pedestrians or slow down. Respondents also recommended improved pedestrian infrastructure, such as increased number of mid-crosswalks and improved pedestrian-scale lighting. Although some crosswalks are currently illuminated, one business indicated that even more flashing lights would likely improve safety. Businesses noted that a consistent speed limit throughout the highway may also help in preventing cars from reaching dangerously high speeds, recommending 35 MPH.

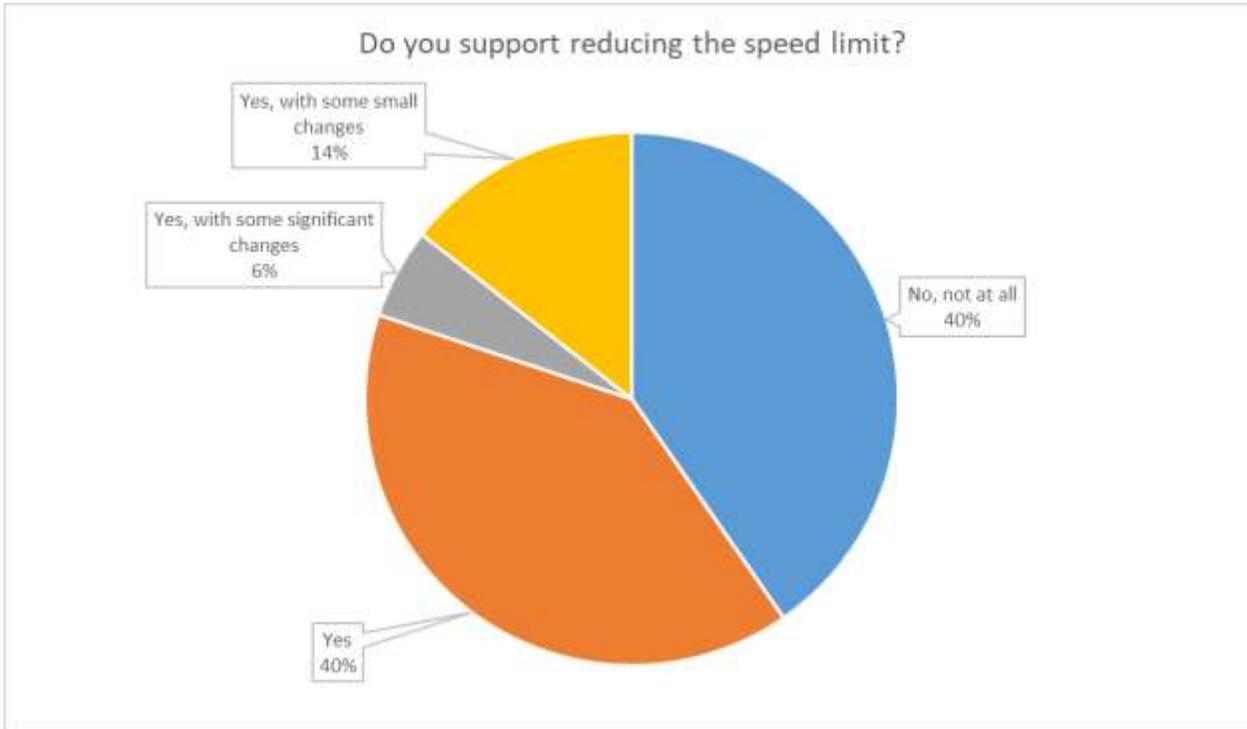
Pacific/OR-8 and Yew Street was the second most mentioned intersection and faced similar issues regarding speeding traffic and poor pedestrian infrastructure. Businesses recommended the installation of mid-block crossings, especially between bus stops and residential areas or other amenities across the street. At this location, it was noted that a traffic light may do little to improve safety as there is already one nearby.

Businesses also identified **Pacific/OR-8 and Quince Street** as an area in need of intervention to improve safety. Several respondents reported having personally seen multiple fatalities at this intersection and underscored the urgency of immediate and radical safety interventions necessary to save lives. Speeding was noted as a factor, and recommended interventions included improved signage and installation of traffic lights.

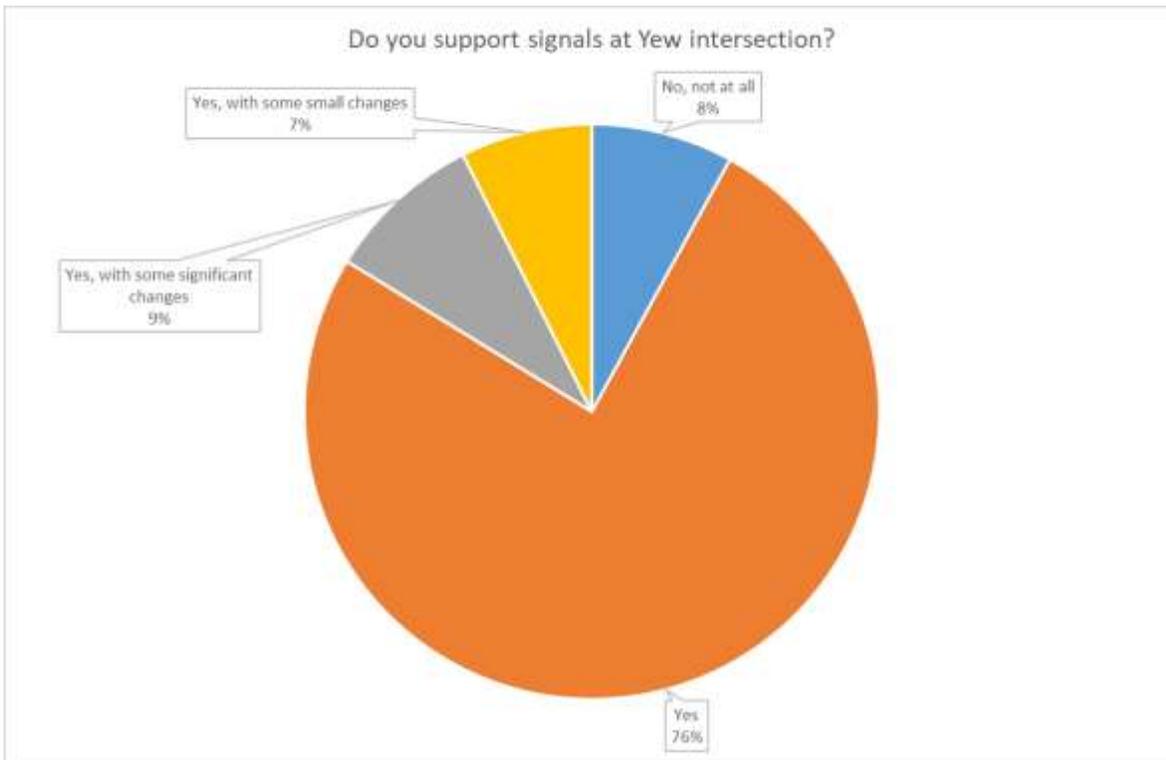
Streets leading into **Cornelius** were mentioned as having poor pedestrian amenities, and businesses recommended completion of the sidewalk network in addition to installing bike lanes in residential areas.

