

# I-5 WILSONVILLE FACILITY PLAN

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# I-5 WILSONVILLE FACILITY PLAN

## Prepared by

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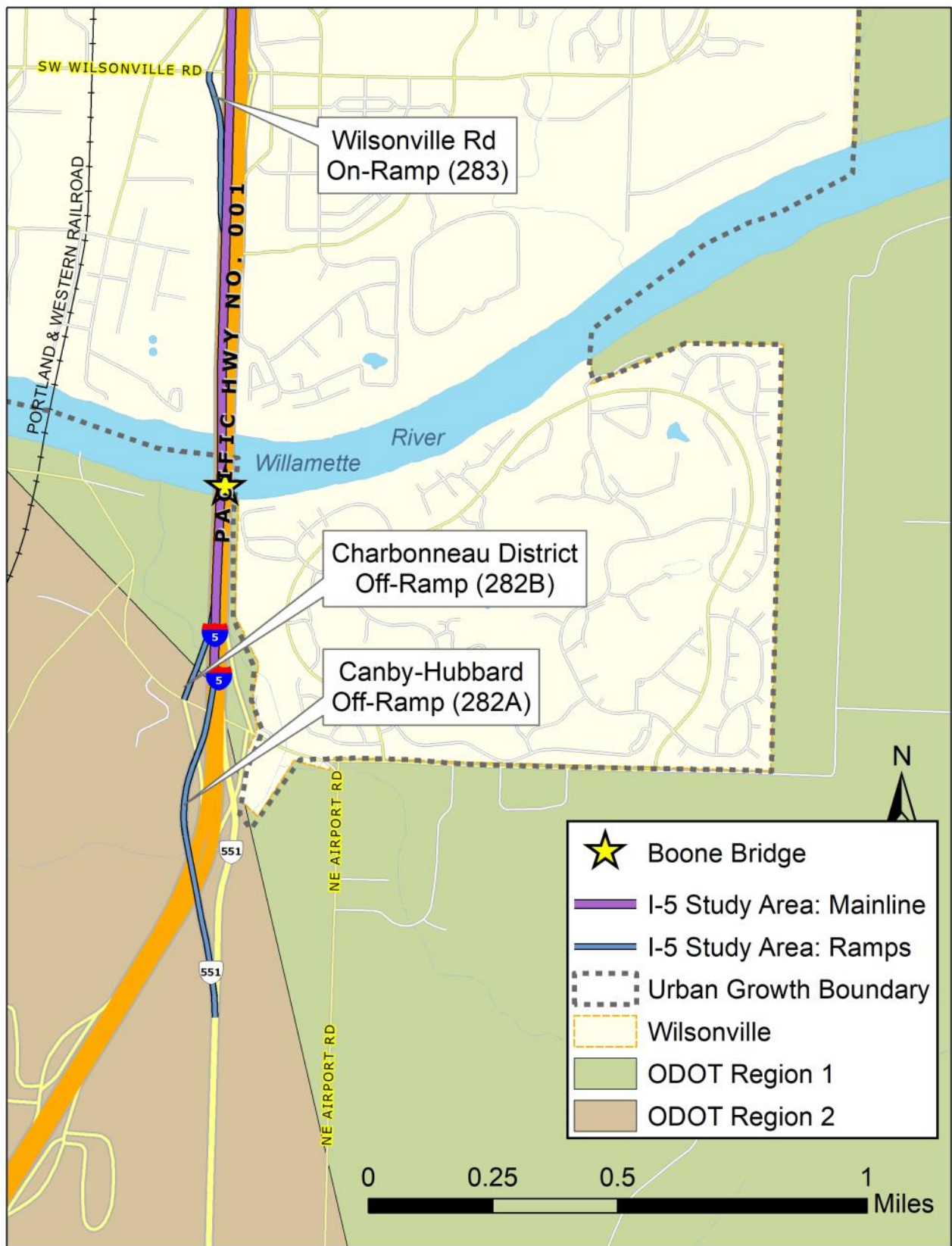
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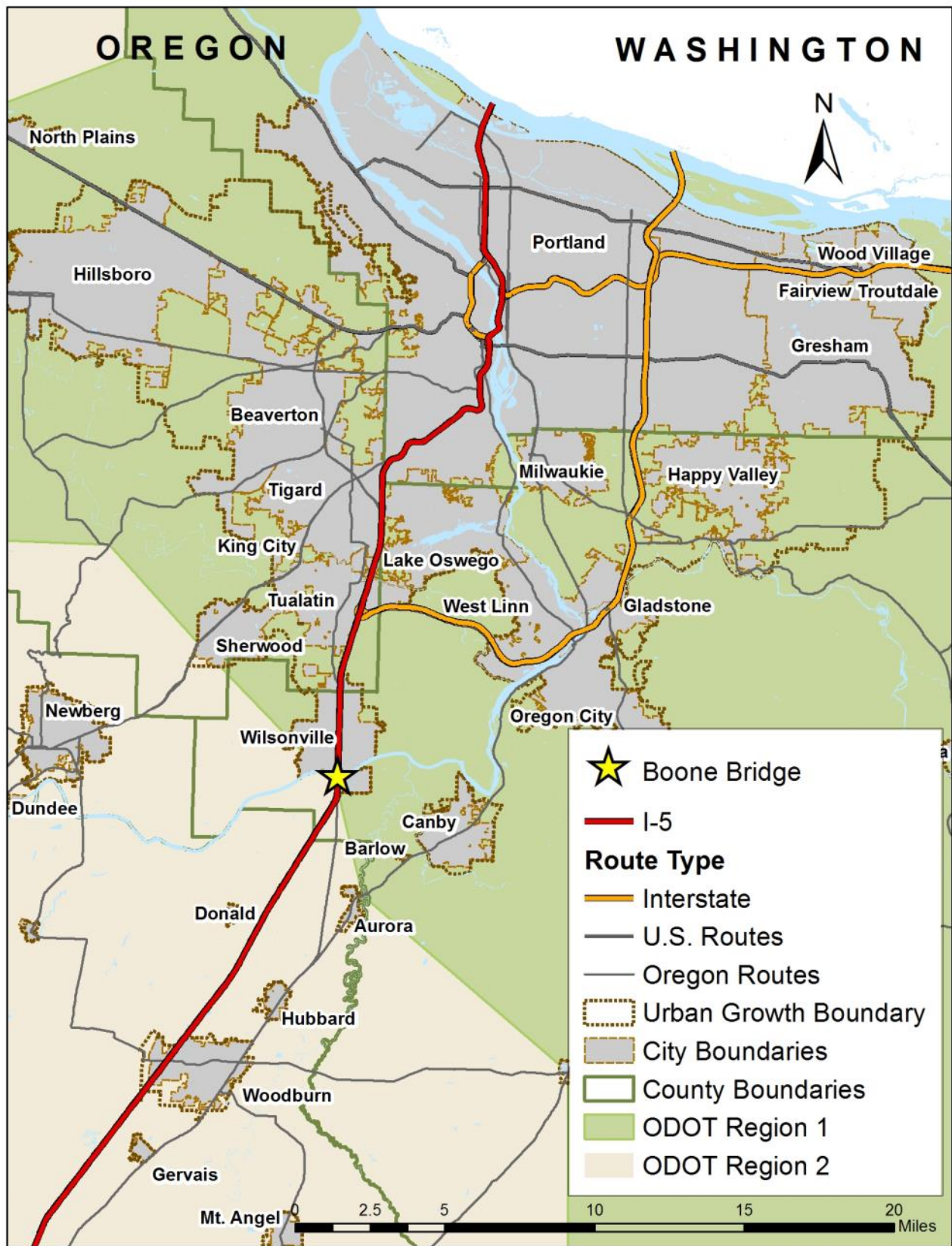


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**FIGURE 1.** Study area map.



**FIGURE 2.** Vicinity map.

## INTRODUCTION

The I-5 Wilsonville Facility Plan evaluates and addresses operational problems on southbound Interstate 5 from the Wilsonville Road on-ramp (Exit 283) to the Canby-Hubbard off-ramp (Exit 282A) (FIGURE 1). A bottleneck on I-5 southbound in the City of Wilsonville slows speeds and reduces travel reliability for people travelling by car, by transit, or moving freight by truck. Failure to address this bottleneck will lead to slower travel, more costly freight movement, reduced livability, and higher safety risks for those who use I-5 and the surrounding local transportation network.

The I-5 Wilsonville Facility Plan evaluates existing and future conditions on southbound I-5, and proposes a solution for the bottleneck. This is a mode-specific facility plan for motor vehicle, freight truck, and transit users of the interstate. It implements the Oregon Highway Plan without amending the highway's classifications or changing the alignment of I-5.



**FIGURE 3.** Aerial photo of the study area, as viewed from above the I-5: Wilsonville Road interchange looking south along I-5.

## Background

This segment of I-5 is the gateway between the Portland metro area and the rest of the state (FIGURE 2) and is a key segment on the primary west coast route for regional, interstate, and international freight movement by truck. I-5 is one of the state's critical seismic lifeline routes, and the Boone Bridge (which is part of the study area) will require upgrades to withstand a major Cascadia Subduction Zone quake. This bridge is the only motor vehicle crossing of the Willamette River within 15 miles of Wilsonville's town center.

This plan represents the Oregon Department of Transportation's latest effort to manage safety and mobility on I-5 in the Wilsonville area, building on several recent successful projects. In 2009, ODOT and the City collaborated to plan the reconstruction of the I-5: Wilsonville Road interchange, including infrastructure improvements and management

strategies to better serve planned growth in the area. Nine years have passed since the adoption of the interchange area management plan. In that time ODOT completed interchange reconstruction, and ODOT and the City implemented the bulk of the management plan's recommendations. More recent projects include the City's addition of a third lane to the Wilsonville Road southbound on-ramp and improvements at the Elligsen Road northbound on-ramp. These projects have improved conditions on Wilsonville Road and I-5 northbound, but most were conceived before growing traffic volumes led to the emergence of the southbound bottleneck. If congestion at this bottleneck continues to increase, southbound I-5 will soon fail to meet the mobility targets the state has set to define whether the highway is performing acceptably.



## POLICY CONTEXT

### The function of I-5 in the study area

The Federal Highway Administration classifies I-5 in the study area as an urban interstate 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, affirms these classifications. It also adds I-5's function as a Tier I seismic lifeline, a high clearance route that serves large freight vehicles, and a reduction review route that requires a formal process before ODOT may construct projects that reduce overhead clearance or roadway width.

