WSDOT

Interstate 5 Tumwater to Mounts Road

PLANNING AND ENVIRONMENTAL LINKAGES STUDY

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Interstate 5 Tumwater to Mounts Road Planning and Environmental Linkages Study

March 2022

Approved by:

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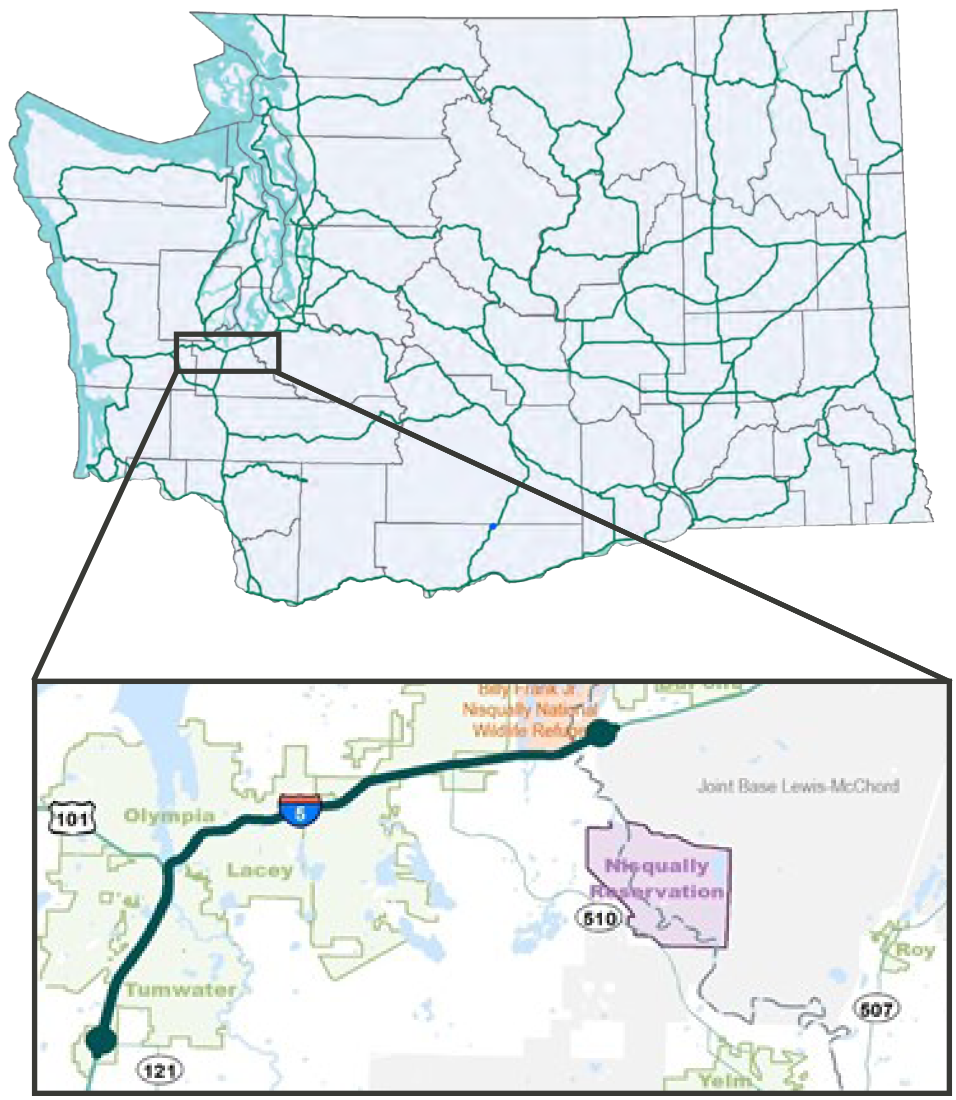
EXECUTIVE SUMMARY

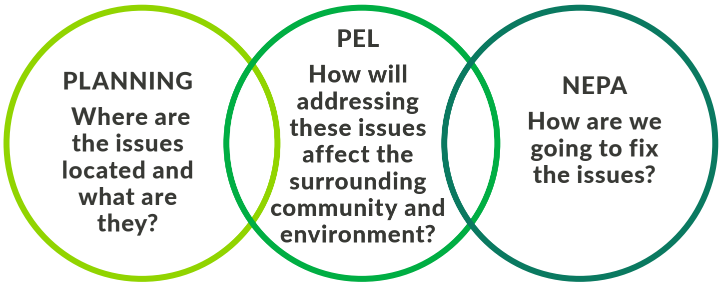
Interstate 5 (I-5) is the major north-south highway through western Washington State and is a major freight and commuter corridor. The study area is on Interstate 5 (I-5) from Tumwater (Exit 99) to Mounts Road (Exit 116). Within the study area travel demand is expected to increase due to population, employment, and economic growth.

The Washington State Department of Transportation (WSDOT) is committed to maintaining and improving transportation services and environmental conditions throughout this corridor. WSDOT's mission is to provide safe, reliable, and cost effective transportation options to improve communities and economic vitality for people and businesses. WSDOT's approach to achieving its mission is called Practical Solutions. This approach uses performance-based, data driven decision making and early community involvement to guide the development and delivery of transportation investments. Our goal is to identify and solve problems as quickly and inexpensively as possible.



PLANNING PROCESS OVERVIEW

The diagram below shows the process WSDOT is using to identify, evaluate, and implement practical solutions to the transportation and environmental challenges in the study area. All three circles include coordination with partners, stakeholders, agencies, and the public.



From 2018 to 2020 WSDOT and the Thurston Regional Planning Council (TRPC) completed the *I-5: Tumwater to Mounts Road Corridor Study* (Corridor Study – https://wsdot.wa.gov/construction-planning/search-studies/i-5-tumwater-mounts-road-corridor-planning-and-environmental-linkages-study). The Corridor Study represents the first circle, planning. The Corridor Study used stakeholder and community input to develop goals and performance measures and to identify mid- and long-term strategies to achieve those goals and improve I-5 system performance between Tumwater Boulevard and Mounts Road. The Corridor Study provided significant public outreach, including public open houses and two on-line surveys. The second on-line survey was conducted specifically to obtain diverse input from overburdened populations. The Corridor Study also sorted numerous strategies into scenarios and ranked the scenarios based on their contribution toward achieving the goals. From the Corridor Study, the following scenarios were selected to move forward for further analysis in the Planning and Environmental Linkages (PEL) process, which is represented by the second circle:

- Operations (Ops)
- Part Time Shoulder Use (PTSU)
- HOV Conversion (HOV)
- Interchanges (Int)
- Widen/Add Capacity (Cap).

The Corridor Study developed over 25 strategies and placed the strategies in the appropriate scenario. After the Corridor Study, WSDOT worked to further evaluate the strategies identified in the Corridor Study through the PEL Study. During the PEL Study, one of the strategies (Widen/Add Capacity) that spanned the entire corridor was broken into three separate strategies for manageability. The PEL Study provided traffic modeling of the strategies to evaluate their effectiveness at achieving the goals outlined in the Corridor Study and included preliminary environmental screening of the strategies. The environmental screening process included reviewing over 25 proposed strategies from the Corridor Study (including the strategy that was sectioned into three separate strategies). The strategies were reviewed using available on-line data and compiling the information on each strategy. This work provided a deeper understanding of the potential impacts to the built and natural environment, restoration opportunities, additional investigation on the corridor constraints, and information needed to transition the strategies into projects after preliminary design. However, due to several factors, coordination with the natural resource agencies has been extremely challenging. Based on the environmental resources, it is anticipated the National Marine Fisheries Service (NMFS) and US Fish and Wildlife Service (USFWS) will be concerned about species listed under the federal Endangered Species Act (also referred to as ESA listed species) in key strategy areas. Additionally, stormwater runoff and endangered species are anticipated to be areas of extreme concern.

To keep the continuity between the Corridor Study and the PEL, each strategy label corresponds to that strategy's scenario in the Corridor Study, Appendix G. The PEL Study also eliminated strategies that were either not practical solutions or did not contribute to the goals and performance measures in the Corridor Study. Chapter 5 provides details on the strategy environmental screening work and results.

This PEL Study differs from a NEPA project-level approach and can be described as a pre-NEPA study, providing high-level screening of the strategies. The environmental screening consisted of reviewing available GIS information and other resources. The screening from this PEL Study was used to develop recommendations and a list of mid- and long- range strategies for NEPA reviews. The NEPA process is represented by the third circle in the diagram.

The preliminary environmental screening and coordination with affected Tribes during the Corridor and PEL Studies identified two key areas of environmental and Tribal concern. These are the Nisqually River Delta at I-5 and the Deschutes River Estuary at the I-5/US 101 interchange. Specific concerns related to these areas include:

- **Nisqually Delta:** there is a bend in the Nisqually River that is currently moving towards I-5. Based on a Draft Hydrology Study by the U.S. Geological Survey (USGS), it could reach I-5 within 17 to 30 years. There are also concerns over the impact the existing I-5 road prism and bridges may have on the environment and the resiliency of I-5 to impacts from climate change. According to the Draft Hydrology Study (USGS), modeled extreme storm events, when combined with sea level rise and higher stream flows expected due to climate change, pose a threat of flooding to properties and infrastructure in the lower Nisqually watershed.

  The Nisqually River watershed has its own lead entity for salmon recovery [Water Resource Inventory Area (WRIA) 11]. Lead entities are watershed-based groups that develop strategies to restore salmon habitat, prioritize projects for state and federal funding, and partner with organizations to complete restoration projects. Salmon Recovery efforts in the Nisqually River basin include investments from the state and federal governments, as well as the Nisqually Indian Tribe.

- **Deschutes Estuary:** There are concerns over water quality issues in this area, including stormwater runoff from I-5. Additionally, the Washington State Department of Enterprise Services (DES) is conducting a NEPA Final Environmental Impact Statement on the Capitol Lake – Deschutes River Estuary restoration, which could potentially impact the US 101 and I-5 interchange.

  The Deschutes River watershed is located within the boundaries of the WRIA 13 (Water Resource Inventory Area 13) lead entity for salmon recovery, and the Deschutes River is the largest watershed within that lead entity. Salmon Recovery efforts in the Deschutes River basin include investments from state and federal governments, as well as the Squaxin Island Tribe.

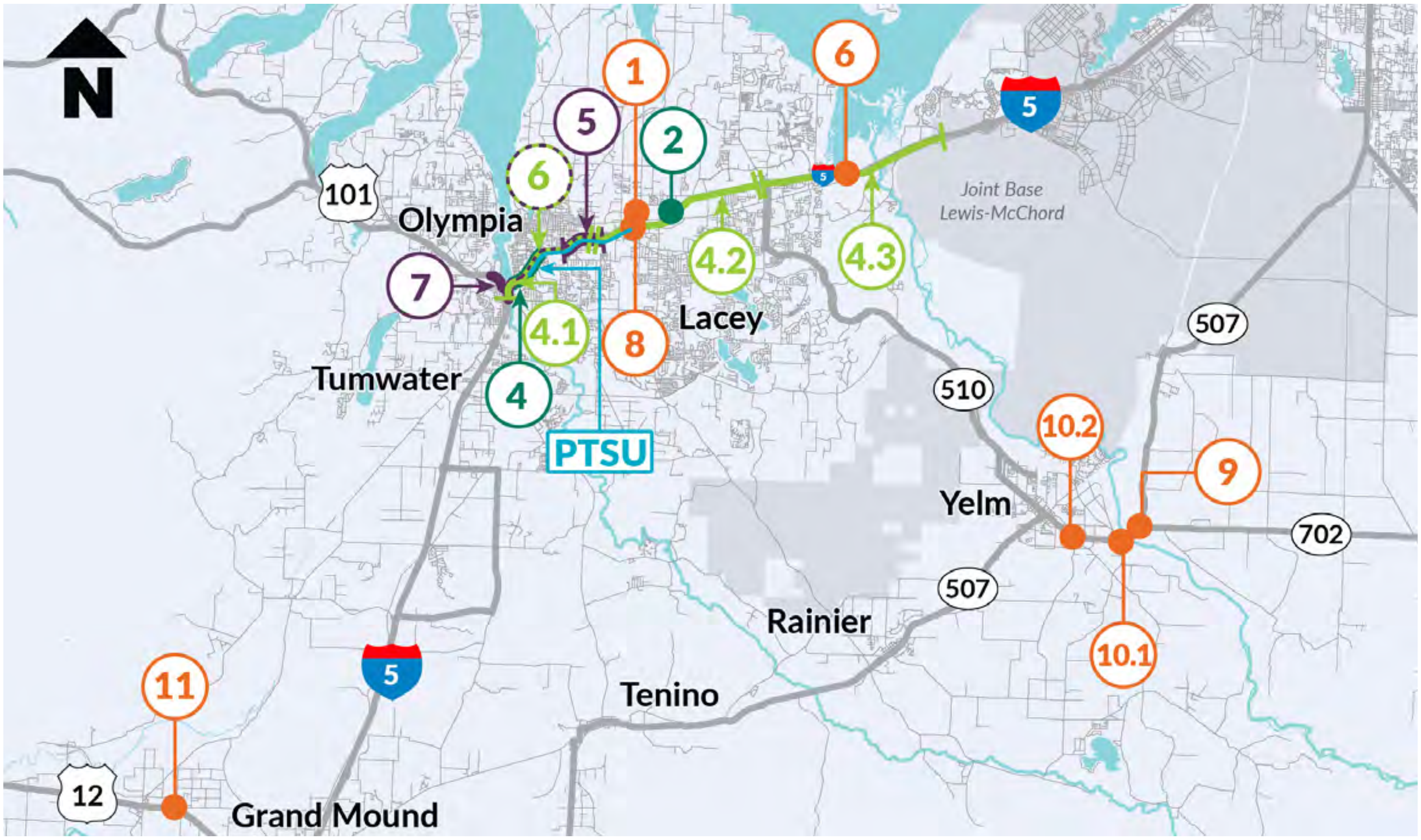
As stated above, the Corridor Study led the coordination and outreach and the PEL process has continued that outreach. The Draft PEL report public review process occurred in March 2022. During the PEL Study there were several coordination meetings with FHWA and with various stakeholders.

In the original Corridor Study, Thurston Regional Planning Council (TRPC) only modeled the scenarios for traffic impacts, and the strategies were categorized into the appropriate scenarios. In the PEL Study, TRPC added to their previous Corridor Study traffic modeling work by providing traffic modeling for the strategies that moved forward into the PEL document. Those strategies were also screened using an existing WSDOT tool, the Environmental Review Summary (ERS) forms. WSDOT applied a practical solutions lens to both the Corridor Study and the PEL Study. Practical Solutions, the traffic modeling outcomes, and the environmental screening were used to determine which strategies provided benefits and were used to place the strategies into mid- and long- term solutions that are recommended to move forward. Using this method, the number of strategies moving forward from the PEL review decreased from 30 to 16. The following 16 mid- and long- term strategies are planned to move forward into NEPA reviews. It is important to note, the scenario with strategies to convert an existing general-purpose lane to HOV lanes did not meet the purpose and need (see Chapter 1 for purpose and need) and those strategies did not move forward.

The scenario and strategy labeling links back to the Corridor Study, Appendix G. The scenarios and strategies recommended to move forward are listed below. Locations are shown on the following figure (Figure ES-1):

Based on the traffic modeling and environmental screening the following scenarios and strategies are moving forward:

Figure ES-1 Locations of Strategies Proposed to Move Forward.



OPERATIONS

- 1 Sleater-Kinney double left turn lanes from Martin Way E to Sleater-Kinney Road SE
- 6 Nisqually / Martin Way at Nisqually Cut Off Road SE
- 8 Sleater-Kinney new signal at NB off-ramp
- 9 SR 507 in Yelm (SR 507 and SR 702)
- 10.1 SR 507 and Vail Road – replace intersection with roundabout
- 10.2 SR 507 and Bald Hill Road – replace existing signal with a roundabout
- 11 US 12 and 183rd Ave Roundabout

INTERCHANGE

- 2 Martin Way Interchange
- 4 US 101 Interchange revision with braided on ramps

ADD CAPACITY

- 4.1 Widen, add capacity US 101 Interchange to Pacific Ave SE Interchange
- 4.2 Widen, add capacity Pacific Ave SE Interchange to Marvin Rd NE Interchange
- 4.3 Widen, add capacity Marvin Rd NE Interchange to Mounts Rd
- 5 I-5 Southbound – Pacific Ave to Plum St off ramp
- 6 I-5 Northbound US 101 on-ramp to Pacific Ave off-ramp
- 7 I-5 Northbound at US 101 – flyover ramp

PART TIME SHOULDER USE (PTSU)

PTSU Allow part time shoulder use in the southbound direction of I-5 between the Sleater-Kinney Rd NE on ramp and Henderson Blvd SE on ramp

Operations

Ops 1 – add a left turn lane from Martin Way East onto Sleater Kinney Road SE. This is a mid-term strategy to improve mobility and travel time from Martin Way onto Sleater-Kinney Road and access to the I-5 southbound ramp.

Ops 6 – Add a lane at the metered on-ramp at Nisqually/ Martin Way and Nisqually Cut Off Road. This is a mid-term strategy with signal timing to improve mobility.

Ops 8 – Construct a signal at the intersection of the I-5 northbound off-ramp and Sleater Kinney Road. Only the southbound lane of Sleater Kinney Road will be signalized; curbing will separate the northbound Sleater Kinney Road. This is a mid-term strategy moving forward for assessment of its potential to reduce rear end crashes related to the intersection.

Ops 9 – Off I-5 improvement at SR 507 and SR 702 in Yelm; replace the signalized intersection with a roundabout. This is a mid-term strategy to improve system resiliency.

Ops 10.1 – Off I-5 improvement at SR 507 and Vail Road in Yelm; replace the T intersection with a roundabout. This is a mid-term strategy to improve system resiliency.

Ops 10.2 - Off I-5 improvement at SR 507 and Bald Hill Road in Yelm; replace the signalized intersection with a roundabout. This is a mid-term strategy to improve system resiliency.

Ops 11 – Off I-5 improvement at US 12 and 183rd Ave in Rochester, replacing the intersection with a roundabout. This is a mid-term strategy to improve system resiliency.

Interchange

Int 2 - Change the Martin Way Interchange to a partial clover leaf interchange. This is a mid-term strategy that improves volume and throughput on I-5.

Int 4 – Construct a braided ramp between southbound I-5 and US 101, replace existing bridge on southbound I-5 to 14th, and install new bridge for on-ramp over Henderson. Exit at Plum Street to access the braided ramp SB I-5 and add an auxiliary lane between Pacific Ave and Capitol Way. This is a mid-term strategy that includes signage and redesign of the Plum Street exit, to improve access to US 101 and improve volume and speeds through I-5 southbound.

Part Time Shoulder Use

PTSU – Allow part time shoulder use in the southbound direction of I-5 between the Sleater-Kinney Road Northeast on-ramp and the Henderson Boulevard Southeast on-ramp.

Widen/Add Capacity

Cap 4.1 – Add a lane (where there are only three lanes) with an HOV lane as the inside lane both directions on I-5 from the US 101 Interchange to the Pacific Ave SE Interchange. This is a long-term strategy that increases volume and speed on I-5. (Note: there are some four lane sections on this corridor).

Cap 4.2 - Add a lane (where there are only three lanes) with an HOV lane as the inside lane both directions on I-5 from the Pacific Ave SE Interchange to the Marvin Road NE Interchange. This is a long-term strategy that increases volume and speed on I-5. (Note: there are some four lane sections on this corridor).

Cap 4.3 – Add a lane with the HOV as the inside lane both directions on I-5 from Marvin Road to Mounts Road. This section of I-5 is only three lanes and allows bicycles on the shoulder. This is a long-term strategy that should review the existing bridges over I-5 for resiliency, climate change, and be designed to accommodate multimodal opportunities.

Cap 5 – Add an auxiliary lane between Pacific Ave and Capitol Way (see Int 4). This long-term strategy would connect with the braided ramp. Recommend further analysis with the signage and redesign of Plum Street.

Cap 6 – Add an auxiliary lane from US 101 on-ramp to the 14th Ave off-ramp, and from Plum Street on-ramp to the Pacific Ave off-ramp. This long-term strategy increases throughput and speeds on I-5.

Cap 7 – Add a flyover off-ramp linking NB I-5 to WB US 101 and merging in on the outside lane of US 101, retaining the Deschutes Parkway on ramp to provide access from the local network to US 101. This long-term strategy would increase throughput in the northbound direction of I-5 and reduce the exit queue on northbound I-5.

Based on practical solutions, traffic modeling, and environmental screening it is anticipated these 16 strategies will move forward into various levels of NEPA documentation. The strategies recommended to move forward all meet the purpose and need of the Corridor Study and the PEL Study.

1 INTRODUCTION

Background

Interstate 5 (I-5) is the major north-south highway through western Washington State and is a major freight and commuter corridor. Beginning in 2018, WSDOT and our transportation partners set out to study the transportation needs along I-5 from Tumwater to Mounts Road SW (Figure 1.1). The study area was selected because travel demand is expected to increase by 2040 due to population, employment, and economic growth. Two studies were undertaken, starting with the I-5 Tumwater to Mounts Road Corridor Study (from 2018 to 2020, referred to in this report as the Corridor Study) and this Planning and Environmental Linkages (PEL) study, which began after completion of the Corridor Study.

WSDOT approaches solving transportation issues using a process called Practical Solutions[1]. This approach to planning and designing focuses on achieving specific performance outcomes and working collaboratively with communities and partners to make the right investments in the transportation system at the right place and at the right time. For example, investing in incremental and multimodal improvements first, such as transportation systems management and operations or non-highway solutions, can avoid or delay costly expansion. Both the Corridor Study and the PEL Study applied practical solutions process into the work.

Figure 1.1 Study Area

I-5: TUMWATER TO MOUNTS ROAD CORRIDOR STUDY

During the 2018 legislative session, the Washington State Legislature allocated funds for a planning study of I-5 between Tumwater (exit 99) and Mounts Road (Exit 116), to develop mid- and long-term strategies to improve the region's transportation performance[2].

From 2018 to 2020 WSDOT and Thurston Regional Planning Council (TRPC) completed the "Interstate 5: Tumwater to Mounts Road Mid- and Long- Range Strategies" (WSDOT 2020; Corridor Study). During the Corridor Study, WSDOT and TRPC engaged stakeholders from Joint Base

[1] For more information, see https://wsdot.wa.gov/about/practical-solutions.
[2] Engrossed Substitute Senate Bill 6106, page 45 line 37 – page 46 line 6.

Lewis McChord, local Cities, Counties, and Tribes (see Corridor Study Appendix A for a full list), and the public developing the following Corridor Study goals:

- **Travel times and reliability -** Improve travel times on I-5 and make them more predictable;
- **Efficiency and equity -** Increase the transportation system's ability to safely, efficiently, and equitably move all people (multimodal) and goods;
- **Accessibility -** Maintain and improve access to job sites, commercial services, and industrial areas;
- **Environmental -** Protect and enhance the environment including reducing the transportation-related impact on wildlife habitat in the Nisqually River delta; and
- **Resilience -** Improve the transportation system's ability to operate during and recover from disruption, such as traffic incidents, natural disasters, and climate change (system resiliency)

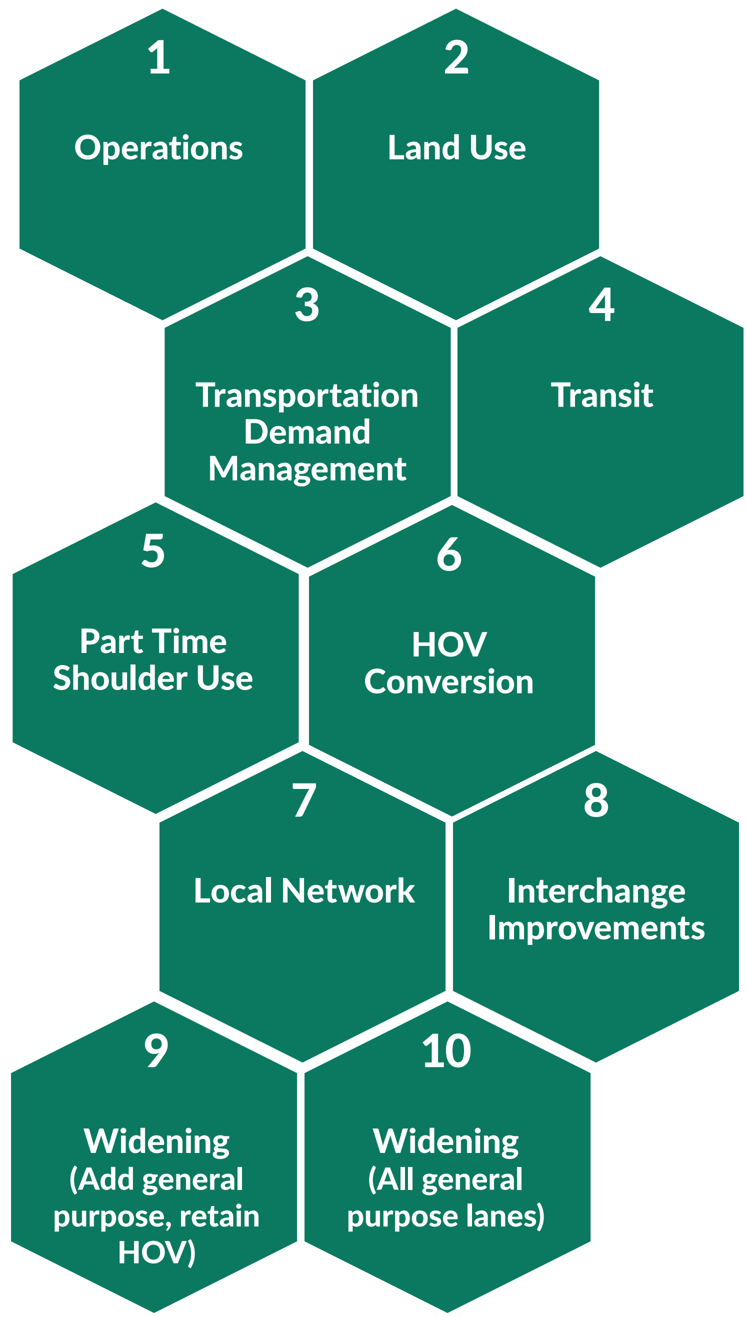
WSDOT and TRPC led a thorough stakeholder and public outreach process, including two on-line surveys and a paper survey distributed at accessible, commonly used public spaces like transit centers and libraries to obtain diverse, equitable public input. The Corridor Study outreach also included two in-person open house events and an online open house using an interactive story map. Using these goals and the input from the outreach, WSDOT crafted a suite of strategies to improve person throughput on I-5, including strategies off the I-5 system to improve overall system resilience. The Nisqually Indian Tribe assisted with the outreach and shared their concerns about salmon recovery and impacts to treaty rights. The Nisqually Indian Tribe and WSDOT funded the U.S. Geological Survey (USGS) hydrology study of the Nisqually River to provide environmental and climate change information on the Nisqually delta. At the time of this PEL Study, the hydrology study was in draft status.

The Corridor Study stakeholder team reviewed over 140 suggested and brainstormed strategies, including air taxis and ferries; moving I-5 out of the Nisqually Delta; adding HOV lanes; changing the speed limit, and many others. The team selected approximately 45 strategies from that work and grouped them into 10 scenarios (see Figure 1.2).

Based on stakeholder and public input, the team ranked the Corridor Study goals and then evaluated the scenarios' effectiveness toward meeting each goal. The study goals were ranked in the following order: efficiency and equity, travel times and reliability, resilience, accessibility, and environmental.

The ten scenarios were evaluated by TRPC and WSDOT using practical solutions, a high-level traffic modeling for the scenarios only and a paired comparison process

Figure 1.2. Scenarios Developed during the Corridor Study



(comparing each scenario against the other proposed scenario). From this work, the scenarios were ranked from 1 to 10 (Figure 1.3).

Figure 1.3. Ranking of Corridor Study Scenarios by Overall Effectiveness

Scenario	Effectiveness
Sustainable Thurston Land Use	●
Intercity Transit Long-range Plan	◑
Transportation Demand Management	◑
Interchange Improvements	◑
Operations Improvements	◑
HOV Conversion	◑
Part Time Shoulder Use	◑
Widen I-5 – All General Purpose	◔
Widen I-5 – Add General Purpose, Retain HOV	◔
Regional Transportation Plan Local Projects	○

Notes: Adapted from Chapter 7 of the Corridor Study. Refer to Chapter 7 of the Corridor Study for details on weighting and the ranking process

WSDOT and our partners relied on the results from the Corridor Study to take a closer look at the state highway and interstate scenarios and strategies using this PEL study. The local improvement scenarios (2,3,4,7) are not reviewed in the PEL study because WSDOT would not be the lead NEPA/SEPA agency for these actions. It is anticipated that our partners will evaluate these scenarios for future implementation. Scenario 10 was combined with Scenario 9.

INTRODUCING THE PEL STUDY

The Planning and Environmental Linkages (PEL) Study builds upon the 2020 Corridor Study, with the goal of providing deeper analysis and environmental screening of the proposed strategies.

The legislature provided additional funding to continue study of this corridor by initiating a Planning and Environmental Linkages (PEL) study. The following is the wording: "$2,250,000 of the motor vehicle account is provided solely for the I-5 Corridor from Mounts Road to Tumwater project for completing a National and State Environmental Policy Act along the I-5 Corridor from Tumwater to Dupont." Because of new streamlined regulations under One Federal Decision[3], a Planning and Environmental Linkages (PEL) Study was determined to be the intermediate step before taking the scenarios and strategies into a full NEPA review. Because the environmental, community, and economic goals were defined by the public and stakeholders early in the Corridor Study, the information easily transitions into the PEL study as a continuum.

WSDOT is building on the goals, scenarios, and strategies developed in the Corridor Study using practical solutions, guidance from Federal Highway Administration (FHWA), and Chapter 200 of the WSDOT Environmental Manual[4]. WSDOT initiated this PEL study to evaluate the Corridor Study strategies for effectiveness and potential environmental impacts. The PEL process outlines a collaborative and integrated approach to transportation decision-making incorporating community, economic, and environmental goals into WSDOT's practical solutions requirements. The PEL process is a high-level screening, and its findings can be used in subsequent regulatory processes, including the National Environmental Policy Act (NEPA), which will conduct deeper analysis to move strategies forward into implementation.

As noted above, this PEL study started to examine six of the original ten scenarios (Figure 1.2), the PEL combined the two widening scenarios, reducing the total to five scenarios. Based on the scenario's effectiveness related to the goals outlined in the Corridor Study, the following scenarios are evaluated in the PEL:

- Operations
- Part Time Shoulder Use
- HOV Conversion
- Interchange Improvements
- Widening/Add Capacity

These scenarios are presented throughout this report in the order of priority ranking based on practical solutions, starting with the lower-cost improvements that could be implemented in the mid-term, to very high-cost solutions that would take many years to implement (long-term).

[3] One Federal Decision- Executive Order 13807 issued August 15, 2017

[4] https://www.wsdot.wa.gov/publications/manuals/fulltext/M31-11/em.pdf

From the scenarios, over 25 strategies were selected for review in the PEL Study. Most of these strategies were on the I-5 corridor; however, there were several strategies located on WSDOT facilities and off the I-5 corridor that are part of the PEL review because of the potential to improve overall system resiliency for unforeseen system closures, such as the December 2017 train derailment. For example, one local network scenario strategy was added to the PEL review and that was Perimeter Road Local Network. While outside of the study area, it was added because it had potential to alleviate congestion through the Nisqually area.

The following graphic (Figure 1.4) describes the relationship between the Corridor Study, PEL study, and future NEPA process.

Figure 1.4: Summary of Relationship Between Corridor Study, PEL, and NEPA

Corridor Study	• Incorporated stakeholder, partner, and public input • Developed & ranked goals & performance measures • Developed many strategies; screened for feasibility • Categorized strategies into like scenarios • Ranked the scenarios based on effectiveness toward goals
PEL	• Continued stakeholder, partner, and public coordination/outreach • Traffic modeling of strategies • Preliminary environmental screening of strategies • Preliminary outreach to regulatory agencies • Recommended strategies to move forward into NEPA review
NEPA	• Review to determine level of NEPA analysis required • Emphasize strategies that will require EA/EIS • Conceptual project development • Environmental discipline reports • Continue coordination with partners and regulatory agencies

NO BUILD ALTERNATIVE

A No Build alternative was used as the base model for comparison in both the Corridor Study and the PEL Study traffic modeling by TRPC. WSDOT modeled more than 20 strategies along the corridor to estimate travel conditions through Year 2045. The No Build alternative, also referred to as the Base Year Model, is discussed in the Corridor Study traffic modeling and in the PEL Study traffic modeling (Appendix A). It includes the existing transportation network plus funded projects in local agency Transportation Improvement Programs (TIPs) and WSDOT's State Transportation Improvement Plan (STIP). The No Build alternative represents a baseline condition that is compared to each proposed strategy.

PEL FEDERAL FRAMEWORK

The PEL process is very flexible, as defined in Federal regulations[5] and policy[6]. The Federal Highways Administration (FHWA) encourages the use of PEL to gain more from transportation planning efforts. Generally, a PEL study is a planning effort that incorporates environmental considerations into transportation decisions early in planning, with the goal of addressing environmental concerns while streamlining project delivery. PEL is most useful for transportation planning efforts that are likely to recommend one or more project-specific solutions that require in-depth NEPA documentation, such as an Environmental Assessment (EA) or an Environmental Impact Statement (EIS). More information about PEL can be found at https://www.environment.fhwa.dog.gov/env_initiatives/PEL.aspx and at https://wsdot.wa.gov/environment/technical/environmental-planning. The approach improves process efficiencies by minimizing potential duplication of planning and NEPA processes, creating one cohesive flow of information.

There are many parallels between PEL and WSDOT's Practical Solutions approach to planning and project delivery. WSDOT's intent is to make the right investments, in the right places, at the right time, while using the right approach. The Practical Solutions approach emphasizes the need for inclusive engagement, including collaboration with partners and affected communities to understand current and future transportation needs. Similarly, the PEL process emphasizes the engagement with federal and state resource agencies, Tribes, study partners and the public. A PEL study documents early considerations and input and documents key planning-level decisions. By compiling the information and analysis developed early during the PEL study, the information is incorporated into a pre-NEPA document, thus streamlining future NEPA processes.