2021 SURVEY RESPONSES (STRATEGIES)

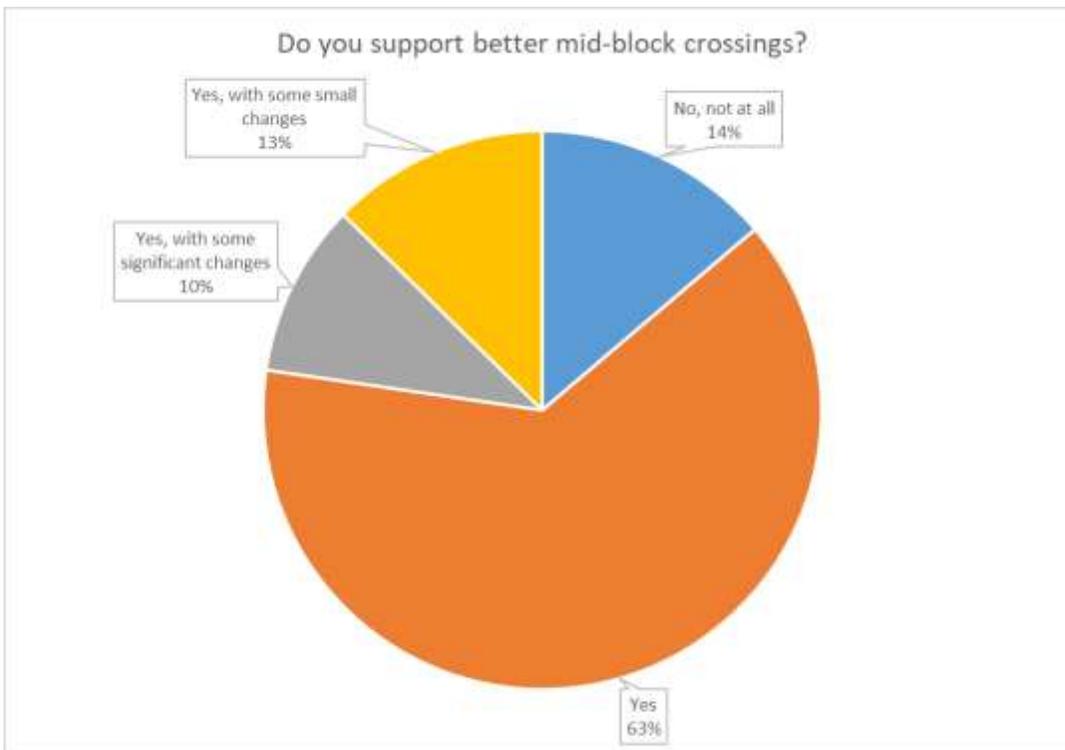
Do you support reducing the speed limit?



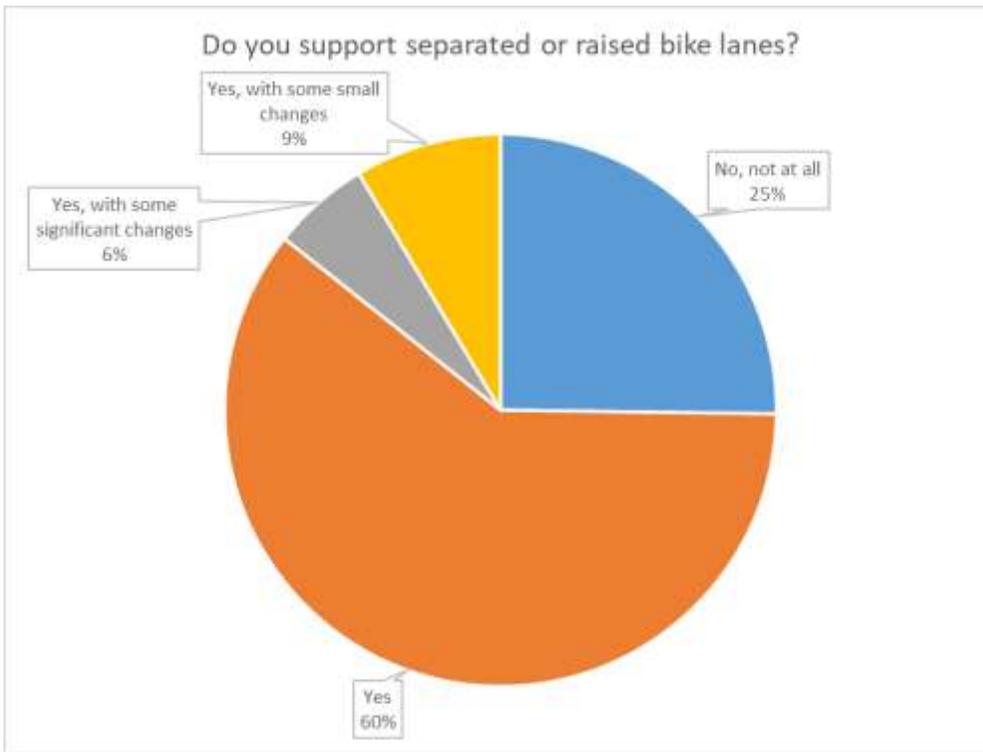
Do you support signals at Yew intersection?



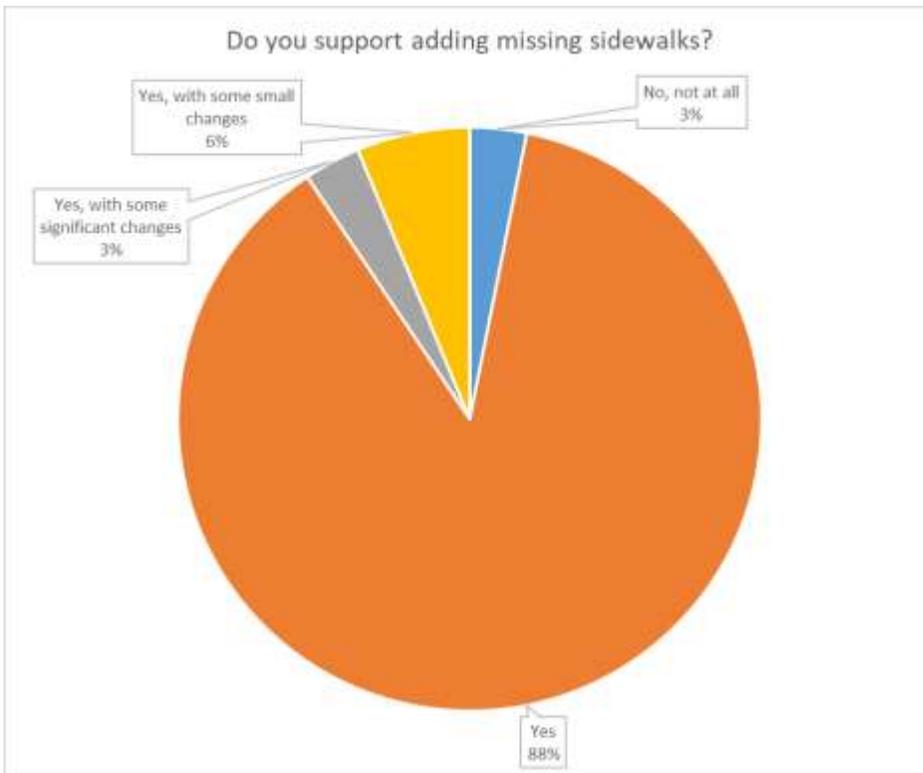
Do you support better mid-block crossings?