Together, these classifications define I-5 as a facility of national significance that provides connections to major cities, interregional, and interstate destinations. Its primary function is to provide safe, reliable, higher-speed operations for longer distance travel and freight movement, as well as emergency services. To fill this function, I-5 needs limited, well-spaced connections to the local system, sufficient clearance for over-dimensional freight, higher travel speeds, reliable travel times, and the structural stability to remain functional after a major quake or other disaster.

### Guiding statewide goals and policies.

The Oregon Highway Plan supplies the major goals and policies that will guide decisions ODOT makes in this plan. The goals that most closely relate to the purpose of this facility plan are:

*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, this plan will need to:

- Remain consistent with I-5's functional classifications (Policy 1A).
- Support freight movement by improving I-5's performance and balancing the needs of freight users with other travelers (1C).
- Maintain or improve the ability of this section of I-5 to serve as a secure lifeline route for emergency services and recovery efforts after a disaster (1E).
- Maintain or improve I-5's performance relative to state mobility targets (1F).
- Maintain highway performance and improve safety by protecting the existing system and making minor improvements before considering expanding road capacity (1G).

*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, this plan will need to:

- Balance state, regional, and local needs, drawing on partnerships with the City of Wilsonville, Clackamas County, and Washington County (2A).
- Ensure that residents, businesses, regional and local governments, state agencies, and tribal governments have opportunities to participate in the planning process (2D).
- Manage and operate I-5 efficiently through the use of strategies such as transportation system management and operations, intelligent transportation systems, and transportation demand management (2E).
- Maintain or improve safe travel in the study area, with a focus on preventing fatal and severe crashes (2F).

In the past two acts authorizing federal funding for ground transportation needs, Congress emphasized the importance of bottleneck identification and addressing bottlenecks on the multimodal transportation system. To respond to this topic of national concern, ODOT completed a 2017 [study of freight delay areas](#). The final report identified this segment of southbound I-5 as part of a Tier 2 Freight Delay Corridor (I-5 from the Columbia River to Interstate 205 is the state's only Tier 1 Corridor). The plan area's inclusion in Tier 2 indicates it is a critical location for investment if the state wishes to reduce the high costs of freight delay and unreliability to Oregon's economy.

#### **Regional plans, policies, and regulations.**

The most recent [Regional Transportation Plan](#) was adopted in 2014. It provides guidance for managing transportation in the Portland metropolitan region to best serve planned growth. Its goals and objectives are consistent with statewide policy. The Regional Transportation Plan classifies I-5 as a throughway, a mobility route with little or no property access and an emphasis with connecting major destinations across the region. Throughways are planned as six lane facilities, with on-ramp, off-ramp, and auxiliary lanes where needed. The Regional Transportation Plan recognizes that the Tigard to Wilsonville mobility corridor (including I-5 in the study area) is a critical gateway for regional travel and commerce, where transportation decisions carry statewide significance.

This facility plan seeks to move our region closer to attaining 2014 Regional Transportation Plan performance targets, which include reducing severe and fatal crashes, and reducing vehicle hours of delay per person and per truck trip. It responds to the Regional Transportation Plan's concern with how peak period congestion in this corridor impacts regional freight reliability, mobility, and travel patterns. In addition, it follows the Regional

Transportation Plan recommendation to consider providing auxiliary lanes between Wilsonville’s on- and off-ramps.

The Regional Transportation Plan identifies the need for a broader multimodal study of the I-5 South Corridor, including parallel facilities. This facility plan addresses one small segment of the I-5 corridor and focuses on motorized travel. It does not preclude the broader multimodal I-5 South Corridor Refinement Plan, address the need for that broader regional study, or preclude any potential multimodal transportation solutions that could be studied as part of a refinement plan.

### **Local plans, policies, and regulations**

The City of Wilsonville’s [Comprehensive Plan](#) (2013) and [Transportation System Plan](#) (2016) set the local policy context for the urban locations within the study area. Relevant goals and policies seek to:

- Increase safe and reliable multimodal access and circulation;
- Reduce reliance on single occupancy vehicles;
- Work with ODOT and regional partners to maintain I-5’s capacity using techniques including auxiliary lanes and targeted interchange improvements; and
- Ensure that development proceeds in balance with the transportation capacity and services needed to accommodate additional trips.

Taken together, these policies work to serve transportation needs on the local system, reduce the burden of single occupancy vehicle travel on I-5, ensure the transportation system can accommodate travel demands of new development, and support ODOT’s efforts to maintain I-5’s capacity.

These two local plans create strong links between transportation planning and development. The Comprehensive Plan directs the City to reduce or delay the level of development if the transportation system will be inadequate to support additional trips (Policy 3.2.3). These documents define the Regional Transportation Plan’s Financially Constrained List and the city’s Capital Improvement Plan as the only sources of improvements that can be considered in determining the transportation system’s planned capacity, function and level of service.

This facility plan also considers the influence that operational improvements would have on the intersection of southbound I-5 and Wilsonville Road, a key link in the local transportation network. The City has designated this segment of Wilsonville Road as a major arterial, freight route and transit route.

Clackamas County’s [Comprehensive Plan](#) (2017) and [Transportation System Plan](#) (2017) set the local policy context for the rural locations within the study area, south of the Willamette River and the Metro Urban Growth Boundary. Relevant goals and policies seek to:

- Enhance and maintain the function of state highways and county arterials in various ways, including with roadway improvements;
- Protect agriculture, forest, and open space uses in rural areas;
- Recognize the need to maintain a transportation system that provides opportunities to harvest agricultural and forest products and deliver them to market;
- Emphasize roadway improvements that help ensure reliable and on-time transit service in the county; and
- Improve and maintain state, regional, and county truck freight routes.

These policies recognize the importance of protecting the rural context while ensuring that highways, county arterials, transit routes, and freight routes function well and meet the needs of Clackamas County. This facility plan seeks to identify operational improvements to existing routes that meet the needs of motorized travelers, without interfering with the rural character or the farm and forest land uses near I-5.

## PURPOSE STATEMENT

The purpose of this facility plan is to identify a long-term operational concept for southbound I-5 in the south Wilsonville area. The plan identifies and evaluates alternatives for addressing a bottleneck that forms in the evening peak on this section of I-5, which reduces efficiency and reliability for people traveling by private vehicle, by bus, and by shuttle; and for freight haulers moving goods by truck.

An appropriate operational concept will meet all of the following criteria as of the year 2040:

- Enables southbound I-5 in the south Wilsonville area to meet state mobility targets
- Enables I-5 to meet local performance benchmarks in the evening peak period
- Improves travel time reliability during the evening peak
- Reduces the risk of fatal or severe crashes
- Reduces the impacts of I-5 evening peak period congestion on Wilsonville Road
- Considers the need for local travel across the Willamette River
- Minimizes the potential for property and environmental impacts
- Can be designed and constructed in combination with the Boone Bridge seismic retrofit project

The location of this bottleneck creates an unusual land use context for this plan. ODOT and the City of Wilsonville have undertaken this planning effort with the purpose of resolving an urban transportation problem, which arises from and impacts travel within the Metro urban growth boundary. Because the causes of this bottleneck involve traffic patterns on the Boone Bridge, which crosses the urban growth boundary, this plan evaluates project alternatives that extend a short distance (approximately 0.7 miles) into Clackamas County rural reserves. This plan is not intended to support or create a basis for urbanization of these rural reserves. ODOT and the City recognize the need to protect the agricultural and forest land uses within the rural portions of the study area.

In addition to the above criteria, this plan will focus on operational concepts that:

- Can likely be constructed within ODOT's existing right-of-way
- Do not create, close, or alter highway access points from rural roads or private properties
- Do not add travel capacity to OR-551 beyond the I-5: OR-551 (Exit 282A) interchange area.

## EXISTING CONDITIONS, NEEDS, AND DEFICIENCIES



**FIGURE 4.** I-5 and the Wilsonville Road (Exit 283) south-bound on-ramp.



**FIGURE 5.** I-5 Boone Bridge over the Willamette River.

### Description of the study area

The facility plan encompasses 0.9 miles of the I-5 southbound mainline (milepost 283.54-282.64), a three-lane section of the highway from the Wilsonville Road on-ramp to the Canby-Hubbard off-ramp. The two-lane Wilsonville Road on-ramp begins at a four-way signalized intersection on Wilsonville Road, merges into one lane at a ramp meter, and is 0.3 miles long (FIGURE 4). There is a project underway to add a third lane to the on-ramp to provide additional vehicle storage when the ramp meter is operating. After the ramp reaches the mainline, a 100-foot long merge lane extends to the south of the ramp’s gore point (the triangular shape formed where the on-ramp lane meets the mainline).

The Boone Bridge is made of two adjacent steel structures that support one bridge surface, which forms a 0.2 mile crossing of the Willamette River (FIGURE 5). The bridge was constructed in 1953

and widened in 1967. The bridge serves as the primary link between the Portland metro area and Marion County, as well as between Wilsonville and the communities of Aurora, Canby, Donald, Hubbard, Molalla, and Woodburn. The nearest alternate motor vehicle crossings over the river are Oregon 219 south of

Newberg and Oregon 43 between West Linn and Oregon City, with a minimum detour length of nearly 13 miles. It has a sufficiency rating of 80.1, indicating it meets desirable criteria. However, its construction took place before modern seismic standards and the bridge has been found to be seismically vulnerable (see the 2016 Oregon Bridge Conditions Report).

The Charbonneau District off-ramp exits the highway 0.7 miles south of the Wilsonville Road on-ramp (FIGURE 6). Its single lane extends a quarter mile before coming to a stop-controlled intersection with NE Miley Road.

The Canby-Hubbard off-ramp begins 0.2 miles south of the Charbonneau off-ramp and merges with Oregon 551 (Wilsonville-Hubbard Highway). The study area includes the first 0.2 miles of the off-ramp, a one-lane section that becomes two lanes at the edge of the study area.