[5] 23 CFR 450.212 and 23 USC 168: Integration of planning and Environmental Review

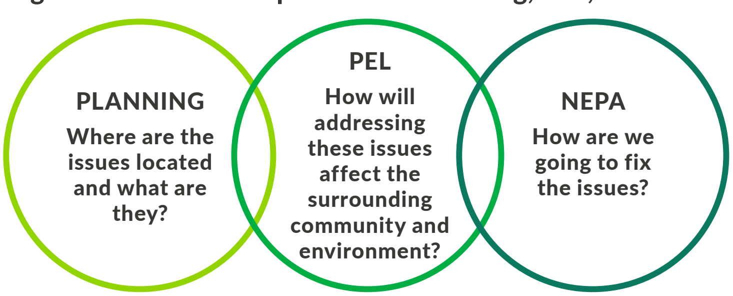
[6] One Federal Decision- Executive Order 13807 issued August 15, 2017

The Colorado DOT PEL handbook provides excellent guidance on the multiple outcomes of a PEL process:

> *"A variety of outcomes can result from the PEL process: a specific project may be identified to advance into project development and NEPA; a set of improvements could be identified with recommendations for priorities to address transportation needs over a longer term; or the process might suggest that no immediate projects should be advanced because the needs do not warrant immediate action, or the controversy, costs, or environmental impacts associated with the project(s) are too high. PEL studies can be and are often used as a tool to prioritize improvements. For example, a PEL study for a corridor could result in the identification of multiple potential projects (such as capacity improvements for a shorter length of the corridor and intersection improvements) that can be prioritized for implementation. PEL studies conducted for projects provide context for future NEPA decisions, such as creating a basic description of the environmental setting, deciding on methodologies for analysis, and identifying programmatic level mitigation for potential impacts most effectively addressed at a regional or state level."*

WSDOT's PEL guidance[7] aligns with Colorado's approach. WSDOT's guidance explains that PEL and NEPA are separate, distinct processes. However, the PEL process informs the environmental review under NEPA and connects the dots from planning, in this case the Corridor Study, to NEPA. A PEL study should be right-sized, with the appropriate type and amount of analysis for use in future planning or NEPA. Importantly, a PEL study does not determine the level of future NEPA or SEPA documentation - this is determined once funding for a project is received and project-specific NEPA and SEPA is initiated.

Figure 1.5. Relationships between Planning, PEL, and NEPA



Screening and Prioritizing Strategies

In this PEL study, WSDOT presents the results of screening to the public and agencies for their review. The details are in Chapter 5. To do the screening, WSDOT developed pre-design and rough location or "footprint" information on the strategies from the Corridor Study. One of the strategies in the Widening/Add Capacity scenarios spanned the entire length of the study area from Deschutes to Mounts Road. Based on modeling and environmental factors, that strategy was divided into three distinct sections:

(1) US 101 interchange to Pacific Avenue Southeast,
(2) Pacific Avenue Southeast to Marvin Road Northeast, and
(3) Marvin Road Northeast to Mounts Road Southwest.

Thus, a total of 30 strategies are presented and screened in this PEL study.

Because the scenarios and strategies relate back to the Corridor Study, a labeling system was developed to keep that relationship. Appendix G of the Corridor Study has the scenarios and strategies numbered. To be consistent with the Corridor Study numbering, the PEL report uses the following scenario and strategy labeling system:

Scenario	Abbreviation	Strategy
Operational Improvements	Ops	1, 5, 6, 7, 8, 11, 2, 3, 9, 10.1, 10.2
Part Time Shoulder Use	PTSU	PTSU (only one strategy)
High Occupancy Vehicle Conversion	HOV	1, 2.1, 2.2, 2.3
Interchange Improvements	Int	1, 2, 3, 4, 5, 6, 7,
Add Capacity/Widening I-5	Cap	4.1, 4.2, 4.3, 5, 6, 7

The full list of strategies with project description is available in Chapter 5.

From the environmental screening contained in this PEL review, WSDOT recommends a wide range of strategies that will provide incremental improvements across the study area. These are presented in Chapter 6.

WSDOT will consider strategies identified when making determinations on capital improvements within its project development processes. WSDOT may also be directed to fund strategies or portions of strategies in this plan by the Washington State Legislature. As funding becomes available to further develop the strategies, WSDOT will initiate formal environmental review. For each independent project that follows from this PEL study, WSDOT and FHWA will determine the appropriate level of environmental documentation (categorical exclusion, environmental assessment, or environmental impact statement).

WSDOT sought additional public, agency and stakeholder review through March 2022. This PEL study builds on the prior Corridor Study. Details on coordination and what we've heard from our partners and the public is provided in the next Chapter.

[7] Chapter 200 of the WSDOT Environmental Manual https://www.wsdot.wa.gov/publications/manuals/fulltext/M31-11/em.pdf

2 PURPOSE AND NEED

This PEL Study purpose and need is linked to the Corridor Study completed in 2020. The Corridor Study was a planning process that included a diverse range of perspectives, disciplines, and backgrounds in outreach and decision making. During the Corridor Study, WSDOT used the legislative proviso, practical solutions, stakeholder input, and community engagement to establish goals, set performance measures, and develop a list of strategies and scenarios. Respondent comments trended toward themes of system resiliency, transit, and the environment. Those strategies are further reviewed and screened in Chapter 5.

The Corridor Study Purpose and Need was:

I-5 and major connecting routes between Tumwater and Mounts Road affect our region's economic vitality, accessibility and mobility, defense operations, and the environment. This segment of I-5 experiences reduced throughput – or number of vehicles per hour, recurring delay, and increasingly unreliable travel times. Performance based strategies are needed to satisfy the following study goals (not listed in order of priority):

Goals

- Improve travel times on I-5 and make them more predictable.
- Increase the transportation system's ability to efficiently, and equitably move all people (multimodal) and goods.
- Maintain and improve accessibility to job sites, commercial services, and industrial areas.
- Protect and enhance the environment including reducing the transportation-related impact on fish and wildlife habitat in the Nisqually River delta.
- Improve the transportation system's ability to operate during disruption and recover from it.

PEL Study purpose and need:

The PEL study purpose is to further evaluate the performance based strategies that meet the goals identified in the Corridor Study. The PEL Study is needed to screen strategies for their contribution toward increasing the transportation system's ability to efficiently and equitably move people and goods; improve environmental conditions; and enhance the safety and resilience of the transportation corridor.

The PEL purpose and need was developed based on the Corridor Study, stakeholder input, information on population and job growth, increase in commuters, along with multimodal and freight considerations. PEL information was obtained through various reviews including additional traffic modeling, preliminary environmental screening, and the draft hydrology study completed by US Geological Survey (USGS). The PEL Study was used to screen strategies for their contribution toward achieving the Corridor Study goals and for environmental complexity.

The following information, mostly from the Corridor Study, is presented to show how the Corridor Study information supports the PEL purpose and need.

TRAFFIC MODELING

During the Corridor Study, the scenarios, but not the individual strategies were part of the traffic model. As part of this PEL study, TRPC completed additional traffic modeling for the strategies identified in the Corridor Study. Because of the pandemic, teleworking was also included in the model. Details on telework assumptions are provided in Appendix B. Based on the traffic modeling results, some strategies were removed from further consideration due to no measurable benefit. Additional information on traffic modeling is detailed in chapter 4, and strategies selected to move forward is discussed in chapter 6.

NO BUILD ALTERNATIVE

The traffic modeling in both the Corridor Study and the PEL Study included a No Build alternative, referred to as the Base Year Model, which included the existing transportation network plus funded projects in local agency Transportation Improvement Programs (TIPs) and WSDOT's State Transportation Improvement Plan (STIP) through year 2045. The No Build alternative represents a baseline condition that is compared to each proposed strategy.

The No Build alternative modeling showed many of the I-5 performance issues seen today remain but are anticipated to be more severe, due to population growth and increased traffic volumes. These issues include regular backups on southbound and northbound I-5 approaching the US 101 interchange.

Performance issues also arose due to changes in the roadway network at JBLM. The main example of this is on southbound I-5 at the Mounts Road interchange (Exit 116) at the east end of the study area.

Currently at Mounts Road interchange southbound, I-5 drops from four lanes to three lanes with the right lane being an exit only lane at the Mounts Road interchange. After the planned and funded widening improvements through JBLM[1], the Mounts Road interchange southbound will decrease from five lanes to three lanes. TRPC traffic modeling predicts Mounts Road interchange southbound, will become a new bottleneck with southbound traffic backing up as far east as Thorne Lane SW in Tillicum.

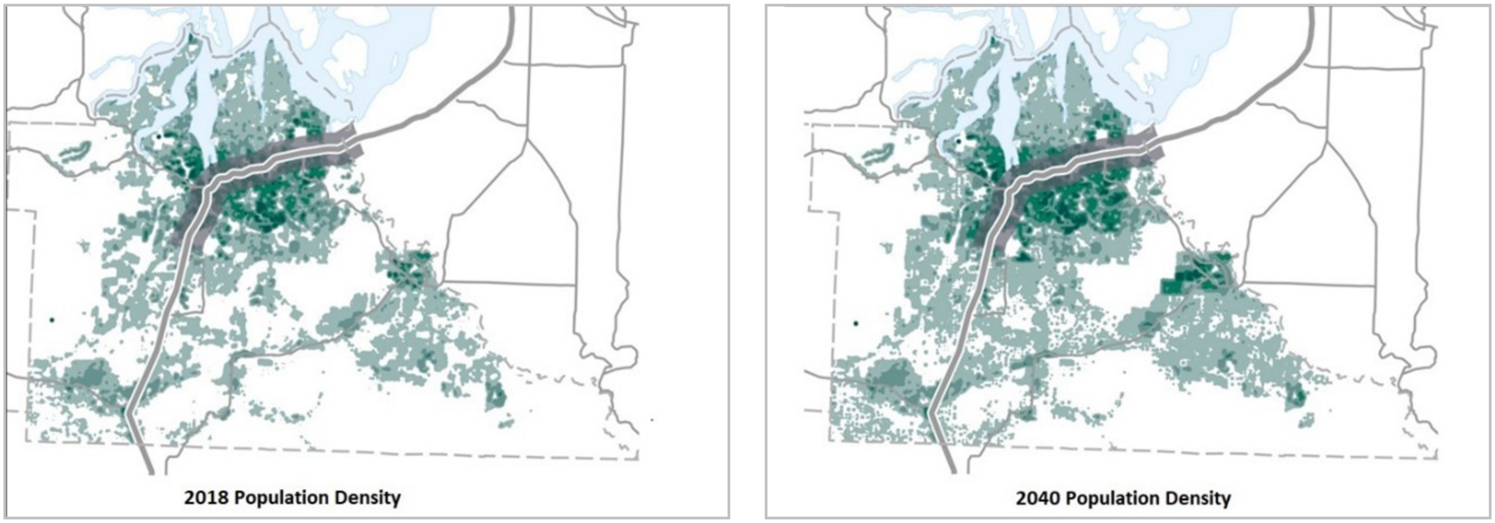
AREA TRENDS FOR JOB GROWTH/ EMPLOYMENT/TRAVEL PATTERNS

As part of the purpose and need, trends for population and economic growth along with travel patterns are important considerations for determining transportation needs within the study area. Because this PEL study is a continuation of the Corridor Study the following Information is directly from the Corridor Study. TRPC forecasts the population will continue to grow to roughly 371,000 by 2040, an increase of 119,000 or 47 percent. Furthermore, TRPC forecasts the balance of population will continue to concentrate in the incorporated cities and urban growth areas between 2018 and 2040 (adding 70,000 people). Other urban areas are also expected to absorb a significant amount of growth. The City of Yelm's population is projected to add 20,000 residents, an increase of 4.1 percent per year.

Along with population growth there is anticipated job growth. The Corridor Study found that roughly 145,600 people work in Thurston County. State government is the largest employment sector in Thurston County with over 24,000 employees. Education, health, and social services, professional and business services, and retail trade are the next largest employment sectors. Prior to the Covid-19 pandemic, over 37,000 new jobs were added since the year 2000- an increase of 1.7 percent per year. Employment is expected to increase about 50 percent from 129,000 to 194,000 by 2040. As employment grows, the balance of job types is anticipated to change. The education, health, and social services sector is projected to overtake state government within the next 25 years (2045). Additionally, Joint Base Lewis McChord is located on the eastern end of the study area in Pierce County and is currently the largest single employer site in Washington State with roughly 52,000 military personnel and civilian worker jobs on site. The growth in population and jobs will add to traffic congestion on this corridor.

[1] WSDOT JBLM Area Improvement web site https://www.wsdot.wa.gov/projects/I5/JBLMImprovements/default.htm

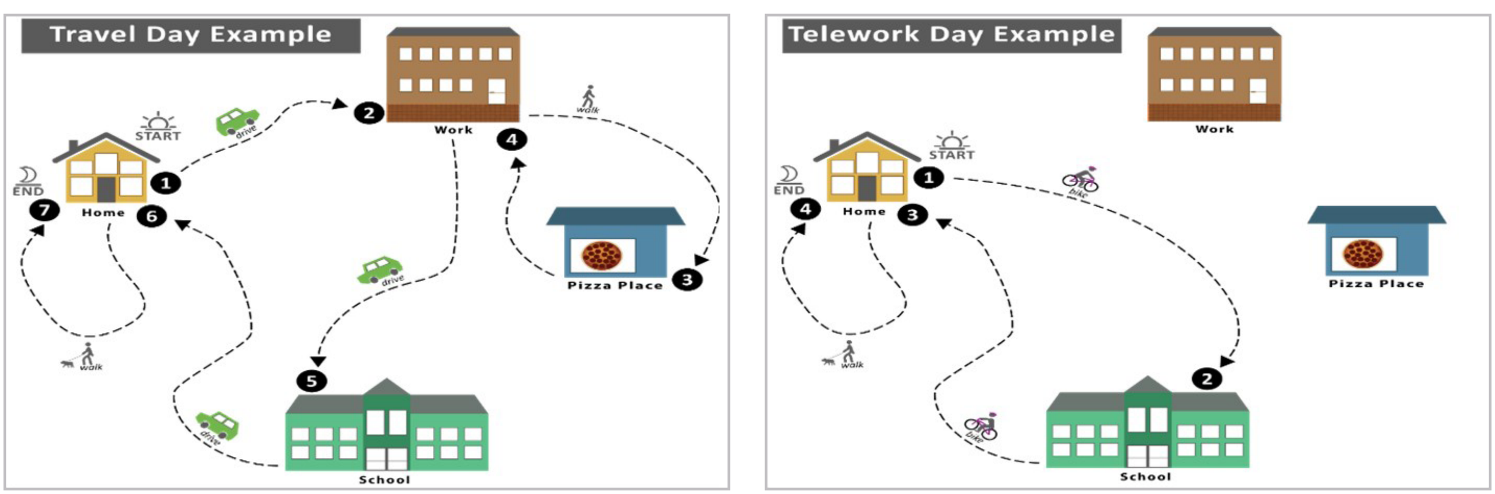
Figure 2.1. Population Density Projections for 2018 and 2040 from TRPC



I-5 connects the study area north to Tacoma and Seattle and south to Centralia. Over 121,000 trips cross the Thurston-Pierce border on I-5 every day. I-5, US 101 and US 12 also serve as important connections to Aberdeen, Hoquiam, and the Olympic Peninsula. Most Thurston County residents (72 percent) work in Thurston County. However, many workers still commute out of county, primarily to Pierce and King Counties. TRPC estimates that by 2045 these outbound commuters will increase from 35,300 in 2015 up to 54,100. Commute modes and timing, like population, are also changing albeit more slowly. People are leaving earlier and experiencing longer commutes. At the same time, the COVID-19 pandemic led to an increase in telework. During the pandemic, for example, many Washington State employees used telework options offered by employers. Following the pandemic, some employers plan to continue allowing remote work opportunities. For example, the WSDOT post pandemic goal is to have 40% of eligible staff teleworking on any given day. Because of the increase in telework, TRPC added five percent teleworking to the 2030 traffic model and nine percent teleworking to the 2045 traffic model. This was applied as a reduction in total vehicle trips. Additional details about telework assumptions are provided in Appendix B.

Other travel modes, including biking, walking, transit, and carpooling have remained relatively stable in terms of the proportion of commuters but are all growing in terms of total number. Electric bikes (Ebikes) are gaining popularity as a transportation and commuting mode. According to the market research firm NPD Group, sales of bicycles in 2020 increased 65 percent from 2019 to 2020, and sales of e-bikes grew 145 percent in 2020 compared to 2019. During the pandemic, many considered Ebikes a safer way to travel than taking transit.

Figure 2.2. Travel Examples, TRPC



Travel Modes

Because I-5 is the most direct route between Dupont and Lacey, part of the study area on I-5 is open to bicycle use. Bike travel is allowed on I-5 between Mounts Road, Exit 116 to Martin Way, Exit 109. The construction on I-5 at Joint Base Lewis McChord (JBLM), closed the JBLM section of I-5 to bicycles. Because of this closure, it was discovered there are hardy bike commuters that use sections of I-5 from Tacoma to Tillicum and to Olympia to get to and from their work destinations, including JBLM.

South of Martin Way, there are existing bike facilities parallel to I-5 from Lacey to Olympia. There are planned bike improvements north of the study area (Gravelly Thorne connector) between Lakewood and Tillicum, parallel to I-5. The City of Lakewood is currently adding bike lanes on many of their surface streets which will provide bike connectivity from Lakewood to Dupont (Gravelly Lake Drive and Washington Boulevard). Because there are bike facilities within and north of the study area, there is a definite need to continue this connectivity by providing and improving bike travel within the study area.

Based on the Corridor Study, 80 percent of the travel modes in the study area were Single Occupancy Vehicles (SOV). Currently, there are no HOV lanes in the project area. Intercity Transit operates one bus route with express bus service from Olympia to Lakewood and one route from East Tumwater to Olympia that uses I-5 for a portion of its route. Sound Transit operates two routes between Lakewood and DuPont. Pierce Transit operates one route from JBLM to Lakewood, with connections to other Pierce County areas. As part of the strategies to provide congestion relief, the need includes providing opportunities to increase transit, HOV, and multimodal transportation options. This benefits transit by allowing buses to use the less congested HOV lane.

Freight

This section of I-5 is a T-1 freight corridor, meaning the freight route carries more than 10 million tons of freight per year. Several ports and the military rely on this freight corridor, including Port of Olympia, Port of Tacoma, Frederickson, Port of Seattle, and JBLM. There is a weigh station north of the study area for I-5 northbound freight. Under the current condition, WSDOT Bridge Engineers have restricted weight on the northbound Nisqually River bridge to 21,500 pounds to maintain its structural integrity. Because of this restriction, freight overloads must use the center lane going northbound on that I-5 bridge.

Operations

According to the Corridor Study, the two main I-5 Nisqually River Bridges have a remaining service life of over 30 years. As stated earlier, the I-5 Northbound bridge over the Nisqually River has a weight restriction of 21,500 pounds per axle and overloads must use the center lane.

Another area of concern is Capitol Lake, which is the Deschutes River estuary, and the existing bridge at the US 101 and I-5 interchange. According to the Bridge Engineering Information System (BEIST) data, the I-5 Capitol Lake bridge was built in 1956 and widened in 1986. The operational rating is listed as 93 tons, and inventory rating is listed as 55 tons. According to the WSDOT Geodata portal, the last inspection was in November 2019 and the bridge condition was listed as "good." WSDOT internal bridge data estimates the bridge lifespan of over 50 years remaining.

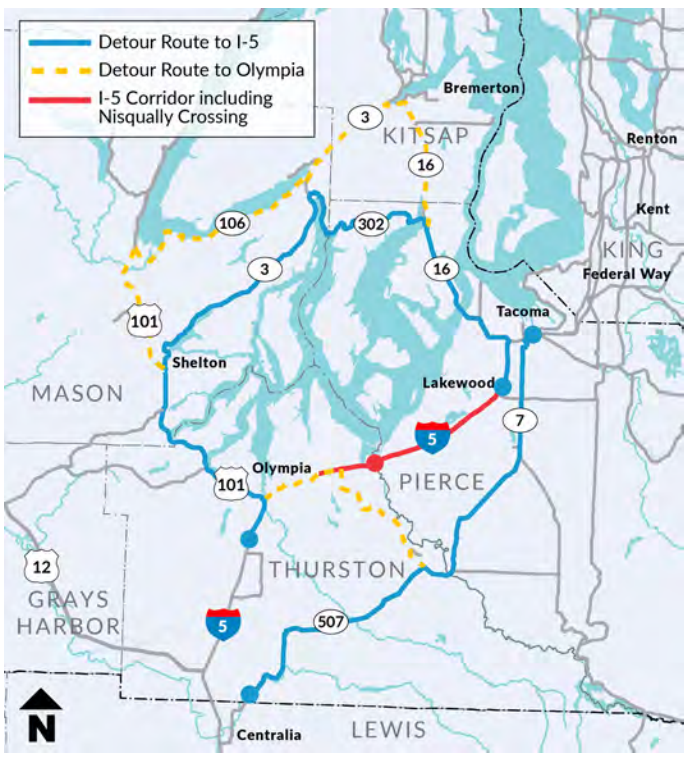
The section of I-5 at JBLM is providing HOV lanes. Those HOV lanes end in the vicinity of Mounts Road at the east end of this study area. This section of I-5 is three lanes both directions and has no HOV lanes. Because there are existing HOV lanes north of this study area, strategies considering HOV lanes were included in the scenarios.

As stated above, because this is the most direct bicycle route between Dupont and Lacey this section of I-5 is open to bicycle use. There is a need to reduce conflicts between uses on this section of I-5, possibly with a separated multimodal facility to better accommodate bikes and increase multimodal options along the corridor.

SYSTEM RESILIENCY AND CONSTRAINTS

In December 2017, a train derailment resulted in the closure of southbound I-5; the alternate routes for I-5 were very congested with extremely long travel times due to the I-5 closure. Due to the corridor's geographic location, there is also the potential for service interruptions due to natural hazards such as flooding, sea-level rise, river channel migration (erosion), and geologic disasters. The USGS draft hydrology study (hydrology study; USGS 2021) provides additional information on hydrologic hazards. Detour routes in the event of a closure of this portion of I-5 are shown in figure 2.3.

Figure 2.3. Detour Routes to I-5



Because of this, the Corridor Study considered strategies for system resiliency. The study area is constrained by several factors including: JBLM; the Nisqually River Delta; McAllister (Medicine) Creek; Puget Sound; and the Nisqually Indian Tribe Reservation. The Corridor Study reviewed options for alternative routes to I-5 and concluded improvements to the I-5 Mainline, interchanges, and improving the existing parallel routes constituted the best practical solution. The Corridor Study included several strategies off I-5 and on other State Routes specifically to provide system resiliency and redundancy in the event of unforeseen closures of I-5.

ENVIRONMENTAL SCREENING

This PEL Study provides a high-level environmental screening of strategies to identify potential impacts and determine the need for future discipline reports. Discipline reports are technical reports by subject matter experts that support specific sections of the NEPA documentation. The PEL provides a framework upon which the NEPA documentation will build. The environmental high-level screening using available on-line information to identify potential impacts for additional review. However, actual impacts are impossible to determine without detailed design information and field investigation. As the PEL Study moves into the NEPA process, information needed will include (depending on the strategy) a variety of discipline reports and additional design details. Chapter 5 details the methods and results of the preliminary environmental screening and discusses additional details needed as the strategies transition into projects.

NISQUALLY RIVER DELTA

The Nisqually River Delta is an important ecological feature providing important habitat for fish, birds, and other animals. It is also a National Wildlife Refuge where significant ecological restoration was done in 2009. It is part of the ancestral home of the Nisqually Indian Tribe and where the Medicine Creek Treaty was signed.

The Nisqually delta is critical rearing habitat for two ESA listed salmon species that support treaty rights and provide food for a third ESA listed species- the Southern Resident Killer Whale.

Figure 2.4. View of I-5 over the Nisqually Delta. Washington Department of Ecology Coastal Atlas, 2016.

The Nisqually section of I-5 is built on fill. This fill acts as a causeway across the Nisqually Delta. There are eight identified bridges located along this stretch of Interstate 5 that convey fresh and tidally influenced water flow. The Nisqually Indian Tribe has expressed concern that I-5 causes an unnatural constriction to natural stream and tidal processes on the Nisqually River and delta. To meet the Corridor Study need for deeper analysis of conditions and risks in the Nisqually River Delta, WSDOT and the Nisqually Indian Tribe jointly funded a hydrology study. USGS provided a draft hydrology study in August 2021; at this time the hydrology study is in peer review and not yet final (USGS 2021). The following is a summary of that report information. The Nisqually River Delta hydrology study included conditions anticipated due to climate change, including sea level rise and changes to frequency and timing of peak river flows. The study also identified lateral channel migration as a potential risk south of I-5. Some of the concerns from the hydrology study include:

- Climate change and the resulting sea level rise and river flows threaten both salmon and infrastructure on the Nisqually River and delta. The draft USGS study (hydrology study) predicts higher peak river flows due to climate change, which would exacerbate flooding at I-5, mobilize more sediment that could raise the river bed elevation, and increase the risk of lateral channel migration.
- Concern over the lack of sediment transport to the delta due to upstream dams (Alder and LaGrande Dams) that block 90 percent of sediment and the I-5 causeway, which may prevent additional sediment transport into the delta.
- Historic evidence of river channel migration that could threaten the integrity of I-5 in the future. For example, an outer bend on the river upstream from I-5 has migrated toward I-5 about 100 meters over the last 17 years. If it continues moving at the same rate, it is estimated it will reach the I-5 embankment within 17 to 30 years. There are several potential channel avulsion paths that could threaten I-5 or other infrastructure along the river.
- Based on the model, while under one to two meters of sea level rise is predicted in the next 80 years, a flood comparable to the one in February 2020 would cover portions of I-5, primarily in the southbound direction near the overflow areas.

The USGS Hydrology Study, which was draft at the time of this PEL Study, confirms that the I-5 causeway and existing bridges are at risk for flooding, are not climate change resilient, and impact the functions and processes that form and maintain habitat for important fish and wildlife species, including federally listed salmon and steelhead.

DESCHUTES ESTUARY - CAPITOL LAKE

At the west end of the study area, is the I-5 and US 101 interchange. The interchange is close to the I-5 crossing at Capitol Lake. Historically, Capitol Lake was not a lake, but part of the tidally influenced Deschutes River estuary at the southern end of Budd Inlet. It had a historic tidal range of approximately 15 vertical feet. Much of the historic estuary beyond the lake has been filled to support downtown Olympia and transportation facilities. In 1951, a dam was constructed at 5th Avenue creating the 260 acre Capitol Lake, which serves as a reflecting pool for the Washington State Capitol. After construction of that dam, approximately 60 to 80 percent of sediment from the Deschutes River has been trapped in the lake. Dredging of the lake has occurred several times, and water quality issues have been recorded since at least the 1970s.

In the late 1990's, the Capitol Lake Adaptive Management Program (CLAMP) was formed to manage issues occurring in Capitol Lake. Those issues include water quality, sedimentation, and invasive species. Over the years there has been much debate over how to best manage the lake, with significant interest in removing the dam and restoring the estuary. In 2008, the Deschutes Estuary Feasibility Study Final Report was completed for the Washington Department of Fish and Wildlife (WDFW). The 2008 Report evaluated three alternatives for estuary restoration. In 2009, the Washington Department of General Administration and the CLAMP Steering Committed released the Capitol Lake Alternatives Analysis-Final Report. In December 2016, the Washington Department of Enterprise Services (DES) submitted the Phase 1 Report on the Capitol Lake/Lower Deschutes Watershed Long-Term

Management Planning to the Legislature. In June 2021, DES released the Draft Environmental Impact Statement for Capitol Lake- Deschutes Estuary. In August 2021, the Olympia City Council voted to support dam removal and estuary restoration on Capitol Lake.

The Deschutes River, estuary, and Budd Inlet are within the usual and accustomed fishing areas of the Squaxin Island Tribe. Per the Tribe's website, the Squaxin Island Tribe is "firmly committed to the restoration of the estuary." WSDOT staff met with the Squaxin Island Tribe in October 2021.

The I-5 crossing over Capitol Lake is located approximately 1.4 miles south (upstream) of the 5th Avenue dam and consists of a single bridge for both northbound and southbound I-5 traffic. The bridge was initially built in 1956 and widened in 1986. While WSDOT internal data estimates the bridge lifespan at over 50 years, there is a need for WSDOT to evaluate the condition of the existing bridge and its resiliency to potential changes that could occur from removing the 5th Avenue dam. While the Washington State Department of Ecology has identified the dam as the biggest influence on poor water quality in Capitol Lake, there is also the need for WSDOT to evaluate its current stormwater infrastructure and water quality at existing discharge locations through this segment of the study area.

Figure 2.5. I-5 Crossing over Capitol Lake, (view to north) with US 101 interchange located immediately west

NO BUILD ALTERNATIVE ENVIRONMENTAL CONSIDERATIONS

Under the No Build alternative, WSDOT would not provide any additional height to the roadway or bridges over the Nisqually Delta, which will not account for sea level rise or channel migration of the Nisqually River. Under the No Build alternative, the resiliency of the I-5 network to climate change, natural disasters, and other hazards will remain the same or likely decline.

AGENCY COORDINATION AND IDENTIFICATION OF FATAL FLAWS

Analyses of both the Nisqually delta and the US 101 interchange at the Capitol Lake-Deschutes estuary are important parts of the PEL study. Another important part of the PEL study included coordination with the FHWA and WSDOT's internal federal liaison to the Services (USFWS and NMFS). Fatal flaws were not identified at this conceptual level; however, coordination with the regulatory agencies is needed once project design details are developed to avoid and minimize significant impacts during the design process.

As stated, the Corridor Study included public outreach and during the PEL study, WSDOT worked with Tribes, the stakeholder group, and others in the study area to obtain their input and capture their concerns. WSDOT will continue to seek local, state, and federal resource and regulatory agencies' review as the project moves forward. Agencies and tribes will continue to be consulted on all future project-specific actions. Chapter 3 provides information on the coordination and outreach for the PEL project.

3 COORDINATION

I-5 Tumwater to Mounts Road Corridor Study

WSDOT implemented an extensive and thorough public outreach and agency coordination effort as part of the I-5 Tumwater to Mounts Road Corridor Study. Outreach and coordination began early in 2018 with letters from WSDOT to six potentially interested Tribal Nations: the Chehalis Confederated Tribes, Cowlitz Indian Tribe, Nisqually Indian Tribe, Puyallup Tribe of Indians, Squaxin Island Tribe, and Yakama Nation. Because there were system resiliency strategies as far south as 183rd and US 12; the Cowlitz Indian Tribe and the Chehalis Confederated Tribes were also invited.

Coordination continued through formation of an Executive Group that met twice in 2018 and three times in 2019. A total of 24 entities, including six tribal nations, seven cities, two counties, one federal military institution, and various planning and transportation groups were invited to participate in the Executive Group and its associated Technical Advisory Group. The Technical Advisory Group met three times in 2018 and five times in 2019. A full list of entities invited to the Executive Group and their participatory status is provided in the Corridor Study.

Additionally, public comment on the Corridor Study was solicited during the spring and summer of 2019. To encourage a diverse, equitable response, WSDOT sought feedback using both paper and online surveys. Paper surveys were provided at foodbanks and to the Nisqually Indian Tribe to ensure overburdened populations had an equal opportunity to provide feedback. Based on the demographics of the first online survey, a second online survey was conducted, focusing on obtaining input from overburdened populations.

WSDOT also hosted two in-person open house events in January 2020 (prior to COVID) and one online open house using an interactive story map. A project webpage was developed for the Corridor Study and PEL Study. The PEL web page included both the Corridor Study and the online story map so they were available for public viewing throughout the PEL process.

WSDOT coordinated extensively with the Thurston Regional Planning Council (TRPC) during several meetings spanning between November 2018 and May 2019. TRPC conducted a comparative traffic model for the various scenarios developed in the Corridor Study for use in the PEL study.

PLANNING AND ENVIRONMENTAL LINKAGES STUDY

WSDOT continued the public outreach and coordination that started with the Corridor Study, meeting with stakeholders throughout completion of the PEL Report. WSDOT met with FHWA for guidance in June 2020 and March, August, and October 2021.

WSDOT presented to the TRPC Executive committee in July 2020 and other stakeholders in May, July, and August 2021. Stakeholder coordination was targeted toward entities that had participated in the Executive Group during the Corridor Study and included participation from the South Sound Military and Communities Partnership (SSMCP); FHWA; the Cities of Lakewood, Olympia, and Lacey; Joint Base Lewis-McChord; Pierce County; Thurston County Public Works; and the Nisqually Indian Tribe (see table 3.1 below). In late May 2021, after a stakeholder presentation, the

PEL Draft Purpose and Need was sent, via email, to all stakeholders for review and comment; no edits were received. The invited participants are listed in the table below.

Table 3.1. Corridor Study Stakeholder Group Invitees

Entity	Status
DuPont	Participated
Federal Highway Administration	Participated
Intercity Transit	Participated
Lacey	Participated
Lakewood	Participated
Nisqually Indian Tribe	Participated
Olympia	Participated
Pierce County	Participated
Pierce Transit	Participated
Port of Olympia	Participated
Thurston County	Participated
Thurston Economic Development Council	Participated
Town of Steilacoom	Participated
TRPC	Participated
Tumwater	Participated
WSDOT	Participated
Yelm	Participated
Puyallup Tribe of Indians	Declined
Yakama Nation	Declined
Chehalis Confederated Tribes	Invited
Cowlitz Indian Tribe	Invited
Joint Base Lewis McChord	Participated through SSMCP
Sound Transit	Invited
Squaxin Island Tribe	Participated

WSDOT continued monthly coordination with TRPC to discuss Traffic modeling progress throughout 2020 and 2021.

WSDOT completed environmental screening for over 25 strategies from the corridor study to identify environmental and land use impacts and created a permitting matrix based on the environmental screening.

In 2021, WSDOT met with FHWA to confirm the approach to environmental screening and clarify the PEL and National Environmental Policy Act (NEPA) process. FHWA clarified that some strategies, once further developed, might move forward as NEPA categorical exemptions (CE's), while others, such as those involving the Nisqually River bridges, would likely require extensive environmental documentation.