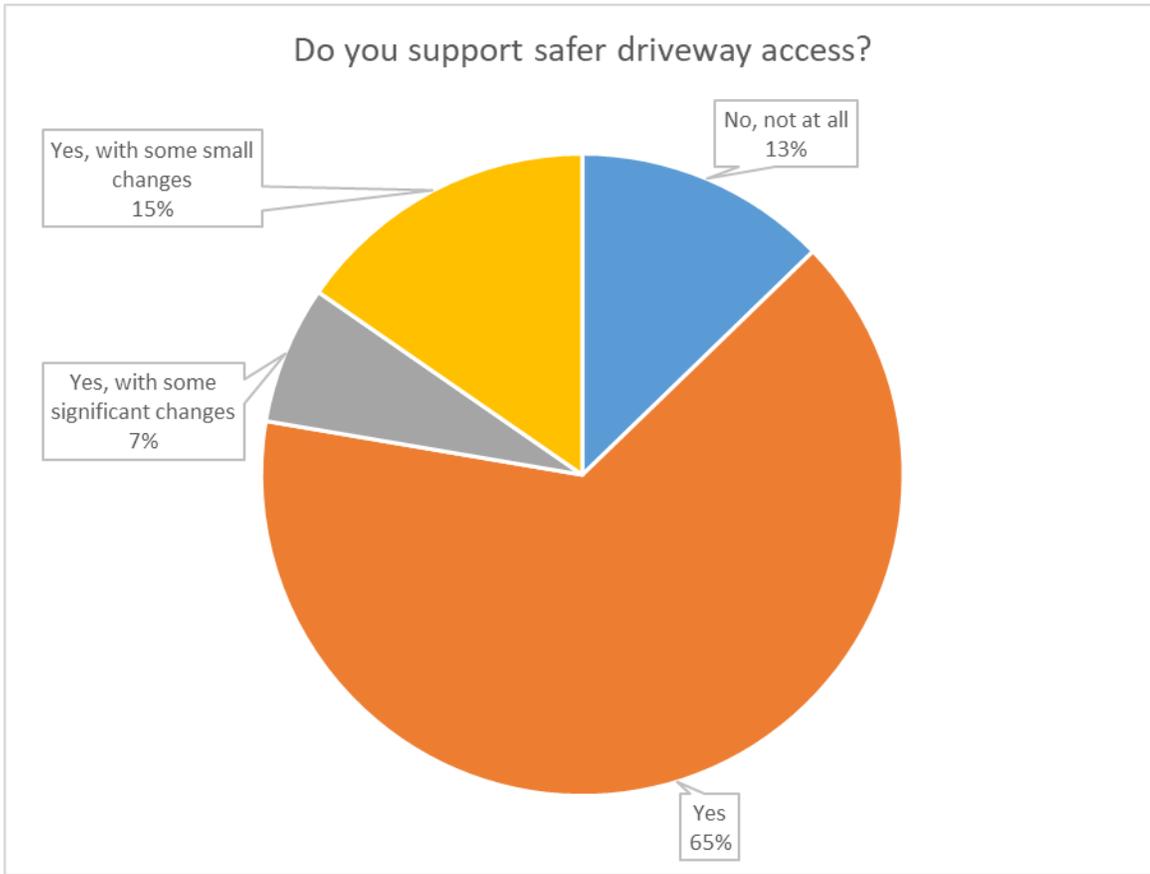
Do you support separated or raised bike lanes?



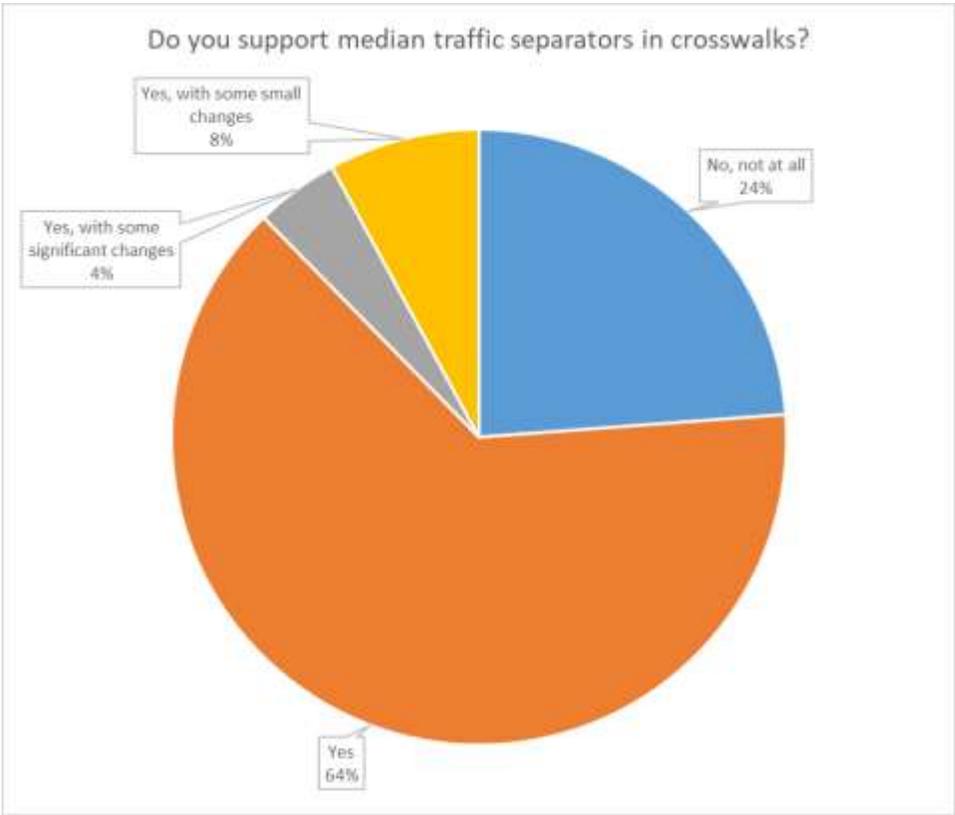
Do you support adding missing sidewalks?



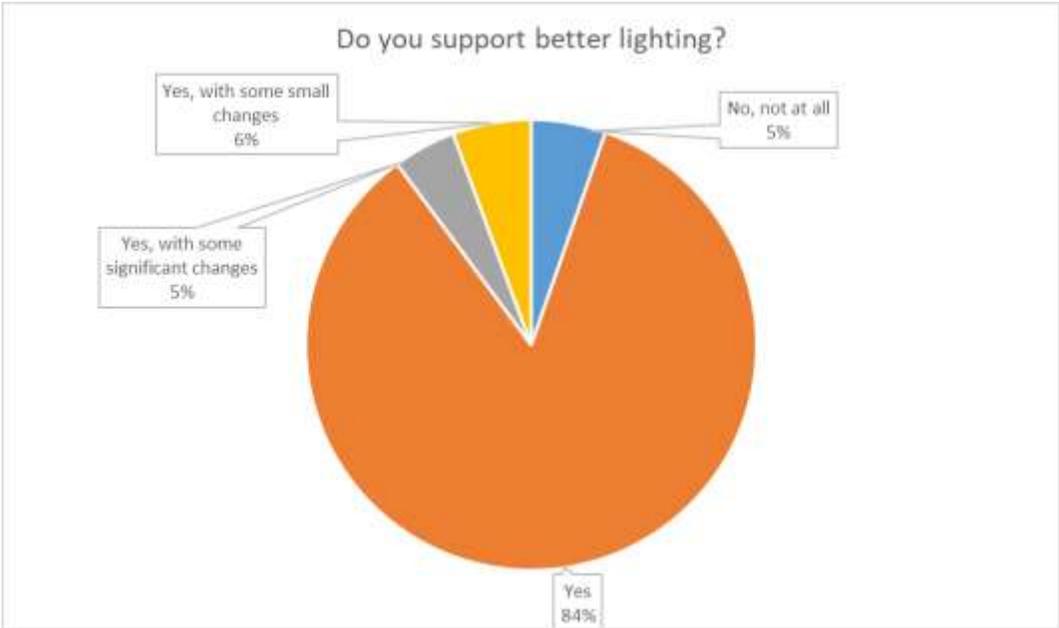
Do you support safer driveway access?



Do you support median traffic separators in crosswalks?