### I-5 traffic patterns and operations

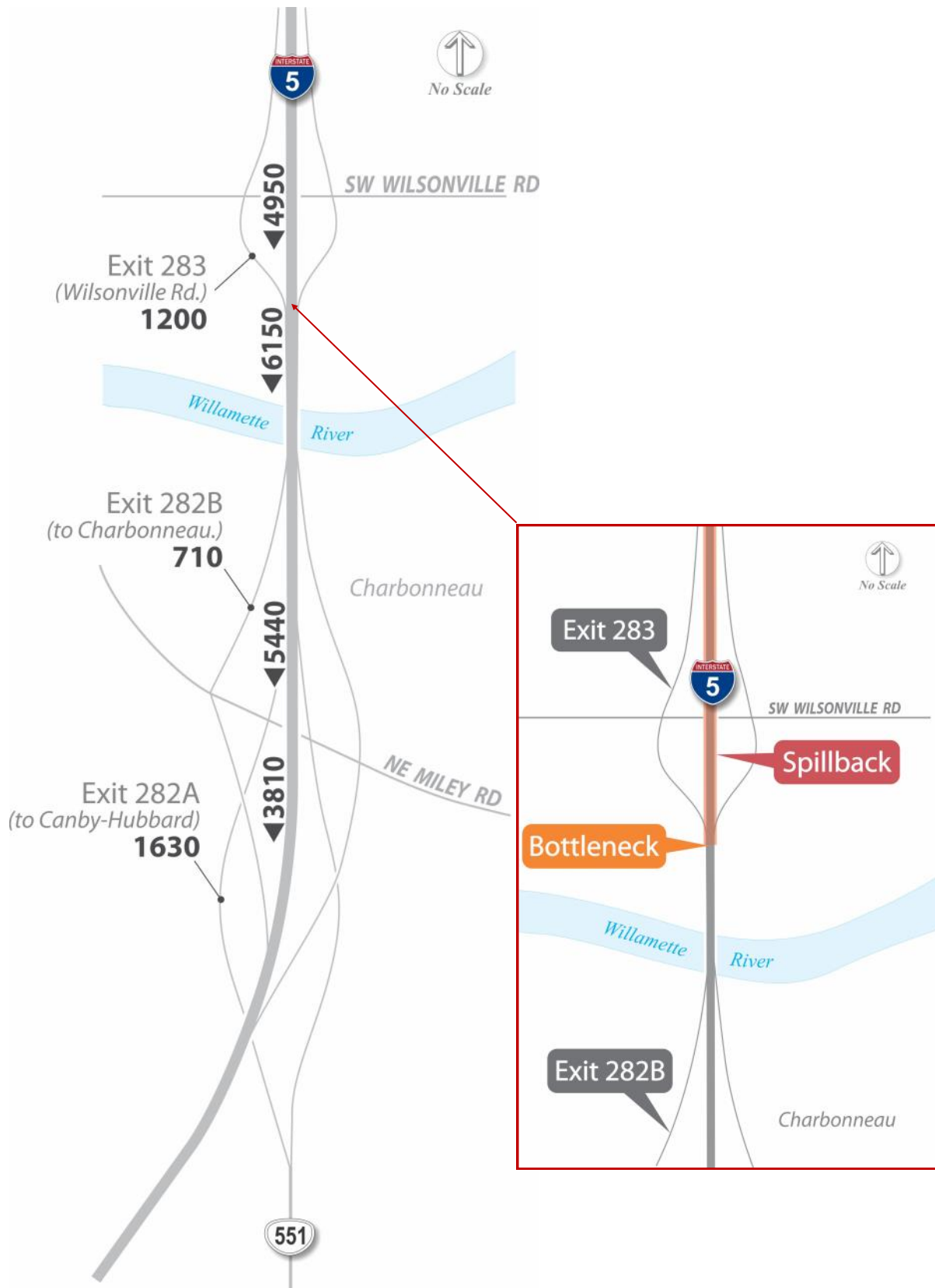
Technical memoranda developed during the planning process can be found in Appendix A.

For analysis purposes, 4-5 p.m. is the peak hour when the greatest volumes move through the study area. On a typical day, I-5 southbound across the Boone Bridge experiences congested conditions from 3-7 p.m.

The annual average daily southbound traffic on the Boone Bridge is 63,590 vehicles. Freight trucks (vehicles with three or more axels and/or six or more tires) represent approximately 14 percent of daily volumes, higher than is typical for Portland metro area freeway segments. Multiple transit agencies route buses along this segment of I-5, including Amtrak (6 southbound buses per weekday), Greyhound (4 southbound buses per weekday), POINT Intercity Transit, (7 southbound buses per weekday),



**FIGURE 6.** I-5 and the Charbonneau District (Exit 282B) and Canby-Hubbard (Exit 282A) interchanges.



**FIGURE 7.** 2017 southbound I-5 traffic volumes during the evening peak hour.



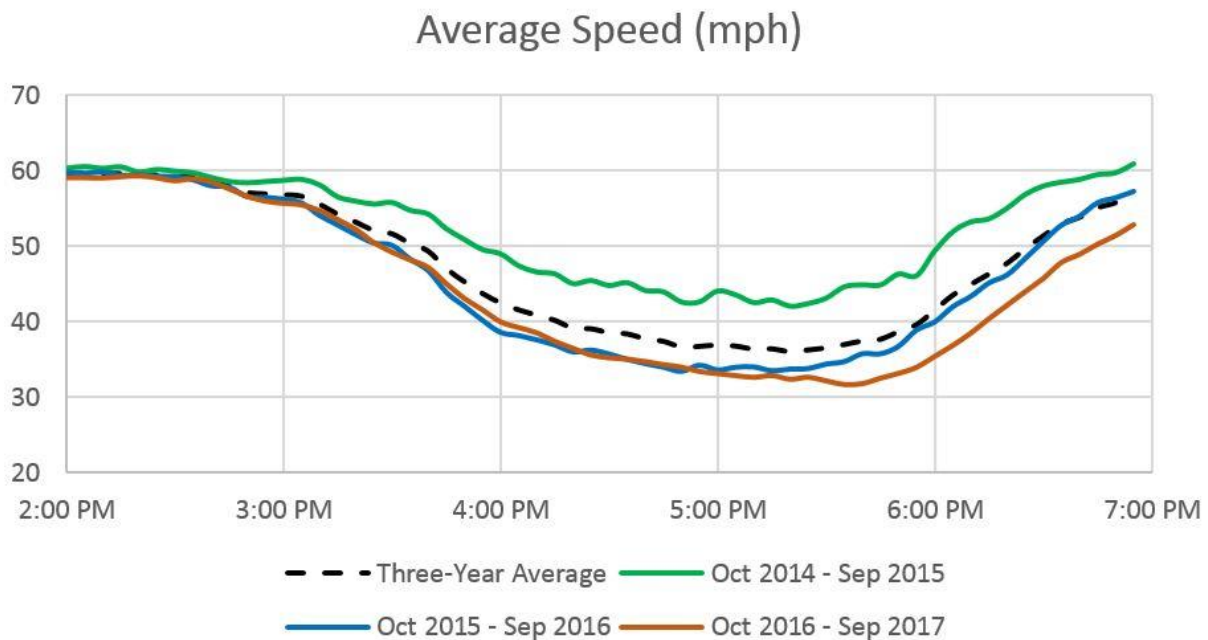
and Wilsonville SMART (14 southbound buses per weekday, some jointly operated with Salem Cherriots). A variety of organizations and operators also route airport and commuter shuttles through the study area.

During the evening peak hour, approximately 6,150 vehicles cross the Boone Bridge heading south (FIGURE 7). Twenty percent of those vehicles enter at the Wilsonville Road on-ramp. Twelve percent of all southbound vehicles crossing the bridge exit at the Charbonneau off-ramp, 26 percent exit at Canby-Hubbard, and the remaining 52 percent continue south on I-5.

Average travel speeds slow considerably over the course of the extended peak period and do not increase until after 6 p.m. The slowest speeds and greatest unreliability occur at I-5 southbound over Wilsonville Road, just north of the merge with the Wilsonville Road on-ramp. Average speeds at this bottleneck location drop to a low of 30 mph for close to an hour during the peak, and have been gradually decreasing for at least three years (FIGURE 8).

This bottleneck is part of a freight delay area on southbound I-5 that extends from the Boone Bridge to I-205. ODOT’s study of freight delay areas determined that delays in this segment result in an annual economic cost of \$746,000 per mile of I-5.

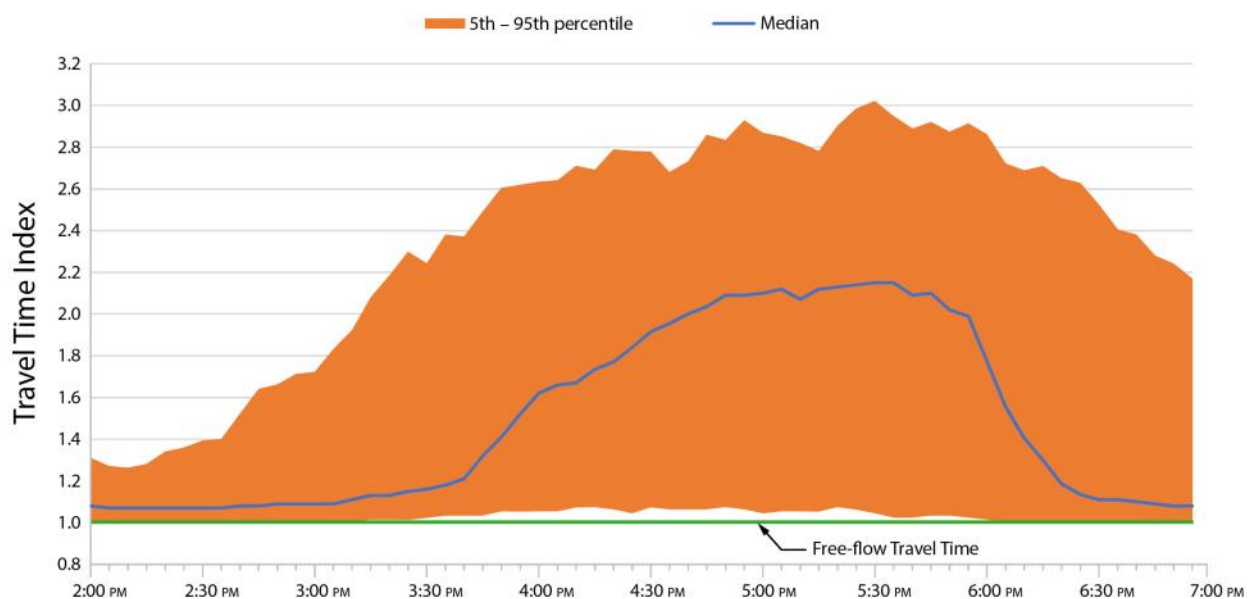
As FIGURE 9 shows, travel through the bottleneck area (the I-5 mainline north of the Wilsonville Road on-ramp) is highly unreliable as well as highly congested during the evening peak. On the most congested days each month, travel through the bottleneck area will take



**FIGURE 8.** Change in average evening peak travel speeds on southbound I-5 from 2014-2017.

three times as long as it does on the least congested days. Travelers and freight movers making regular trips in the corridor must plan extra time for their trip to ensure they will not be late. This unpredictability can be more frustrating and costly for users than consistent and predictable congestion.