In consultation with FHWA, WSDOT decided to separate the "widen, add capacity" strategy into three separate strategies because this strategy stretched across a long corridor. Dividing the strategy into three strategies with logical sections would make the environmental documentation more manageable, as each section would be its own strategy and have separate environmental documentation. This was especially helpful for the strategies containing the Nisqually River and delta, and the Capitol Lake-Deschutes River Estuary which will require extensive environmental documentation. Fortunately, because I-5 is an existing highway, there is flexibility for defining logical termini/independent utility. After dividing the "widen, add capacity" strategy into three separate strategies, WSDOT completed environmental screening on those three separate "widen, add capacity" strategies.

Building upon the coordination from the Corridor Study, WSDOT continued to coordinate with Tribes and other stakeholders throughout the PEL process in 2020 and 2021. During the PEL study, WSDOT hosted one meeting of the stakeholder group and actively responded to questions and comments in between meetings. In August 2021, the U.S. Geological Survey (USGS) provided a draft hydrologic study of the Nisqually River delta at I-5, which was funded by WSDOT and the Nisqually Indian Tribe. TRPC provided traffic modeling reports in March and September 2021. The Squaxin Island Tribe reached out to WSDOT in October 2021 expressing an interest in the project and WSDOT staff coordinated with Squaxin Island Tribal representatives. The Squaxin Island Tribe highlighted the importance of the Capitol Lake-Deschutes River estuary to the Squaxin Island Tribe and emphasized the importance of a current project, the Capitol Lake – Deschutes Estuary NEPA documentation.

RESOURCE AGENCY COORDINATION

One of the challenges with PEL coordination has been meeting with the resource agencies. The original plan was to set up a resource agency committee; however, due to resource agency staff capacity that plan was not attainable. Without a specific project design, it is difficult to obtain resource agency review. Fortunately, WSDOT staff are experienced in working with federal and state regulations and were able to provide initial environmental review and feedback for the strategies, specifically the Nisqually Delta and the Deschutes Estuary area. However, this is not a substitute for coordination with resource agencies, and that coordination will need to occur when preliminary project design details are available. WSDOT has invited local, state, and federal resource and regulatory agencies to review the PEL study report. Agencies and tribes will continue to be consulted on all future project-specific actions.

The traffic modeling and environmental screening was used to move the strategies into environmental review and eliminate some strategies that did not meet the purpose and need. Chapter 6 provides information on the strategies moving forward. Traffic modeling completed by TRPC is discussed in the next chapter.

4 TRAFFIC MODELING

Corridor Study Traffic Modeling

During the previous Corridor Study, WSDOT partnered with Thurston Regional Planning Council (TRPC) in 2018 to develop a transportation modeling framework through the Thurston Region and adjacent areas, with emphasis on the I-5 corridor between 93rd Avenue in Tumwater and Mounts Road and on US-101 between the I-5 interchange and Black Lake Boulevard (including off-system improvements for resiliency). This modeling framework used the integrated Travel Demand Model (TDM) and Dynamic Traffic Assignment (DTA) platforms.

The Corridor Study reviewed too many strategies to conduct traffic modeling for them all. The study team first screened strategies for preliminary feasibility, then consulted relevant agencies and subject matter experts to help with the screening. The team developed five goals and 12 supporting performance measures and ranked the goals using a "forced-choice pair comparison" and incorporating feedback from public surveys. The team categorized the strategies into ten scenarios and used modeling built for a future year of 2040 to rank the scenarios based on their effectiveness toward meeting the study goals.

The model scenarios were ordered, using practical solutions, starting with lower cost, easier to implement items, and then grouped based on which scenarios built upon others and scenarios that were mutually exclusive. The Corridor Study used the modeling framework to compare performance measures for these scenarios. Most of the scenarios included multiple strategies. The results of this modeling guided more in-depth modeling of the strategies in this PEL. For more information on the modeling from the Corridor Study, see Chapter 1 of this PEL Study.

NO ACTION ALTERNATIVE

TRPC modeled over 25 strategies along the corridor, including a No Build alternative, to estimate travel conditions through Year 2045. TRPC conducted traffic modeling for the Corridor Study and then completed a separate model for the PEL Study, which built on the Corridor Study model. The PEL Study traffic modeling specifically evaluated the strategies in the PEL, rather than the scenarios from the Corridor Study. Some strategies were modeled together. The No Build alternative is discussed in the Corridor Study traffic modeling and in the PEL Study traffic modeling (Appendix A) and is referred to as the Base Year model. It includes the existing transportation network plus funded projects in local agency Transportation Improvement Programs (TIPs) and WSDOT's State Transportation Improvement Plan (STIP). The No Build alternative represents a baseline condition that is compared to each proposed strategy.

The No Build alternative modeling showed many of the I-5 performance issues seen today remain but are anticipated to be more severe, due to population growth and increased traffic volumes. These issues include regular backups on southbound and northbound I-5 approaching the US 101 interchange.

Performance issues also arose due to changes in the roadway network at JBLM. The main example of this is on southbound I-5 at the Mounts Road interchange (Exit 116) at the east end of the study area.

Currently at Mounts Road interchange southbound, I-5 drops from four lanes to three lanes with the right lane being an exit only lane for the interchange. After the planned and funded widening improvements through JBLM[1], the Mounts Road interchange southbound will decrease from five lanes to three lanes. TRPC traffic modeling predicts Mounts Road interchange southbound, will become a new bottleneck with southbound traffic backing up as far north as Thorne Lane SW in Tillicum.

PEL STUDY MODELING

As with the Corridor Study, WSDOT contracted with TRPC to provide transportation modeling support and other assistance. Using the TDM/DTA model framework, alternatives were analyzed for their benefit for either a 2030- or 2045-time horizon, compared to a base model with the same time horizon. The analysis focused on evaluating the improvement of mobility, using one or both performance measures: (a) Intersection level of service and (b) I-5 corridor speed. For specific details on modeling methods and parameters, see the Traffic Modeling Report in Appendix A.

The following tables summarize the scenarios modeled for the 2030- and 2045-time horizons and the results of that modeling. All figures are from the TRPC Modeling Report. The drawings are conceptual and not to scale.

[1] WSDOT JBLM Area Improvement web site https://www.wsdot.wa.gov/projects/I5/JBLMImprovements/default.htm

Strategy Ops 1: Sleater-Kinney Double Left turn lanes from Martin Way E to Sleater-Kinney Road SE

Strategy #	Strategy	Model Run	Description	Model Results
Ops 1	Sleater-Kinney Double Left turn lanes from Martin Way E to Sleater-Kinney Road SE	Scenario 1 - 2030	Add left turn lane from Martin Way East onto Sleater-Kinney Road SE	Increased capacity for vehicles turning left and through the intersection in the westbound direction in peak hour. Very little improvement for speed or delay.

Left: Base Model; Right: Improvement

Strategy Ops 2: SR 507 and Centre Street Roundabout

Strategy #	Strategy	Model Run	Description	Model Results
Ops 2	SR 507 and Centre Street Roundabout	2030 Base year model	New Roundabout	Not applicable; applied to base year model.

Note: Figures are not provided for strategies that were incorporated into the base year models.

Strategy Ops 3: SR 507 and Sussex Ave E / SR 507 and Old Highway 99 Roundabout

Strategy #	Strategy	Model Run	Description	Model Results
Ops 3	SR 507 Sussex Ave E / SR 507 and Old Hwy 99	2045 Base year model	New Roundabout	Not applicable; applied to base year model.

Note: Figures are not provided for strategies that were incorporated into the base year models.

Strategy Ops 5: Steilacoom Road and SR 510 Roundabout

Strategy #	Strategy	Model Run	Description	Model Results
Ops 5	Steilacoom Road and SR 510	2045 Base year model	New Roundabout	Not applicable; applied to base year model.

Note: Figures are not provided for strategies that were incorporated into the base year models.

Strategy Ops 6: Nisqually/ Martin Way at Nisqually Cut off Road SE

Strategy #	Strategy	Model Run	Description	Model Results
Ops 6	Nisqually / Martin Way at Nisqually Cut Off Road SE	Scenario 2 - 2030	Extra lane approaching ramp meter for northbound ramp	Very little improvement for volume, speed, or delay. May have more impact if signal timing adjusted.

Left: Base Model; Right: Improvement

Strategy Ops 7: Deschutes Parkway Extended Taper

Strategy #	Strategy	Model Run	Description	Model Results
Ops 7	Deschutes Parkway Extended Taper	Scenario 4 - 2030	Extend taper on on-ramp	Very little change in volume, speed, or delay.

Left: Base Model; Right: Improvement

Strategy Ops 8: Sleater-Kinney New signal at NB off-ramp

Strategy #	Strategy	Model Run	Description	Model Results
Ops 8	Sleater-Kinney new signal at NB off-ramp	Scenario 3 - 2030	Construct signal at intersection of I-5 northbound off-ramp and Sleater-Kinney Road. Only southbound lane will be signalized; separate northbound with curbing	Decreased speed and volumes in SB direction of Sleater-Kinney Road. Very little benefit to volumes or speed on I-5 off ramp. Should be assessed for its potential to reduce rear end crashes related to the intersection.

Left: Base Model; Right: Improvement

Strategy Ops 9: SR 507 and SR 702 – replace existing signal with a Roundabout

Strategy #	Strategy	Model Run	Description	Model Results
Ops 9	SR 507 in Yelm (SR 507 and SR 702)	Scenario 5 - 2030	Replace intersection with roundabout	This strategy does not benefit I-5 but improves system resiliency. Significant improvement to overall delay at the intersection and in queue length on SR 702 approaching SR 507

Left: Base Model; Right: Improvement

Strategy Ops 10.1: SR 507 and Vail Road – replace T intersection with a Roundabout

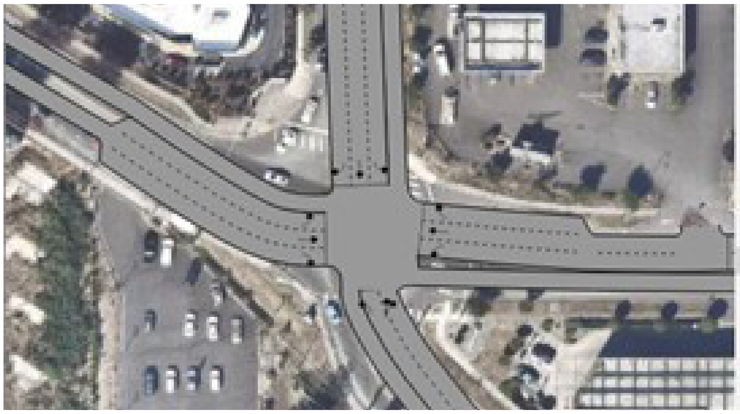
Strategy #	Strategy	Model Run	Description	Model Results
Ops 10.1	SR 507 and Vail Road- replace intersection with roundabout	Scenario 5 - 2030	Replace intersection with roundabout	This strategy does not benefit I-5 but improves system resiliency. Slight improvement to delay at intersection and improvement on ease of left hand turns.

Left: Base Model; Right: Improvement

Strategy Ops 10.2: SR 507 and Bald Hill Road – replace existing signal with a Roundabout

Strategy #	Strategy	Model Run	Description	Model Results
Ops 10.2	SR 507 and Bald Hill Road- replace existing signal with a roundabout	Scenario 5 - 2030	Replace intersection with roundabout	This strategy does not benefit I-5 but improves system resiliency. Decreased delay at the intersection

Left: Base Model; Right: Improvement




Strategy Ops 11: US 12 and 183rd Ave Roundabout

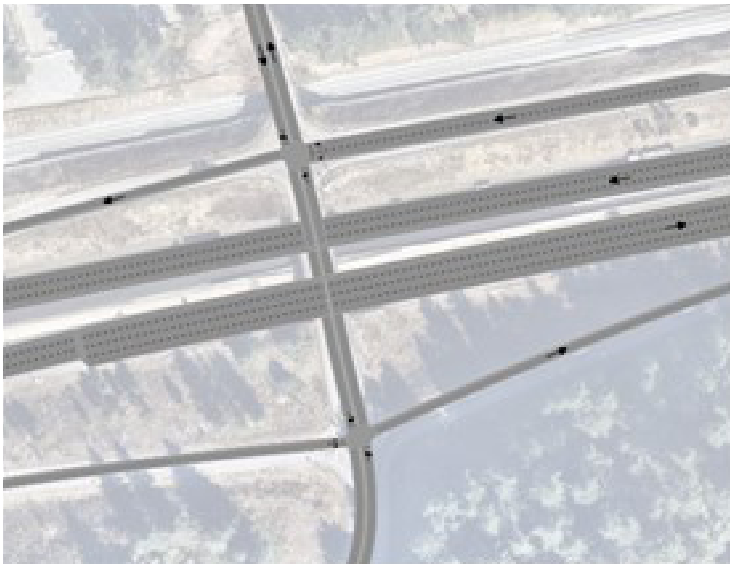
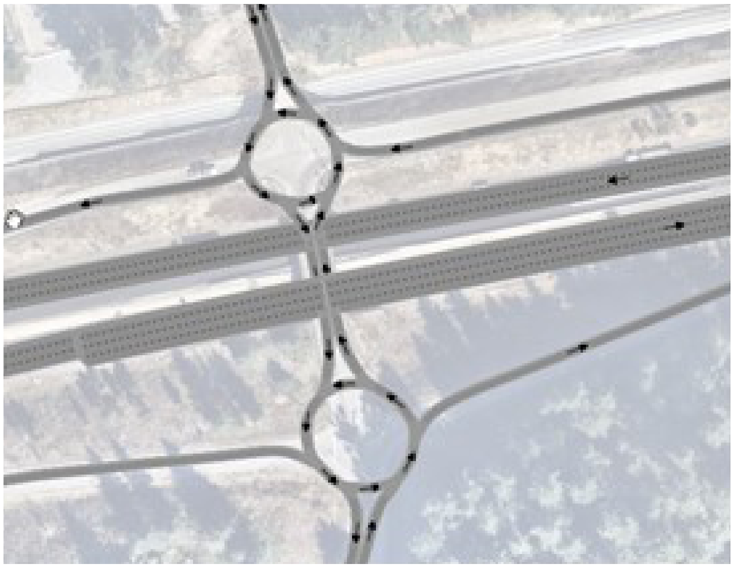
Strategy #	Strategy	Model Run	Description	Model Results
Ops 11	US 12 and 183rd Ave Roundabout	2045 Base year model	New Roundabout (this is for I-5 resiliency)	Not applicable; applied to base year model.

Note: Figures are not provided for strategies that were incorporated into the base year models.

Strategy Int 1: Mounts Road Interchange

Strategy #	Strategy	Model Run	Description	Model Results
Int 1	Mounts Road Interchange	Scenario 8 - 2030	Roundabouts on both the northbound and southbound ramps. Move ramp meter slightly on southbound on-ramp.	Very little difference in speed or volumes on I-5 by adding roundabouts.

Left: Base Model; Right: Improvement

Strategy Int 2: Martin Way Interchange

Strategy #	Strategy	Model Run	Description	Model Results
Int 2	Martin Way Interchange	Scenario 2-2045	Partial Cloverleaf Interchange	Delay reduced on Martin at interchange. Volumes decreased on Martin Way EB and increased on Martin Way WB and I-5 SB. Volume/throughput increased on I-5 SB without causing new delay.

TRPC notes in the modeling report that the model consistently showed that any small changes in volume or delay at the Martin Way, Sleater-Kinney, and Pacific Avenue interchanges results in large traffic backups. Thus, TRPC recommends additional modeling of those three interchanges be conducted in the future.

Left: Base Model; Right: Improvement

Strategy Int 3: Pacific Avenue Interchange NB off-ramp

Strategy #	Strategy	Model Run	Description	Model Results
Int 3	Pacific Ave Interchange NB off ramp	Scenario 9 - 2030	Add a lane to northbound off ramp.	Very little difference in volume, delay, or queue length

Left: Base Model; Right: Improvement

Strategy Int 4: US 101 Interchange

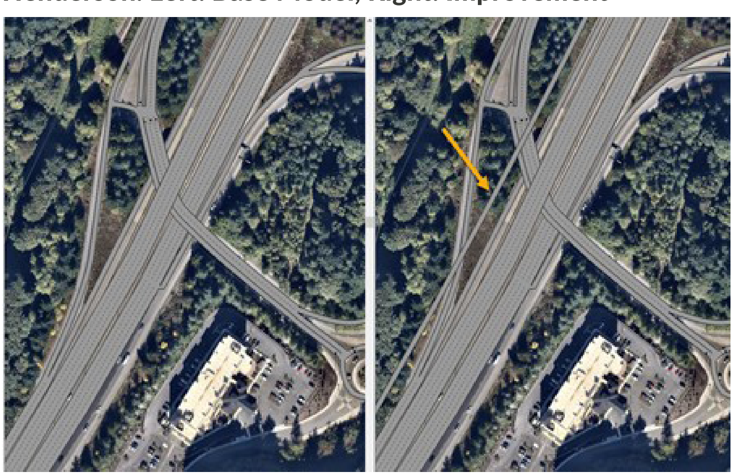
Strategy #	Strategy	Model Run	Description	Model Results
Int 4	US 101 Interchange revision with braided on ramps	Scenario 1-2045	Construct braided ramp between southbound I-5 and US 101, replace existing bridge on southbound I-5 to 14th, and install new bridge for on-ramp over Henderson. Exit at Plum Street to access braided ramp SB I-5 and add an auxiliary lane between Pacific Ave and Capitol Way.	Increased speed in Eastside segment of I-5 in SB direction. Throughput increased in section with braided ramp. Much of the traffic still used the existing US 101 merge, rather than braided ramp, due to lower speeds on braided ramp and likely capacity limitations on Plum St. Potentially could change with signage and redesign of Plum St exit. Congestion in I-5 NB increased, congestion on US 101 WB increased, likely due to increased volumes on I-5 SB to US 101.

TRPC notes in the modeling report that although the US 101 braided ramp functions well, the auxiliary lane from the Sleater-Kinney interchange southbound to alleviate the exist at Plum Street results in increased volumes of traffic that may cause a LOS decrease on US 101 in the westbound direction. TRPC recommends future modeling to re-examine the merge onto US 101 if this moves forward.

14th: Left: Base Model; Right: Improvement

Capitol Blvd Bridge: Left: Base Model; Right: Improvement

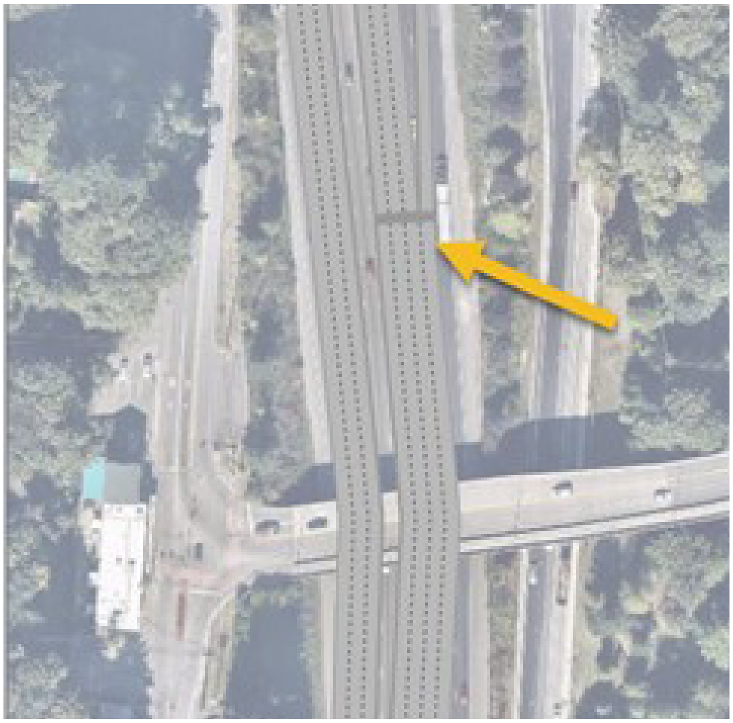
Henderson: Left: Base Model; Right: Improvement



Strategy Int 5: Tumwater to US 101 Hard Shoulder Running/Part Time Shoulder Use

Strategy #	Strategy	Model Run	Description	Model Results
Int 5	US 101 and I-5 (NB PTSU (5 to US 101)	Scenario 10 - 2030	Add a part time shoulder use lane in the northbound direction between the Deschutes Way off ramp and the US 101 off ramp.	Reduced queue delay in right hand lane, but over one-hour time period, delays were not severe

Left: Base Model; Right: Improvement



Strategy Int 6: Trosper Northbound on-ramp

Strategy #	Strategy	Model Run	Description	Model Results
Int 6	Trosper northbound on-ramp	2030 Base year model	Construct 3 adjacent roundabouts	Not applicable; applied to base year model.

Note: Figures are not provided for strategies that were incorporated into the base year models.

Strategy Int 7: Tumwater Boulevard Interchange

Strategy #	Strategy	Model Run	Description	Model Results
Int 7	Tumwater Boulevard Interchange	Scenario 7- 2045	Increase travel lanes from 3 to 4 lanes on Tumwater Blvd and construct bridge over I-5, install 2 roundabouts at ramp connections, and modify and improve ramps to freeway	This improvement assists with traffic flow on Tumwater Boulevard and reduces the left turns but does not make a large difference on I-5.

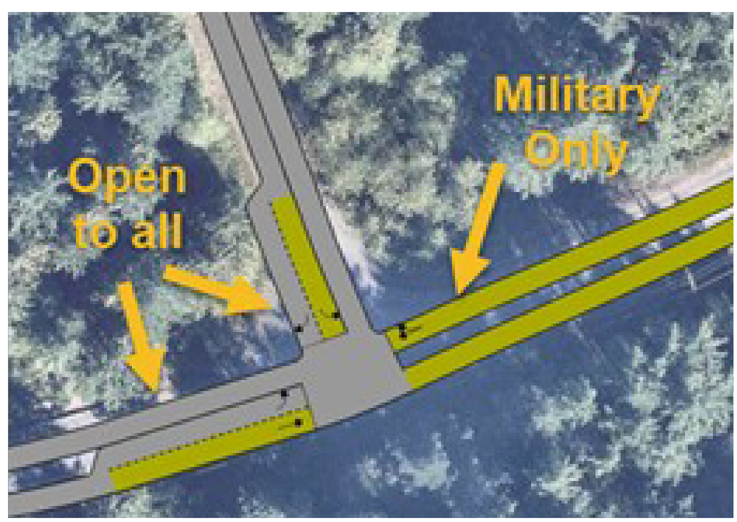
Left: Base Model; Right: Improvement

Strategy Misc-Per: Perimeter Road

Strategy #	Strategy	Model Run	Description	Model Results
Per	Perimeter Rd	Scenario 7 - 2030	Remove gate at Mounts Rd and Perimeter Rd to open to general traffic; add gate at Perimeter Dr and Center Dr; add a SB lane to Center Dr connecting over the weigh station ramp.	Increased throughput on I-5 between Center Street and Mounts Road. This may be due to some JBLM traffic accessing I-5 directly at Center Street (where merge is less congested). Decreased delay at merge at Mounts Rd. Also allows vehicles traveling from DuPont to Old Pacific Highway to avoid I-5. This alternative will be increasingly important during heavy congestion.

Location – I-5 Off-Ramp
Left: Base Model; Right: Improvement
Orange – restricted to Joint Base Lewis McChord Base traffic

Location – Perimeter Road and Center Avenue
Left: Base Model; Right: Improvement
Orange – restricted to Joint Base Lewis McChord Base traffic



Strategy PTSU: Part Time Shoulder Use

Strategy #	Strategy	Model Run	Description	Model Results
PTSU	Allow part time shoulder use in southbound direction on existing I-5 shoulder between Sleater-Kinney Rd NE on-ramp and Henderson Blvd SE on-ramp.	Scenario 6 - 2030	Consists of allowing travel on the existing shoulder in the southbound direction of I-5, between the Sleater-Kinney Rd NE on-ramp and the Henderson Blvd SE on-ramp.	Modeling results indicate this improvement will improve speeds in the heavily congested area approaching the Plum Street Off-ramp. Without the improvement, by 2030 speeds will be between 6 and 24 m.p.h. during the peak period (4-5 pm weekday). With the improvement, speeds will increase to 55-60 mph. Additional throughput (capacity) will be able to travel through this section of I-5 with the improvement.

Various Locations North to South- Left: Base Model; Right: Improvement

High Occupancy Vehicle (HOV) Conversion Strategies:

Strategy HOV 1: HOV Conversion US 101 to Mounts Road

Strategy HOV 2.1: HOV to Martin Way Northbound Ramp

Strategy HOV 2.2: Plum Street Northbound HOV on-ramp

Strategy HOV 2.3: Trosper Northbound Metering HOV

Strategy #	Strategy	Model Run	Description	Model Results
HOV 1	HOV Conversion US 101 to Mounts Road	Scenario 3- 2045	Convert existing general purpose inside lane to HOV on both NB and SB directions starting at MP 104.3 through Pierce Co to connect with new HOV lanes and add HOV queue jumps NB at Martin Way, Plum St, and Trosper	Greater delay and reduced throughput/volume on I-5 in both directions for all traffic. Traffic in the HOV lane experienced little delay, unless caught in queue while entering or exiting I-5.
HOV 2.1	HOV to Martin Way Northbound Ramp	Scenario 3-2045	Add HOV queue jumps NB at Martin Way, Plum St, and Trosper	Greater delay and reduced throughput/volume on I-5 in both directions for all traffic. Traffic in the HOV lane experienced little delay, unless caught in queue while entering or exiting I-5.
HOV 2.2	Plum Street Northbound HOV on-ramp	Scenario 3-2045	Add HOV queue jumps NB at Martin Way, Plum St, and Trosper	Greater delay and reduced throughput/volume on I-5 in both directions for all traffic. Traffic in the HOV lane experienced little delay, unless caught in queue while entering or exiting I-5.
HOV 2.3	Trosper Northbound Metering HOV	Scenario 3-2045	Add HOV queue jumps NB at Martin Way, Plum St, and Trosper	Greater delay and reduced throughput/volume on I-5 in both directions for all traffic. Traffic in the HOV lane experienced little delay, unless caught in queue while entering or exiting I-5.

Note: These strategies are grouped because they were modeled under one scenario.

Mounts Road Interchange connect SB HOV; Left: Base Model; Right: Improvement. Green is HOV lane.

Mounts Road Interchange connect NB HOV; Left: Base Model; Right: Improvement. Green is HOV lane.

Mounts Road Interchange connect NB HOV; Left: Base Model; Right: Improvement. Green is HOV lane.

Strategy Cap 4.1: Widen, Add Capacity Pacific Ave SE Interchange to US 101 Interchange

Strategy Cap 4.2: Widen, Add Capacity Marvin RD NE Interchange to Pacific Ave SE

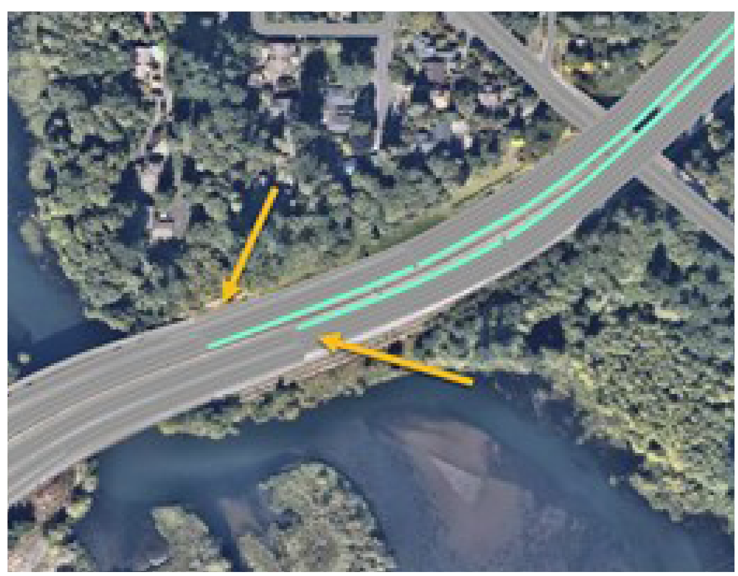
Strategy #	Strategy	Model Run	Description	Model Results
Cap 4.1	Widen, Add Capacity US 101 Interchange to Pacific Ave SE Interchange	Scenario 6-2045	Where there are only three lanes, add a lane with the HOV lane as the inside lane both directions I-5 from Pacific Ave SE interchange to US 101 interchange (some portions are already four lanes)	Southbound: Speeds increased at Nisqually Delta, but delay caused by lane end at Mounts Rd caused delay to through traffic. Alternative improvements at Mounts Rd should be identified. Speeds increased through remainder of the I-5 corridor. Some delay remains at Eastside segment- this scenario does not include braided ramp to US 101. Slight decrease in speeds at Deschutes Pkwy segment where there was a lane drop back to three lanes. Throughput increased throughout corridor. HOV traffic experienced very little delay throughout corridor. Northbound, throughput increased throughout corridor. Speeds increased throughout corridor with the exception of E street and Deschutes parkway segments, but this scenario does not include flyover ramp to US 101.
Cap 4.2	Widen, Add Capacity Pacific Ave SE Interchange to Marvin Rd NE Interchange	Scenario 6-2045	Where there are only three lanes add a lane with the HOV lane as the inside lane both directions I-5 from Marvin Rd NE interchange to Pacific Ave SE interchange (some portions are already four lanes)	

Note: These strategies are grouped because they were modeled under one scenario.

Mounts Road Interchange connect SB HOV; Left: Base Model; Right: Improvement. Green is HOV lane.

Mounts Road Interchange connect NB HOV; Left: Base Model; Right: Improvement. Green is HOV lane.

Mounts Road Interchange connect NB HOV; Left: Base Model; Right: Improvement. Green is HOV lane.



Strategy Cap 4.3: Widen, Add Capacity Mounts Road to Marvin Road

Strategy #	Strategy	Model Run	Description	Model Results
Cap 4.3	Widen, Add Capacity Marvin Rd NE Interchange to Mounts Rd	Scenario 9 - 2045	This portion is only three lanes, add a lane with the HOV lane as the inside lane both directions I-5 from Marvin Road on-ramp to Mounts Road	Compared to Scenario 6, there is increased congestion at Marvin Road, but it is still at an acceptable LOS. There is congestion starting in the Pacific Avenue segment in the southbound direction.

As noted by TRPC in the modeling report, preliminary modeling shows that five lanes southbound would function better through the Nisqually Delta and avoid a future level of service failure after the JBLM project is completed. TRPC recommends future modeling to explore other ways of smoothing out the merge in this area that does not require two additional lanes (in addition to the three existing lanes through the Nisqually Delta.)

Approaching Mounts Road Interchange; Left: Base Model; Right: Improvement. Green is HOV lane.

After Marvin Road Interchange; Left: Base Model; Right: Improvement. Green is HOV lane.

Strategy Cap 5: I-5 Southbound - Pacific Ave to Plum St off ramp

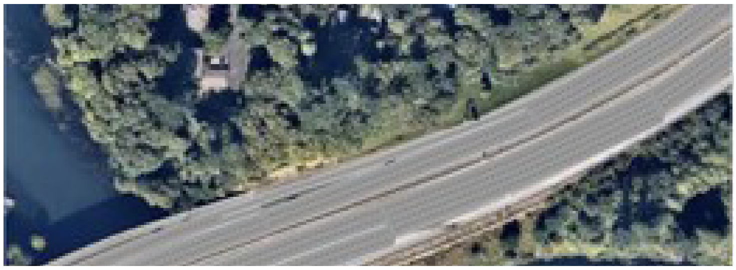
Strategy #	Strategy	Model Run	Description	Model Results
Cap 5	I-5 Southbound - Pacific Ave to Plum St off ramp	Scenario 1- 2045	Add an auxiliary lane between Pacific Ave and Capitol Way	See Int 4 - Increased speed in Eastside segment of I-5 in SB direction. Throughput increased in section with braided ramp. Much of the traffic still used the existing US 101 merge, rather than braided ramp, due to lower speeds on braided ramp and likely capacity limitations on Plum St. Potentially could change with signage and redesign of Plum St exit. Congestion in I-5 NB increased, congestion on US 101 WB in-creased, likely due to increased volumes on I-5 SB to US 101.

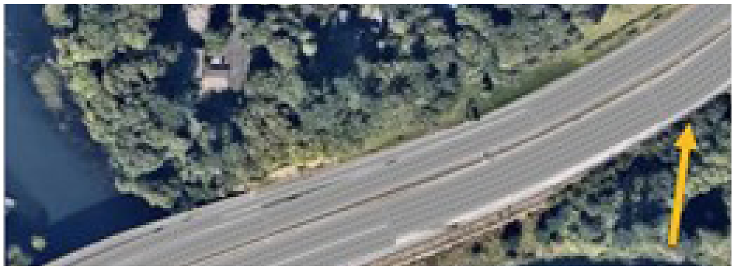
Note: This strategy was modeled with strategy Int 4. See strategy Int 4 for maps.