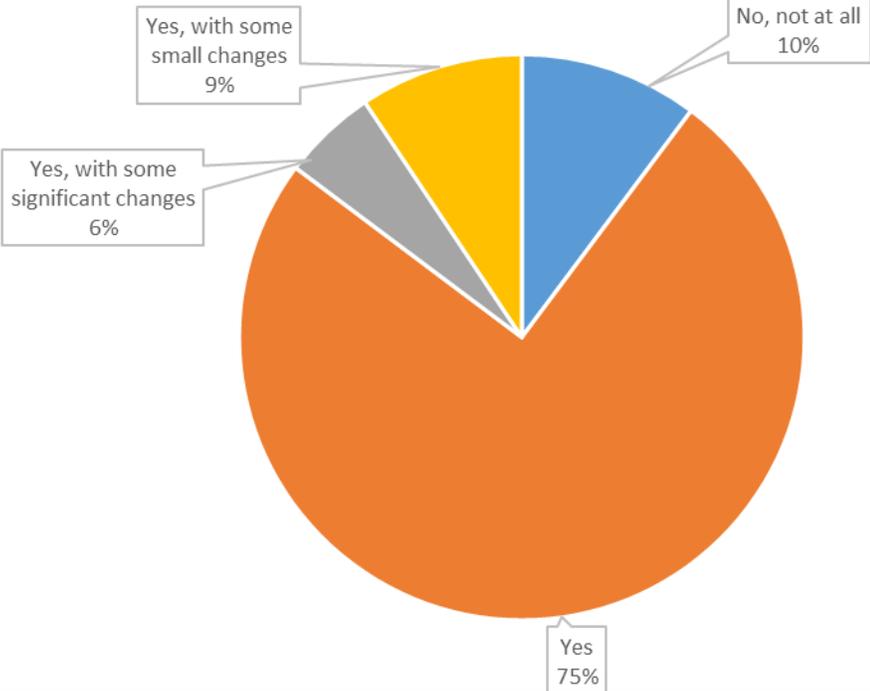


Do you support better lighting?

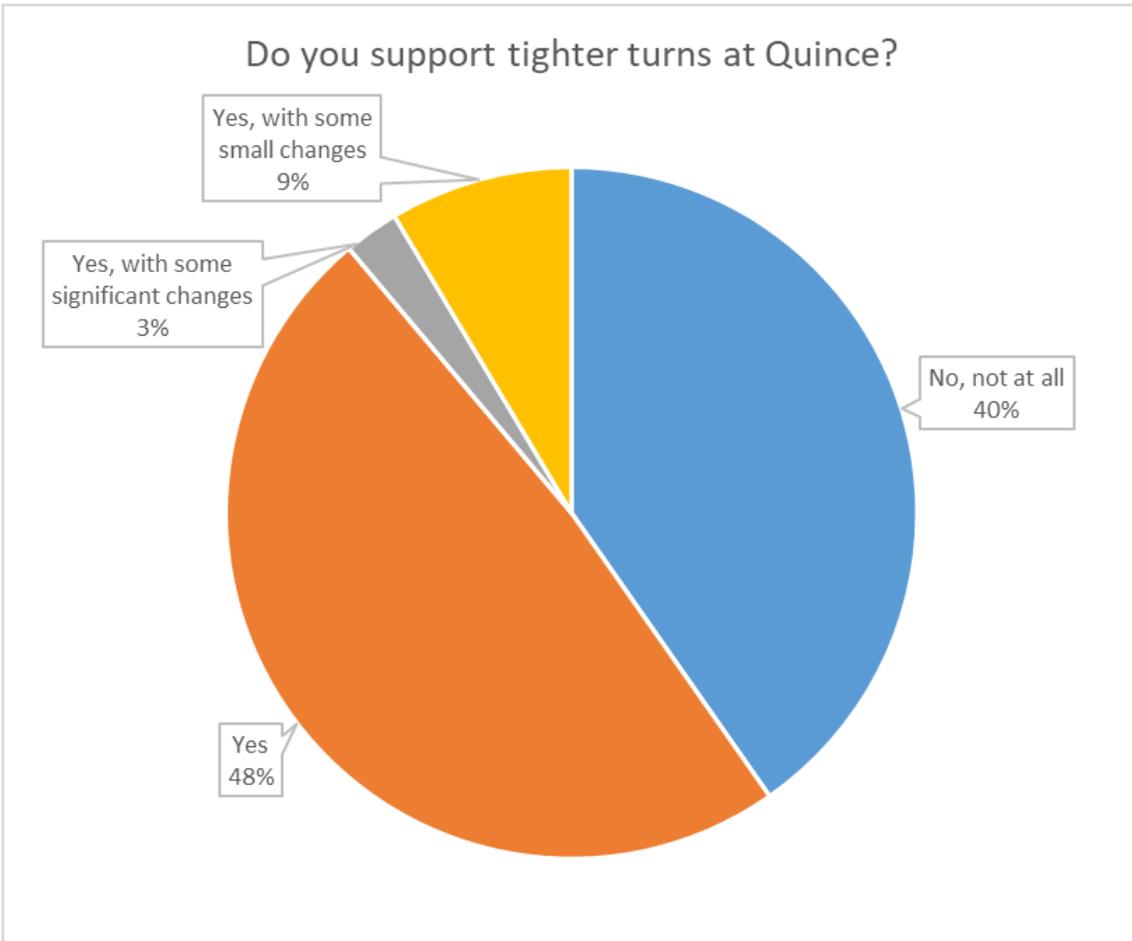


Do you support improved TriMet stops?

Do you support improved TriMet stops?



Do you support tighter turns at Quince?



EAST FOREST GROVE SAFETY IMPROVEMENT PLAN

APPENDIX H

**CRASH DIAGRAMS, OR-8 EAST FOREST GROVE
OREGON DOT CRASH DATA 2012-2019
CREATED JUNE 2021**

Intersection of OR-8 and OR-47

West - People involved in Crash				
Straight/Rear End	Injuries			Property Damage Only
	Major	Minor	No Injury	
Dawn and Dusk				
Daylight				1
Dark				
Turn				
Dawn and Dusk				
Daylight		1	1	
Dark				

Center - People involved in Crash				
Straight/Rear End	Injuries			Property Damage Only
	Major	Minor	No Injury	
Dawn and Dusk				
Daylight		4		
Dark				
Turn				
Dawn and Dusk		15	5	
Daylight	14	7	6	
Dark				
Angle				
Dawn and Dusk				
Daylight		2	3	2
Dark				

East - People involved in Crash				
Straight/Rear End	Injuries			Property Damage Only
	Major	Minor	No Injury	
Dawn and Dusk				
Daylight				
Dark				
Turn				
Dawn and Dusk		1P	1	-
Daylight				4
Dark				
Angle				
Dawn and Dusk				
Daylight				4
Dark				

OR-8/Pacific Avenue

West

Center

East

South

OR-47

South/SE/SW - People involved in Crash				
Straight/Rear End	Injuries			Property Damage Only
	Major	Minor	No Injury	
Dawn and Dusk	1	2	3	
Daylight		19	16	8
Dark				
Turn				
Dawn and Dusk				
Daylight		2	1	2
Dark				

North/NE - People involved in Crash				
Straight/Rear End	Injuries			Property Damage Only
	Major	Minor	No Injury	
Dawn and Dusk				
Daylight				3
Dark				
Turn				
Dawn and Dusk				
Daylight		1	1	
Dark				



Note: A single crash illustrated in on map can have multiple injuries listed in the table.