The bottleneck begins to form where the Wilsonville Road on-ramp merges onto the I-5 mainline. With no local access bridge and no nearby alternatives for crossing the Willamette River, local travelers use the Wilsonville Road on-ramp to cross the river via the Boone Bridge. Six out of 10 vehicles entering at the Wilsonville Road on-ramp use the first two exits south of the river (FIGURE 10). They are joined on these exits by 3 out of 10 vehicles that entered the study area on I-5 while making longer-distance regional trips. Meanwhile, the other vehicles entering at Wilsonville Road attempt to merge left to reach a less congested lane, and the



**FIGURE 9.** Evening peak travel time reliability in the bottleneck area on the southbound I-5 mainline.

*The free-flow travel time is how long it takes to drive this segment when there is no congestion. The median travel time is how long it takes to drive this segment at a particular time on a day with average congestion. For this section of I-5, the median travel time is twice the free-flow travel time during the peak hour (4-5 p.m.). The orange area represents the variation in travel times that are observed in the bottleneck area (equivalent to the difference between the second-best travel day each month and the second worst).*

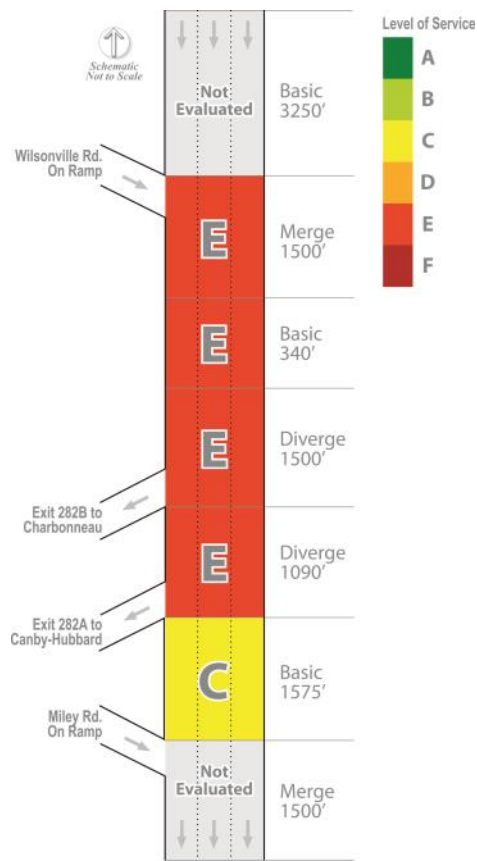
through travelers also merge left to avoid the slowest conditions. These movements lead to much higher vehicle volumes in the right-hand lane than in the inner lanes as traffic moves across the Boone Bridge. This imbalance in vehicle volumes across lanes contributes to slow and unreliable travel conditions on the I-5 mainline that extend north toward the Elligsen exit.

ODOT measures highway mobility using the volume-to-capacity or v/c ratio, which assesses theoretical demand to use the facility compared to the actual vehicle capacity (based on number of lanes, road geometry, traffic control and travel speeds). Higher v/c ratios indicate greater levels of congestion. The bottleneck area has a v/c ratio of 0.98. The statewide



**FIGURE 10.** Destinations for southbound vehicles on I-5 in the study area.

*Left: vehicles entering at the Wilsonville Road on-ramp. Middle: vehicles traveling into the study area on the I-5 mainline. Right: all southbound vehicles crossing the Boone Bridge.*



**FIGURE 11.** 2017 level of service grades for southbound I-5 in the study area.

mobility target of 0.99 represents the point where there is no available capacity on the roadway.

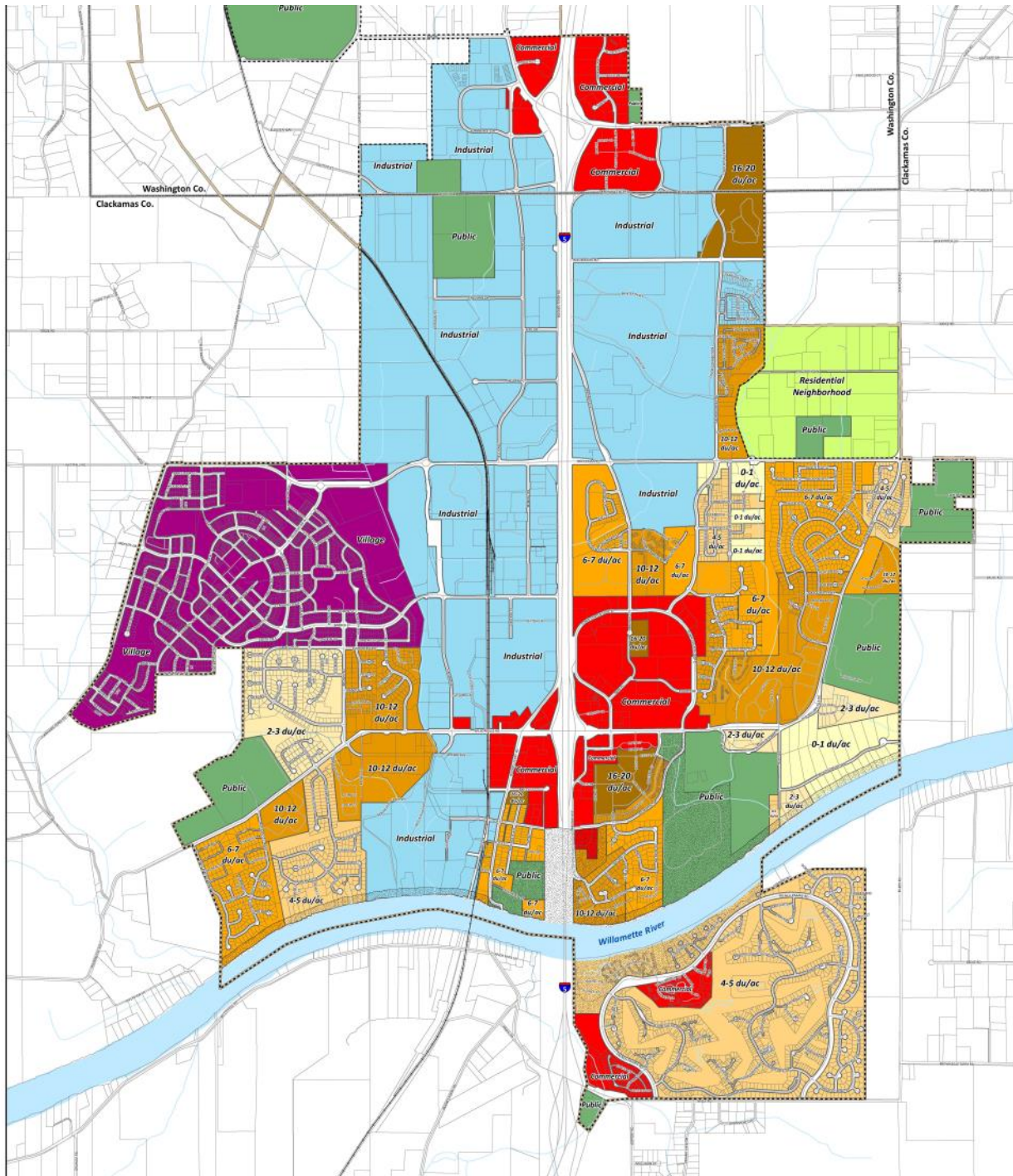
The City of Wilsonville uses level of service, another mobility measure that assesses operational efficiency and delay, then assigns an “A-F” grade. This measure shows level of service grade “E” (the City’s benchmark for minimum acceptable operations) through most of the study area and confirms that the congested conditions in the study area do not fully clear until after the Canby-Hubbard off-ramp (FIGURE 11).

### Crash history

Analysis of the most recent available crash data (2011-2015) found above-average crash rates on the I-5 southbound mainline between the Wilsonville Road off-ramp and on-ramp, with rear-end and sideswipe crashes indicating that the collisions are due to speed differences by lane and merging attempts taking place in congested conditions. Sections of the study area south of the bottleneck location had crash rates at or below average rates. No fatal or severe injury crashes occurred during the five years analyzed. The study area does not contain any locations that ODOT’s Safety Priority Index System ranks in the top 10 percent (the locations with the most and most severe crashes statewide).

### Land use context and local traffic conditions

Wilsonville is a regional employment destination with more than 20,000 workers and I-5 provides critical access to area employers. The majority of the city’s large employers are industrial businesses, with commercial development as a secondary sector. The area along Wilsonville Road to the west of I-5 is zoned commercial with surrounding industrial development, and to the east of I-5 is zoned commercial with surrounding residential development and public park lands (FIGURE 12). The Wilsonville Town Center sits in the northeast quadrant of the I-5 Wilsonville Road interchange and is planned for commercial development. This zoning was established to allow businesses to take advantage of direct freight access to and from the freeway interchanges, avoiding undesirable truck traffic in residential neighborhoods.



### Comprehensive Plan Map



0 0.5 Mile  
March 2018

#### Land Use Designations

- Commercial
- Industrial
- Public
- Residential 0-1 dwelling units per acre
- Residential 2-3 dwelling units per acre
- Residential 4-5 dwelling units per acre
- Residential 6-7 dwelling units per acre
- Residential 10-12 dwelling units per acre
- Residential 16-20 dwelling units per acre
- Residential Neighborhood
- Village

- County Boundary
- City Boundary
- Urban Growth Boundary
- Taxlots
- Willamette River Greenway



Disclaimer: The City of Wilsonville makes no representations, express or implied, as to the accuracy, completeness and timeliness of the information displayed. Data errors and omissions may exist in map and report. This map is not suitable for legal, engineering, or planning purposes. Please contact the City of Wilsonville Planning Division to verify report information is complete and accurate.