Strategy Cap 6: I-5 Northbound US 101 on-ramp to Pacific Ave off-ramp

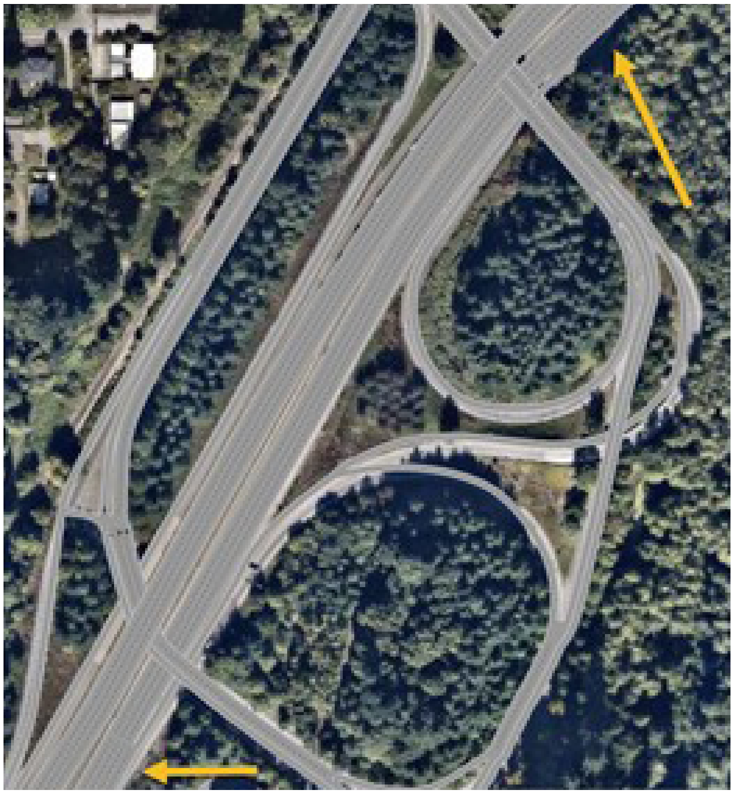
Strategy #	Strategy	Model Run	Description	Model Results
Cap 6	I-5 Northbound US 101 on-ramp to Pacific Ave off-ramp	Scenario 5 - 2045	Add an auxiliary lane from US 101 on-ramp to 14th Avenue off-ramp, and from Plum Street on-ramp to Pacific Avenue off-ramp	Speeds increased in various segments along NB I-5 near US 101 merge where aux lane smoothed out lane drops and adds. At larger Eastside St segment, speeds and throughput/ volume increased. Delay was increased north of auxiliary lane, with the lane drop.

Start of Auxiliary Lane NB after US 101 merge; Left: Base Model; Right: Improvement

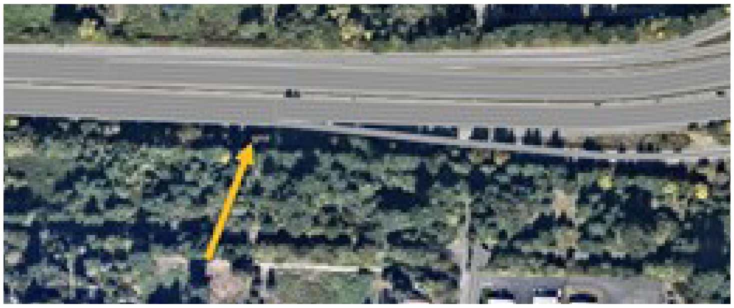




Henderson Blvd; Left: Base Model; Right: Improvement



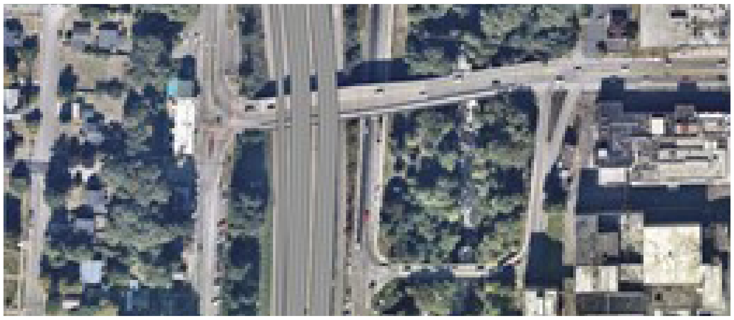
End at Pacific Off-Ramp; Left: Base Model; Right: Improvement



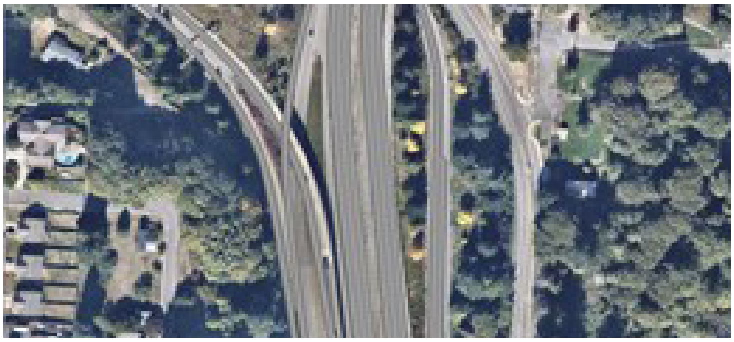
Strategy Cap 7: I-5 Northbound at US 101- Flyover Ramp

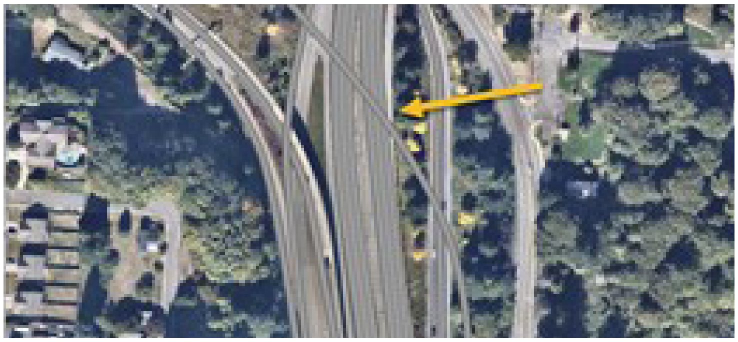
Strategy #	Strategy	Model Run	Description	Model Results
Cap 7	I-5 Northbound at US 101- Flyover Ramp	Scenario 4-2045	Add a flyover off-ramp linking NB I-5 to WB US 101, and merging in on the outside lane of US 101, retaining the Deschutes Parkway on-ramp to provide access from the local network to US 101	Throughput increased slightly in NB direction. Queue to exit I-5 to merge to US 101 was reduced. I-5 volumes remained unchanged.

NB Flyover near Custer Way; Left: Base Model; Right: Improvement

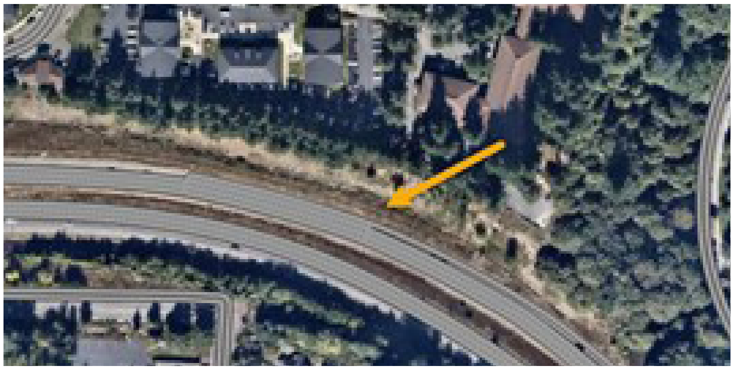


Deschutes US-101 On-ramp; Left: Base Model; Right: Improvement





Flyover Ramp Merge with Mainline WB US 101; Left: Base Model; Right: Improvement



WSDOT used the results of this traffic modeling to recommend strategies for implementation or NEPA review. Those recommendations are discussed in further detail in the next chapter.

5 ENVIRONMENTAL SCREENING

PEL Strategies Environmental Screening

The PEL Study provides a high-level screening of the strategies to identify potential environmental impacts and the traffic modeling results provide the strategies' effectiveness in meeting PEL project goals. The screening process helps develop recommendations and a list of actions, including developing the NEPA alternatives to move forward as part of practical solutions. This chapter focuses on the results of the environmental screening. The traffic modeling results are discussed in the previous chapter, Chapter 4.

As described in Chapter 1, the previous Corridor Study recommended over 25 strategies for consideration in the PEL study. These strategies were then grouped into scenarios for evaluation by WSDOT, including: operations; interchange improvements; HOV conversion; part time shoulder use; and widening/add capacity. Based on modeling, environmental factors, and in collaboration with FHWA, the "widening/add capacity" strategy from Deschutes to Mounts Road (Cap 4) was divided into three smaller sections during the PEL process (Cap 4.1, 4.2, 4.3).

As part of the PEL study, WSDOT conducted a high-level environmental screening to evaluate environmental issues for each of the 30 proposed strategies. WSDOT created conservative, minimum footprint area maps to support the environmental screening, which was a "desk exercise" that consisted of reviewing existing available GIS information and other resources (but did not include field work). Additional analysis will be conducted during the environmental review process. An internal WSDOT form, the Environmental Review Summary (ERS) form, was used to document the results of the environmental screening. An example ERS form is provided in Appendix C.

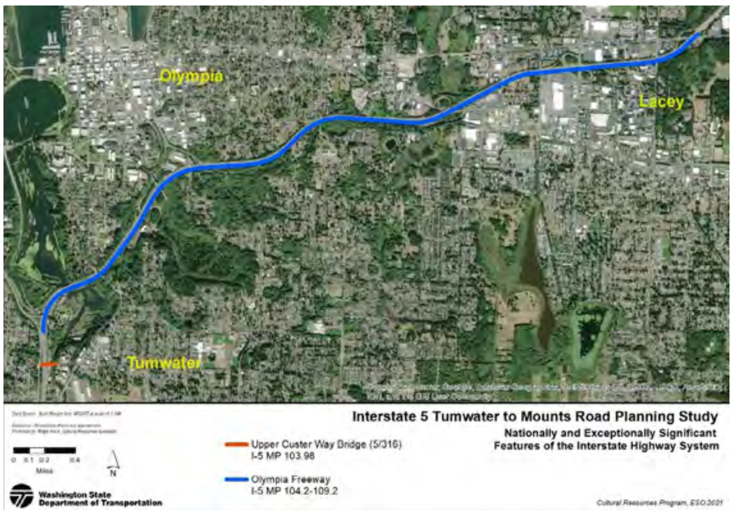
Environmental screening of each strategy included the following review:

- Cultural resources
- Water quality and stormwater
- Visual quality and aesthetics
- Air quality
- Endangered Species
- Wetlands, critical areas, and resource lands
- Hazardous materials
- Noise
- Land Use
- Title VI and Environmental Justice
- Long-term environmental commitments
- Potential permits

The environmental screening was completed using publicly available GIS maps and databases available online from local, state, and federal agencies. These included, but were not limited to: the WSDOT GIS Workbench (including census data on overburdened populations); WDFW Priority Habitats and Species (PHS) database; WDFW Fish Passage Database; Washington Information System for Architectural and Archaeological Records Data (WISAARD); USFWS Information for Planning and Consultation (IPAC); Thurston County GeoData Center; WA Department of Natural Resources Geologic Information Portal; WA Department of Ecology Coastal Atlas; Recreation and Conservation Office Database; Federal Emergency Management Flood Data; Scenic Byways; National Marine Fisheries critical habitat maps; aerial imagery; and land use information.

The previous Corridor Study noted that most sections of the Interstate System are exempt from review under Section 106 of the National Historic Preservation Act by a 2005 FHWA exemption. However, the section of the project from Trosper Way to Martin Road (mileposts 104 - 109), falls within the "Olympic Freeway", which is not included in the exemption, shown in Figure 5.1 below.

Figure 5.1. Historical Highway



The PEL team created a matrix summarizing the results of the screening for all the strategies and sought input internally and from external partners, such as FHWA, throughout the screening process. The environmental screening results are summarized in Environmental Matrix Appendix D.

This PEL Study provides a high-level strategy screening to help determine future discipline reports and potential impacts. However, actual impacts are impossible to determine without detailed design information. As the PEL Study moves into the NEPA process information needed will include several discipline reports (depending upon the strategy) and additional details such as:

- Water crossing design and channel hydraulics
- Wetland boundaries
- Geotechnical information
- Footprint of road fill
- New impervious surface
- Stormwater treatment
- ROW acquisition
- Footprint Disturbance both inside and outside of right of way
- Vertical alignment
- Detours, especially detours that might impact environmental justice/overburdened populations
- Property acquisition
- Cultural resources
- Recreational and conservation properties
- Potential contamination.

STRATEGY SCREENING RESULTS

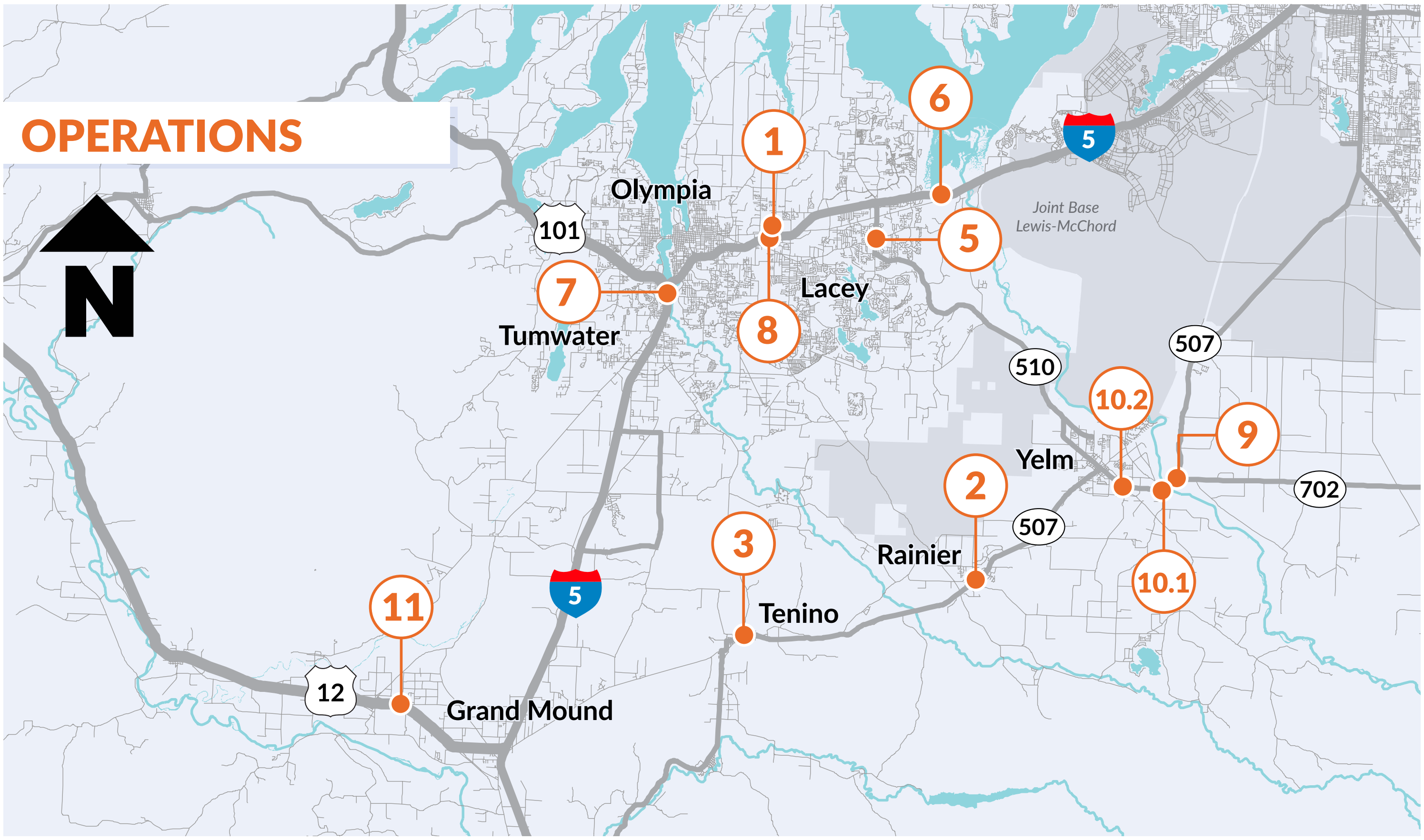
As stated in earlier chapters, the Corridor Study developed several scenarios and strategies. The screening results are provided by the scenario and the strategy within that scenario. These scenarios and strategies are labeled so they relate back to Appendix G of the Corridor Study. At the beginning of each scenario section, we have provided a map showing the location of the proposed strategies. For each independent project that follows from this PEL study, WSDOT and FHWA will determine the appropriate level of environmental documentation (categorical exclusion, environmental assessment, or environmental impact statement).

NO BUILD ALTERNATIVE

The traffic modeling in both the Corridor Study and the PEL Study included a No Build alternative, referred to as the Base Year Model, which included the existing transportation network plus funded projects in local agency Transportation Improvement Programs (TIPs) and WSDOT's State Transportation Improvement Plan (STIP) through year 2045. The No Build alternative represents a baseline condition that is compared to each proposed strategy.

Under the No Build alternative, WSDOT would not provide any additional height to the roadway or bridges over the Nisqually Delta, which will not account for sea level rise or channel migration of the Nisqually River. Under the No Build alternative, the resiliency of the I-5 network to climate change, natural disasters, and other hazards will remain the same or likely decline. Under the No Build alternative, I-5 will likely impact the recovery of multiple ESA listed fish populations and the Nisqually Indian Tribe's ability to exercise treaty rights.

Figure 5.2. Operations Scenario Strategies



Strategy #	Strategy	Description	Milepost
Ops 1	Sleater-Kinney Double Left turn lanes from Martin Way E to Sleater-Kinney Road SE	Add left turn lane from Martin Way East onto Sleater-Kinney Road SE.	local system
Ops 2	SR 507 and Centre Street Roundabout	New roundabout.	22.7
Ops 3	SR 507 Sussex Ave E / SR 507 and Old Hwy 99	New roundabout.	14.7
Ops 5	Steilacoom Road and SR 510	New roundabout.	3.3 - 3.5
Ops 6	Nisqually / Martin Way at Nisqually Cut Off Road SE	Extra lane approaching ramp meter for northbound ramp.	114.1 - 114.5
Ops 7	Deschutes Parkway Extended Taper	Extend taper on on ramp.	104.1 - 104.2
Ops 8	Sleater-Kinney new signal at NB off ramp	Construct signal at intersection of I-5 northbound off ramp and Sleater-Kinney Road. Only southbound lane will be signalized; separate northbound with curbing.	108.2 - 108.4
Ops 9	SR 507 in Yelm (SR 507 and SR 702)	Replace intersection with roundabout.	31.1
Ops 10.1	SR 507 and Vail Road - replace intersection with roundabout	Replace intersection with roundabout.	30.5
Ops 10.2	SR 507 and Bald Hill Road - replace existing signal with a roundabout	Replace intersection with roundabout.	29.2
Ops 11	US 12 and 183rd Ave Roundabout	New roundabout.	42.7 - 43.0

OPERATIONS

Strategy Ops 1: Sleater-Kinney Double Left turn lanes from Martin Way E to Sleater-Kinney Road SE

This strategy is to improve mobility and travel time from Martin Way E onto Sleater-Kinney Road SE and access to the I-5 SB on-ramp (local system improvement, possibly a City project).

Potential environmental issues:

- Soils identified as more preferred for pocket gophers by USFWS are in vicinity
- Ecology listed sites within 300 feet- may require hazardous materials review.

Strategy Ops 5: Steilacoom Road and SR 510 Roundabout

This strategy is to improve mobility through an alternate I-5 route.

Potential environmental issues:

- New alignment potentially within a wellhead protection area
- New roundabout located on "prime farmland if irrigated. Potential effects on agricultural land will be addressed in NEPA documentation.

Strategy Ops 6: Nisqually/Martin Way at Nisqually Cut Off Road SE

This strategy is to provide an extra lane approaching the ramp meter for the NB ramp. Adding an extra lane on the ramp is expected to increase safety and modal mobility and improve the merge zone onto I-5 NB during peak periods of congestion.

Potential environmental issues:

- Close to the Nisqually Indian Tribe Reservation
- Close to overburdened population
- Sensitive roadside area
- Wetland review may be required but impacts are not anticipated
- 500 year flood zone adjacent
- Travel trailer park north of the project area
- Tribal trust enterprise in the project vicinity
- McAllister Creek stream crossing in vicinity; not anticipated to be impacted
- If McAllister Creek crossing will be impacted, hazmat analysis may be required.

Strategy Ops 7: Deschutes Parkway Extended Taper

This strategy would restripe ramp from NB I-5 onto US 101 to lengthen the two-lane section by approximately 140 feet, and end the two-lane section where the shoulder width is reduced from the existing 8 feet to 4 feet. Potential for shoulder rebuild. Improves the merge zone onto US 101 during peak periods of congestion.

Potential environmental issues:

- Ramp project area is a cultural resources sensitive roadside area
- Stream in project vicinity
- There is a culvert in the project vicinity but anticipate it will not be impacted
- If culvert work will be required, hazmat analysis for asbestos will be required
- Close to but not anticipated to be within shoreline jurisdiction
- Soils identified as more preferred for pocket gophers by USFWS are in vicinity

Strategy Ops 8: Sleater-Kinney New signal at NB off-ramp

This strategy is to construct a new signal at the intersection of 1-5 NB off ramp and Sleater-Kinney Road. Only Sleater-Kinney SB would be signalized, there would be curbing added to separate Sleater-Kinney NB.

Potential environmental issues:

- Sensitive roadside area
- Recreational uses adjacent, including trail, I-5 park, and flag plaza

Strategy Ops 11: US 12 and 183rd Ave Roundabout

This strategy would realign Roseburg Street to be the south leg of the roundabout. This will shift the center of the intersection south of the existing center eliminating impacts to the existing railroad crossing. This would improve mobility through an alternate I-5 route during congestion.

Potential environmental issues:

- Soils identified as more preferred for pocket gophers by USFWS are in vicinity
- New alignment within a wellhead protection area
- New roundabout located on "prime farmland if irrigated" possible conversion of agricultural land
- A small portion of the new alignment within a 100 year floodplain
- A small portion of the new alignment within a Conservancy Shoreline District

SR 507 Roundabouts

These strategies were developed because SR 507 is often used as an alternate route when there are closures or backups on I-5. The purpose of doing a series of roundabouts is to alleviate congestion on SR 507, especially when it is used as an alternate route to I-5. All the proposed roundabouts are single lane roundabouts; some are compact roundabouts.

Strategy Ops 2: SR 507 and Centre Street – install a compact Roundabout

Potential environmental issues:

- Soils identified as more preferred for pocket gophers by USFWS are in vicinity

Strategy Ops 3: SR 507 (Sussex Ave) and SR 99 – install a compact Roundabout

Potential environmental issues:

- Soils identified as more preferred for pocket gophers by USFWS are in vicinity
- Ecology identified hazmat site with status "cleanup started" within 300 feet.

Strategy Ops 9: SR 507 and SR 702 – replace existing signal with a Roundabout

Potential environmental issues:

- Roundabout will be configured to avoid impacts to adjacent businesses and the McKenna Elementary School
- Ecology identified hazmat site with status "awaiting cleanup" within 300 feet.

Strategy Ops 10.1: SR 507 and Vail Road – replace T intersection with a Roundabout

Potential environmental issues:

- Property adjacent is designated as agricultural lands of statewide importance
- National Register of Historic Places site is within 500 ft of the intersection (Salish Lumber Company, Superintendents Home)
- Centralia Canal Bridge and Centralia Canal close to the intersection
- Stream in project vicinity
- If work on McKenna Creek culvert will occur, hazmat analysis may be required.

Strategy Ops 10.2: SR 507 and Bald Hill Road – replace existing signal with a Roundabout

Potential environmental issues:

- Soils identified as more preferred for pocket gophers by USFWS are in vicinity

INTERCHANGES

Strategy Int 1: Mounts Road Interchange

This strategy would install Roundabouts at both the northbound and southbound ramps and with a small shift to the existing southbound ramp meter.

Potential environmental issues:

- Could require acquisition from JBLM and may require a temporary detour through JBLM
- Red Salmon Creek is near the northbound roundabout location
- Ecology listed sites within 300 feet- may require hazardous materials review.
- If culvert work will occur, culverts must be assessed for asbestos.

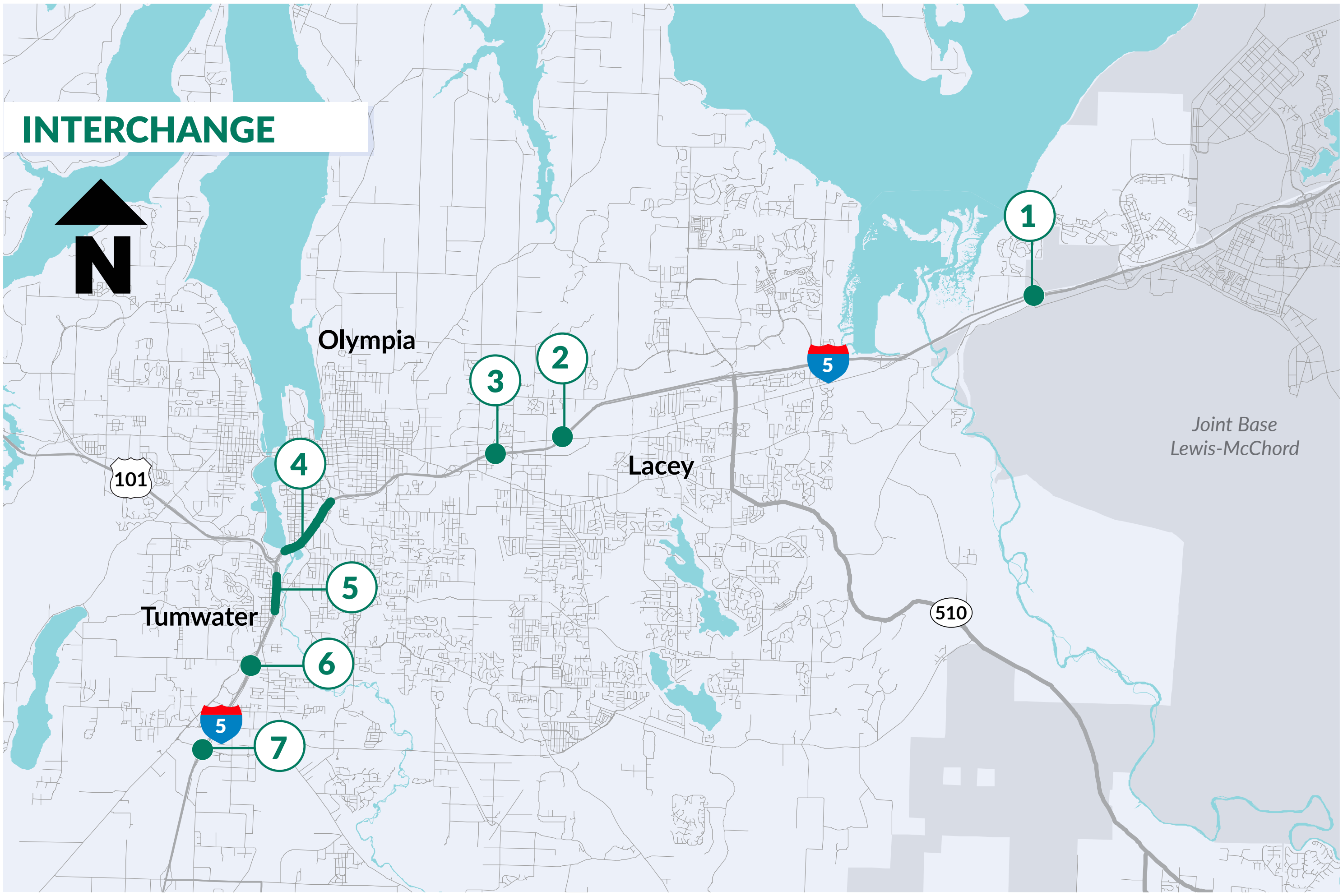
Strategy Int 2: Martin Way Interchange

This strategy would install loop ramps (partial cloverleaf) at both northbound and southbound ramps and direct transit access to the existing park and ride.

Potential environmental issues:

- Eligible historic resources in the project area (Olympic Freeway)

Figure 5.3. Interchange Scenario Strategies



Strategy #	Strategy	Description	Milepost
Int 1	Mounts Road Interchange	Roundabouts on both the northbound and southbound ramps. Move ramp meter slightly on southbound on ramp.	116.6 - 116.7
Int 2	Martin Way Interchange	Partial cloverleaf interchange.	109.0 - 109.6
Int 3	Pacific Ave Interchange NB off ramp	Add a lane to northbound off ramp.	107.1 - 107.5
Int 4	US 101 Interchange revision with braided on ramps	Construct braided ramp between southbound I-5 and US 101, replace existing bridge on southbound I-5 to 14th, and install new bridge for on-ramp over Henderson. Exit at Plum Street to access braided ramp SB I-5 and add an auxiliary lane between Pacific Ave and Capitol Way.	104.7 - 105.7
Int 5	US 101 and I-5 (NB PTSU I-5 to US 101)	Add a part time shoulder use lane in the northbound direction between the Deschutes Way off ramp and the US 101 off ramp.	103.6 - 104.1
Int 6	Trosper northbound on ramp	Construct 3 adjacent roundabouts.	102.7 - 102.9
Int 7	Tumwater Boulevard Interchange	Increase travel lanes from 3 to 4 lanes on Tumwater Blvd and construct bridge over I-5, install 2 roundabouts at ramp connections, and modify and improve ramps to freeway.	101.3 - 101.3

- College Creek is within the project area; there is an existing culvert most likely in the project area (not covered under the federal court injunction for fish passage)*
- There are wetlands in the project area, there is the potential for wetland and stream and wetland buffer impacts
- Ecology listed sites within 300 feet- may require hazardous materials review.

Strategy Int 3: Pacific Avenue Interchange NB off-ramp

This strategy would install a left turn lane by widening the inside of the existing off-ramp. This would allow for two left turn lanes and maintaining a right turn lane to improve traffic flow through this intersection.

Potential environmental issues:

- Wetland review may be required
- Woodard Creek is in project area; culvert crosses under the off-ramp; this may not be an issue if the work can be done without touching the culvert.
- If culvert work is required, hazmat analysis of culverts for asbestos will be needed.

Strategy Int 4: US 101 Interchange

This strategy would install multiple braided ramps, replace the existing bridge from southbound I-5 to 14th Street and construct a new bridge for the braided ramp over Henderson Boulevard. Replace the northbound outside shoulder with full depth pavement to allow for hard shoulder running during peak traffic periods. Part of the work may involve extending an existing railroad tunnel, depending on the design.

Potential environmental issues:

- Eligible historic resources in the project area
- Moxlie Creek is in the project vicinity
- There is a fish passage barrier culvert in the project area. Pending project footprint, if this culvert is in the project area it will be required to be fixed.

* https://wsdot.wa.gov/construction-planning/protecting-environment/improving-fish-passage/federal-court-injunction-fish-passage

Strategy Int 5: Tumwater to US 101 Hard Shoulder Running/Part Time Shoulder Use

This strategy would provide hard shoulder running (also referred to as part time shoulder use) northbound on I-5 from the Tumwater on ramp to US 101.

Potential environmental issues:

- No known environmental issues with this strategy

Strategy Int 6: Trosper Northbound on-ramp

This strategy would install HOV lane and ramp meters on both lanes of the loop ramp to Northbound I-5. The City of Tumwater will be providing the widening of the loop ramp to two lanes. WSDOT's portion of the project will be adding the queue jump and ramp metering to improve traffic flow.

Potential environmental issues:

- Ground disturbing activities will be limited to installing the ramp meter
- If additional ground disturbance is required, hazmat analysis may be required due to old gas station site identified by Ecology within 300 feet of the on-ramp.

Strategy Int 7: Tumwater Boulevard Interchange

This strategy would realign and rebuild ramps and widen Tumwater Boulevard beyond the ramp termini. Widen the lanes on Tumwater Boulevard from 3 to 4 lanes and widen the bridge over I-5, install 2 roundabouts at the ramp termini. Work also includes drainage, ITS, illumination and removal of a signal. The project is to improve level of service in anticipation of future growth near the Tumwater Boulevard interchange.

Potential environmental issues:

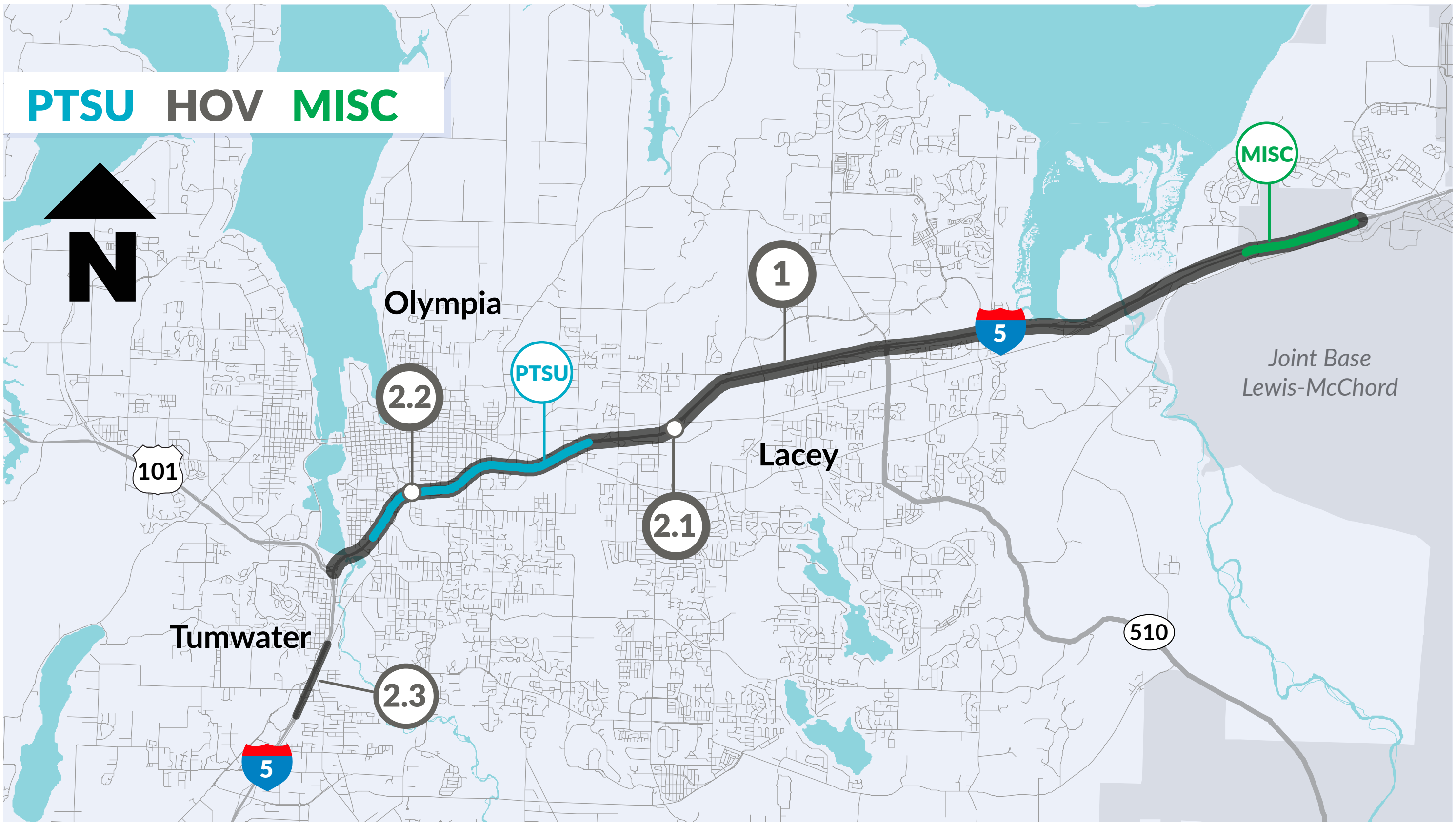
- Potential Wetland in the vicinity
- Soils identified as more preferred for pocket gophers by USFWS are in vicinity

HARD SHOULDER RUNNING (PART TIME SHOULDER USE)

Strategy PTSU: Part time shoulder use

This strategy is proposed on SB I-5 between the Sleater-Kinney Rd NE on-ramp and the Henderson Blvd SE on-ramp.