Data Source:
Oregon Department of Transportation
February 2021
Data displayed includes: vehicle movement,
collision type, and light conditions
Date range: 2012-2019

- # Number of Collisions
- Direction of Travel
- ↘ Angled Collision
- ↻ Turning Collision
- B/P Bike/Pedestrian Collision
- 🚌 Bus Stop
- 🚚 Fixed Object Collision
- ⇨ Rear End Collision



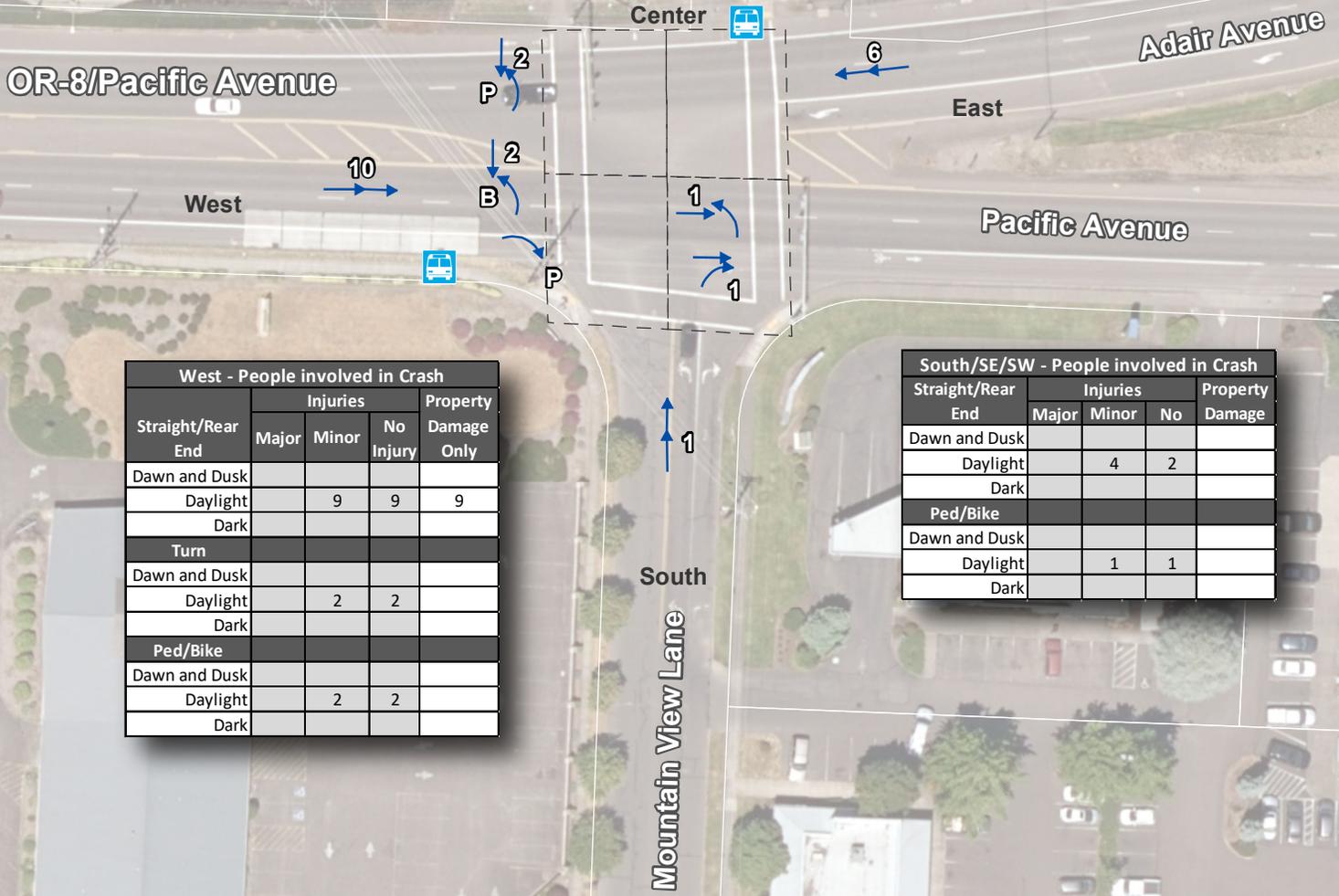
OR-8 East Forest Grove Safety
Improvements Plan

Jacobs

Intersection of OR-8 and Mountain View Lane

Center - People Involved in Crash				
Straight/Rear End	Injuries			Property Damage Only
	Major	Minor	No Injury	
Dawn and Dusk				
Daylight				
Dark				
Turn				
Dawn and Dusk				2
Daylight				2
Dark				

East - People Involved in Crash				
Straight/Rear End	Injuries			Property Damage Only
	Major	Minor	No Injury	
Dawn and Dusk				
Daylight		2	2	6
Dark				
Angle				
Dawn and Dusk				2
Daylight				
Dark				



West - People Involved in Crash				
Straight/Rear End	Injuries			Property Damage Only
	Major	Minor	No Injury	
Dawn and Dusk				
Daylight		9	9	9
Dark				
Turn				
Dawn and Dusk				
Daylight		2	2	
Dark				
Ped/Bike				
Dawn and Dusk				
Daylight		2	2	
Dark				

South/SE/SW - People Involved in Crash				
Straight/Rear End	Injuries			Property Damage
	Major	Minor	No	
Dawn and Dusk				
Daylight		4	2	
Dark				
Ped/Bike				
Dawn and Dusk				
Daylight		1	1	
Dark				



Note: A single crash illustrated in on map can have multiple injuries listed in the table.

Data Source:
Oregon Department of Transportation
February 2021
Data displayed includes: vehicle movement,
collision type, and light conditions
Date range: 2012-2019

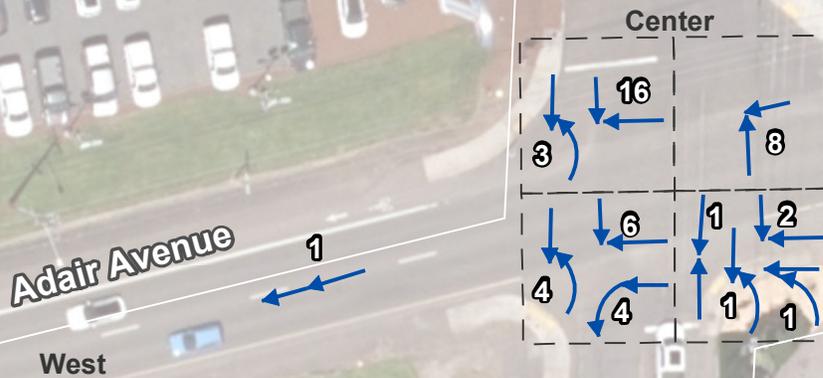
0 50 100 Feet

- # Number of Collisions
- Direction of Travel
- ↘ Angled Collision
- ↻ Turning Collision
- B/P Bike/Pedestrian Collision
- Bus Stop
- Fixed Object Collision
- Rear End Collision

Intersection of Adair Avenue and Yew Street

North/NE - People Involved in Crash				
Straight/Rear End	Injuries			Property Damage Only
	Major	Minor	No Injury	
Dawn and Dusk		1	2	
Daylight				
Dark				

East - People Involved in Crash				
Straight/Rear End	Injuries			Property Damage Only
	Major	Minor	No Injury	
Dawn and Dusk				
Daylight		4	2	6
Dark				



Center - People Involved in Crash				
Straight/Rear End	Injuries			Property Damage Only
	Major	Minor	No Injury	
Dawn and Dusk		1	1	
Daylight				
Dark				
Turn				
Dawn and Dusk				
Daylight	1	5	7	10
Dark		1	2	
Angle				
Dawn and Dusk				
Daylight	7	25	29	20
Dark				

West - People Involved in Crash				
Angle	Injuries			Property Damage Only
	Major	Minor	No Injury	
Dawn and Dusk		2	3	
Daylight				
Dark				

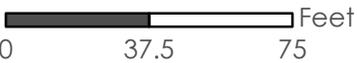
OR-8/Pacific Avenue



Note: A single crash illustrated in on map can have multiple injuries listed in the table.