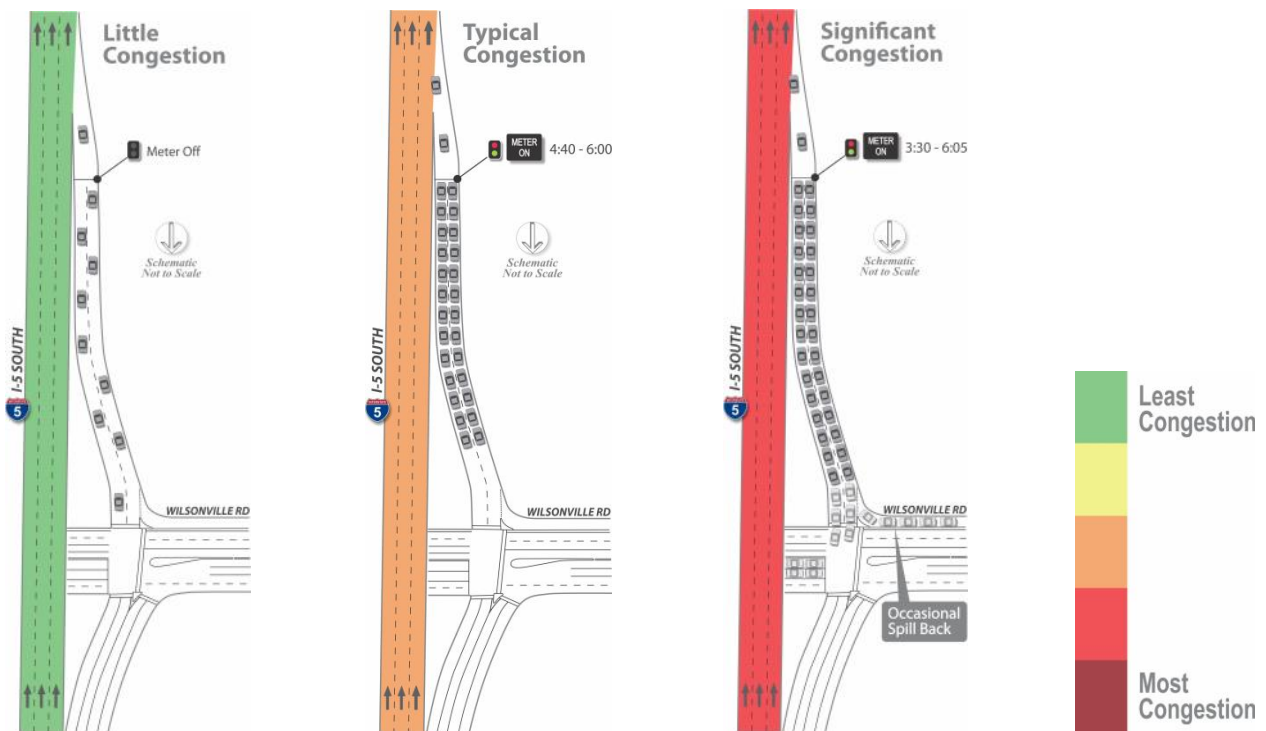
This map is to be used in conjunction with written text provided in the Wilsonville Comprehensive Plan. When interpreting the intent of the Plan, the text supersedes the map in the event of a conflict.

**FIGURE 12.** City of Wilsonville comprehensive plan map (2018).



The City of Wilsonville has data showing that upwards of 90 percent of Wilsonville employees come from outside the city limits, with significant draw from the satellite communities to the south, such as Canby, Woodburn and Salem. For these commuters, the Boone Bridge provides the only direct crossing of the Willamette River. Since the early 2000s, the region has added several hundred future employment acres to the Urban Growth Boundary on the north end of the city, such as the Coffee Creek Industrial Area and Basalt Creek Employment Area. Wilsonville has adopted the Concept Plan and Master Plan for Coffee Creek and is developing the Concept Plan for Basalt Creek.

I-5 bisects Wilsonville, with only three east-west crossings of the highway within city limits. Wilsonville Road, the southernmost of these crossings, supports multimodal accessibility with pedestrian and bicycle pathways on both sides of the street and an eight lane cross-section underneath I-5. Despite recent improvements to the interchange area and on-ramps, Wilsonville Road experiences peak period congestion, delays and unreliability due to high demand at the Wilsonville Road southbound on-ramp. Conditions at the on-ramp vary greatly from day to day. Three consecutive days of video data showed one day when the ramp meter never activated, one day when moderate queues at the ramp meter formed on the on-ramp, and one day when long queues spilled back from the on-ramp onto Wilsonville Road (FIGURE 13). Comparisons with traffic data confirmed that these three days reflect a typical range of different conditions that occur at this on-ramp.



**FIGURE 13.** Ramp meter operations and queuing observed on the Wilsonville Road on-ramp on three consecutive days in 2018.

City staff and stakeholders report that during the extended evening peak when the ramp meter is in operation, queues from cars waiting to turn onto the on-ramp can disrupt the flow of through traffic in both directions on Wilsonville Road. These severe queues are more likely to occur during seasonal peak travel periods in the summer months. Local travelers may take a variety of detours to avoid this intersection, creating congestion on other local roads and increasing demand at the city’s other two I-5 crossings and at upstream I-5 interchanges. These delayed and unreliable conditions have led to Planning Commission and City Council concerns regarding how the planned transportation system will perform as traffic increases on I-5 and the Wilsonville community grows.

Charbonneau, a neighborhood within the Wilsonville city limits, is located south of the Willamette River and east of I-5. This neighborhood is zoned primarily residential with some commercial uses. I-5 provides the only direct access between Charbonneau and the rest of Wilsonville.

South of the Wilsonville city limits and the Metro Urban Growth Boundary, the Clackamas County lands adjacent to I-5 are zoned Rural Residential Farm Forest 5-Acre (RRFF-5) and Exclusive Farm Use (EFU) (FIGURE 14). The primary allowed uses in RRFF-5 lands are farm activities, low-density residential dwellings, conservation efforts, fish and wildlife management programs, government-owned recreational facilities, and essential utilities. Existing land uses in these lands appear to be mostly residential neighborhoods. In EFU lands, the primary allowed uses are forestry and farming, with other uses allowed or conditionally approved if they do not force changes in or increase the costs of accepted farm or forest uses nearby. Near the study area, existing land uses include forested areas, several farms, some private buildings, a church, and a golf club. The areas adjacent to southbound I-5 and the 282B/282A off-ramps are mostly forested, with no buildings directly along the highway.



**FIGURE 14.** Clackamas County zoning for the lands adjacent to I-5 south of the Wilsonville city limits.

## Seismic concerns

I-5 is in the seismic hazard area of the Cascadia Subduction Zone, which has historically experienced earthquakes of magnitude 9.0 or greater every 400-600 years. Many of I-5's 348 bridges were built before modern seismic design specifications. In the event of a Cascadia Subduction Zone earthquake, which based on the historical record is expected in the next 50 years, five I-5 bridges across the state would be expected to collapse and 19 more to suffer heavy damage.

I-5 is a Tier 1 Seismic Lifeline route, and is one of the most critical routes for Oregon's emergency response and recovery efforts. In 1998, ODOT performed a Phase I retrofit to prevent the bridge's superstructure from falling off the piers in an earthquake. The Boone Bridge will require a Phase II seismic retrofit to meet modern seismic standards and remain serviceable in the event of a severe earthquake.

## Environmental resources

The Willamette River introduces a range of environmental resources to the study area. Impacts to these resources would need to be avoided, minimized, or mitigated when a capital project moves forward. Chinook salmon and steelhead fish species rely on the Willamette River for habit, and are subject to Endangered Species Act regulations. Locations along rivers and streams are typically areas where there may be a high probability for encountering archaeological resources and where wetlands may be found. The banks of the river in both the City of Wilsonville and Clackamas County are part of the Willamette River Greenway, and may be subject to Section 4(f) restrictions on the use of public parks and recreational lands for transportation projects. The areas south and west of the Willamette River are adjacent to land designated as rural reserve lands in Clackamas County; these reserves may contain farmland, forests, natural preserves, or streamside lands beyond the Urban Growth Boundary where development is prohibited. Noise impacts and impacts to human health must also be studied during project development.



## FUTURE CONDITIONS

### Methodology for future forecasting

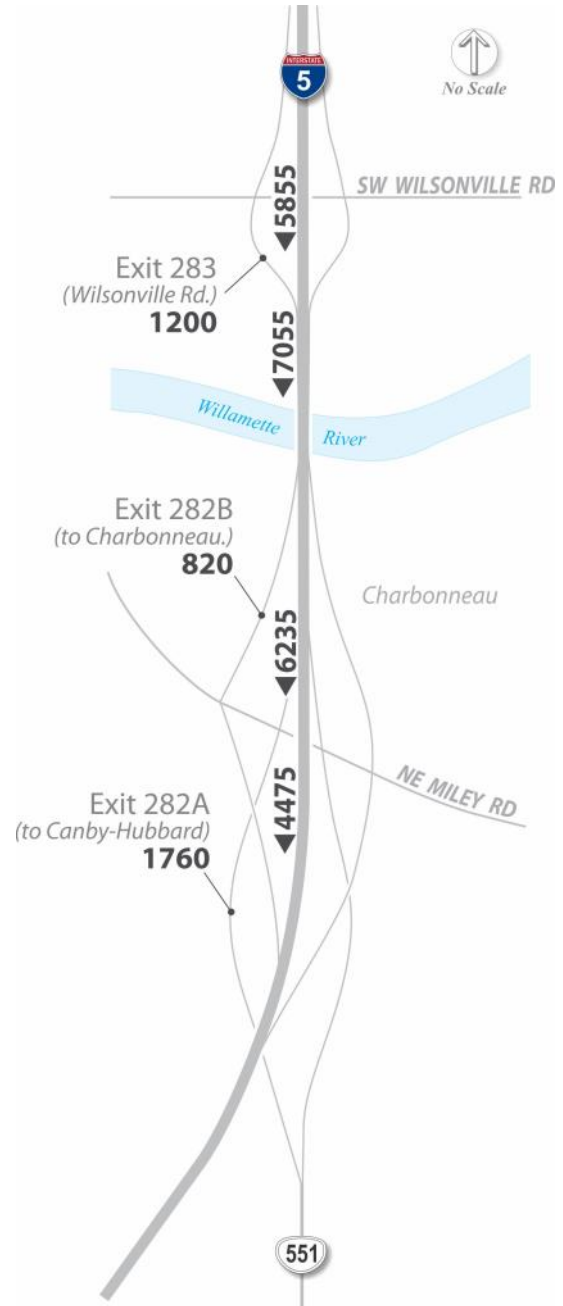
The Metro Travel Demand Model predicts future travel volumes and patterns based on anticipated growth in population and jobs; planned land use changes; and planned transportation projects in the Portland metro area. This model is the most-commonly used tool for analysis of planning alternatives in this region of Oregon. Its forecasts provide a useful perspective on the direction future trends are likely to take, and how different project alternatives could affect transportation performance. Its results are best interpreted as showing order-of-magnitude differences between options or scenarios, rather than exact predictions of the future.

The Travel Demand Model’s outputs have been analyzed in more detail using technical procedures from the Highway Capacity Manual, which sets out widely used and industry-standard approaches to modeling traffic operations at specific roadway segments or intersections.

The project team used existing conditions data to calibrate the model’s outputs, in order to better reflect what current travel patterns suggest may occur in the future.