Figure 5.4. PTSU, HOV, MISC Scenario Strategies



Strategy #	Strategy	Description	Milepost
PTSU	Part time shoulder use in southbound direction on existing I-5 shoulder between Sleater-Kinney Rd NE on-ramp and Henderson Blvd SE on-ramp.	Consists of allowing travel on the existing shoulder in the southbound direction of I-5, between the Sleater-Kinney Rd NE on-ramp and the Henderson Blvd SE on-ramp.	105.0 - 108.0

Strategy #	Strategy	Description	Milepost
HOV 1	HOV Conversion US 101 to Mounts Road	Convert existing general purpose inside lane to HOV on both NB and SB directions starting at MP 104.3 through Pierce Co to connect with new HOV lanes and add HOV queue jumps NB at Martin Way, Plum St, and Trosper.	104.3 - 117.0
HOV 2.1	HOV Martin Way Northbound Ramp	Add HOV queue jumps NB at Martin Way, Plum St, and Trosper.	109.2 - 109.6
HOV 2.2	Plum Street Northbound HOV on ramp	Add HOV queue jumps NB at Martin Way, Plum St, and Trosper.	105.7 - 105.8
HOV 2.3	Trosper Northbound Metering HOV	Add HOV queue jumps NB at Martin Way, Plum St, and Trosper.	102.5 - 103.2

Strategy #	Strategy	Description	Milepost
Misc - Per	Perimeter Rd	Remove gate at Mounts Rd and Perimeter Rd to open to general traffic; add gate at Perimeter Dr and Center Dr; add a SB lane to Center Dr connecting over the weigh station ramp.	116.5 - 118.0

PTSU= Part Time Shoulder Use **HOV**= High Occupancy Vehicle **MISC**= Miscellaneous

Potential environmental issues:

- Inside lane would move 5 ft closer to the centerline
- Streams and culverts in the project vicinity
- Depending on footprint of excavation and potential culvert work, hazmat analysis may be required.

HOV CONVERSION

The HOV conversion was not to add a lane, but to convert an existing general purpose lane to an HOV and/or add HOV ramps.

Strategy HOV 1: HOV Conversion US 101 to Mounts Road

This strategy would use the existing lanes and convert/restripe one general purpose lane to an HOV lane in both directions. No capacity increase on I-5.

Potential environmental issues:

- All work would be within existing pavement, no environmental issues anticipated

Strategy HOV 2.1: HOV to Martin Way Northbound Ramp

This strategy would modify the existing Martin Way Northbound on-ramp to add HOV bypass lane. The strategy assumes that ramp metering is already in place for this on-ramp. It is anticipated the strategy will improve traffic flow.

Potential environmental issues:

- Ecology listed sites within 300 feet - may require hazardous materials review.
- Close to the I-5 trail but no 4(f) impacts are anticipated
- College Creek is in the project vicinity but no impacts to the creek are anticipated
- Section 4(f) impacts are impacts to significant publicly owned parks, recreation areas, schools, and wildlife and waterfowl refuges, as well as significant historic sites (whether privately or publicly owned).

Strategy HOV 2.2: Plum Street Northbound HOV on-ramp

This strategy would modify the existing Northbound on-ramp to add an HOV bypass lane. This would involve replacing the on-ramp bridge over Eastside St, raise the on-ramp profile, and construct retaining walls with top barrier. No new ROW would be required for the final project however, there will be temporary construction easements and access breaks for construction. It is anticipated that this will include ramp metering.

Potential environmental issues:

- Indian Creek and culvert in the project vicinity (non-navigable)
- Moxlie Creek in the project vicinity (non-navigable)
- If culvert work is needed, may require Hazmat analysis (asbestos)

Strategy HOV 2.3: Trosper Metering HOV

This strategy would add HOV queue jumps in the northbound direction at Martin Way, Plum Street, and Trosper.

Potential environmental issues:

- Soils identified as more preferred for pocket gophers by USFWS are in vicinity

MISCELLANEOUS - PERIMETER ROAD

Strategy Misc-Per: Perimeter Road

This strategy would remove the gate at Mounts Rd and Perimeter Rd to open to general traffic, add a gate at Perimeter Dr and Center Dr, and add a southbound lane to Center Dr connecting over the weigh station ramp.

Potential environmental issues:

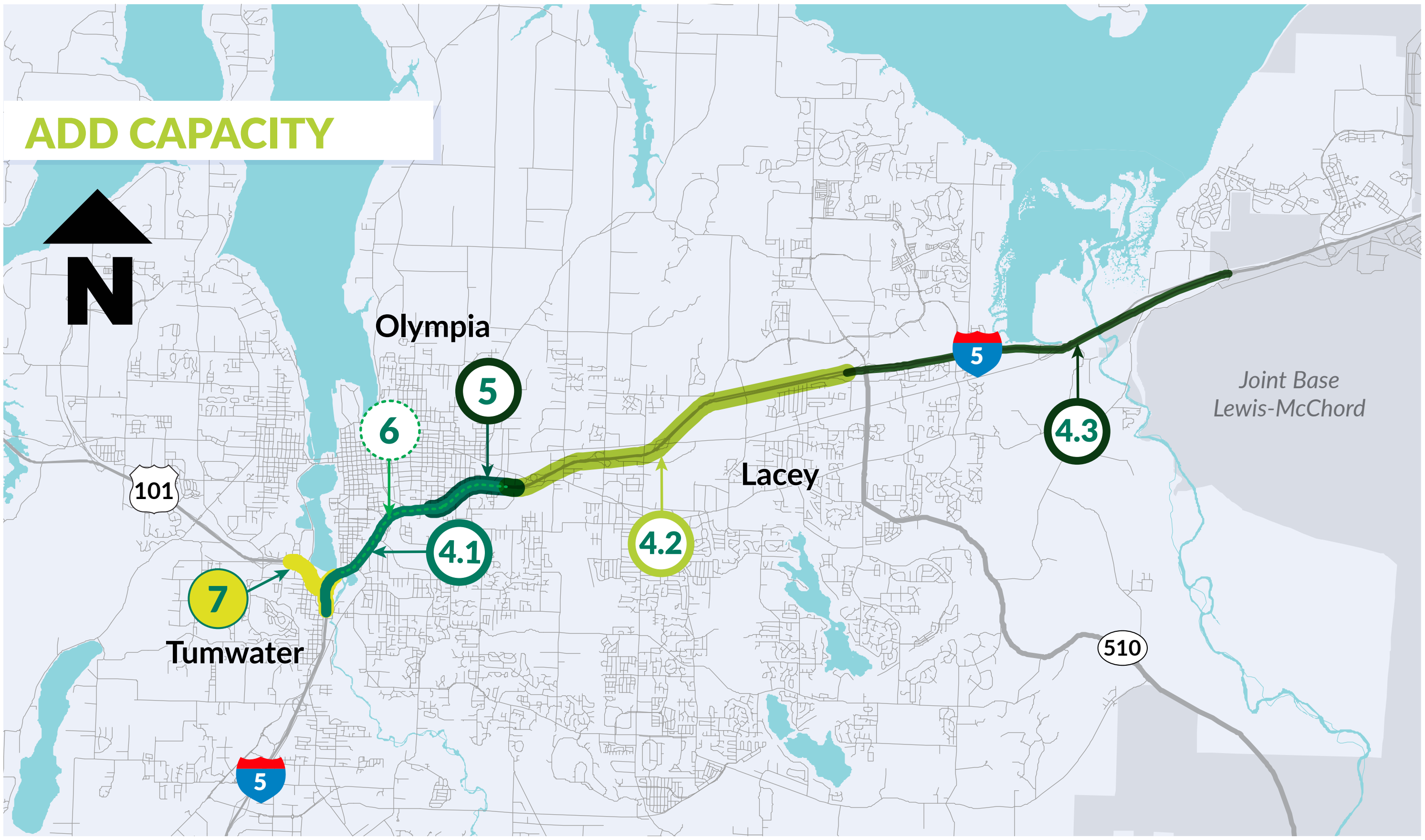
- Map review shows there is likely at least one unmapped crossing of Red Salmon Creek in the project area
- Gopher soil status is unknown
- Hazmat review likely to be required
- Project location would be primarily on US Army base.

WIDEN/ADD CAPACITY

Capacity expansion from Deschutes on-ramp to Mounts Road (divided into 3 sections)

In coordination with FHWA and WSDOT environmental staff, it was determined that the PEL review should include smaller logical sections of the proposed

Figure 5.5. Add Capacity Scenario Strategies



Strategy #	Strategy	Description	Milepost
Cap 4.1	Widen, Add Capacity US 101 Interchange to Pacific Ave SE Interchange	Portions are already four lanes; add a lane where there are only three lanes, with the HOV lane as the inside lane both directions I-5 from Pacific Ave SE interchange to US 101 interchange.	104.3 - 107.1
Cap 4.2	Widen, Add Capacity Pacific Ave SE Interchange to Marvin Rd NE Interchange	Portions are already four lanes, add a lane where there are only three lanes, with the HOV lane as the inside lane both directions I-5 from Marvin Rd NE interchange to Pacific Ave SE interchange.	107.1 - 111.7
Cap 4.3	Widen, Add Capacity Marvin Rd NE Interchange to Mounts Rd	Widen I-5, add capacity by adding one HOV lane and maintaining the three existing general purpose lanes, and provide multimodal accommodations.	111.7 - 117.0
Cap 5	I-5 Southbound - Pacific Ave to Plum St off ramp	Add an auxiliary lane between Pacific Avenue and Capitol Way.	106.1 - 107.2
Cap 6	I-5 Northbound US 101 on ramp to Pacific Ave off ramp	Add an auxiliary lane from US 101 on ramp to 14th Avenue off ramp, and from Plum Street on ramp to Pacific Avenue off ramp.	104.6 - 107.1
Cap 7	I-5 Northbound at US 101 - flyover ramp	Add a flyover off ramp linking NB I-5 to WB US 101, and merging in on the outside lane of US 101. Retain the Deschutes Parkway on ramp to provide access from the local network to US 101.	104.1 - 104.4; 366.9 - 367.3

Deschutes on-ramp to Mounts Road. As stated in the Colorado PEL guidance:

> *For example, a PEL study for a corridor could result in the identification of multiple potential projects (such as capacity improvements for a shorter length of the corridor and intersection improvements) that can be prioritized for implementation.*

After reviewing the traffic modeling, watershed, and environmental results the corridor was divided into the three sections, with each section becoming a separate strategy. The sections were selected based on logical termini and independent utility, as well as traffic modeling results, environmental factors such as drainage basin and watershed boundaries. The justification for these sections is provided with each of the sections. Note the area from Tumwater to US 101 has no proposals for widening or other work on I-5 and was therefore not included in these sections.

Strategy Cap 4.1: Widen, Add Capacity US 101 Interchange to Pacific Ave SE Interchange

The westernmost section of the I-5 project corridor spans from Pacific Avenue SE interchange to the US 101 interchange and includes the crossing at Capitol Lake. This section has portions that are already four lanes wide. By widening those portions that are not already four lanes this addresses several goals from the PEL purpose and need, including improving travel time, reliability, safety, efficiency, and equitability through this section by adding capacity and HOV lanes, while maintaining accessibility to industrial areas and job sites. This section has bike and pedestrian facilities adjacent to and separate from I-5. This section is especially critical for maintaining access to the State Capitol and Port of Olympia employment centers. Additionally, this section is the most likely to require review of historic properties and contains most of the historic Olympia freeway, which extends from Trosper Road to Martin Way (which is in Section 2).

Braided ramps are proposed on I-5 prior to the I-5 and US 101 interchange to provide easier connections from SB I-5 to US 101 and to the Capitol area. This section also includes upgrading the bridge crossing at Capitol Lake, the mouth of the Deschutes River, to meet current design criteria and improve resiliency of I-5 to climate change. In addition, there is a proposed flyover ramp to link Northbound I-5 to WB US 101 replacing the existing ramp and improving the connection to WB US 101 and to West Olympia. This work also helps to make the crossing forward compatible with future restoration efforts in the watershed.

This section is logical from a watershed approach because it closely aligns with the boundaries of the Indian Creek and Deschutes River/Capitol Lake drainage basins, which both discharge to Budd Inlet. The flyover ramp and braided ramps provide a set of improvements very different from the other sections. Because this section has such a different set of challenges than the other two sections and is a logical boundary within the watershed, it is proposed as a separate section.

This strategy would provide a corridor of four lanes each direction on I-5. Most of the northbound corridor is already 4 lanes. The inside lane will be converted to HOV on each direction on I-5.

Potential environmental issues:

- US Army Corps of Engineer review for impacts to waterways
- US Coast Guard will require a Navigation Impact Report
- Work in and adjacent to Tribal fishing areas
- Work over Moxlie Creek, the Deschutes River and Capitol Lake
- ESA listed species in the project area, including salmon and steelhead
- WDFW HPA approval
- Shoreline Review
- Local Critical Area permits
- FEMA Flood Plain
- Hazmat Analysis
- 4 (f) impact considerations, including Watershed Park and Tumwater Historical Park
- Considerations for compatibility with future dam removal and restoration of Capitol Lake.

Strategy Cap 4.2: Widen, Add Capacity Pacific Ave SE to Marvin RD NE Interchange

The middle section of the I-5 project corridor spans from the Marvin Road NE Interchange to the Pacific

Avenue SE Interchange and includes water crossings at Woodland and Woodard Creeks. This section addresses goals from the PEL purpose and need, like other proposed sections, but without the complexities related to the major river crossings at the Nisqually River Delta or Capitol Lake. This section has portions that are already four lanes wide. By widening the section portions that are three lanes to four lanes, providing HOV lanes, this addresses the goal of improving travel time, reliability, safety, efficiency, and equitability by adding capacity while maintaining accessibility to industrial areas and job sites.

This section's multimodal accommodations should extend to Exit 109, where the southbound bicycle restriction begins on I-5. At Martin Road, Exit 109, the bicyclists can connect to the paved Woodland Trail. Between Martin Road, Exit 109, and Trosper Road, Exit 102, bicycles are prohibited on I-5.

From a watershed approach, this section is logical because it closely aligns with the boundaries of the Woodland Creek and Woodard Creek drainage basins, which both discharge to Henderson Inlet. Because this section has less complexity, already has four lanes in some areas, and is a logical boundary within the watershed, it is proposed as a separate section.

This strategy would provide a corridor of four lanes each direction on I-5. Portions of the corridor are already four lanes. The inside lane will be converted to HOV on each direction on I-5.

Potential environmental issues:

- Shoreline Review
- Wetlands and buffers
- Streams and water crossings – Woodland, Woodard, and possibly Indian Creeks
- Several ESA listed species including fish

Strategy Cap 4.3: Widen, Add Capacity Mounts Road to Marvin Road

This is the easternmost section of the project corridor; it spans from Mounts Road to the Marvin Road NE interchange and includes the crossing at the Nisqually River Delta. This section addresses several goals from the PEL purpose and need, including improving travel time, reliability, safety, efficiency, and equitability through this section by widening I-5 and adding capacity and multimodal accommodations, while maintaining accessibility to industrial areas and job sites.

This section addresses the PEL purpose and need goal to improve the transportation and estuarine habitat constraints related to the Nisqually River Bridges and the river's delta, while improving the climate change resiliency of I-5 through the delta and ensuring the exercise of Tribal treaty rights. This strategy would elevate I-5 to improve climate change resiliency and improve the natural processes that build and maintain habitat. The environmental review process for this section will be highly complex due to important habitat features, ESA listed species, and adjacent land uses which include agricultural and Tribal lands, a National Wildlife Refuge, and a United States military base. From a watershed perspective, this section is logical because it aligns closely with the boundaries of the Nisqually River, Red Salmon Creek, and McAllister Creek drainage basins- all of which discharge to the Nisqually Delta. This strategy may move forward independently if funding becomes available.

The Cap 4.3 strategy is the section of I-5 from the interchange at Marvin Rd to the interchange at Mounts Rd, which aligns very closely with the Nisqually River and McAllister Creek watershed boundaries. This section poses unique challenges, including a bend in the Nisqually River that has been moving towards I-5.

This strategy would widen I-5 to 4 lanes by adding one HOV lane and providing multimodal (bike/pedestrian) accommodations to increase capacity and relieve congestion through this section of I-5. It includes upgrading the existing bridges through the Nisqually Delta to improve river flow and habitat for fish and wildlife, including ESA listed species, meet current water crossing requirements, and improve resiliency.

Potential environmental issues:

- US Army Corps of Engineer review for impacts to waterways
- US Coast Guard will require a Navigation Impact Report
- Work in and adjacent to Tribal fishing areas
- Work in the Nisqually River, McAllister (Medicine) and Red Salmon Creeks

- ESA listed species in the project area, including salmon and steelhead
- WDFW HPA approval
- Shoreline Review
- Local Critical Area permits
- FEMA floodplain
- Hazmat Analysis
- 4 (f) impact considerations, including an adjacent federal wildlife refuge
- Overburdened populations are in the project area
- Climate change resiliency considerations

Strategy Cap 5: I-5 Southbound- Pacific Ave to Plum St off ramp

This strategy would add an auxiliary lane between Pacific Avenue and Capitol Way.

Potential environmental issues:

- Wetland review likely required
- Two crossings of Indian Creek within project area that may be fish passage barriers
- Local critical area permits
- Hazmat analysis required for culvert work.

Strategy Cap 6: I-5 Northbound US 101 on-ramp to Pacific Ave off-ramp

This strategy would add an auxiliary lane from US 101 on-ramp to 14th Avenue off-ramp, and from Plum Street on-ramp to Pacific Avenue off-ramp.

Potential environmental issues:

- Wetland review likely required
- Two crossings of Indian Creek, one crossing of Moxlie Creek, and crossing of the Deschutes River/Capitol Lake
- Culvert work will require hazmat analysis for asbestos
- Local critical area permits
- Conservancy shoreline jurisdiction
- A section of the Historic Olympic Freeway
- Several recreational and historic properties adjacent
- Floodplain review

Strategy Cap 7: I-5 Northbound at US 101-Flyover Ramp

This strategy would add a flyover off ramp linking northbound I-5 to westbound US 101 and merging in on the outside lane of US 101. Retain the Deschutes Parkway on-ramp to provide access from the local network to US 101.

Potential environmental issues:

- Several recreational and historic properties adjacent
- Wetland review required
- Streams and fish passage barriers in vicinity
- Culvert work will require hazmat analysis for asbestos
- Numerous ESA listed fish species
- Potentially needing Shoreline Review

ADDITIONAL ESA CONSIDERATIONS

WSDOT coordinated internally with staff experienced in evaluating project impacts to endangered species. From this coordination, the following should be considered as strategies move forward into NEPA review:

- Proposed designs should avoid/minimize impacts to fish and channel flows;
- Widening the roadway footprint should avoid impacts to pocket gophers and their habitat;
- Stormwater pollutants are anticipated to cause adverse effects and even death to protected species;
- If fish handling is required, it is an expected “take” of ESA listed species;
- Capitol Lake vicinity appears to have several culverts/crossings subject to the federal injunction.

Using the information from Chapter 4 Traffic Modeling and the environmental screening conducted in this chapter, the next chapter provides the strategies moving forward that meet the purpose and need of this PEL Study.

6 STRATEGIES MOVING FORWARD AND STRATEGIES ELIMINATED

The Corridor Study identified many strategies to alleviate congestion on I-5. The PEL review has identified strategies that can be easily implemented, providing practical solutions to achieve incremental improvements on I-5. The PEL study also identified several reviews needed to move the more complex strategies forward into NEPA review. One of the main benefits of PEL is that it allows planning analyses and decisions to be carried forward into the environmental review (NEPA/SEPA) process. This helps reduce duplication between the planning and environmental review processes which can lead to more efficient project delivery.

This section discusses the strategies recommended for elimination and those recommended to move forward for NEPA review and potential implementation. It categorizes strategies as mid-term (expected to be implemented by 2030) and long-term (expected to be implemented by 2045). For strategies moving forward, this section includes a brief visual of environmental complexity, also referred to as environmental linkages.

Consistent with practical solutions methodology, categorizing strategies into mid and long term allows projects to move forward both independently and concurrently to alleviate congestion on I-5.

STRATEGIES RECOMMENDED TO MOVE FORWARD FOR WSDOT FUTURE ASSESSMENT

The Corridor Study identified many strategies to alleviate congestion on I-5. From the environmental screening contained in this PEL review, WSDOT recommends a wide range of strategies that will provide incremental improvements across the corridor. The PEL study also identifies the detailed reviews that will be needed to move the more complex selected strategies forward. WSDOT will consider strategies identified when making determinations on capital improvements within its project development processes. WSDOT may also be directed to fund strategies or portions of strategies in this plan by the Washington State Legislature. As funding becomes available to further develop the strategies, WSDOT will initiate formal environmental review. For each independent project that follows from this PEL study, WSDOT and FHWA will determine the appropriate level of environmental documentation (categorical exclusion, environmental assessment, or environmental impact statement). Mid range strategies are intended for year 2030, and long range strategies are intended for year 2045.

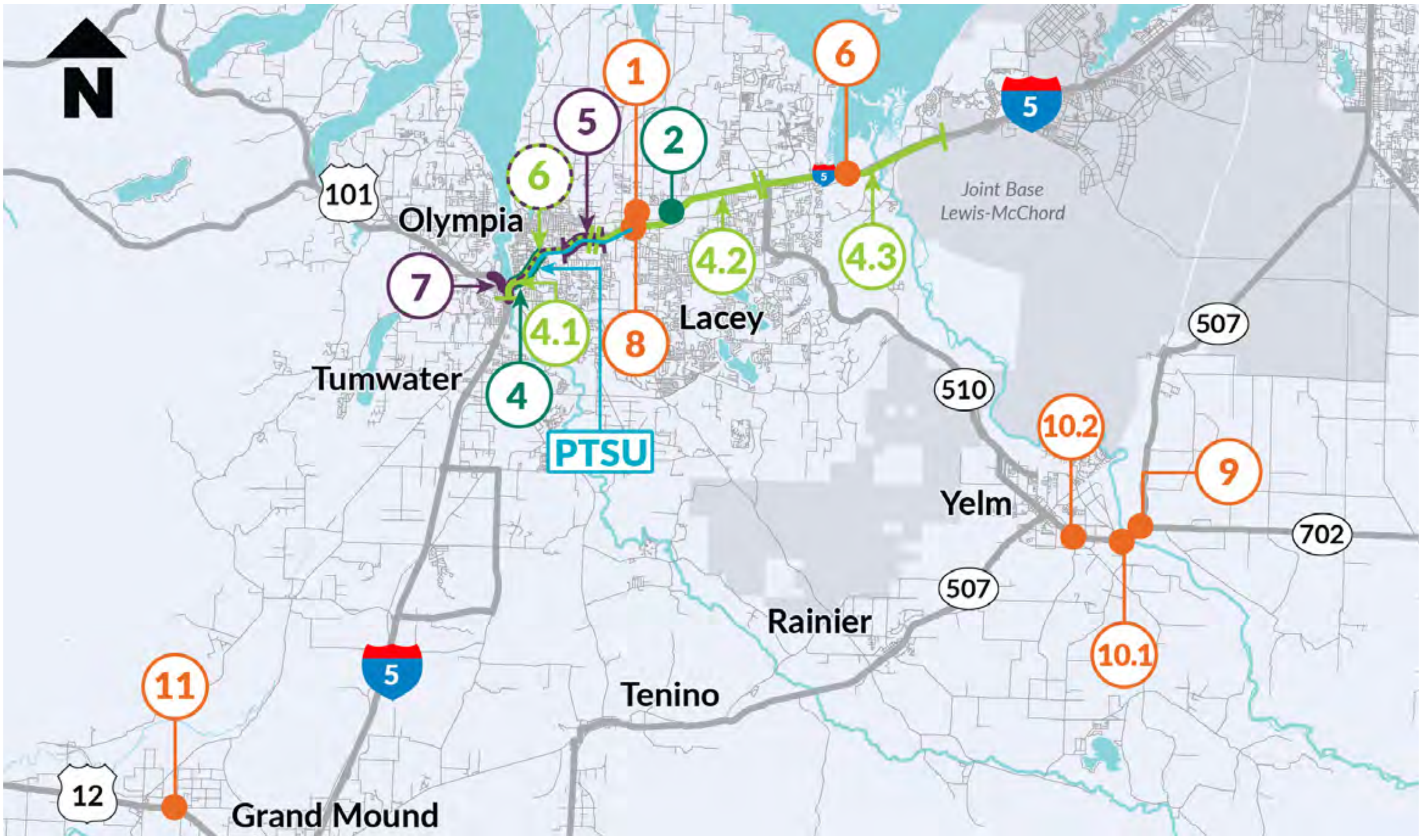
Based on the traffic modeling results, 16 strategies are recommended to move forward for WSDOT future assessment. The following tables summarize the recommendations for each strategy recommended to move forward and include a summary of environmental linkages from the environmental screening. The environmental screening is discussed in Chapter 5. The Environmental Linkages Key is as follows:

Environmental Linkages Key

Resources Impacted	Anticipated Permits	Anticipated Difficulty
Impacted resources ≥ 12	Permits 4-5	● High
Impacted resources 8-11	Permits 3	◕ Medium-high
Impacted resources 4-7	Permits 2	◑ Medium
Impacted resources 1-3	Permits 1	◔ Medium-low
Impacted resources 0	Permits 0	○ Low

The following figure (Figure 6.1) shows the locations of the strategies moving forward:

Figure 6.1. Locations of Strategies Proposed to Move Forward



OPERATIONS

- 1 Sleater-Kinney double left turn lanes from Martin Way E to Sleater-Kinney Road SE
- 6 Nisqually / Martin Way at Nisqually Cut Off Road SE
- 8 Sleater-Kinney new signal at NB off-ramp
- 9 SR 507 in Yelm (SR 507 and SR 702)
- 10.1 SR 507 and Vail Road – replace intersection with roundabout
- 10.2 SR 507 and Bald Hill Road – replace existing signal with a roundabout
- 11 US 12 and 183rd Ave Roundabout

INTERCHANGE

- 2 Martin Way Interchange
- 4 US 101 Interchange revision with braided on ramps

ADD CAPACITY

- 4.1 Widen, add capacity US 101 Interchange to Pacific Ave SE Interchange
- 4.2 Widen, add capacity Pacific Ave SE Interchange to Marvin Rd NE Interchange
- 4.3 Widen, add capacity Marvin Rd NE Interchange to Mounts Rd
- 5 I-5 Southbound – Pacific Ave to Plum St off ramp
- 6 I-5 Northbound US 101 on-ramp to Pacific Ave off-ramp
- 7 I-5 Northbound at US 101 – flyover ramp

PART TIME SHOULDER USE (PTSU)

- PTSU Allow part time shoulder use in the southbound direction of I-5 between the Sleater-Kinney Rd NE on ramp and Henderson Blvd SE on ramp

Strategies Proposed to Move Forward for Future Assessment: Operations Scenario

Strategy #	Strategy	Description	Model Results	Environmental Linkages	Carried forward?	Mid or Long Term	Recommendations
Ops 1	Sleater-Kinney Double Left turn lanes from Martin Way E to Sleater-Kinney Road SE	Add left turn lane from Martin Way East onto Sleater-Kinney Road SE	Increased capacity for vehicles turning left and through the intersection in the westbound direction in peak hour. Very little improvement for speed or delay.	◔	Yes	Mid	Move forward due to improvements to mobility and travel time from Martin Way onto Sleater-Kinney Road and access to the I-5 southbound ramp.
Ops 6	Nisqually / Martin Way at Nisqually Cut Off Road SE	Extra lane approaching ramp meter for northbound ramp	Very little improvement for volume, speed, or delay. May have more impact if signal timing adjusted.	◔	Yes	Mid	Recommend moving forward to evaluate whether signal timing improves mobility.
Ops 8	Sleater-Kinney new signal at NB off-ramp	Construct signal at intersection of I-5 northbound off-ramp and Sleater-Kinney Road. Only southbound lane will be signalized; separate northbound with curbing	Decreased speed and volumes in SB direction of Sleater-Kinney Road. Very little benefit to volumes or speed on I-5 off ramp.	◔	Yes	Mid	Although this showed little benefit to mobility on I-5, recommend moving forward to evaluate for its potential to reduce rear end crashes related to the intersection.
Ops 9	SR 507 in Yelm (SR 507 and SR 702)	Replace intersection with roundabout	Significant improvement to overall delay at the intersection and in queue length on SR 702 approaching SR 507	◔	Yes	Mid	Recommend moving forward because improves system resiliency.

Strategies Proposed to Move Forward for Future Assessment: Operations Scenario (continued)

Strategy #	Strategy	Description	Model Results	Environmental Linkages	Carried forward?	Mid or Long Term	Recommendations
Ops 10.1	SR 507 and Vail Road- replace T intersection with a roundabout	Replace T-intersection with roundabout	Slight improvement to delay at intersection and improvement on ease of left hand turns.	◐	Yes	Mid	Recommend moving forward because improves system resiliency.
Ops 10.2	SR 507 and Bald Hill Road- replace existing signal with a roundabout	Replace intersection with roundabout	Decreased delay at the intersection	◔	Yes	Mid	Recommend moving forward because improves system resiliency.
Ops 11	US 12 and 183rd Ave roundabout	New roundabout	Not applicable; applied to base year model.	◐	Yes	Mid	Recommend moving forward because improves system resiliency.

Strategies Proposed to Move Forward for Future Assessment: Interchange, PTSU, and Miscellaneous Scenarios

Strategy #	Strategy	Description	Model Results	Environmental Linkages	Carried forward?	Mid or Long Term	Recommendations
Int 2	Martin Way Interchange	Partial Cloverleaf Interchange at both the northbound and southbound ramps	Delay reduced on Martin at interchange. Volumes decreased on Martin Way EB and increased on Martin Way WB and I-5 SB. Volume/ throughput increased on I-5 SB without causing new delay.	◐	Yes	Mid	Recommended to move forward due to improved volume and throughput on I-5.

Strategies Proposed to Move Forward for Future Assessment: Interchange, PTSU, and Miscellaneous Scenarios (continued)

Strategy #	Strategy	Description	Model Results	Environmental Linkages	Carried forward?	Mid or Long Term	Recommendations
Int 4	US 101 Interchange revision with braided on ramps	Construct braided ramp between southbound I-5 and US 101, replace existing bridge on southbound I-5 to 14th, and install new bridge for on-ramp over Henderson. Exit at Plum Street to access braided ramp SB I-5 and add an auxiliary lane between Pacific Ave and Capitol Way.	Increased speed in Eastside segment of I-5 in SB direction. Throughput increased in section with braided ramp. Much of the traffic still used the existing US 101 merge, rather than braided ramp, due to lower speeds on braided ramp and likely capacity limitations on Plum St. Potentially could change with signage and redesign of Plum St exit. Congestion in I-5 NB increased, congestion on US 101 WB increased, likely due to increased volumes on I-5 SB to US 101.	◕	Yes	Mid	Recommended to move forward for further analysis due to potential benefits to speed on I-5 southbound. Recommend considering signage and redesign of Plum St exit.

Strategies Proposed to Move Forward for Future Assessment: Interchange, PTSU, and Miscellaneous Scenarios (continued)

Strategy #	Strategy	Description	Model Results	Environmental Linkages	Carried forward?	Mid or Long Term	Recommendations
PTSU	Part Time Shoulder Use (PTSU)	Allow hard shoulder running (also called part time shoulder use) on the existing southbound I-5 shoulder between the Sleater-Kinney Rd NE on-ramp and the Henderson Blvd SE on-ramp	Modeling results indicate this improvement will improve speeds in this heavily congested area approaching the Plum Street Off-ramp. Without the improvement, by 2030 speeds will be between 6 and 24 m.p.h. during the peak period (4-5 pm weekday). With the improvement, speeds will be 55-60 mph. Additional throughput (capacity) will travel through this section of I-5 with this improvement.	◐	Yes	Mid	Recommended to move forward due to increased capacity and speed through this segment.