Data Source:
Oregon Department of Transportation
February 2021
Data displayed includes: vehicle movement,
collision type, and light conditions
Date range: 2012-2019

- # Number of Collisions
- Direction of Travel
- ↘ Angled Collision
- ↻ Turning Collision
- B/P Bike/Pedestrian Collision
- 🚌 Bus Stop
- 🚧 Fixed Object Collision
- Rear End Collision



OR-8 East Forest Grove Safety Improvements Plan
Jacobs

Intersection of Pacific Avenue and Yew Street

Adair Avenue

Yew Street

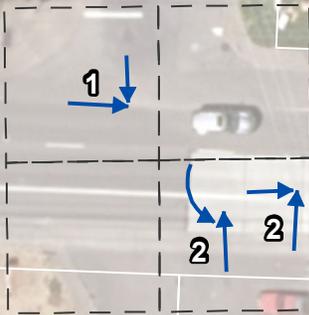
North

Center

West

OR-8/Pacific Avenue

West - People Involved in Crash				
Straight/Rear End	Injuries			Property Damage Only
	Major	Minor	No Injury	
Dawn and Dusk				
Daylight		1	1	
Dark				



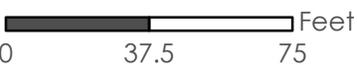
Center - People Involved in Crash				
Straight/Rear End	Injuries			Property Damage Only
	Major	Minor	No Injury	
Dawn and Dusk				
Daylight				
Dark				
Turn				
Dawn and Dusk				
Daylight		1	1	2
Dark				
Angle				
Dawn and Dusk				
Daylight		2	2	2
Dark				



Note: A single crash illustrated in on map can have multiple injuries listed in the table.

Data Source:
Oregon Department of Transportation
February 2021

Data displayed includes: vehicle movement,
collision type, and light conditions
Date range: 2012-2019



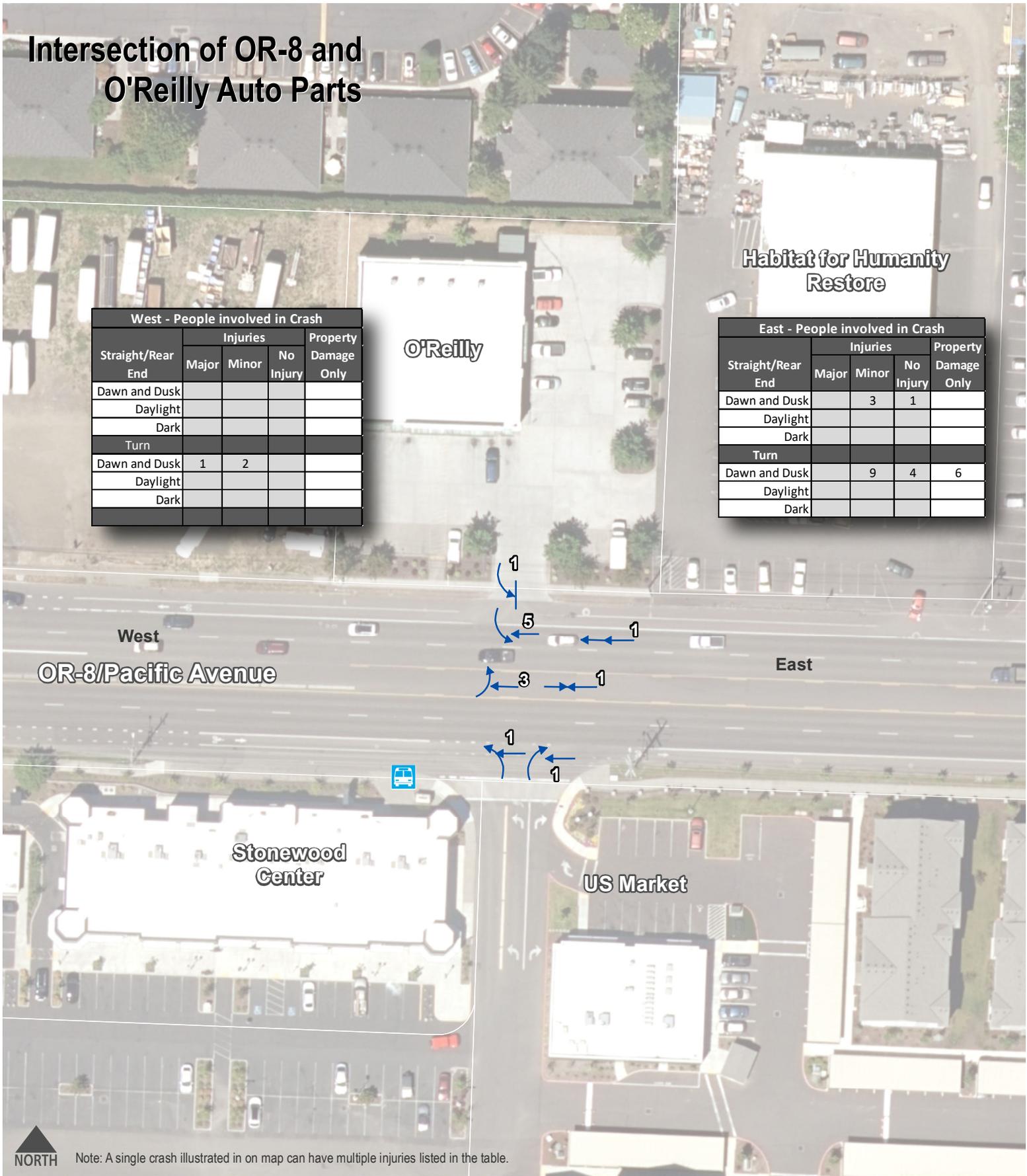
- Number of Collisions
- Direction of Travel
- Angled Collision
- Turning Collision

- Bike/Pedestrian Collision
- Bus Stop
- Fixed Object Collision
- Rear End Collision

OR-8 East Forest Grove Safety
Improvements Plan

Jacobs

Intersection of OR-8 and O'Reilly Auto Parts



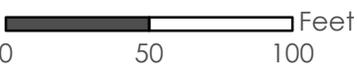
West - People Involved in Crash				
Straight/Rear End	Injuries			Property Damage Only
	Major	Minor	No Injury	
Dawn and Dusk				
Daylight				
Dark				
Turn				
Dawn and Dusk	1	2		
Daylight				
Dark				

East - People Involved in Crash				
Straight/Rear End	Injuries			Property Damage Only
	Major	Minor	No Injury	
Dawn and Dusk		3	1	
Daylight				
Dark				
Turn				
Dawn and Dusk		9	4	6
Daylight				
Dark				

NORTH Note: A single crash illustrated in on map can have multiple injuries listed in the table.

Data Source:
Oregon Department of Transportation
February 2021
Data displayed includes: vehicle movement,
collision type, and light conditions
Date range: 2012-2019

- # Number of Collisions
- Direction of Travel
- ↘ Angled Collision
- ↻ Turning Collision
- B/P Bike/Pedestrian Collision
- 🚌 Bus Stop
- 📌 Fixed Object Collision
- ⇨ Rear End Collision



OR-8 East Forest Grove Safety Improvements Plan

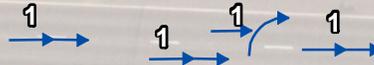


Intersection of OR-8 and 1st Street

West - People Involved in Crash				
Straight/Rear End	Injuries			Property Damage Only
	Major	Minor	No Injury	
Dawn and Dusk		1	1	
Daylight				
Dark				

East - People Involved in Crash				
Straight/Rear End	Injuries			Property Damage Only
	Major	Minor	No Injury	
Dawn and Dusk				
Daylight				2
Dark				

OR-8/Pacific Avenue



1st Street

Center - People Involved in Crash				
Straight/Rear End	Injuries			Property Damage Only
	Major	Minor	No Injury	
Dawn and Dusk				
Daylight		2	1	
Dark				
Turn				
Dawn and Dusk				
Daylight		1	2	
Dark				



Note: A single crash illustrated in on map can have multiple injuries listed in the table.