### Anticipated traffic volumes and operations in 2040

The model predicts a 15 percent increase in evening peak hour traffic volumes on I-5 southbound over the Boone Bridge, from 6,150 vehicles in 2017 to 7,055 in 2040 (FIGURE 15). Modeled origin and destination patterns for the



**FIGURE 15.** Southbound I-5 traffic volumes forecast for the year 2040 during the evening peak hour.

future are similar to those gathered via GPS data from 2017, with some minor variations. When considered together, the two sources suggest that in the future roughly 60-70 percent of vehicles entering on the Wilsonville on-ramp and 35 percent of vehicles coming from farther north on the I-5 mainline will take one of the first two off-ramps south of the Willamette River. For every 10 vehicles heading south over the Boone Bridge, one will be expected to take the Charbonneau exit and two to three will be expected to take the Canby-Hubbard exit.

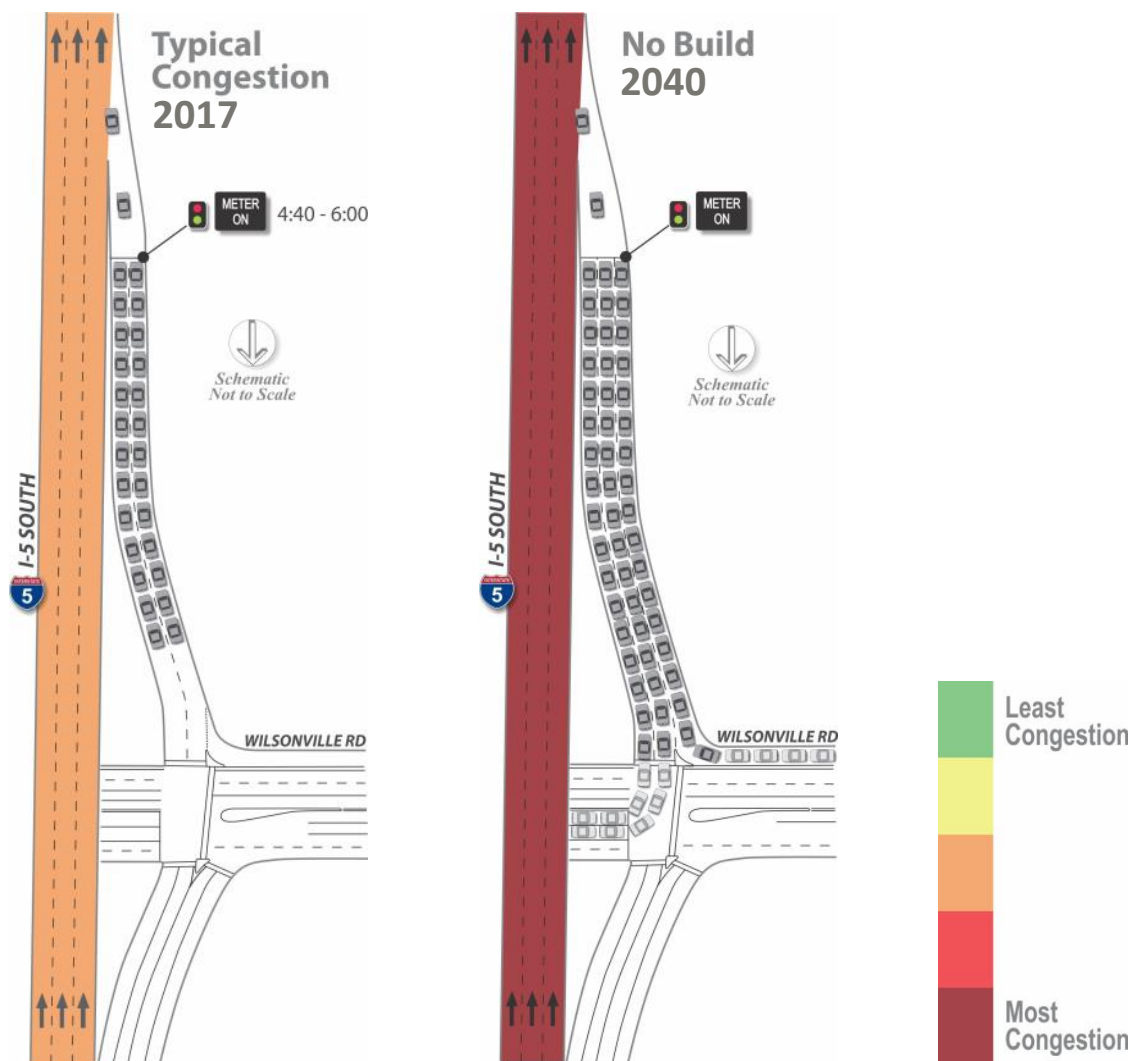
If no improvements or operational changes are made to this study area, traffic congestion will worsen significantly on I-5 in this segment (Table 1). From the Wilsonville on-ramp to the Charbonneau off-ramp, the highway will fail to meet state mobility standards with v/c ratios above 0.99. Speeds in these segments drop as low as 22 mph during the average evening peak. These conditions will make travel through this section on I-5 significantly less reliable and increase the hours per day that travelers would experience congested conditions. Such degradation in performance would be expected to lead to more frequent rear-end and sideswipe collisions.

**TABLE 1.** Southbound I-5 levels of service forecast for the year 2040 during the evening peak hour.

	Segment	Volume/ Capacity	LOS
1	North of Wilsonville Road On-Ramp (Basic)	0.88	F
2	Wilsonville Road On-Ramp (Merge)	1.09 (Fwy) 0.61 (Ramp)	F
3	Boone Bridge (Basic)	1.06	F
4	Charbonneau Off-Ramp (Diverge)	1.08 (Fwy) 0.42 (Ramp)	F
5	Canby/Hubbard Off-Ramp (Diverge)	0.95 (Fwy) 0.89 (Ramp)	D
6	South of Canby/Hubbard Off-Ramp (Basic)	0.67	B

Forecasts suggest a 40 percent increase in the number of vehicles seeking to enter I-5 southbound from Wilsonville Road, some coming from nearby locations, others from areas further east, west, or north. With increased congestion on the I-5 mainline, ODOT might need to decrease the ramp meter rate and/or increase the hours it operates to protect the freeway’s operations. During the peak hour, queues waiting at the ramp meter would fill the on-ramp and spill back onto Wilsonville Road (FIGURE 16). Vehicles would wait more than 80 seconds to move through the intersection of I-5’s southbound ramps and Wilsonville Road . Of the 1,700 drivers who would prefer to use this on-ramp

during the peak hour, 30 percent would not be able to enter if ramp meter rates remain the same. (More would not be able to enter if ODOT needed to reduce the meter rate to protect operations on I-5 during heavy congestion.) These travelers who could not enter the on-ramp would have to choose other routes, shift trips to other times, choose other modes, or not make their trip. Travel along Wilsonville Road would become more challenging in the afternoon and evening. Overall, the local system will experience more hours of congestion on more routes as these vehicles seek alternate ways to make their trips.



**FIGURE 16.** Ramp meter operations and queuing on the Wilsonville Road southbound on-ramp, as observed during typical evening peak hour congestion in 2017 (*left*) and as projected for 2040 (*right*).

## PLAN ALTERNATIVES AND COMPARISON OF LONG-TERM OPERATIONS

### Conceptual design of plan alternatives

ODOT and the City of Wilsonville have identified three alternatives for study, each of which adds a ramp-to-ramp lane from the Wilsonville Road on-ramp across the Boone Bridge. As ODOT’s 2012 Highway Design Manual explains, ramp-to-ramp (or auxiliary) lanes “are introduced adjacent to through lanes for limited distances for specific operational or capacity reasons. They are used to provide lane balance, facilitate weaving maneuvers, and help smooth out flow in through lanes. A typical application is to provide [a ramp-to-ramp] lane on the mainline between closely spaced interchanges” (p. 9-18). **FIGURE 17** provides an example of a ramp-to-ramp lane on I-5 northbound in North Portland. In the study area, there are three



**FIGURE 17.** A ramp-to-ramp lane on I-5 northbound between the N Rosa Parks Way on-ramp (304) and the N Lombard St East off-ramp (305A).

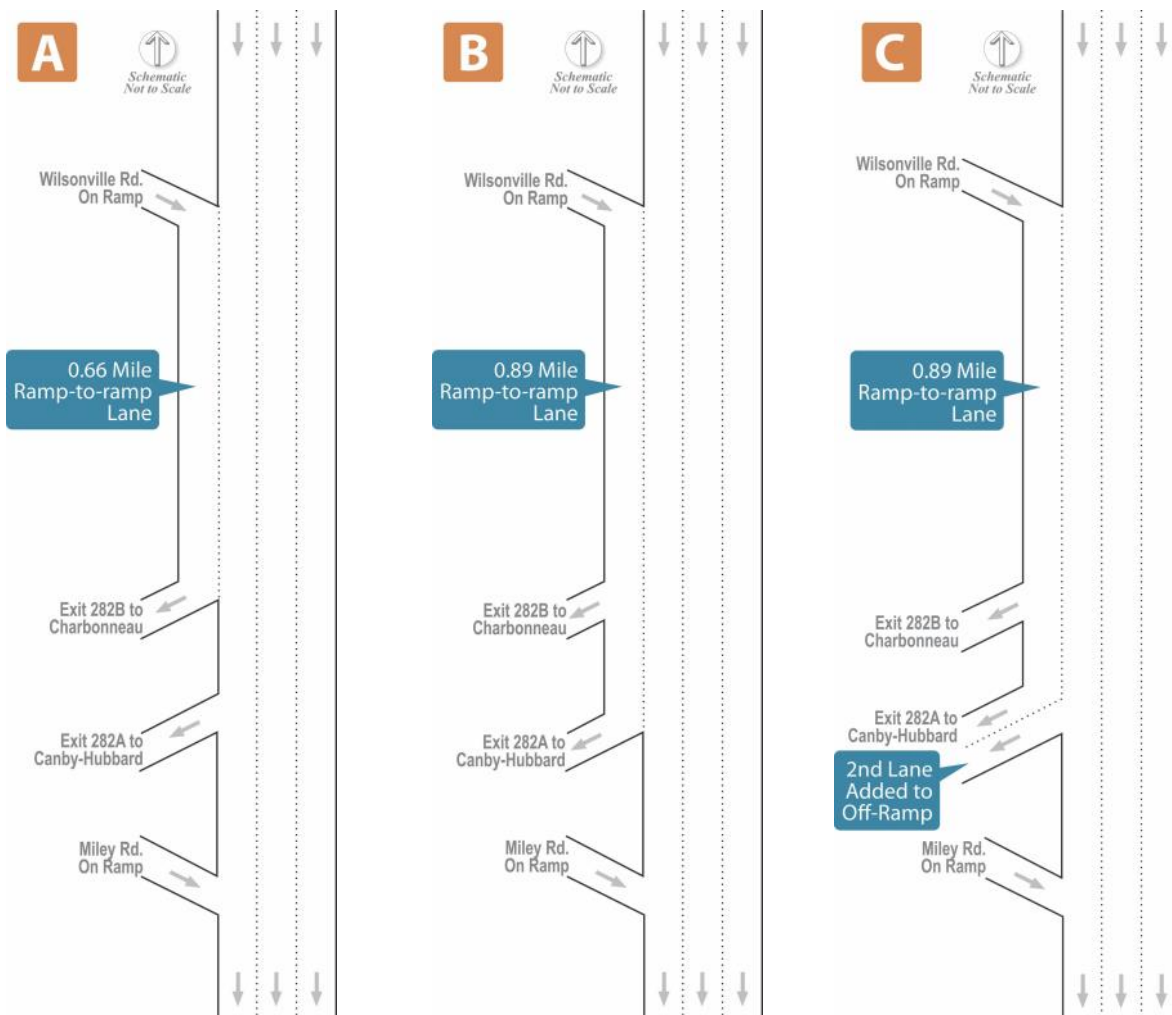
*This ramp to ramp lane is 0.2 miles long, comparable to the distance between the Charbonneau and Canby-Hubbard off-ramps.*

interchanges in a one mile segment of I-5. ODOT has established spacing standards of three miles between interchanges for interstates in urban areas.