Strategies Proposed to Move Forward for Future Assessment: Widen, Add Capacity Scenario

<table>
<tr><th>Strategy #</th><th>Strategy</th><th>Description</th><th>Model Results</th><th>Environmental Linkages</th><th>Carried forward?</th><th>Mid or Long Term</th><th>Recommendations</th></tr>
<tr><td>Cap 4.1</td><td>Widen, Add Capacity US 101 interchange to Pacific Ave SE Interchange</td><td>Portions are already four lanes; add a lane where there are only three lanes, with the HOV lane as the inside lane both directions I-5 from Pacific Ave SE interchange to US 101 interchange</td><td rowspan="2">Southbound: Speeds increased at Nisqually Delta, but delay caused by lane end at Mounts Rd caused delay to through traffic. Alternative improvements at Mounts Rd should be identified. Speeds increased through remainder of the I-5 corridor. Some delay remains at Eastside segment- this scenario does not include braided ramp to US 101. Slight decrease in speeds at Deschutes Pkwy segment where there was a lane drop back to three lanes. Throughput increased throughout corridor. HOV traffic experienced very little delay throughout corridor. Northbound, throughput increased throughout corridor. Speeds increased throughout corridor with the exception of E street and Deschutes parkway segments, but this scenario does not include flyover ramp to US 101.</td><td>●</td><td>Yes</td><td>Long</td><td>Recommended to move forward due to increased volume and speed.</td></tr>
<tr><td>Cap 4.2</td><td>Widen, Add Capacity Pacific Ave SE Interchange to Marvin Rd NE Interchange</td><td>Portions are al-ready four lanes, add a lane where there are only three lanes, with the HOV lane as the inside lane both directions I-5 from Marvin Rd NE interchange to Pacific Ave SE interchange</td><td>●</td><td>Yes</td><td>Long</td><td>Recommended to move forward due to increased volume and speed.</td></tr>
</table>

Strategies Proposed to Move Forward for Future Assessment: Widen, Add Capacity Scenario (continued)

Strategy #	Strategy	Description	Model Results	Environmental Linkages	Carried forward?	Mid or Long Term	Recommendations
Cap 4.3	Widen, Add Capacity Marvin Rd NE Interchange to Mounts Rd	This section is entirely three lanes. Add a lane with the HOV lane as the inside lane both directions I-5 from Marvin Road on-ramp to Mounts Road, and provide multimodal accommoda-tions	Compared to Scenario 6, there is increased congestion at Marvin Road, but it is still at an acceptable LOS. There is congestion starting in the Pacific Avenue segment in the southbound direction.	●	Yes	Long	Recommended moving forward due to increased volume and speed and improved climate change resiliency. Widening should accommodate multimodal opportunities.
Cap 5	I-5 Southbound - Pacific Ave to Plum St off ramp	Add an auxiliary lane between Pacific Ave and Capitol Way	Increased speed in Eastside segment of I-5 in SB direction. Throughput increased in section with braided ramp. Much of the traffic still used the existing US 101 merge, rather than braided ramp, due to lower speeds on braided ramp and likely capacity limitations on Plum St. Potentially could change with signage and redesign of Plum St exit. Congestion in I-5 NB increased, congestion on US 101 WB increased, likely due to increased volumes on I-5 SB to US 101.	◔	Yes	Long	Recommend to move forward due to increased throughput on braided ramp section. Recommend further analysis with signage and redesign of Plum St exit.

Strategies Proposed to Move Forward for Future Assessment: Widen, Add Capacity Scenario (continued)

Strategy #	Strategy	Description	Model Results	Environmental Linkages	Carried forward?	Mid or Long Term	Recommendations
Cap 6	I-5 Northbound US 101 on-ramp to Pacific Ave off-ramp	Add an auxiliary lane from US 101 on-ramp to 14th Avenue off-ramp, and from Plum Street on-ramp to Pacific Avenue off-ramp	Speeds increased in various segments along NB I-5 near US 101 merge where aux lane smoothed out lane drops and adds. At larger Eastside St segment, speeds and throughput/volume increased. Delay was increased north of auxiliary lane, with the lane drop.	◕	Yes	Long	Recommend to move forward due to increased speed and throughput.
Cap 7	I-5 Northbound at US 101-Flyover Ramp	Add a flyover off-ramp linking NB I-5 to WB US 101, and merging in on the outside lane of US 101. Retain the Deschutes Parkway on-ramp to provide access from the local network to US 101	Throughput increased slightly in NB direction. Queue to exit I-5 to merge to US 101 was reduced. I-5 volumes remained unchanged.	◕	Yes	Long	Recommend to move forward due to increased throughput in northbound direction and reduced queue at exit.

Based on practical solutions, traffic modeling, and environmental screening it is anticipated these 16 strategies will move forward into various levels of NEPA documentation. The strategies recommended to move forward all meet the purpose and need of the Corridor Study and the PEL Study.

STRATEGIES RECOMMENDED FOR ELIMINATION FROM FUTURE REVIEW

Using the results from the TRPC traffic modeling and accounting for certain logistical factors, this study recommends 14 strategies be eliminated from WSDOT future review. Some of these strategies can be implemented by local agencies. These recommendations are summarized as follows:

Strategies Recommended for Elimination from Future Assessment: Operations Scenario

Strategy #	Strategy	Description	Model Results	Carried forward?	Recommendations
Ops 2	SR 507 and Centre Street Roundabout	New Roundabout	Not applicable; applied to base year model.	No	Not recommended for WSDOT to move forward because this strategy is being implemented by the local agency.
Ops 3	SR 507 Sussex Ave E / SR 507 and Old Hwy 99	New Roundabout	Not applicable; applied to base year model.	No	Not recommended for WSDOT to move forward because this strategy is being implemented by the local agency.
Ops 5	Steilacoom Road and SR 510	New Roundabout	Not applicable; applied to base year model.	No	Not recommended for WSDOT to move forward because this strategy is being implemented by the local agency.
Ops 7	Deschutes Parkway Extended Taper	Extend taper on on-ramp	Very little change in volume, speed, or delay.	No	Not recommended to move forward due to very little improvement to mobility or system resiliency.

Strategies Recommended for Elimination from Future Assessment: Interchange and Miscellaneous Scenarios

Strategy #	Strategy	Description	Model Results	Carried forward?	Recommendations
Int 1	Mounts Road Interchange	Roundabouts on both the northbound and southbound ramps. Move ramp meter slightly on southbound on-ramp.	Very little difference in speed or volumes on I-5 by adding roundabouts.	No	Not recommended to move forward due to very little benefit to speed or volumes on I-5.
Int 3	Pacific Ave Interchange NB off ramp	Add a lane to northbound off ramp.	Very little difference in volume, delay, or queue length	No	Not recommended to move forward due to very little benefit to volume, delay, or queue length.
Int 5	US 101 and I-5 (NB PTSU (5 to US 101)	Add a part time shoulder use lane in the northbound direction between the Deschutes Way off ramp and the US 101 off ramp.	Reduced queue delay in right hand lane, but over one-hour time period, delays were not severe	No	Not recommended to move forward due to very little benefit to performance measures.

Strategies Recommended for Elimination from Future Assessment: Interchange and Miscellaneous Scenarios (continued)

Strategy #	Strategy	Description	Model Results	Carried forward?	Recommendations
Int 6	Trosper northbound on-ramp	Construct 3 adjacent roundabouts	Not applicable; applied to base year model.	No	Not recommended for WSDOT to move forward because this strategy is being implemented by the local agency.
Int 7	Tumwater Boulevard Interchange	Increase travel lanes from 3 to 4 lanes on Tumwater Blvd and construct bridge over I-5, install 2 roundabouts at ramp connections, and modify and improve ramps to freeway	This improvement assists with traffic flow on Tumwater Boulevard and reduces the left turns but does not make a large difference on I-5.	No	Not recommended for WSDOT to move forward because this strategy is being implemented by the local agency.
Per	Perimeter Rd	Remove gate at Mounts Rd and Perimeter Rd to open to general traffic; add gate at Perimeter Dr and Center Dr; add a SB lane to Center Dr connecting over the weigh station ramp.	Increased throughput on I-5 between Center Street and Mounts Road. This may be due to some JBLM traffic accessing I-5 directly at Center Street (where merge is less congested). Decreased delay at merge at Mounts Rd. Also allows vehicles traveling from DuPont to Old Pacific Highway to avoid I-5. This alternative will be increasingly important during heavy congestion.	No	Not recommended to move forward due to minimal improvement on to I-5 mobility.

Strategies Recommended for Elimination from Future Assessment: High Occupancy Vehicle (HOV) Scenarios

Strategy #	Strategy	Description	Model Results	Carried forward?	Recommendations
HOV 1	HOV Conversion US 101 to Mounts Road	Convert existing general purpose inside lane to HOV on both NB and SB directions starting at MP 104.3 through Pierce Co to connect with new HOV lanes and add HOV queue jumps NB at Martin Way, Plum St, and Trosper	Greater delay and reduced throughput/volume on I-5 in both directions for all traffic. Traffic in the HOV lane experienced little delay, unless caught in queue while entering or exiting I-5.	No	Not recommended to move forward due to increased delay and reduced throughput/ volume on I-5.

Strategies Recommended for Elimination from Future Assessment: High Occupancy Vehicle (HOV) Scenarios (continued)

Strategy #	Strategy	Description	Model Results	Carried forward?	Recommendations
HOV 2.1	HOV to Martin Way Northbound Ramp	Add HOV que jumps NB at Martin Way, Plum St, and Trosper	Greater delay and reduced throughput/volume on I-5 in both directions for all traffic. Traffic in the HOV lane experienced little delay, unless caught in queue while entering or exiting I-5.	No	Not recommended to move forward due to increased delay and reduced throughput/ volume on I-5.
HOV 2.2	Plum Street Northbound HOV on-ramp	Add HOV que jumps NB at Martin Way, Plum St, and Trosper	Greater delay and reduced throughput/volume on I-5 in both directions for all traffic. Traffic in the HOV lane experienced little delay, unless caught in queue while entering or exiting I-5.	No	Not recommended to move forward due to increased delay and reduced throughput/ volume on I-5.
HOV 2.3	Trosper Northbound Metering HOV	Add HOV que jumps NB at Martin Way, Plum St, and Trosper	Greater delay and reduced throughput/volume on I-5 in both directions for all traffic. Traffic in the HOV lane experienced little delay, unless caught in queue while entering or exiting I-5.	No	Not recommended to move forward due to increased delay and reduced throughput/ volume on I-5.

7 NEXT STEPS

The PEL study provides a link between the strategies developed in the previous Corridor Study and the NEPA process required to move strategies forward for implementation. The following figure (Figure 7.1) summarizes the work done in the Corridor Study and PEL Study and shows how those studies lead into the NEPA process.

As described in Chapter 6, 16 strategies have been recommended to move forward into NEPA and implementation. Some strategies will require an in-depth NEPA process, while others can move forward quickly. The intent is for the simpler mid-term strategies to be implemented sooner while more complex long-term strategies concurrently or independently move through the NEPA process.

Figure 7.1: Summary of Relationship Between Corridor Study, PEL, and NEPA

Corridor Study

- Incorporated stakeholder, partner, and public input
- Developed & ranked goals & performance measures
- Developed many strategies; screened for feasibility
- Categorized strategies into like scenarios
- Ranked the scenarios based on effectiveness toward goals

PEL

- Continued stakeholder, partner, and public coordination/outreach
- Traffic modeling of strategies
- Preliminary environmental screening of strategies
- Preliminary outreach to regulatory agencies
- Recommended strategies to move forward into NEPA review

NEPA

- Review to determine level of NEPA analysis required
- Emphasize strategies that will require EA/EIS
- Conceptual project development
- Environmental discipline reports
- Continue coordination with partners and regulatory agencies

NEPA REVIEWS

This PEL study has provided a path forward for multiple strategies within a very complex corridor. The anticipated next step is to advance information discovered for the Tumwater to Mounts Road project during the Corridor and PEL studies into the National Environmental Policy Act (NEPA) process. As funding becomes available to further develop the strategies, WSDOT will initiate formal environmental review. For each independent project that follows from this PEL study, WSDOT and FHWA will determine the appropriate level of environmental documentation (categorical exclusion, environmental assessment, or environmental impact statement). Field studies and design will be customized to each project and corresponding level of environmental documentation. A consulting team will be selected to move the NEPA work forward, starting in early 2022. The NEPA work is anticipated to include providing formal resource agency, Tribal, Federal Highway Administration (FHWA), and Public Scoping meeting(s) (possibly virtual), and depending on the strategy, will include preparing specific discipline reports and a permitting matrix for: the natural environment; review and considerations of overburdened communities; and the built environment. The work will require ongoing stakeholder and public communications, preliminary design and, depending on the strategy, field assessments. The NEPA process should result in the appropriate environmental investigation, documentation, public outreach, and agency coordination to sufficiently determine appropriate and practical solution alternatives for the identified strategies.

FUNDING CONSIDERATIONS

Funding will be a major driving factor on which strategies move forward and when. The previous Corridor Study was initiated by Senate Bill 6106 (2017-2018 legislative session), which provisioned a *"corridor study to identify potential improvements between exit 116 and exit 99 off Interstate 5. The study should further develop mid- and long-term strategies from the corridor sketch, and identify potential US 101/I-5 interchange improvements, a strategic plan for the Nisqually River bridges, regional congestion relief options, and ecosystem benefits to the Nisqually River estuary for salmon productivity and flood control."*

The Corridor Study was conducted from 2018 to 2020, including outreach to stakeholders. The PEL study began in March 2020 as a continuation of the Corridor Study and included additional stakeholder outreach and screening of the strategies.

The Washington State legislature appropriated $2.25 million for SEPA/NEPA review. Because of FHWA, One Federal Decision, and information from the Corridor Study, it was determined the best approach would be to start with a Planning and Environmental Linkages (PEL) Study, setting the stage for a NEPA/SEPA review.

The Washington State Legislature has appropriated $5 million to move the PEL into NEPA review.

ADDITIONAL CONSIDERATIONS

There are several factors to consider when moving strategies forward for NEPA review and implementation. For example, WSDOT will continue coordinating with stakeholders, especially local agencies and Tribes, to identify opportunities to coordinate design of projects that are in close proximity to strategies identified to move forward in this PEL Study. WSDOT will engage in conversations about environmental restoration projects that could impact WSDOT facilities or influence the design of the strategies identified to move forward in this PEL Study.

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A APPENDIX A: TRAFFIC MODELING REPORT

I-5 Tumwater to Mounts Road

Planning and Environmental Linkages Study – Modeling Report

Thurston Regional Planning Council

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TABLE OF CONTENTS

INTRODUCTION

In 2018, the Washington State Department of Transportation (WSDOT) Headquarters and Olympic Region and Thurston Regional Planning Council (TRPC) entered in partnership to develop a transportation modeling framework for the Thurston Region and adjacent areas, with emphasis on the I-5 corridor between 93rd Avenue in Tumwater to Mounts Road and SR-101 from I-5 to Black Lake Boulevard. The modeling framework includes integrated Travel Demand Model (TDM) and Dynamic Traffic Assignment (DTA) model platforms.

In 2019-2020 WSDOT and TRPC continued their partnership collaborating on the I-5 Tumwater to Mounts Road Study. This planning study evaluated a range of improvements for the I-5 corridor through a variety of performance measures.

In 2020-2021 WSDOT began the I-5 Tumwater to Mounts Road Planning and Environmental Linkages (PEL) study. They contracted with TRPC to provide transportation modeling support and other assistance. Using the TDM/DTA model framework, alternatives were analyzed for their discrete benefit, for either a 2030 or 2045 time horizon, compared to a base model at the same time horizon. The analysis focused on evaluating the effect of the improvement on mobility, using either or both of the following as performance measures:

- Intersection level of service.
- I-5 corridor speed.

Modeling results were integrated into the PEL study.

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MODEL FRAMEWORK OVERVIEW

The integrated modeling framework includes enhancements to the existing Regional Travel Demand Model as well as the development of the I-5 DTA.

Regional Travel Demand Model

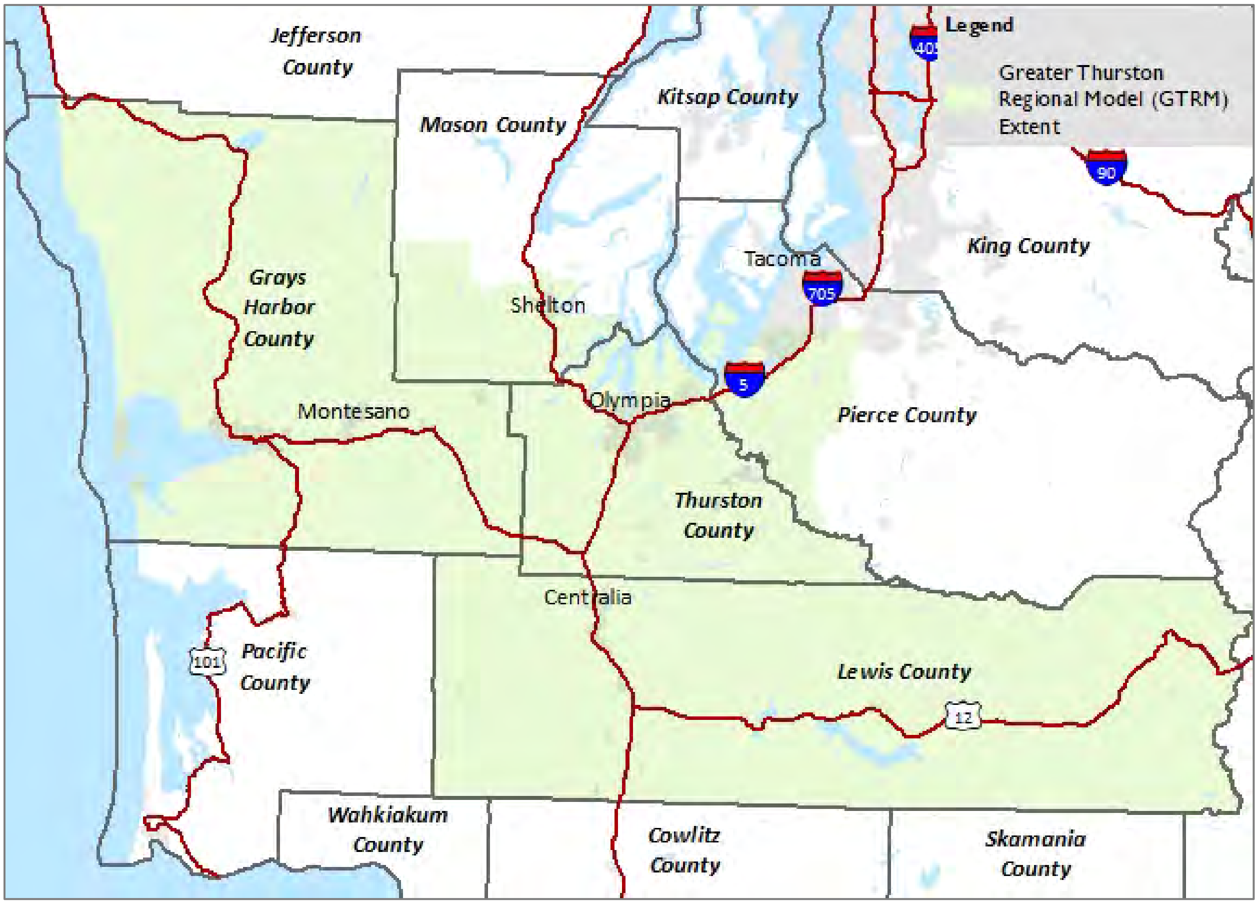
TRPC's Greater Thurston Regional Model (GTRM), a macro model developed in the EMME modeling platform, covers all of Thurston, Lewis and Grays Harbor counties, and parts of Pierce and Mason counties (Figure 1). Macro models are typically used to evaluate the impacts of future changes in either transportation facilities (supply) or land use location and/or quantity (demand) on the regional transportation system's level of service.

The GTRM model provides estimates of trips (volume) and speeds (delay) in the peak hour by various modes of travel such as vehicles, trucks, transit, school buses, bicycles, and pedestrians on all major roadways and paths within the model area. The trip tables generated in the travel demand model are used as inputs into the I-5 DTA.

While a macro model can quickly forecast impacts of significant changes in supply and demand, many more location-specific policy decisions require analytics that stretch the applicability of macro models, such as measuring the impact of intersection controls, presence of turning bays at intersections, impact of buses stopping in the roadway, and response to other traffic through car following, and lane changing. These shortcomings can be overcome by using a DTA model in conjunction with the regional model.

Full documentation of the GTRM is available on TRPC's website: http://www.trpc.org/860/Regional-Travel-Demand-Model.

FIGURE 1: Geographic extent of the Greater Thurston Regional Model

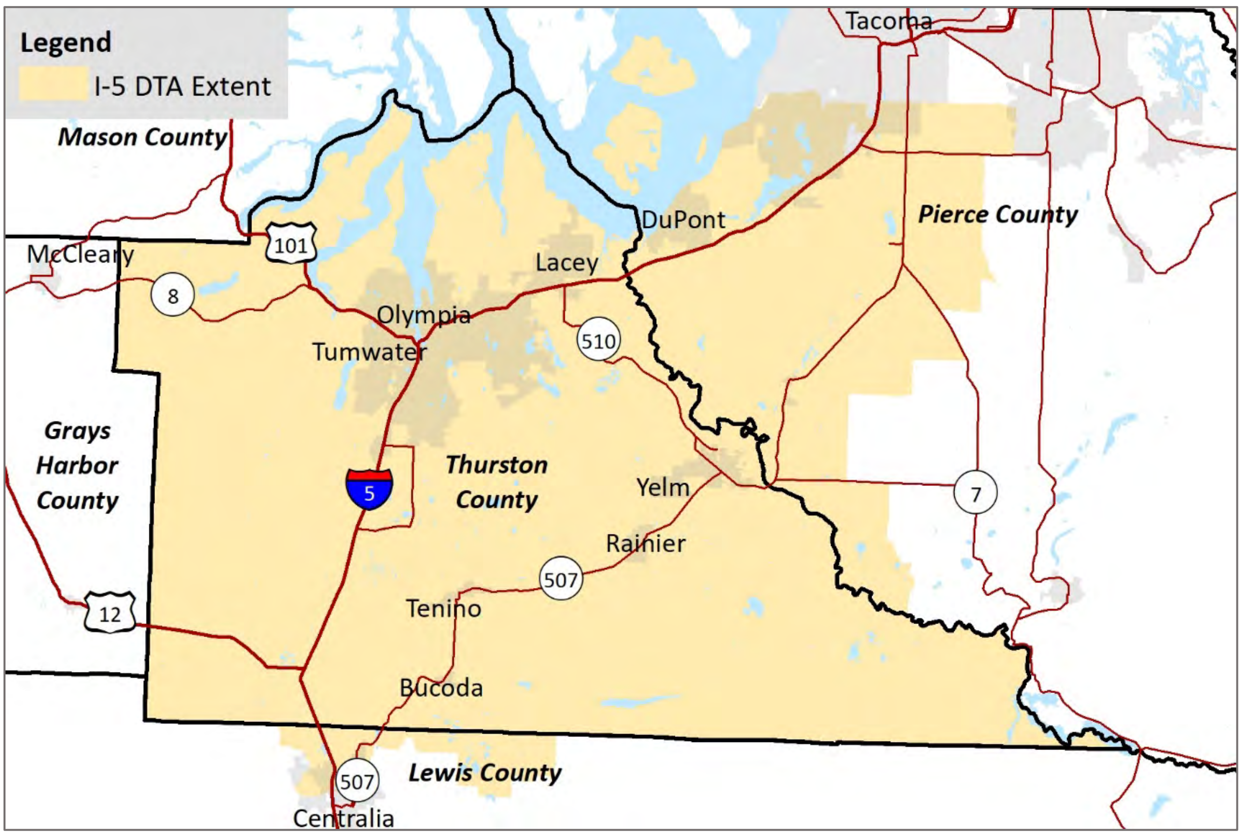


Dynamic Traffic Assignment Model

The DTA model developed for the planning study (I-5 DTA), and used in the PEL study is a subarea mesoscopic traffic model built in the Dynameq modeling platform. The Dynameq modeling platform allows for the simulation of the movement of individual vehicles on lanes, with car-following models, gap-acceptance models, and explicit signal timings normally associated with conventional microscopic models such as Synchro. The I-5 DTA is used to model traffic flows, intersection movements, and traffic delay.

The I-5 DTA model extends from Pierce County (SR-512) to Lewis County (including Centralia), and covers all of Thurston County (Figure 2).

FIGURE 2: Geographic extent of the I-5 DTA model



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I-5 PEL STUDY MODEL UPGRADES

Updates to the Models

The models underwent several updates after the completion of the planning study and prior to the PEL study. They included:

Updating the land use forecast for the trip tables. The base year was updated to a new 2018 base, and the future year was extended to 2045 to be consistent with TRPC's recently adopted updated to the Population and Employment forecast.

A 2030 mid-year model was developed.

A new process for exporting trip tables from the TDM into the DTA was implemented to increase consistency between model scenarios.

A number of network tweaks were implemented to better direct traffic flows between local streets and I-5.

The DTA model was reviewed by Transpo Consulting, and a number of network and operational upgrades were implemented to increase model stability.

- Re-coded ramp to freeway merger by splitting the end of the link, and increased the speeds to 60 mph.
- Adjusted ramp meters by changing the double signal change to a single meter with dual movement.
- Adjusted non-signalized intersections with a generalized cost function adding a turn penalty for right turns (5 seconds) and left turns (10 seconds).
- Increase traffic flow to roundabouts.

Changes were made to model run protocol, including:

- Trip tables were developed for one-hour periods rather than half hour periods.
- The DTA assignment intervals were changed from a total of 10 at 30-minute intervals, to 20 at 15-minute intervals.
- The origin-destination path search was increased from 10 to 20 per interval.
- Reduced the number of iterations for the assignments from 65 to 60.

Model Calibration/Validation

After network and trip table updates, The DTA model was re-calibrated to traffic counts, with emphasis placed on balancing traffic between I-5 and parallel routes. After model calibration, the model was validated in three ways:

- Traffic count validation (volumes).
- Speed data on major corridors.
- Intersection delay within the City of Olympia.

Traffic Counts

Travel models are expected to replicate observed conditions within reason before being used for analysis. A standard part of the model validation process is to compare modeled traffic volumes with traffic counts measured on the road network.

The I-5 DTA model volumes compared to traffic counts produced an R squared of 0.9682 for the PM peak hour (Figure 3). The R squared was slightly higher for both peak periods when looking at freeway and freeway ramp volumes compared to counts.

FIGURE 3A: R squared correlation between DTA subarea model volumes and traffic counts – all facilities - PM

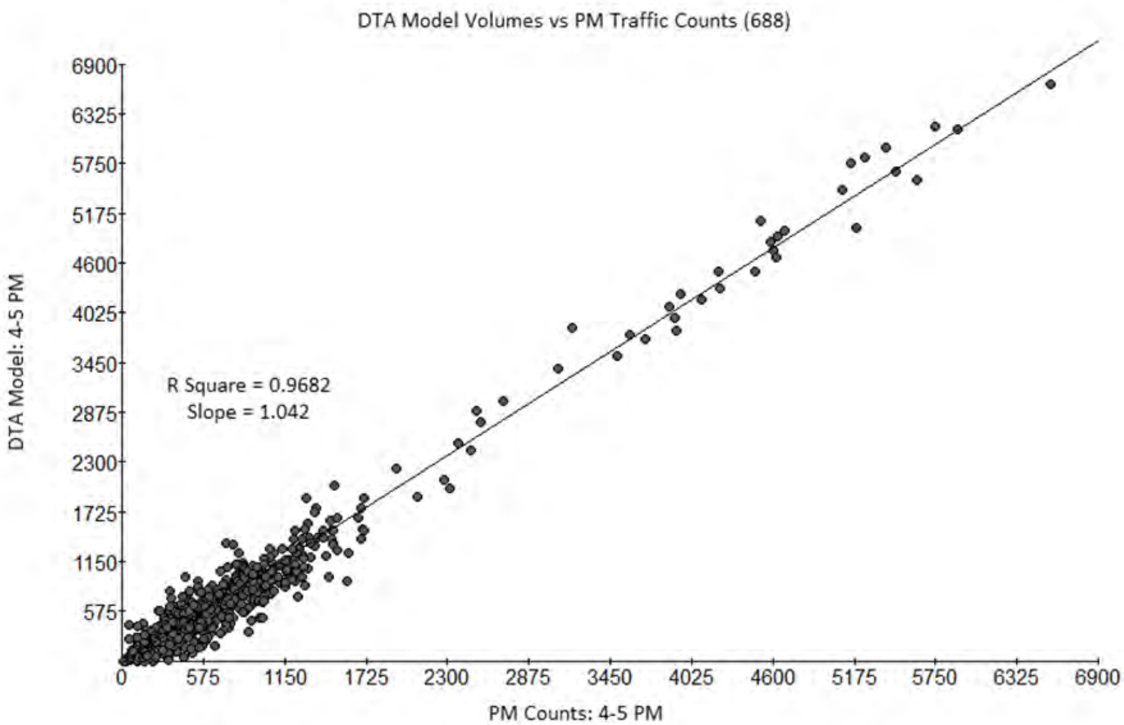
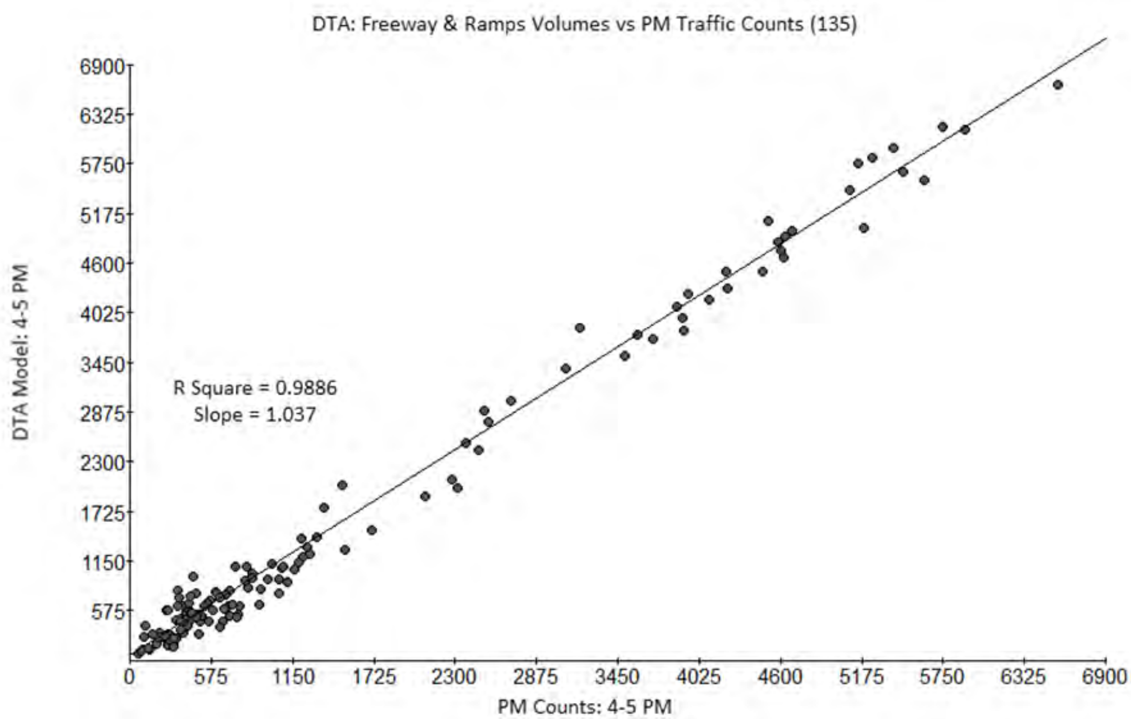


FIGURE 3B: R squared correlation between I-5 DTA subarea model volumes and traffic counts – freeway and ramps - PM


DTA: Freeway & Ramps Volumes vs PM Traffic Counts (135)
DTA Model: 4-5 PM
PM Counts: 4-5 PM
R Square = 0.9886
Slope = 1.037
6900
6325
5750
5175
4600
4025
3450
2875
2300
1725
1150
575
0
575
1150
1725
2300
2875
3450
4025
4600
5175
5750
6325
6900

Speed Comparison

Other I-5 DTA model validation data sets are corridor travel time and average speed. Travel time and speed data were downloaded from the National Performance Management Research Data Set (NPMRDS) procured and sponsored by Federal Highway Administration (FHWA), and provided to Washington State Department of Transportation (WSDOT) and Metropolitan Planning Organizations such as TRPC. NPMRDS data from February of 2017 onward is provided by a team led by the University of Maryland Center for Advanced Transportation Technology Laboratory (CATT Lab) and is based on data collected by INRIX.

The following data were downloaded for the corridors shown in Figure 10.

- Month: Entire month of March 2018
- Days: All weekdays
- Time of day: 6-9 am and 3-6 pm
- Passenger vehicles and trucks

Data were compared to the I-5 DTA model data to validate the model for both the I-5 and US-101 corridors and other major arterials within the study area. The reliability of the NPMRDS data declines for lower volume corridors.