Data Source:
Oregon Department of Transportation
February 2021

Data displayed includes: vehicle movement,
collision type, and light conditions
Date range: 2012-2019

Number of Collisions

Direction of Travel

Angled Collision

Turning Collision

Bike/Pedestrian Collision

Bus Stop

Fixed Object Collision

Rear End Collision

0 50 100 Feet

OR-8 East Forest Grove Safety
Improvements Plan

Jacobs



Oregon

Kate Brown, Governor

Department of Transportation

Transportation Region 1
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Subject: OR-8 Tualatin Valley Highway Improvement Plan – Forest Grove Warrant and NCHRP 562 Analysis Memo

This memorandum presents a review of the collected traffic data for the OR-8 Tualatin Valley Highway Improvement Plan – Forest Grove regarding a pedestrian crossing analysis per NCHRP Report 562 and a traffic signal warrant analysis per the MUTCD at three locations along OR-8 in the City of Forest Grove: Adair Avenue/Yew Street, Pacific Avenue/Yew Street, and Pacific Avenue/A and B Row.

Recommendations

The following are recommendations based on the preliminary analysis:

- It is likely that the intersection of OR-8 (Adair Avenue) and Yew Street would meet signal warrants. It is recommended that additional work be completed to collect a 14-hour midweek day turning movement count at the intersection and a tube count that measures the 85th percentile speed along OR-8 (Adair Avenue) just east of the intersection. This data should be collected after the pandemic has passed. In addition to the likelihood of meeting signal warrants based on traffic volumes, the intersection exhibits a high crash frequency (more than six crashes per year) and a high observed crash rate (more than triple the statewide critical crash rate for similar intersections), that could be mitigated with installation of a traffic signal. Finally, during the two-hour weekday AM and PM peak periods, there are more than 16 pedestrians per hour crossing OR-8 (Adair Avenue) and they would benefit from having a signalized crossing.
- It is possible that the intersection of OR-8 (Pacific Avenue) and Yew Street would meet signal warrants. It is recommended that additional work be completed to collect a 14-hour midweek day turning movement count at the intersection and a tube count that measures the 85th percentile speed along OR-8 (Pacific Avenue) just west of the intersection. This data should be collected after the pandemic has passed. During the two-hour weekday AM and PM peak

periods, there are more than 12 pedestrians per hour crossing OR-8 (Pacific Avenue) and they would benefit from having a signalized crossing. Signalization of this location could also provide a benefit to maintaining throughput and coordination on Yew Street, provided that the intersection of OR-8 (Adair Avenue) and Yew Street is also signalized.

- Based on the collected traffic data, there are no locations that would meet traffic signal warrants along the segment of OR-8 between OR-47 (Quince Street) and Mountain View Lane due to low side-street and driveway traffic volumes.
- Locations under consideration for traffic signals will need to complete an Intersection Control Evaluation to evaluate a roundabout.
- The volume and speed of westbound traffic, number of pedestrians crossing OR-8 (Adair Avenue) at Yew Street, and the reported crash history at this location suggest a recommendation for a Pedestrian Hybrid Beacon (PHB) or an RRFB (provided a full traffic signal is not warranted), along with associated improvements such as ADA ramps, a marked continental crosswalk, and other signing and striping modifications. The two-lane section would not require a median island treatment.
- The volume and speed of eastbound traffic and number of pedestrians crossing OR-8 (Pacific Avenue) at Yew Street suggest a recommendation for a Pedestrian Hybrid Beacon (PHB) or an RRFB (provided a full traffic signal is not warranted), along with associated improvements such as ADA ramps, marked continental crosswalk, and other signing and striping modifications. The two-lane section would not require a median island treatment.
- The volume and speed of two-way traffic, number of pedestrians crossing OR-8 (Pacific Avenue) between OR-47 (Quince Street) and Mountain View Lane, roadway width, presence of bus stops, distance between signalized crossings, and reported crash history in the roadway segment suggest a recommendation for a Pedestrian Hybrid Beacon (PHB) or an RRFB along with associated improvements such as ADA ramps, marked continental crosswalk, and other signing and striping modifications. From the traffic data, the intersection with A and B Row would appear to be the likeliest place to install a crossing, and such a project is proposed as part of STIP project K21608. The five-lane section would require a median island treatment with pedestrian push buttons. Access management at nearby driveways needs to be investigated.
- Per the 2009 MUTCD, Section 4F.02.04.A, a PHB should be installed at least 100 feet from side streets or driveways that are controlled by STOP or YIELD signs.

Data Collection

- Turning movement count data (including pedestrians and bicycles) was collected on April 27, 2021 from 7:00 AM to 9:00 AM and 4:00 PM to 6:00 PM at OR-8 (Adair Avenue) and Yew Street and at OR-8 (Pacific Avenue) and Yew Street.
- Tube count data (speed, classification, and volume) was collected on OR-8 (Pacific Avenue) east of OR-47 from 11:00 AM on April 26, 2021 until 11:00 AM on April 28, 2021.
- Pedestrian count data was collected at 15 locations between OR-47 (Quince Street) and Mountain View Lane on April 27, 2021 from 7:00 AM to 9:00 AM and 4:00 PM to 6:00 PM.

Traffic Signal Warrant Analysis

OR-8 (Adair Avenue) and Yew Street

The intersection of OR-8 (Adair Avenue) and Yew Street in Forest Grove was reviewed based on traffic data collected on April 27, 2021.

Warrant 1 – Eight-Hour Vehicular Volume

Traffic data was collected for four hours, from 7:00 AM – 9:00 AM and from 4:00 PM – 6:00 PM, so it is not possible to evaluate this warrant directly. The ODOT Preliminary Traffic Signal Warrant Analysis spreadsheet might indicate the suitability of the intersection for a full signal, but the analysis is dependent on the assumption of the K factor for percentage of side street volume that occurs during the peak hour. A K factor equal to or lower than 8.4 percent (the major street approach K factor was estimated to be 8.8 percent based on a tube count collected further west) would allow Case B to be met for the 100% warrant.

In addition, the determination of the suitability of using the 70% warrant analysis (based on an 85th percentile speed greater than 40mph) needs to be confirmed. The posted speed on OR-8 (Adair Avenue) in the area is 40mph, which is the same posted speed further west at the tube count location. At the tube count location, the 85th percentile speed in the westbound direction was measured at 41mph. This is strong evidence that speeds in the area suggest the suitability of the use of the 70% warrant analysis. Under that condition, a side street K factor equal to or lower than 12.0 percent would indicate that Case B would be satisfied.

The MUTCD Warrant 1 analysis is also dependent on whether or not the 85th percentile speed exceeds 40mph. Under the condition where the 85th percentile speed is less than 40mph, two of the four hours of data (4:00 PM – 5:00 PM and 5:00 PM – 6:00 PM) collected meet Condition A and Condition B. For the combination warrant using the 80% volumes, Condition A would be satisfied for two hours while Condition B would be satisfied for three hours. If the 85th percentile speed was measured to be greater than 40mph, the 70% warrant would be satisfied for two hours for Condition A and for four hours for Condition B. For the 56% volume combination warrant, Condition A would be satisfied for two hours and Condition B satisfied for four hours.

Because OR-8 (Adair Avenue) is one-way westbound, the afternoon hours carry more traffic than the morning hours at this location. Based on the westbound tube count, the AM peak hour has less volume than six of the individual PM hours. Therefore, use of the AM peak period may not be a good indication as to traffic conditions at the intersection in regards to its ability to meet warrants. Finally, while traffic has picked up at this stage of the COVID-19 pandemic, it is still lower than pre-pandemic volumes, and may not fully account for typical traffic volumes.