The operational problems in the study area stem from the lack of capacity in the right-hand lane to accommodate the volume of vehicles using the closely-spaced interchanges. A ramp-to-ramp lane is a targeted, lower-cost improvement that may improve traffic flow and add safe merging and weaving space. Use of ramp-to-ramp lanes alongside through lanes is consistent with Regional Transportation Plan policy establishing interstate cross-sections of three travel lanes per direction, plus ramp-to-ramp lanes where needed.

In all three build alternatives, the ramp-to-ramp lane could be constructed with the Boone Bridge seismic retrofit as one project.

Option A (FIGURE 18) adds a ramp-to-ramp lane at the Wilsonville Road on-ramp merge that



**FIGURE 18.** The three ramp-to-ramp lane options studied.

drops at an exit-only lane to the Charbonneau off-ramp.

Option B extends the ramp-to-ramp lane to terminate as an exit-only lane at the Canby-Hubbard off-ramp.

Option C is similar to Option B but expands the Canby-Hubbard off-ramp to become a two-lane exit, until it joins the existing two-lane section of the ramp. Travelers may access the exit either from the ramp-to-ramp lane, which departs the highway as the outer off-ramp lane, or from the right-hand through lane, which offers an optional exit to the inner off-ramp lane.

In all of the build alternatives, the three-lane Wilsonville Road on-ramp merges into one lane as it passes the ramp meter, before vehicles enter the ramp-to-ramp lane. This is due to safety concerns with multi-lane merges onto the highway, which have led ODOT to stop using those designs for new projects.

All three of these options meet the expectations laid out in the purpose statement for minimizing potential impacts within the rural reserves. Based on the data available, it appears that ODOT owns the right-of-way needed for any of the three options. None of the three options create, add, or alter highway access from either private properties or rural roads. None of the options add travel capacity to OR-551 beyond the interchange area.

#### **Elimination of a local bridge operational concept**

ODOT and the City of Wilsonville screened out a local bridge option as a potential operational concept, as it did not fit the criteria laid out in the plan purpose. Siting a new structure and building local road connections to it would have the potential for significant property and environmental impacts. In previous Transportation System Plan efforts, the City of Wilsonville determined that there is no promising alignment for a new bridge within the city limits north of the Willamette River. Most potential locations would have significant impacts to existing residential neighborhoods, public parks, or local schools. Several existing arterials that might serve as potential bridge connections are too close to the I-5: Wilsonville Road interchange, and the traffic impacts would create unacceptable safety and operational problems in the interchange area. In the Willamette River, a new bridge would require adding piers in the river or on the natural areas along the river, as well as in-water construction work. This creates the potential for substantial environmental impacts to natural resources, habitat, and fish passage. South of the river, a new bridge structure and new local road connections would have the potential to directly impact protected farm and forest lands by requiring the purchase of new right-of-way. They could also indirectly impact rural land uses by creating new access points to adjacent properties, influencing property values, or impacting the operating costs for farm and forest uses. Construction of a local bridge also could not be combined with the Boone Bridge seismic retrofit project.

The City and ODOT agreed that build alternatives on I-5 would have comparatively lower impacts to the built, rural, and natural environments in the study area. The City is leading a separate project to plan and design the French Prairie Bridge, which would provide a new bicycle and pedestrian crossing of the Willamette River that could accommodate emergency vehicles as well.

### Performance, benefits, impacts, and planning-level costs of build alternatives

The project team used Highway Capacity Manual methodologies to compare how the three build alternatives would operate in 2040, and contrasted their performance with the no-build (existing) configuration of I-5.

To assess how each option compared to the no-build during the evening peak hour, the project team analyzed them using four performance measures:

- Volume-to-capacity ratios, benchmarked against the state mobility target of v/c at or below 0.99.
- Level of service, benchmarked against the City of Wilsonville target of grade “E” or above.
- Worst observed speed under typical peak hour congestion.
- Vehicle density, which evaluates how many vehicles are in each lane per mile.

The methodologies for predicting future safety outcomes are limited without more engineering detail than is available at this stage of planning. However, the measures above can provide indirect information about potential changes in crash risk, which are discussed below.

**TABLE 2.** 2040 performance of the southbound I-5 mainline: no build scenario compared to ramp-to-ramp lane options

Performance measures (2040 Evening peak hour)	Baseline (No Build)	Option A	Option B	Option C
<b>Worst volume-to-capacity ratio</b>	1.09	0.95	0.89	0.88
<b>Worst level of service</b>	F	E	E	D
<b>Lowest speed</b>	22	45	44	52
<b>Highest vehicle density</b>	79	40	37	35

All three options:

- Improve I-5's performance compared to the no-build (TABLE 2).
- Reduce congestion on I-5 to below state mobility targets and achieve level of service grade "E" or better on all segments of I-5 within the project area.
- Offer sufficient congestion reductions that they could be expected to improve travel time reliability.
- Improve I-5 speeds during the evening peak hour so that they remain at or above 44 mph on the typical weekday, compared to no-build speeds of below 25 mph.
- Provide more space between vehicles, which allows drivers more time to react to changing conditions and reduces the risk of crashes.
- Are expected to reduce crash rates, due to reductions in congestion and separation of weaving and merging movements from through traffic. Preventing crashes also contributes to improvements in reliability (by reducing the frequency of incidents that create unexpected delays).
- Improve local travel that uses I-5 to cross the river, by reducing congestion at the Wilsonville Road on-ramp merge point and providing separation from through traffic on the I-5 mainline.
- Present little potential for private property impacts. While right-of-way needs cannot be identified in detail until additional project design has taken plan, ODOT appears to own sufficient right-of-way to accommodate a ramp-to-ramp lane. No structures have been identified in the area where a ramp-to-ramp lane would be built.
- Present similar potential for environmental impacts. The greatest potential impacts come from the modification to the Boone Bridge itself, because the Willamette River contains the most significant cultural and natural resources in the project area. The ramp-to-ramp lane is the same over the Boone Bridge structure in all three options, so the three options would have substantially similar potential impacts to the river and its banks. The nature of these impacts will depend on how the ramp-to-ramp lane and seismic retrofit are designed, and will be assessed during project development.
- Are similar in planning-level cost estimates, with less than a 10 percent cost difference estimated between Options A (the least expensive) and C (the most expensive). The majority of the project costs stem from modifying the Boone Bridge to accommodate an additional lane, which would require the same improvements in all options. Costs of extending the lane south of the structure to Exit 282A and adding a second lane to the Canby-Hubbard off-ramp appear relatively low. Current planning-level cost estimates for the ramp-to-ramp lane project (not including the seismic work) are in the \$80 million



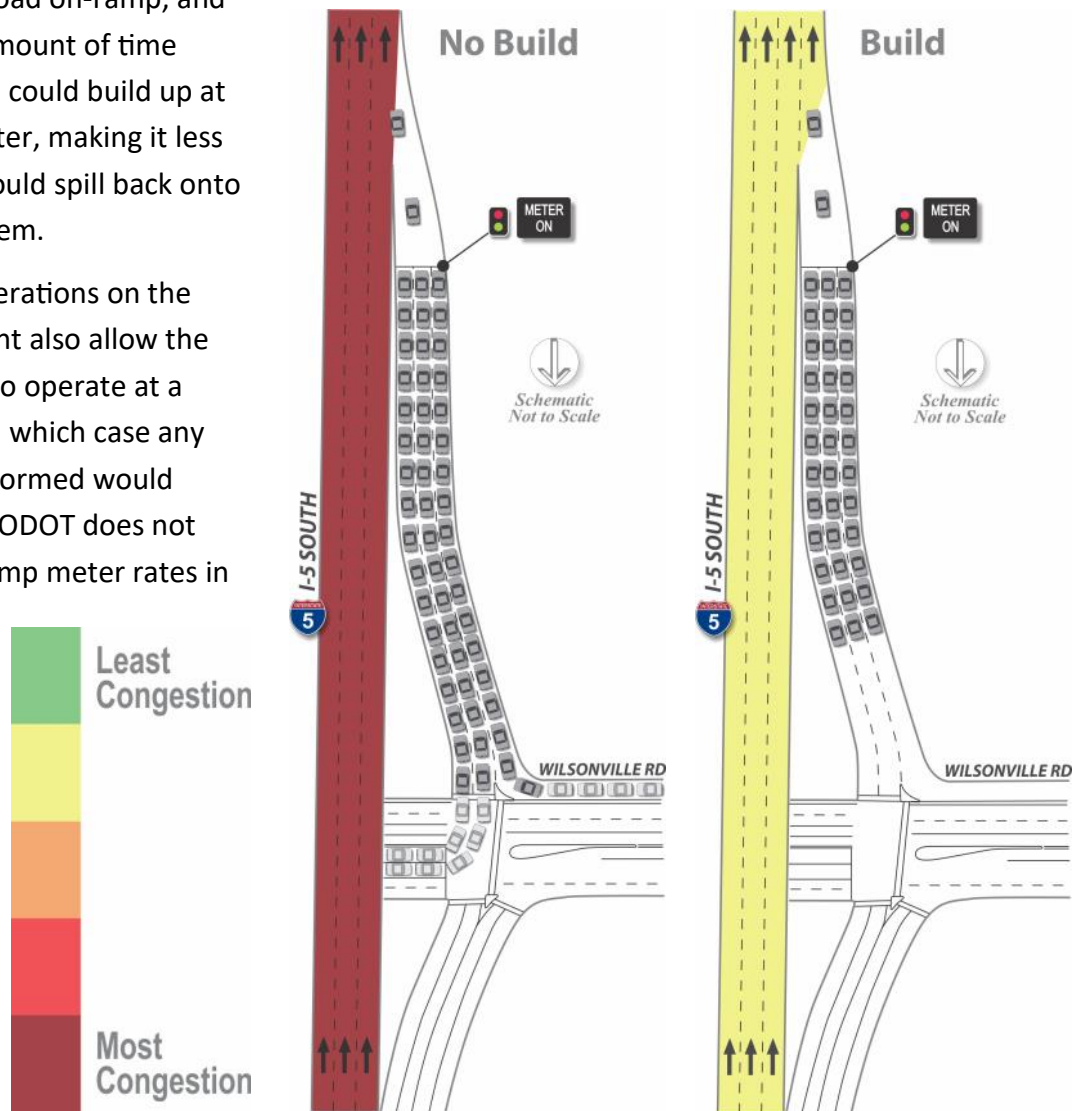
range.