FIGURE 4: Corridor segments for speed and travel time validation

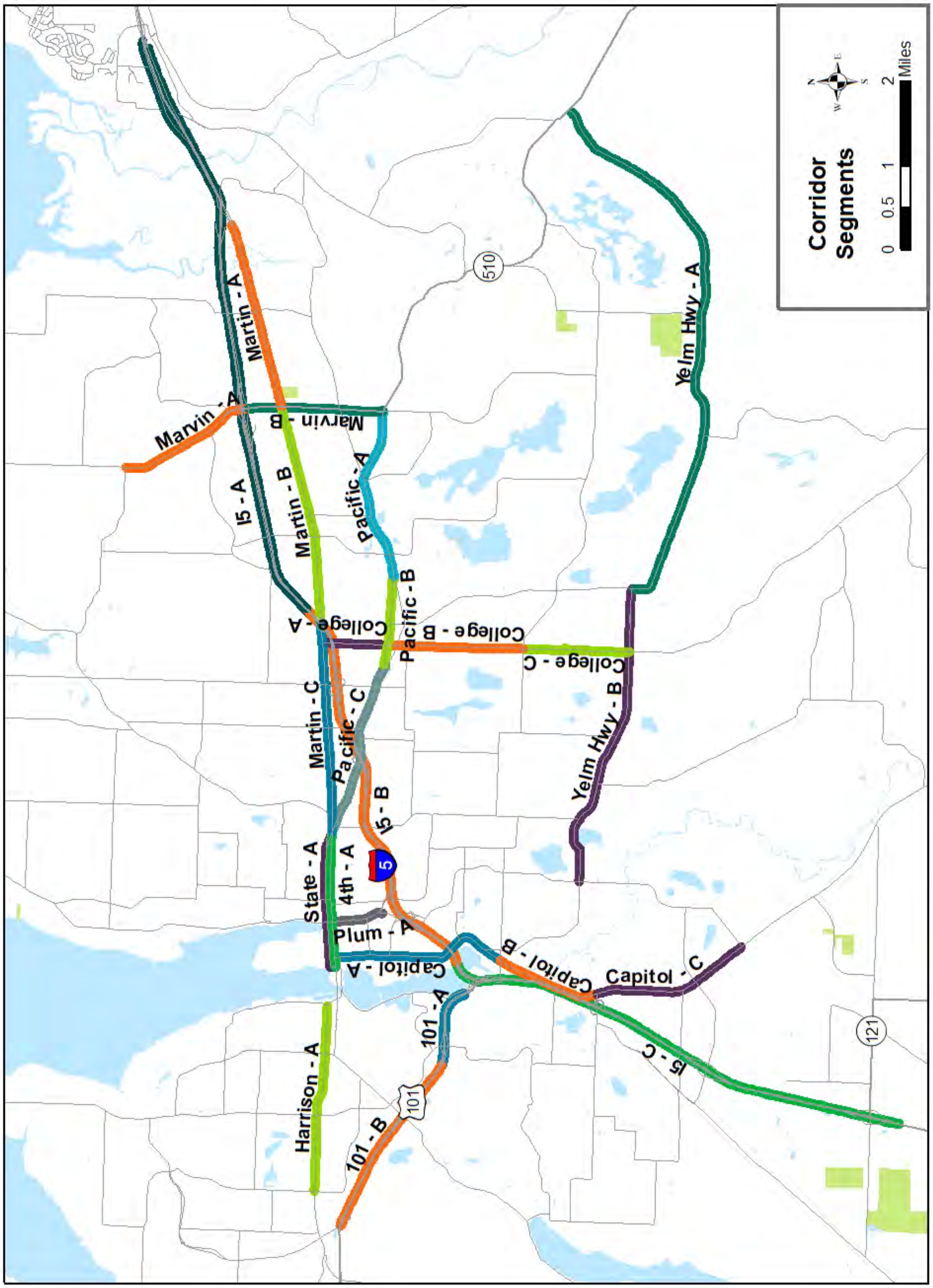


TABLE 4: PM I-5 DTA speed comparison (miles per hour)

	2018 NPMRDS - Corridor 2018 PM Average Congested Speed						2018 DTA - Corridor PM Congested Speed						Difference					
	North Bound			South Bound			North Bound / EB			South Bound /WB			North Bound / EB			South Bound /WB		
	3 to 4	4 to 5	5 to 6	3 to 4	4 to 5	5 to 6	3 to 4	4 to 5	5 to 6	3 to 4	4 to 5	5 to 6	3 to 4	4 to 5	5 to 6	3 to 4	4 to 5	5 to 6
I-5 Seg A							59	59	59	58	34	20						
I-5 Seg B	61	61	60	58	57	58	58	57	57	59	55	53	3	4	3	0	2	5
I-5 Seg C	59	59	59	48	41	39	58	57	56	50	41	34	1	2	2	-2	0	5
I-5 Seg D	62	61	61	60	60	60	62	60	60	62	61	61	0	1	1	-2	-1	-1
Martin Wy Seg A	25	25	24	27	25	24	29	29	28	28	25	26	-4	-3	-5	-1	0	-2
Martin Wy Seg B	20	21	20	18	17	19	23	23	23	20	19	19	-4	-2	-3	-2	-1	0
Martin Wy Seg C	16	15	16	16	15	16	20	20	19	20	20	20	-4	-5	-3	-5	-4	-3
Capitol Blvd Seg A	18	18	17	17	15	14	20	20	19	19	18	18	-2	-2	-3	-2	-3	-3
Capitol Blvd Seg B	20	16	14	24	21	19	25	23	22	27	27	26	-5	-7	-8	-3	-6	-7
Capitol Blvd Seg C	14	13	12	18	19	15	18	19	18	19	17	16	-4	-6	-6	0	2	-1
Plum Seg A	16	14	15	18	15	12	11	11	10	14	13	14	5	3	5	4	2	-2
College Seg A	17	16	15	15	15	12	19	18	17	16	14	13	-1	-2	-2	-1	2	-1
College Seg B	14	14	16	17	20	19	28	28	27	31	30	30	-14	-14	-12	-13	-10	-11
College Seg C	21	18	19	23	27	21	27	26	27	22	21	20	-7	-8	-8	1	6	1
Marvin Seg A	23	26	25	17	19	20	23	22	22	27	26	27	0	4	3	-10	-7	-7
Marvin Seg B	15	15	15	17	15	15	18	17	18	18	13	11	-3	-2	-4	-2	3	4
4th/State Seg A	17	17	16	18	18	18	20	19	19	18	17	16	-3	-2	-3	0	2	1
Harrison Seg A	16	19	19	19	18	20	23	23	23	19	19	19	-6	-4	-4	-1	-1	1
Pacific/Lacey Seg A	24	21	22	27	23	25	25	20	16	25	24	24	-1	2	6	1	-1	1
Pacific/Lacey Seg B				16	15	16	19	18	18	23	23	22				-7	-7	-6
Pacific/Lacey Seg C	17	16	15	17	17	17	18	16	16	15	14	14	-1	-1	-1	2	3	3
US 101 Seg A	49	49	48	51	52	52	49	48	48	55	54	52	0	1	1	-4	-2	0
US 101 Seg B	58	58	59	60	60	60	59	59	59	59	58	57	-1	-1	-1	1	2	3
Yelm Hwy Seg A	34	40	39	39	43	35	46	45	45	45	45	45	-11	-5	-6	-6	-3	-10
Yelm Hwy Seg B	24	22	20	27	24	22	27	26	26	26	25	25	-3	-4	-6	1	-1	-3

Intersection Delay

City of Olympia engineering staff provided the modeling team with 2018 and 2020 Synchro files. The Synchro files contained level of service (for more on Level of Service see Appendix A) estimates developed with traffic counts. In general, the DTA model estimated intersection LOS fairly well. Where differences occurred, they were attributed to:

- Differences in signal timing plans. These were corrected in the study area and will be updated for the entire model in future updates.
- Issues with network configurations, mainly centroid connections too close to the intersections. These were outside of the main study area and will updated in future model updates.
- Differences in traffic volumes compared to traffic counts.

In general, the I-5 DTA model delay reflected delay modeled in Synchro. Some areas of the model, notably West Olympia (Cooper Point Drive and Harrison Avenue) require additional network refinement and calibration. This will be completed in future model updates, as these areas are outside of the main area of interest of the I-5 PEL study.

TABLE 4: Intersection Level of Service Comparison – Synchro versus DTA

Corridor Intersections		Control Type	Olympia 2018 Synchro Model		I-5 PEL Model 2018 DTA	
			Seconds	LOS	Seconds	LOS
Martin Way	College St	Signal	19	B	24	C
	Sleater-Kinney Rd	Signal	52	D	30	C
	Lilly Rd	Signal	39	D	29	C
	Ensign Rd	Signal	7	A	10	A/B
	Phoenix St	Signal	20	B	23	C
	Pacific Ave	Signal	14	B	22	C
State Ave	Puget Dr	Signal	19	B	14	B
	Plum St	Signal	17	B	19	C
	Adams St	Signal	10	A	16	B
	Franklin St	Signal	5	A	4	A
	Washington St	Signal	5	A	11	B
	Capitol Way	Signal	21	C	26	C
	Columbia St	Signal	9	A	14	B
4th Ave	Eastside St	Signal	14	B	6	A
	Plum St	Signal	17	B	7	A
	Cherry St	Signal	8	A	6	A
	Adams St	Signal	7	A	3	A

Corridor Intersections		Control Type	Olympia 2018 Synchro Model		I-5 PEL Model 2018 DTA	
			Seconds	LOS	Seconds	LOS
	Franklin St	Signal	7	A	8	A
	Washington St	Signal	8	A	3	A
	Capitol Way	Signal	8	A	11	B
	Columbia St	Signal	13	B	2	A
Pacific Ave	Boulevard Rd	Signal	20	B	20	B
	Patterson St	Signal	9	A	10	A/B
	I-5 on-ramp	Signal	10	B	13	B
	I-5 off-ramp	Signal	15	B	21	C
	Fones Rd	Signal	26	C	44	D
	Lilly Rd	Signal	17	B	22	C
	Sleater-Kinney Rd	Signal	49	D	35	C/D
Plum St	Legion Way	Signal	23	C	18	B
	8th Ave	Signal	14	B	17	B
	Union Ave	Signal	30	C	27	C
Capitol Way	Legion Way	Signal	10	B	7	A
	Union Ave	Signal	11	B	13	B
	14th Ave	Signal	29	C	26	C
Cooper Point Rd	Evergreen Park	Signal	21	C	22	C
	Carriage Dr	Signal	15	B	12	B
	Black Lake Blvd	Signal	64	E	43	D
	Haggen Dr.	Signal	14	B	21	B
	Capital Mall Dr	Signal	39	D	26	C
	Mall Loop	Signal	15	B	21	C
	Harrison Ave	Signal	41	D	34	C
Harrison Ave	Delphi Rd	Signal	20	C	9	A
	Kaiser Rd	Signal	27	C	29	C
	Yauger Way	Signal	21	C	2	A
	Cooper Point Rd	Signal	41	D	34	C
	Kenyon St	Signal	16	B	21	C
	Division St	Signal	54	D	37	D

Performance Measures

The pages that follow outline various mid and long-term scenarios that analyze individual or grouped improvements identified for the study area. All improvements evaluated based on congestion relief, either at the intersection or corridor level. The graphs and tables that are included in the scenario descriptions highlight intersection delay, corridor speed, and corridor volumes.

In general, intersection delay and corridor speed can be translated into a planning-level level of service (LOS). They should be used with caution; local jurisdictions have adopted two-hour level of service standards for intersections; delay is report for a one-hour period in this report (peak hour – 4-5 pm). In addition, local jurisdiction engineers take into account delay on individual legs of an intersection when determining LOS; this report shows overall delay at an intersection. The isn't an adopted LOS standard for corridors.

With these caveats, the tables following shows how intersection and corridor delay can be translated into a LOS.

TABLE 5: Intersection Level of Service

Level of Service	**Signalized Intersection**	**Unsignalized Intersections**	**Description**
A	< 10	< 10	Very low vehicle delays, free traffic flow, signal progression extremely favorable.
B	10 to 20	10 to 15	Good signal progression, more vehicles stop and experience higher delays than for LOS A.
C	20 to 35	15 to 25	Stable traffic flow, fair signal progression, significant number of vehicles stop at signals.
D	35 to 55	25 to 35	Noticeable traffic congestion, longer delays and unfavorable signal progression.
E	55 to 80	35 to 50	Limit of acceptable vehicle delay, unstable traffic flow, progression of traffic near capacity, frequent cycle failures.
F	> 80	> 50	Unacceptable delay, extremely unstable flow, heavy congestion, traffic exceeds capacity, stop- and-go conditions.

SOURCE: HIGHWAY CAPACITY MANUAL 2010, TRANSPORTATION RESEACH BOARD, 2010

TABLE 6: Corridor Level of Service

Automobile Level of Service as Percent Free Flow Speed (PFFS)

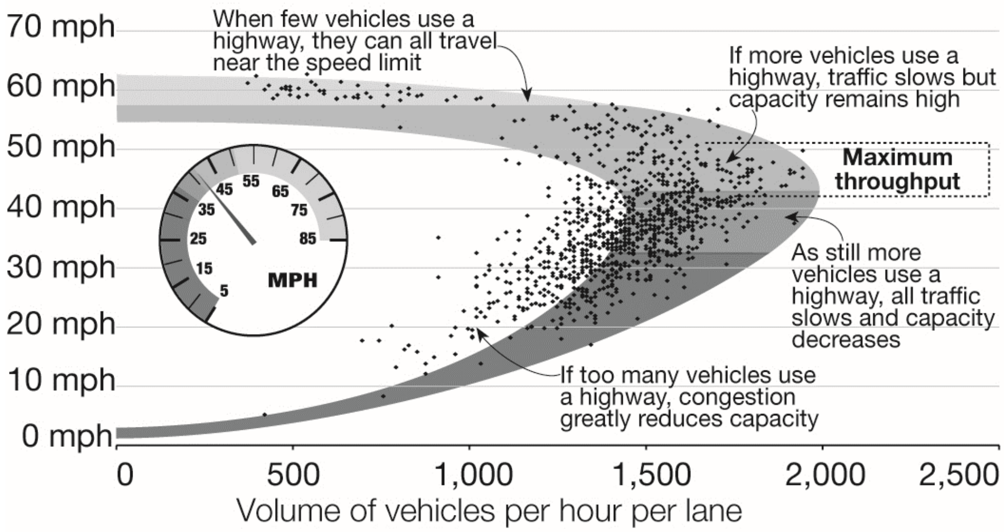
Level of Service	**A-B**	**C**	**D**	**E**	**F**
PFFS (%)	> 83.3	> 75.0 to 83.3	> 66.7 to 75.0	> 58.5 to 66.7	58.5 or less
Posted Speed (mph)					
70	> 58	>53 to 58	> 47 to 53	> 41 to 47	41 or less
65	> 54	> 49 to 54	> 43 to 49	> 38 to 43	38 or less
60	> 50	>45 to 50	> 40 to 45	> 35 to 40	35 or less
55	> 46	> 41 to 46	> 37 to 41	> 32 to 37	32 or less
50	> 42	> 38 to 42	> 33 to 38	> 29 to 33	29 or less
45	> 37	> 34 to 37	> 30 to 34	> 26 to 30	26 or less
40	> 33	> 30 to 33	> 27 to 30	> 23 to 27	23 or less
35	> 29	> 26 to 29	> 23 to 26	> 20 to 23	20 or less
30	> 25	> 23 to 25	> 20 to 23	> 18 to 20	18 or less
25	> 21	> 19 to 21	> 17 to 19	> 15 to 17	15 or less
20	> 17	> 15 to 17	> 13 to 15	> 12 to 13	12 or less

Source: Adapted from Chapter 15, Level of Service section, Highway Capacity Manual, 2010.

Corridor LOS C and D also generally reflects maximum throughput (70 to 85 percent of posted speed.

Understanding maximum throughput: An adaptation of the speed/volume curve

Represents I-405 northbound at 24th NE, 6-10 a.m. weekdays volume;
Speed limit 60 mph; Maximum throughput speed ranges between:
70%-85% of posted speed



Data source: WSDOT Northwest Region Traffic Office.

2030 SCENARIOS

The study team identified 13 improvements, or groups of improvements, as mid-term solutions based on improvements identified in the initial planning study. They were compared to a 2030 base year. The model components for the base year are listed in Appendix B. The 2030 scenarios, including modeling results, are found in the following sections. It should be noted that performance measures were selected based on the geographic area of influence of each scenario.

List of 2030 Scenarios

The following is a list of scenarios for 2030. All were compared to 2030 Base Scenario.

Model	Project	Description	Planning Study Cross Reference
Scenario 1 - 2030	Martin Way and Sleater-Kinney	Add left turn lane from Martin Way East onto Sleater-Kinney Road SE	See Appendix G Operations 1
Scenario 2 - 2030	Nisqually / Martin Way at Nisqually Cut Off Road SE)	Extra lane approaching ramp meter for northbound ramp	See Appendix G Operations 6
Scenario 3 - 2030	Sleater-Kinney Interchange	Construct signal at intersection of I-5 northbound off-ramp and Sleater-Kinney Road. Only southbound lane will be signalized; separate northbound with curbing	See Appendix G Operations 8
Scenario 4 - 2030	Deschutes Parkway	Extend taper on on-ramp	See Appendix G Operations 7
Scenario 5 - 2030	SR 507 in Yelm (SR 507 and SR 702)	Replace intersection with roundabout	Appendix G Operations 9
Scenario 5 - 2030	SR 507 in Yelm (SR 507 at Vail Road)	Replace T-intersection with roundabout	Appendix G Operations 10
Scenario 5 - 2030	SR 507 in Yelm (SR 507 at Bald Hill Road)	Replace intersection with roundabout	Appendix G Operations 10

Model	Project	Description	Planning Study Cross Reference
Scenario 6 - 2030	Part time shoulder use for southbound lane on I-5	Consists of allowing travel on the existing shoulder in the south-bound direction of I-5, between the Sleater-Kinney on-ramp and the Henderson on-ramp.	See Appendix G PTSU
Scenario 7 - 2030	Perimeter Road	Remove gate at Mounts Rd and Perimeter Rd to open to general traffic; add gate at Perimeter Dr and Center Dr; add a SB lane to Center Dr connecting over the weigh station ramp.	See Appendix G - Local Network 26
Scenario 8 - 2030	Mounts Road Interchange	Roundabouts on both the northbound and southbound ramps. Move ramp meter slightly on southbound on-ramp.	See Appendix G Interchange 1
Scenario 9 - 2030	Pacific Avenue Interchange	Add a lane to northbound off-ramp.	See Appendix G Interchange 3
Scenario 10 - 2030	Part time shoulder use for northbound lane on I-5 approaching US 101	Add a part time shoulder use lane between the Deschutes Way off- ramp and the US 101 off-ramp.	See Appendix G Interchange 5

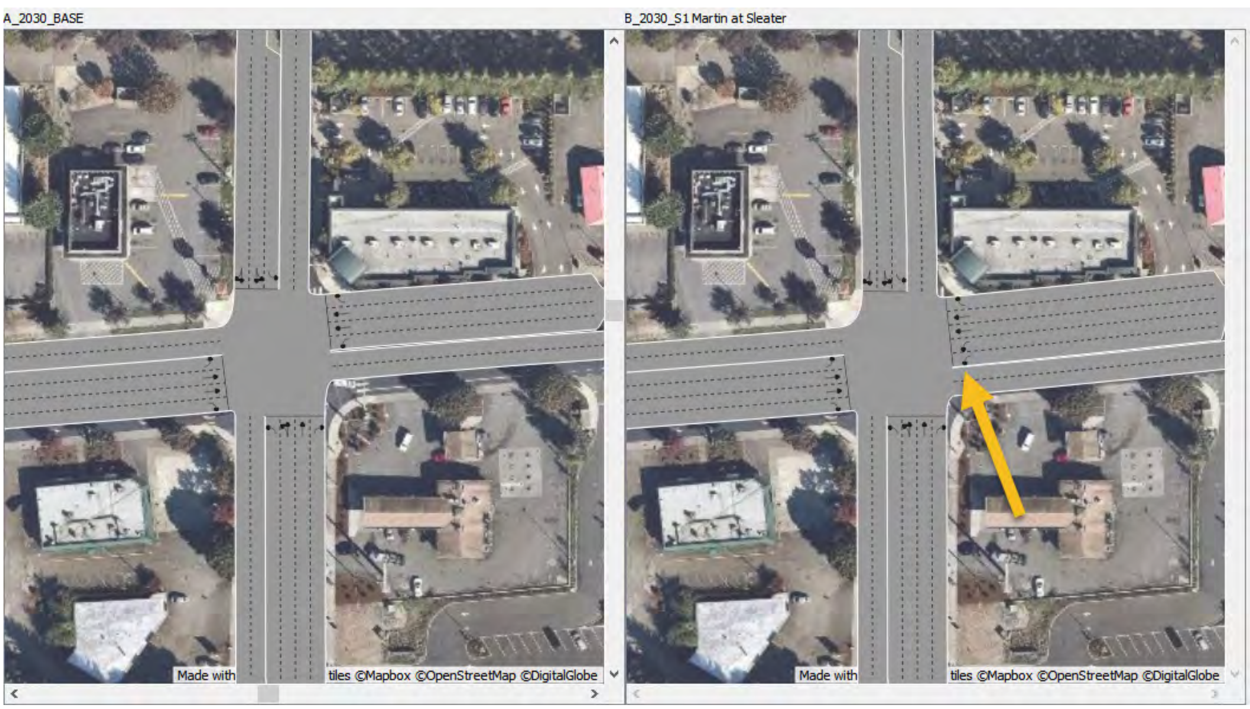
Scenario 1 – 2030 - Martin Way and Sleater-Kinney

Description: Add left turn lane from Martin Way East onto Sleater-Kinney Road SE

Vicinity Map:

Improvement:

Left: Base Model; Right: Improvement



Volume:

Left: Base Model; Right: Improvement. Time period: 4 – 5 pm

Volume shown on road segments - number of trips per hour.

Speed and Delay:

Left: Base Model; Right: Improvement. Time period: 4 – 5 pm.

Speed shown on road segments – average m.p.h. Delay shown in white box – seconds.

Observations:

The improvement allows for a greater number of vehicles to turn left and to proceed through the intersection in the westbound direction during the peak hour. It makes very little difference to speed or delay.

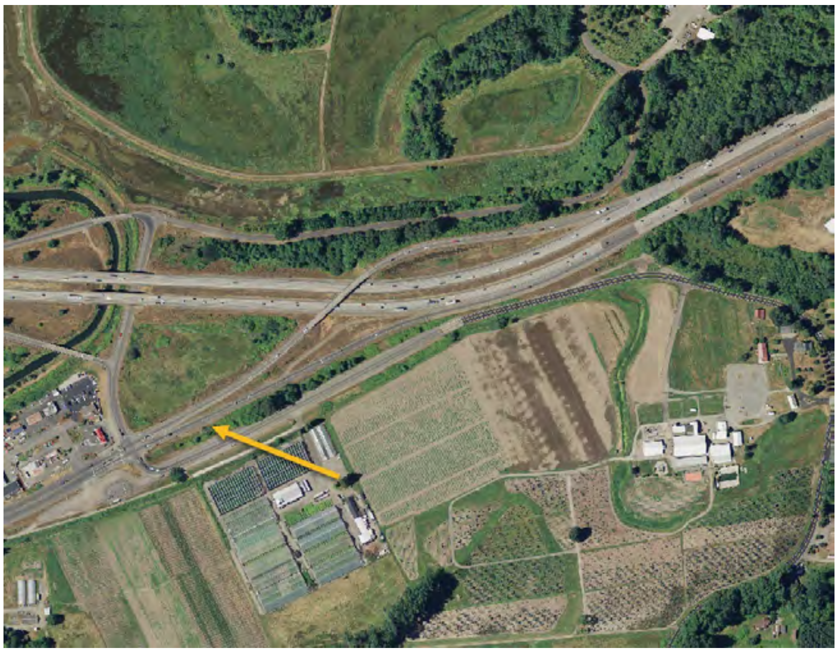
Recommendation:

Move forward; include in 2045 Base Model.

Scenario 2 – 2030 - Nisqually / Martin Way at Nisqually Cut Off Road SE

Description: Extra lane approaching ramp meter for northbound ramp

Vicinity Map:



Improvement:

Left: Base Model; Right: Improvement

Volume:

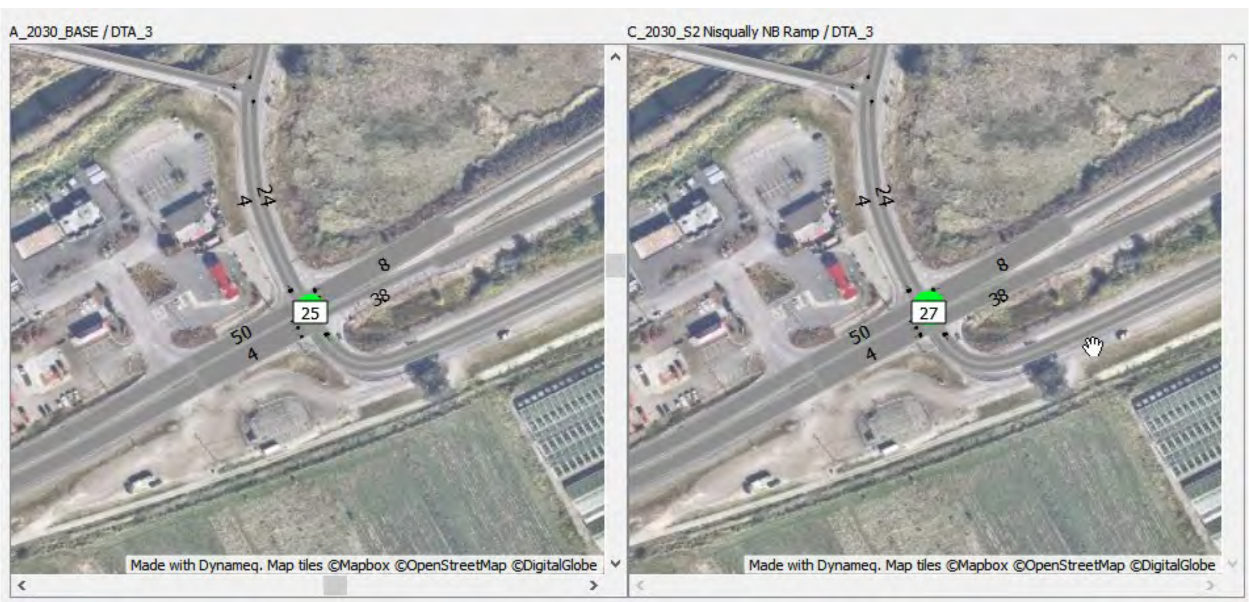
Left: Base Model; Right: Improvement. Time period: 4 – 5 pm

Volume shown on road segments - number of trips per hour.

Speed and Delay:

Left: Base Model; Right: Improvement. Time period: 4 – 5 pm.

Speed shown on road segments – average m.p.h. Delay shown in white box – seconds.



Observations:

Very little difference on volume, speed, or delay. May have more of an impact if signal timing is adjusted.

Recommendation:

Move forward; include in 2045 Base Model.

Scenario 3 – Sleater-Kinney Interchange

Description: Construct signal at intersection of I-5 northbound off-ramp and Sleater-Kinney Road. Only southbound lane will be signalized; separate northbound with curbing

Vicinity Map:

Improvement:

Left: Base Model; Right: Improvement

Volume:

Left: Base Model; Right: Improvement. Time period: 4 – 5 pm

Volume shown on road segments - number of trips per hour.

Speed and Delay:

Left: Base Model; Right: Improvement. Time period: 4 – 5 pm.

Speed shown on road segments – average m.p.h. Delay shown in white box – seconds.

Observations:

The signal will lead to decreased speed and volumes in the southbound direction of Sleater-Kinney Road (the signal would only be on one side of the street). It had very little effect on volumes or speed on the I-5 off-ramp. If this is being implemented for mobility there is little benefit. The improvement should be assessed for safety benefits.

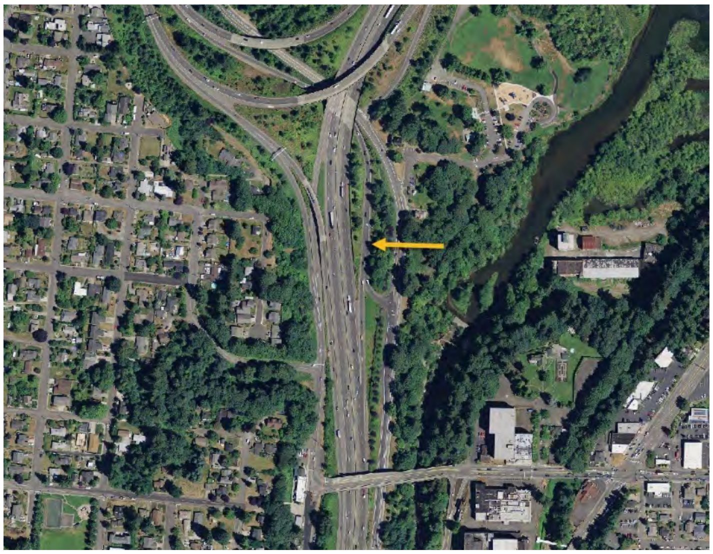
Recommendation:

Move forward; include in 2045 Base Model as it may provide safety benefits.

Scenario 4 – Deschutes Parkway

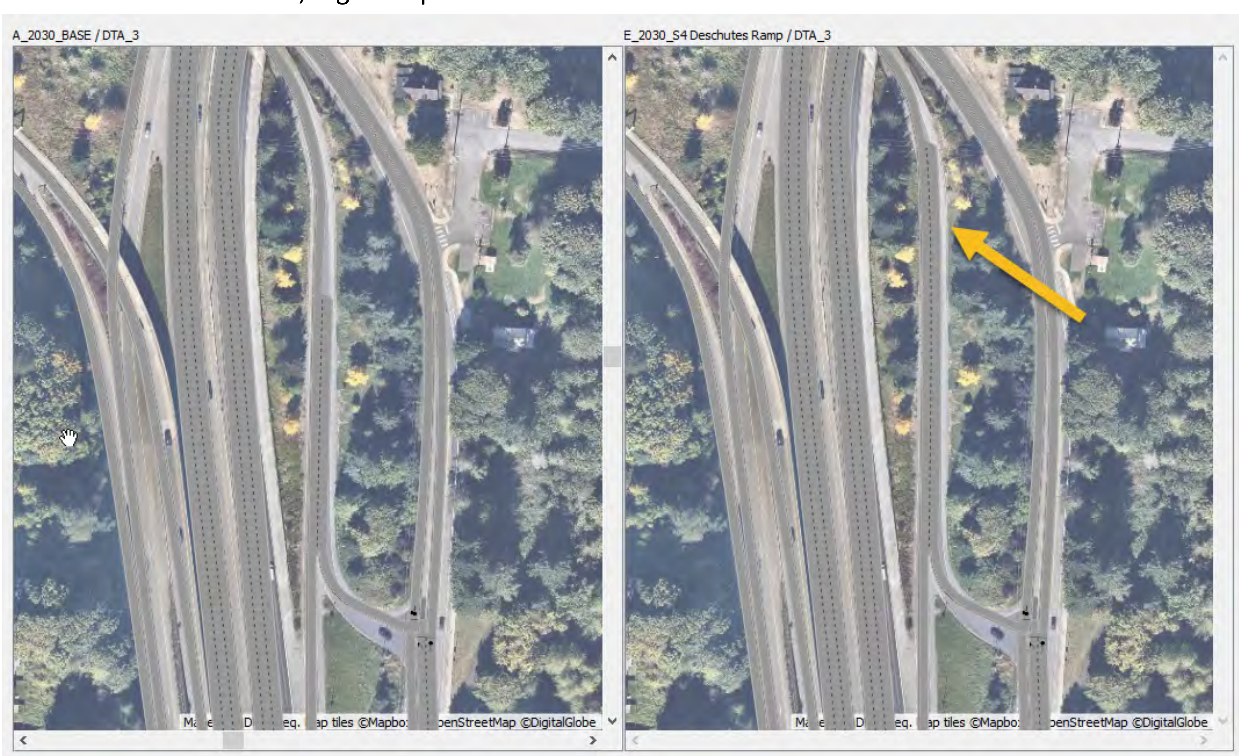
Description: Extend taper on on-ramp

Vicinity Map:



Improvement:

Left: Base Model; Right: Improvement.

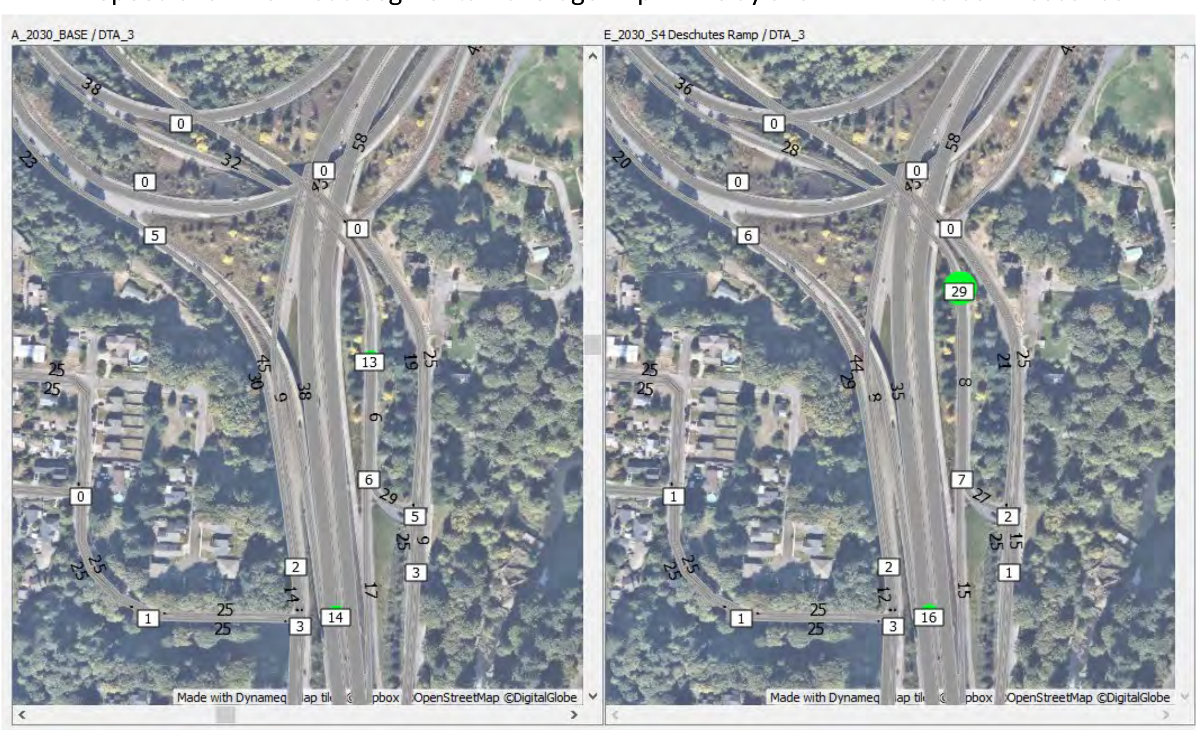


Volume:

Left: Base Model; Right: Improvement. Time period: 4 – 5 pm
Volume shown on road segments - number of trips per hour.

Speed and Delay:

Left: Base Model; Right: Improvement. Time period: 4 – 5 pm.
Speed shown on road segments – average m.p.h. Delay shown in white box – seconds.



Observations:

Overall there is very little changes in volumes, speed or delay between the two alternatives.

Recommendation:

Don’t move forward; no measurable benefit in a very geographically constrained area.