Based on the information available, and the likelihood of the intersection meeting signal warrants, the recommendation is to collect both a 14-hour midweek day turning movement count and a tube count that measures the 85th percentile speed.

Warrant 2 – Four-Hour Vehicular Volume

Based on the available traffic data, both PM hours would meet the requirements for the Four-Hour Vehicular Volume warrant. It is very likely that the PM hours from noon until 4:00 PM would also meet the Warrant 2. If the 85th percentile speed was determined to be greater than 40mph, this would further increase the likelihood that Warrant 2 would be met.

Warrant 3 – Peak Hour

Based on the available traffic data, both PM hours would meet the requirements for Warrant 3.

Warrant 4 – Pedestrian Volume

Based on the available traffic data, it is unlikely that Warrant 4 would be met. The minimum four-hour pedestrian volume, using the 70% factor based on the 40mph posted speed and the major street volume, is 75 pedestrians per hour. During the four hours that turning movement counts were collected, there was a total of 66 pedestrians crossing OR-8 (Adair Avenue), an average of 16 pedestrians per hour. The peak hour pedestrian volume was 33 pedestrians, which does not meet the criteria for the pedestrian peak hour volume of 93 pedestrians.

Warrant 7 – Crash Experience

The reported crash data indicates that there has been an average of 6.6 crashes per year between 2012 and 2019. This exceeds the requirement of five crashes per year in Part B of Warrant 7. Based on the available data, and depending on whether or the 85th percentile speed is greater than 40mph, it is likely that traffic volumes would meet Part C of Warrant 7. Further investigation is needed to determine if there has been an adequate trial of alternatives to reduce crashes that has failed to reduce their occurrence.

OR-8 (Pacific Avenue) and Yew Street

The intersection of OR-8 (Pacific Avenue) and Yew Street in Forest Grove was reviewed based on traffic data collected on April 27, 2021.

Warrant 1 – Eight-Hour Vehicular Volume

Traffic data was collected for four hours, from 7:00 AM – 9:00 AM and from 4:00 PM – 6:00 PM, so it is not possible to evaluate this warrant directly. The ODOT Preliminary Traffic Signal Warrant Analysis spreadsheet might indicate the suitability of the intersection for a full signal, but the analysis is dependent on the assumption of the K factor for percentage of side street volume that occurs during the peak hour. A K factor equal to or lower than 9.9 percent (the major street approach K factor was estimated to be 7.2 percent based on a tube count collected further west) would allow Case B to be met for the 100% warrant.

In addition, the determination of the suitability of using the 70% warrant analysis (based on an 85th percentile speed greater than 40mph) needs to be confirmed. The posted speed on OR-8 (Pacific

Avenue) in the area is 40mph, which is the same posted speed further west at the tube count location, At the tube count location, the 85th percentile speed in the westbound direction was measured at 42mph. This is strong evidence that speeds in the area suggest the suitability of the use of the 70% warrant analysis. Under that condition, a side street K factor equal to or lower than 14.1 percent would indicate that Case B would be satisfied.

The MUTCD warrant analysis is also dependent on whether or not the 85th percentile speed exceeds 40mph. Under the condition where the 85th percentile speed is less than 40mph, two of the four hours of data (4:00 PM – 5:00 PM and 5:00 PM – 6:00 PM) collected meet Condition A and Condition B. For the combination warrant using the 80% volumes, Condition A and Condition B would be satisfied for two hours. If the 85th percentile speed was measured to be greater than 40mph, the 70% warrant would be satisfied for two hours for Condition A and for three hours for Condition B. For the 56% volume combination warrant, Condition A would be satisfied for two hours and Condition B satisfied for four hours.

OR-8 (Pacific Avenue) is one-way eastbound and the afternoon hours carry more traffic than the morning hours. Based on the tube count, the AM peak hour has less volume than six of the individual PM hours. Therefore, use of the AM peak period may not be a good indication as to traffic conditions at the intersection in regards to its ability to meet warrants. Finally, while traffic has picked up at this stage of the COVID-19 pandemic, it is still lower than pre-pandemic volumes, and may not fully account for typical traffic volumes.

Based on the information available, the intersection may meet signal warrants, though it would appear to be slightly less likely than the intersection of OR-8 (Adair Avenue) and Yew Street to the north. The recommendation is the same, however; to collect both a 14-hour midweek day turning movement count and a tube count that measures the 85th percentile speed.

Warrant 2 – Four-Hour Vehicular Volume

Based on the available traffic data, both PM hours would meet the requirements for the Four-Hour Vehicular Volume warrant. It is likely that the PM hours from noon until 4:00 PM would also meet the Warrant 2. If the 85th percentile speed was determined to be greater than 40mph, this would further increase the likelihood that Warrant 2 would be met.

Warrant 3 – Peak Hour

Based on the available traffic data, neither PM hour would meet the requirements for Warrant 3.

Warrant 4 – Pedestrian Volume

Based on the available traffic data, it is unlikely that Warrant 4 would be met. The minimum four-hour pedestrian volume, using the 70% factor based on the 40mph posted speed and the major street volume, is 75 pedestrians per hour. During the four hours that turning movement counts were collected, there were a total of 47 pedestrians crossing OR-8 (Pacific Avenue), an average of 12 pedestrians per

hour. The peak hour pedestrian volume was 25 pedestrians, which does not meet the criteria for the pedestrian peak hour volume of 93 pedestrians.

Warrant 7 – Crash Experience

The reported crash data indicates that there have been an average of less than one reported crash per year between 2012 and 2019. This rate is below the requirement of five crashes per year in Part B of Warrant 7. Therefore, the intersection would not meet the requirements of Warrant 7.

OR-8 between OR-47 (Quince Avenue) and Mountain View

Based on the collected traffic data, there are no locations that would meet traffic signal warrants along this segment of OR-8. The primary deficiency is the low side-street/driveway traffic volume, with the highest minor street hourly volume located at the intersection of OR-8 and the O'Reilly Auto Parts driveway (north) and the Sherwin-Williams driveway (south), with 68 vehicles during the 4:00 PM – 5:00 PM hour. Though there are pedestrians crossing the highway and a history of reported crashes in the segment, neither condition would meet the requirements of the Warrant 4 or Warrant 7, respectively.

NCHRP 562 Analysis

OR-8 (Adair Avenue) and Yew Street

Based on an NCHRP 562 analysis of the collected traffic data, which includes pedestrian and vehicle peak hour volumes, crossing distance, posted speed, and other factors, this intersection is identified as a location that meets the treatment category for a RED indication. If the intersection meets traffic signal warrants, a signal is recommended to be installed. If the intersection does not meet traffic signal warrants, this location would be a candidate for a pedestrian hybrid beacon or RRFB.

OR-8 (Pacific Avenue) and Yew Street

Based on an NCHRP 562 analysis of the collected traffic data, which includes pedestrian and vehicle peak hour volumes, crossing distance, posted speed, and other factors, this intersection was identified as a location that meets the treatment category for a RED indication. If the intersection meets traffic signal warrants, a signal is recommended to be installed. If the intersection does not meet traffic signal warrants, this location would be a candidate for a pedestrian hybrid beacon or RRFB.

OR-8 (Pacific Avenue) and A and B Row

Based on an NCHRP 562 analysis of the collected traffic data, which includes pedestrian and vehicle peak hour volumes, crossing distance, posted speed, and other factors, this intersection was identified as a location that meets the treatment category for a RED indication. Because the intersection does not meet traffic signal warrants, this location is a candidate for a pedestrian hybrid beacon or RRFB. A median island is recommended as well.