- Could be combined with design and construction of the Boone Bridge Seismic retrofit project.

### Impacts of a ramp-to-ramp lane on Wilsonville Road and local system operations

Any ramp-to-ramp lane option would benefit local system performance (FIGURE 19). The Wilsonville Road on-ramp meter activates in response to congestion on the I-5 mainline. With all ramp-to-ramp options reducing congestion on I-5, the ramp meter would likely be on for fewer hours per day. This would increase the total period of time when vehicles would be able to flow freely onto I-5 from the Wilsonville Road on-ramp, and reduce the amount of time when queues could build up at the ramp meter, making it less likely they would spill back onto the local system.

Improved operations on the mainline might also allow the ramp meter to operate at a faster rate, in which case any queues that formed would clear faster. (ODOT does not determine ramp meter rates in



**FIGURE 20.** Comparison of ramp meter operations and queuing forecast for the year 2040 on the Wilsonville Road on-ramp , if no changes were made (*left*) or if a ramp-to-ramp lane were constructed (*right*).

long range plans. Traffic engineers assess meter rates after a project is constructed and ODOT has collected data on how conditions on the freeway change as a result.)

### **Comparison of alternatives**

Of the three build alternatives, Option C provides the greatest improvements to I-5's performance.

- This alternative would reduce congestion well below the levels experienced today and increase peak hour speeds to above 50 mph throughout the project area.
- The addition of a second off-ramp lane at Canby-Hubbard (the busier of the study area's two exits) creates greater separation of the traffic entering I-5 at Wilsonville Road from the traffic already on the mainline. Vehicles on I-5 could merge directly into the second exit lane from the outer I-5 travel lane, without merging into the ramp-to-ramp lane first.
- Because of the improved traffic flow and increased separation of merging/weaving from through traffic, Option C would be expected to offer the greatest reduction in crash rates for the longest period of time.

## PUBLIC INVOLVEMENT AND LOCAL GOVERNMENT PARTICIPATION

ODOT Region 1 and the City of Wilsonville partnered on the [Southbound I-5 Boone Bridge Congestion Study](#) (September 2017 through May 2018). This facility plan is the final product of that study. The Technical Advisory Committee for the study included ODOT, the City, Clackamas County, Washington County, DKS Associates, and Angelo Planning Group. (Marion County chose not to participate in the committee but received updates at project milestones.) After reviewing the technical analysis results, the committee unanimously recommended Option C as the preferred solution.

Public and stakeholder involvement activities began in December of 2017. Wilsonville area outreach efforts were led by city staff and consultants and regional outreach efforts were coordinated by ODOT. The City created a website for the congestion study, shared regular monthly articles in the [Boones Ferry Messenger](#), sent media releases to [The Wilsonville Spokesman Newspaper](#) and provided information via email. The city's Planning Commission received five presentations from the project team between November 2017 and April 2018, including a work session in March and a public hearing on the draft facility plan in April. In



**FIGURE 20.** City of Wilsonville Mayor Tim Knapp introduces the project to community members attending the March 14th Open House.

June, the City Council approved a resolution of support for the I-5 Wilsonville Facility Plan.

The project team focused outreach efforts on gathering feedback about experiences with the operational problems on I-5, presenting the ramp-to-ramp options, and asking for input on the recommendation that Option C should be constructed as part of a seismic retrofit project in the future. An open house held at Wilsonville City Hall in March (FIGURE 20) drew 30-40 attendees who discussed the results of technical analysis with project team staff, received a presentation of major findings, and participated in a question and answer session. The same materials were shared in an online open house and survey hosted by the City during the second half of March. ODOT shared the draft facility plan for a 45 day public comment period beginning in April, with links to public review materials available on the city's website.

In addition, the project team met with the following stakeholder groups in March and April to share congestion study findings, answer questions, and gather input:

- Wilsonville Chamber of Commerce
- Wilsonville Rotary Club
- Charbonneau Homeowners' Association
- Washington County Coordinating Committee — Transportation Advisory Committee
- Oregon Freight Advisory Committee
- Washington County Coordinating Committee
- ODOT Region 1 Mobility Advisory Committee
- Clackamas County Coordinating Committee — C4 Metro Subcommittee
- French Prairie Forum
- Joint meeting of the Transportation Policy Alternatives Committee and Metro Technical Advisory Committee

The majority of the feedback received during the public involvement process affirmed that the project team has correctly identified the transportation problems in the study area, that the recommended operational concept was appropriate, and that ODOT should invest in building the auxiliary lane improvement as part of the seismic rehabilitation of the Boone Bridge.

A detailed synthesis of public input can be found in Appendix B.

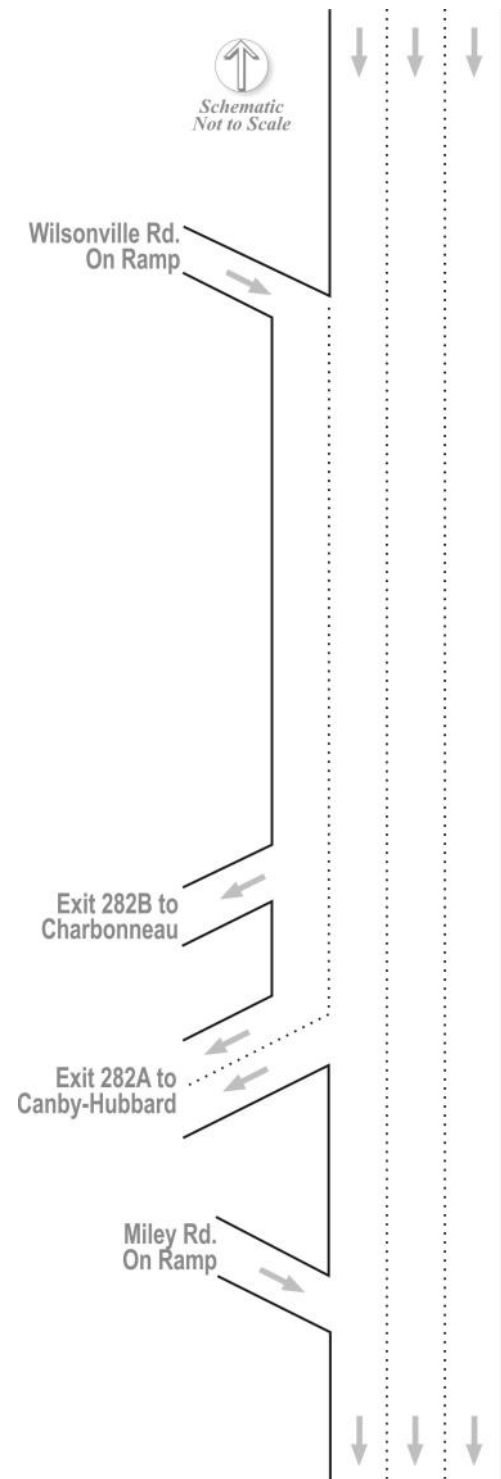
## PLANNED IMPROVEMENTS

This facility plan recommends Option C (FIGURE 21) as the best operational concept for this location for the 20-year planning horizon. This recommendation reflects the Technical Advisory Committee’s consensus that this option is the most cost-effective long-term solution for the bottleneck that forms on I-5 at the Wilsonville Road on-ramp.

Option C is consistent with the state, regional, and local policies outlined in this plan. A ramp-to-ramp lane is a targeted, lower-cost improvement that will protect I-5’s operations for decades to come, while maintaining the regionally-approved cross-section of six through lanes. It improves safety and reliability for longer-distance travel, freight movement, and emergency services. Option C responds to Regional Transportation Plan direction to address the impacts of peak period congestion on freight reliability, mobility, and travel patterns in this part of the I-5 corridor. It also supports desired development in the City of Wilsonville by managing the impacts of I-5 congestion on Wilsonville Road and the local transportation system. It meets screening criteria related to protecting farm and forest uses in rural reserves from urbanizing impacts. It presents only minor differences in costs and environmental impacts compared to Options A and B.

### Financial feasibility assessment.

Based on revenue forecasts prepared for the 2018 Regional Transportation Plan, resources exist within ODOT’s financially-constrained budget for the 2028-2040 period to design and construct a southbound auxiliary lane serving I-5 southbound from exits 283 to 282A. These resources are expected to be combined with additional funding from the ODOT bridge program to complete the seismic rehabilitation



**Figure 21.** Option C, the recommended operational concept.

components of the Boone Bridge improvements. Completing the operation and seismic components as one project will allow ODOT to achieve economies of scale, reducing total costs.

## IMPLEMENTATION RECOMMENDATIONS

Adoption of this plan is the first of several steps needed to improve the operations of southbound I-5 in the Boone Bridge area. Once this plan is adopted, ODOT will submit Option C as a project for the 2018 Regional Transportation Plan Financially Constrained Project List, for funding in the 2028-2040 time frame.

The next step will be to secure funding for project development, which will include analysis of engineering alternatives and their potential environmental impacts. ODOT's Bridge Section will analyze the Boone Bridge seismic needs to determine what improvements would ensure the structure remains standing if a major quake occurs. Once those engineering recommendations are available, the operational and seismic work will be combined into one project.

While this project development work occurs, ODOT will continue to collaborate with regional partners to increase multimodal safety, efficiency, accessibility, and reliability in the I-5 mobility corridor. ODOT fully supports the Regional Transportation Plan's recommendation of a multimodal refinement plan for the I-5 corridor from Tigard to Wilsonville. This facility plan does not preclude any transportation alternatives that could be considered as part of that broader refinement plan. Refinement plans often lead to updates to other long range plans, capital improvement plans, and transportation demand management decisions. If a refinement plan is adopted for the corridor, ODOT will review this facility plan to verify whether Option C remains an appropriate operational concept for I-5 in the Boone Bridge area.