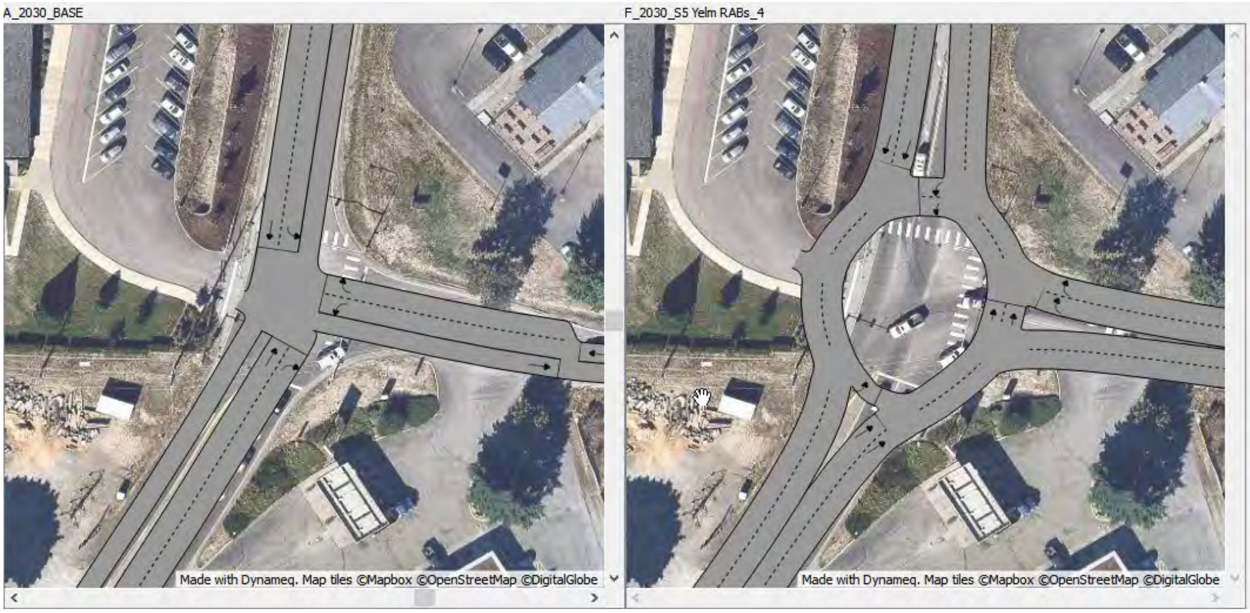
Scenario 5 – SR 507 Roundabouts - Yelm

Description: Replace existing intersections on SR 507 at SR 702, Vail Road and Bald Hill Road in Yelm.

Vicinity Map:

Improvement 1 – Roundabout at SR 507 and SR 702:

Left: Base Model; Right: Improvement.



Volume:

Left: Base Model; Right: Improvement. Time period: 4 – 5 pm

Volume shown on road segments - number of trips per hour.

Speed and Delay:

Left: Base Model; Right: Improvement. Time period: 4 – 5 pm.

Speed shown on road segments – average m.p.h. Delay shown in center of intersection – seconds.

Queue Length:

Top: Base Model; Bottom: Improvement. Time period: 4 – 5 pm.

Lane queues shown in red. Time period: 5:15 pm.

Observations:

There is both a significant reduction in overall delay at the intersection, and in the queue length on SR 702 approaching SR 507.

Recommendation:

Move forward; include in 2045 Base Model.

Improvement 2 – Roundabout at SR 507 and Vail Road:

Left: Base Model; Right: Improvement.

Volume:

Left: Base Model; Right: Improvement. Time period: 4 – 5 pm

Volume shown on road segments - number of trips per hour.

Speed and Delay:

Left: Base Model; Right: Improvement. Time period: 4 – 5 pm.
Speed shown on road segments – average m.p.h. Delay shown in center of intersection – seconds.

Queue Length:

Lane queues shown in red. Time period: 5:15 pm.

Observations:

There is a slight decrease in delay at the intersection, and an improvement on the ease of left hand turns (see Regional Traffic Patterns at end of section.)

Recommendation:

Move forward; include in 2045 Base Model.

Improvement 3 – Roundabout at SR 507 and Bald Hills Road:

Left: Base Model; Right: Improvement.

Volume:

Left: Base Model; Right: Improvement. Time period: 4 – 5 pm
Volume shown on road segments - number of trips per hour.

Speed and Delay:

Left: Base Model; Right: Improvement. Time period: 4 – 5 pm.
Speed shown on road segments – average m.p.h. Delay shown in center of intersection – seconds.

Queue Length:

Lane queues shown in red. Time period: 5:15 pm.

Observations:

There is a decrease in delay at the intersection.

Recommendation:

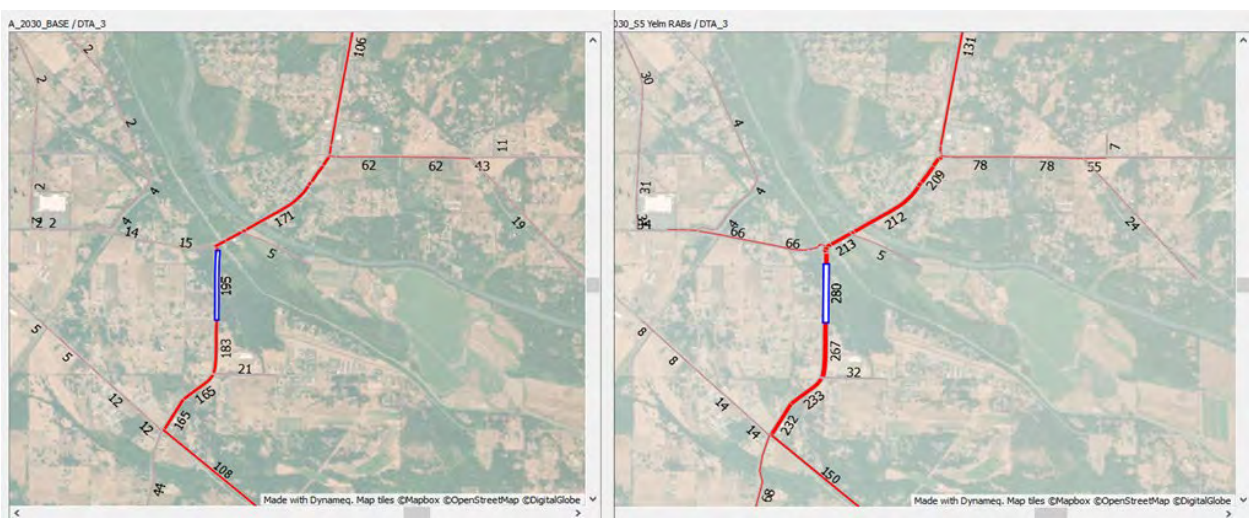
Move forward; include in 2045 Base Model.

Regional Traffic Patterns:

Left: Base Model; Right: Improvement. Time period: 4 – 5 pm.
Select link data shows traffic traveling through the link highlighted in white with a blue outline.
The traffic volumes traveling through the select link data shown in red and black text.

Image below shows traffic traveling through the westbound on SR 507 approaching the roundabout at Vail Road.

The image below shows traffic traveling northbound on Vail Road approaching the roundabout at SR 507.



The image below shows traffic traveling northwest-bound on Bald Hills Road approaching the roundabout at SR 507.

Observations:

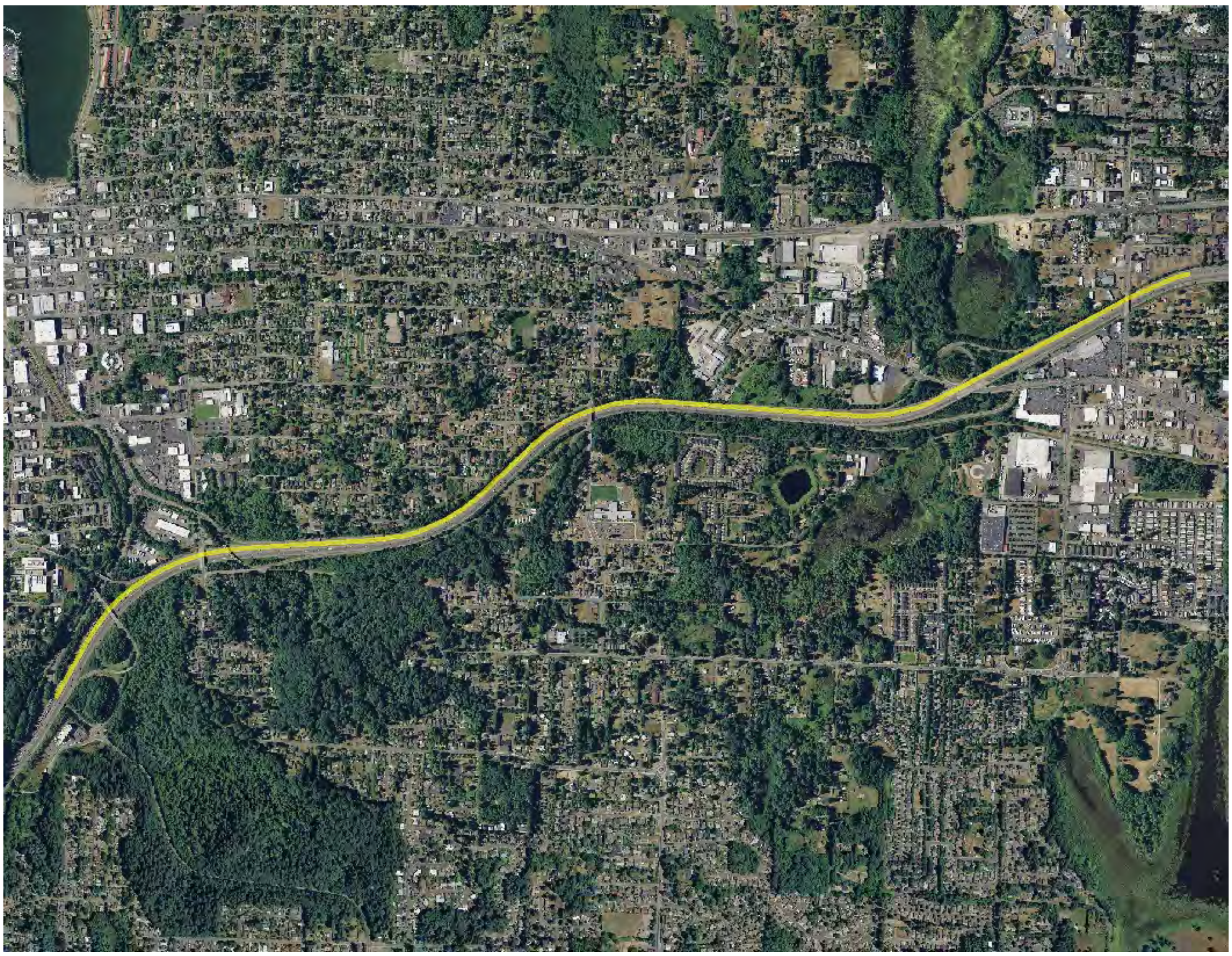
Select links show how traffic patterns change given improvements by isolating traffic flows through a specific road segment, or link on the system. The select links shown in this section indicate the following.

- In general, the roundabout at SR 507 and Vail Road will lead to a greater number of left-hand turns than the non-signalized intersection:
    - From SR 507 to Vail Road
    - From Vail Road to SR 507
- Less vehicles were traveling up Bald Hills Road and turning right on SR 507, likely to avoid left turns at Vail Road.
- No other major shifts in traffic patterns were observed with the roundabouts.

Scenario 6 – 2030 - Part time shoulder use for southbound lane on I-5

Description: Part time shoulder use for southbound lane on I- 5, between the Sleater-Kinney on-ramp and the Henderson on-ramp

Vicinity Map:



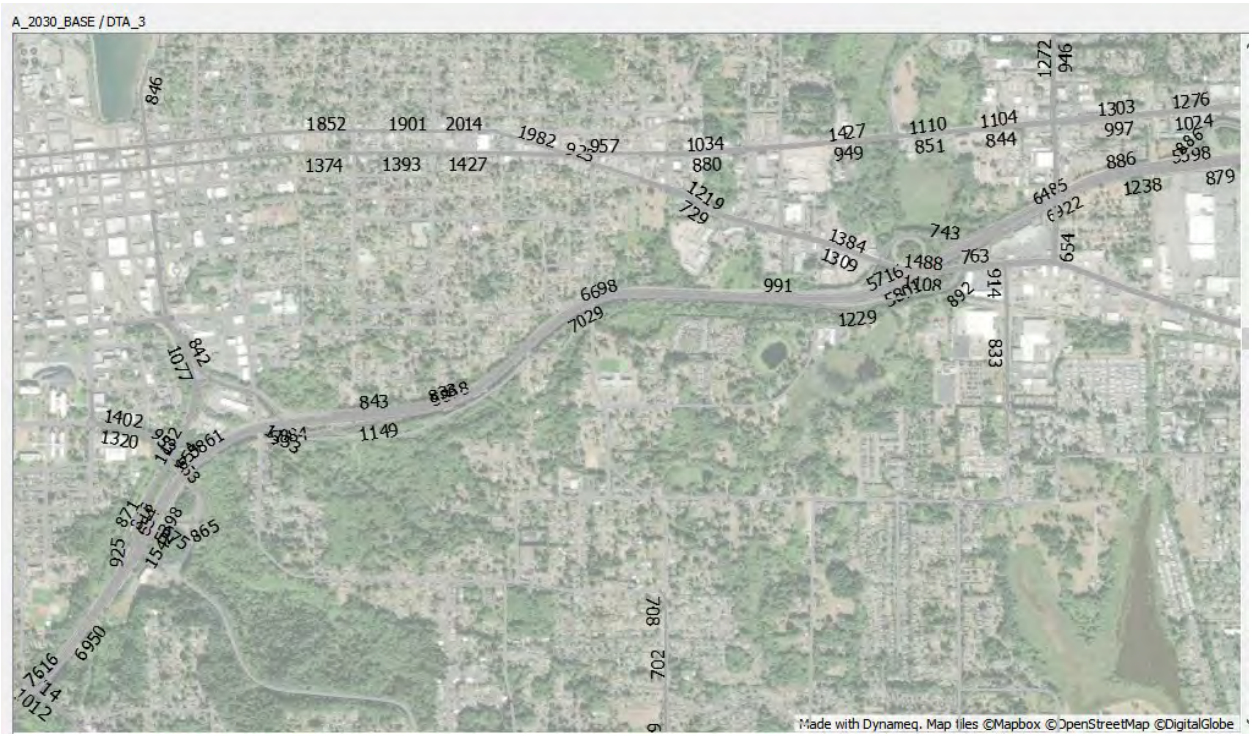
Improvement:

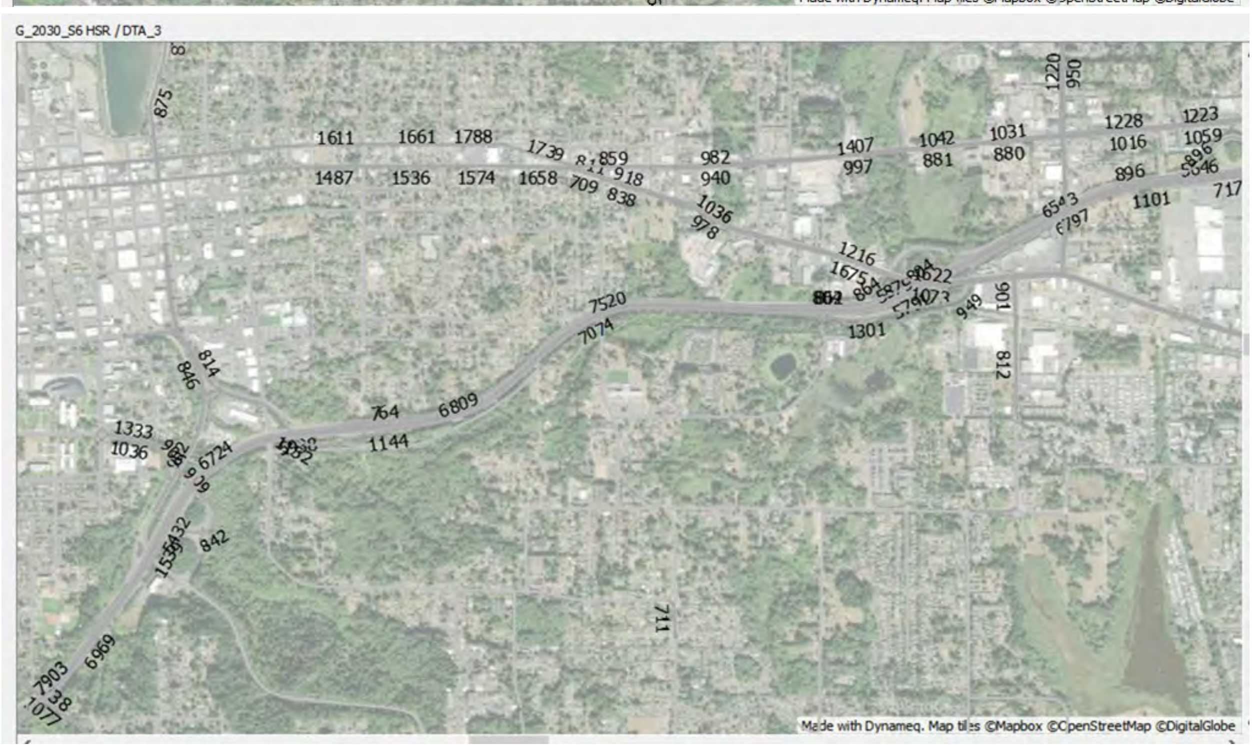
Left: Base Model; Right: Improvement – various locations (north to south)

Volume:

Top: Base Model; Bottom: Improvement. Time period: 4 – 5 pm

Volume shown on road segments - number of trips per hour.

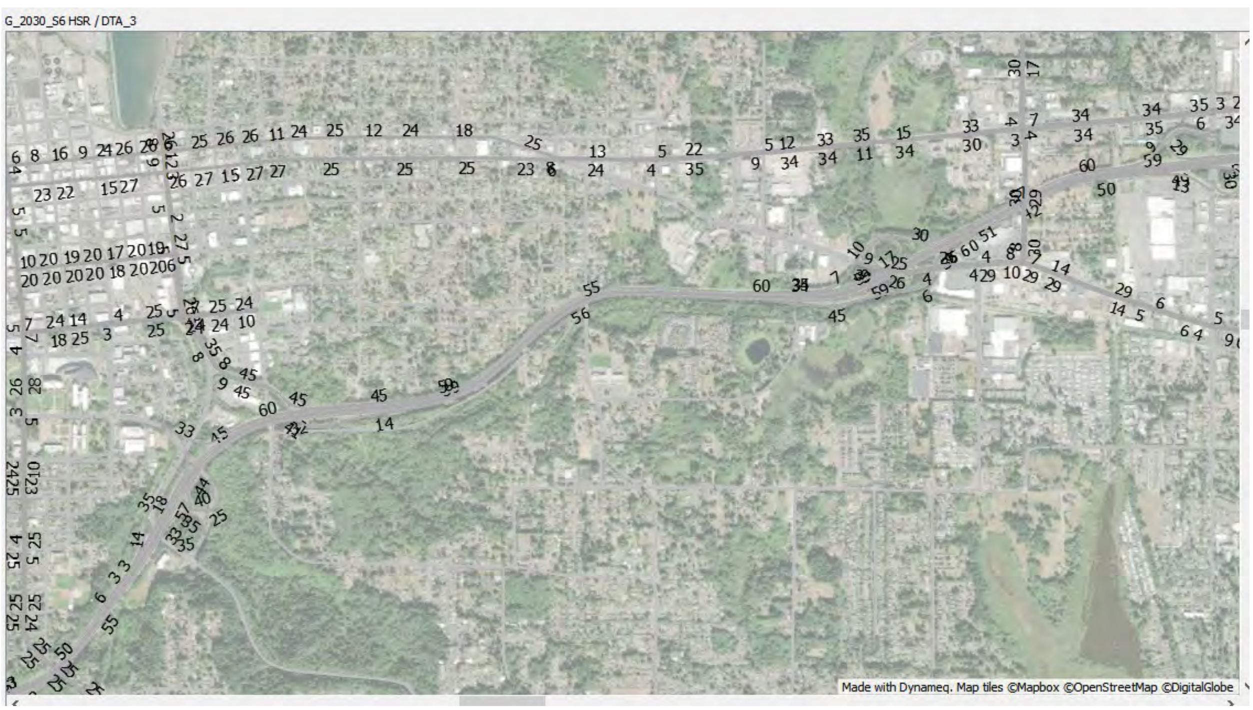




Speed:

Top: Base Model; Bottom: Improvement. Time period: 4 – 5 pm.

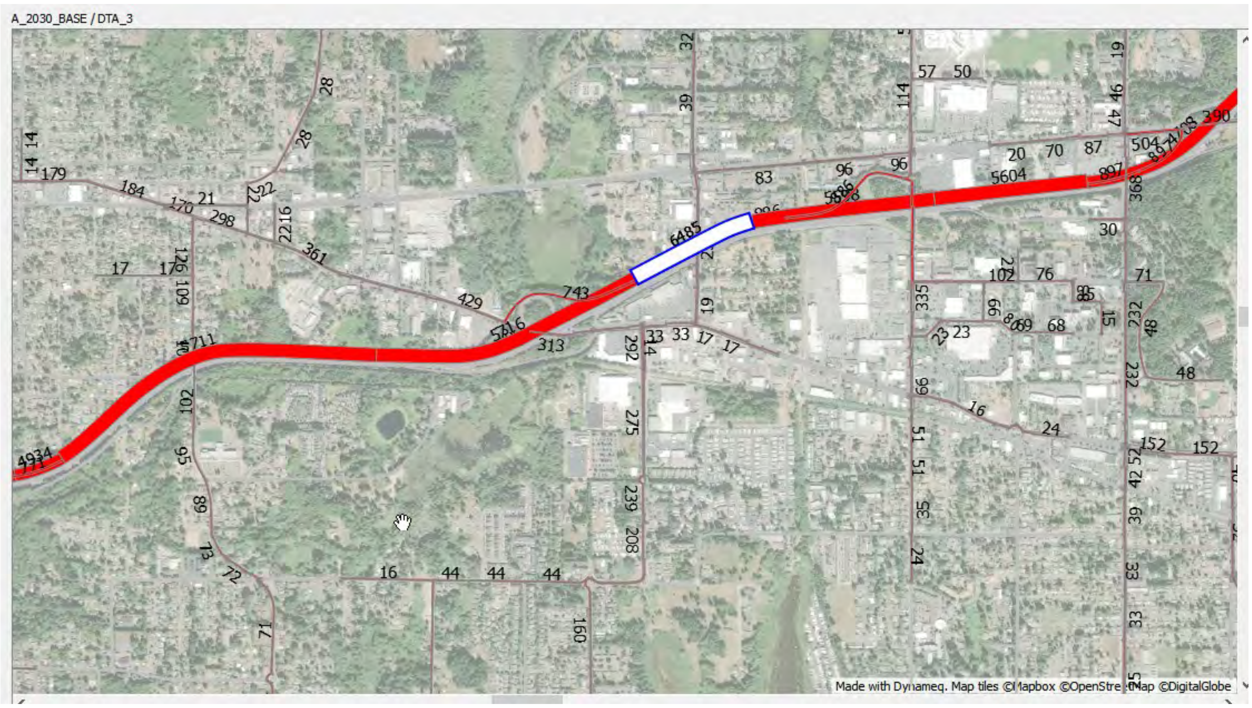
Speed shown on road segments – average m.p.h.

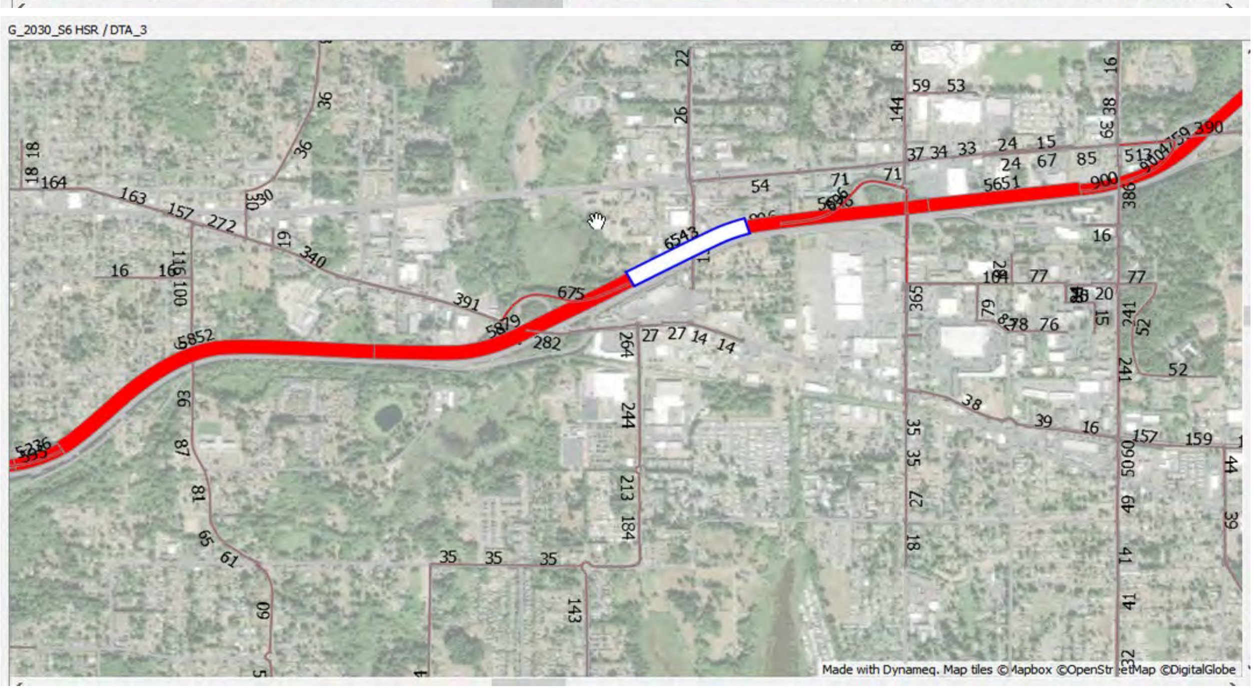


Regional Traffic Patterns:

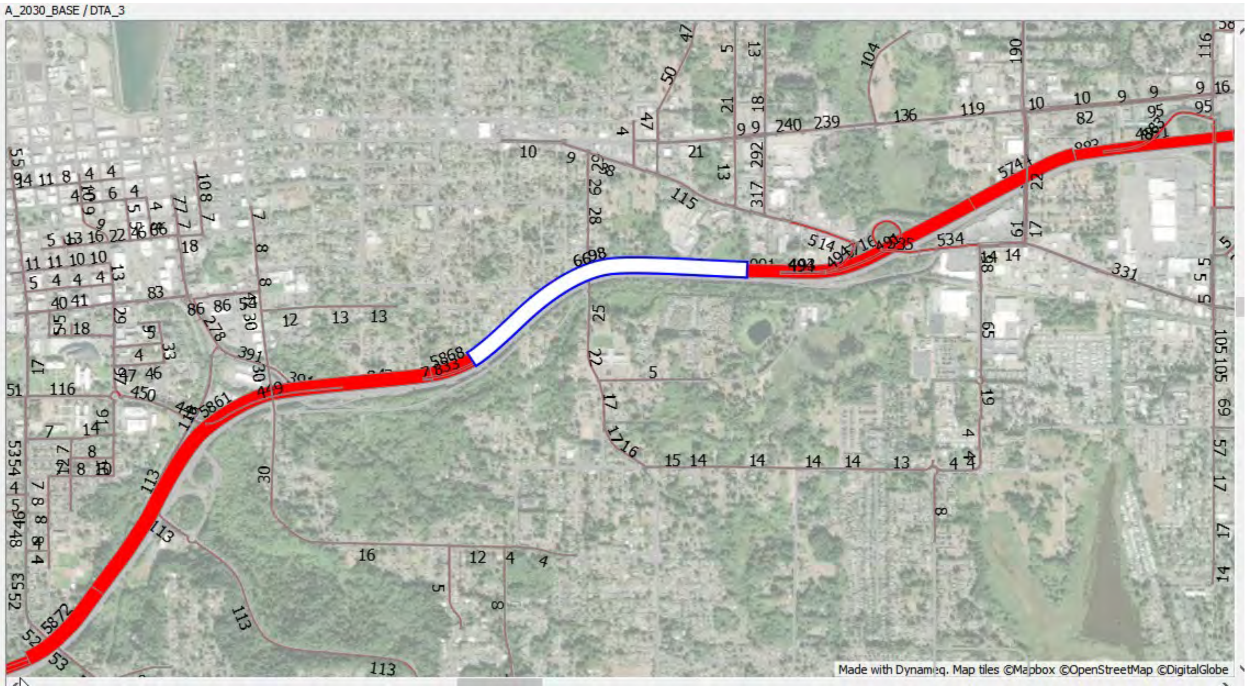
Top: Base Model; Bottom: Improvement. Time period: 4 – 5 pm.
Select link data shows traffic traveling through the link highlighted in white with a blue outline.
The traffic volumes traveling through the select link data shown in red and black text.

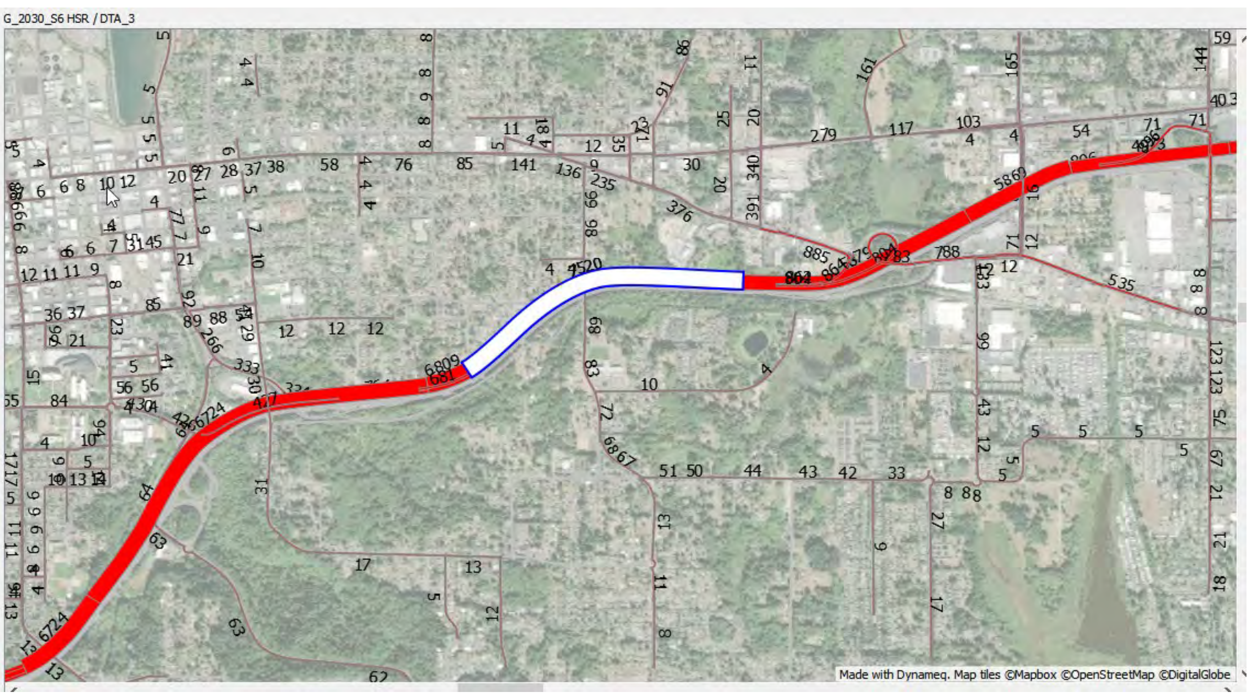
Images below shows traffic traveling southbound on I-5 approaching the Pacific Way interchange where the improvement begins.



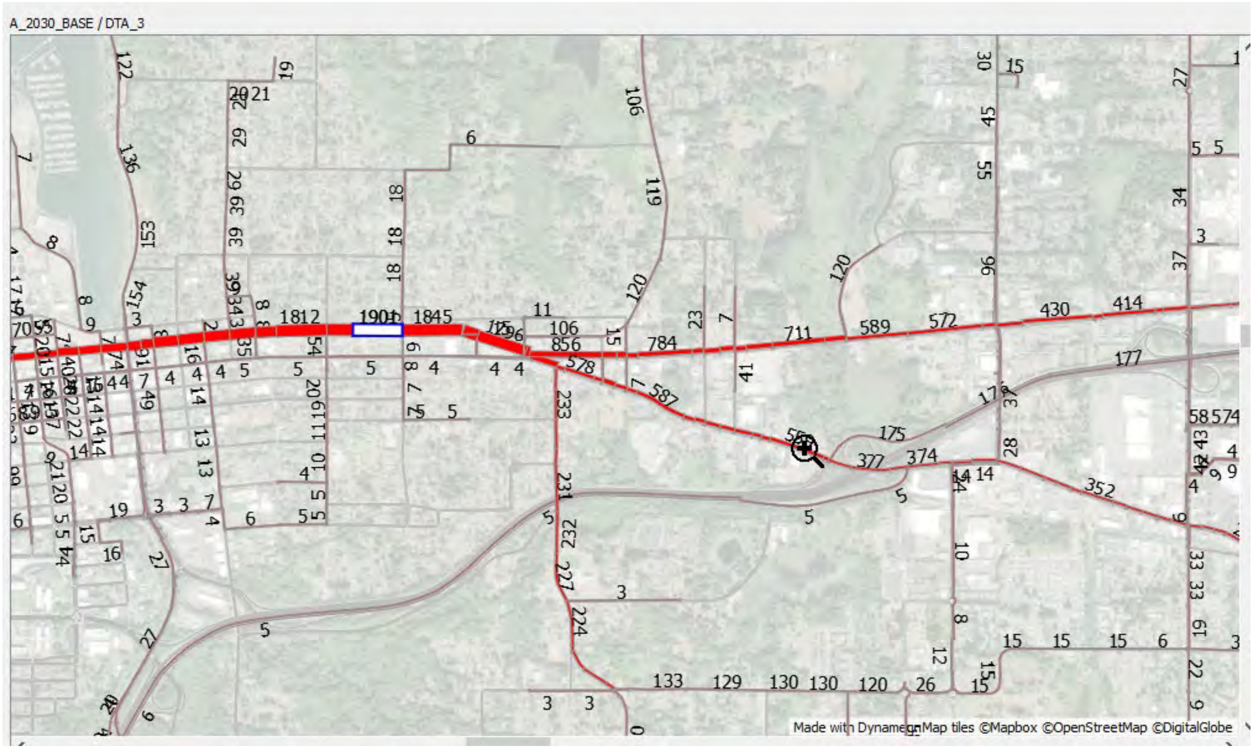


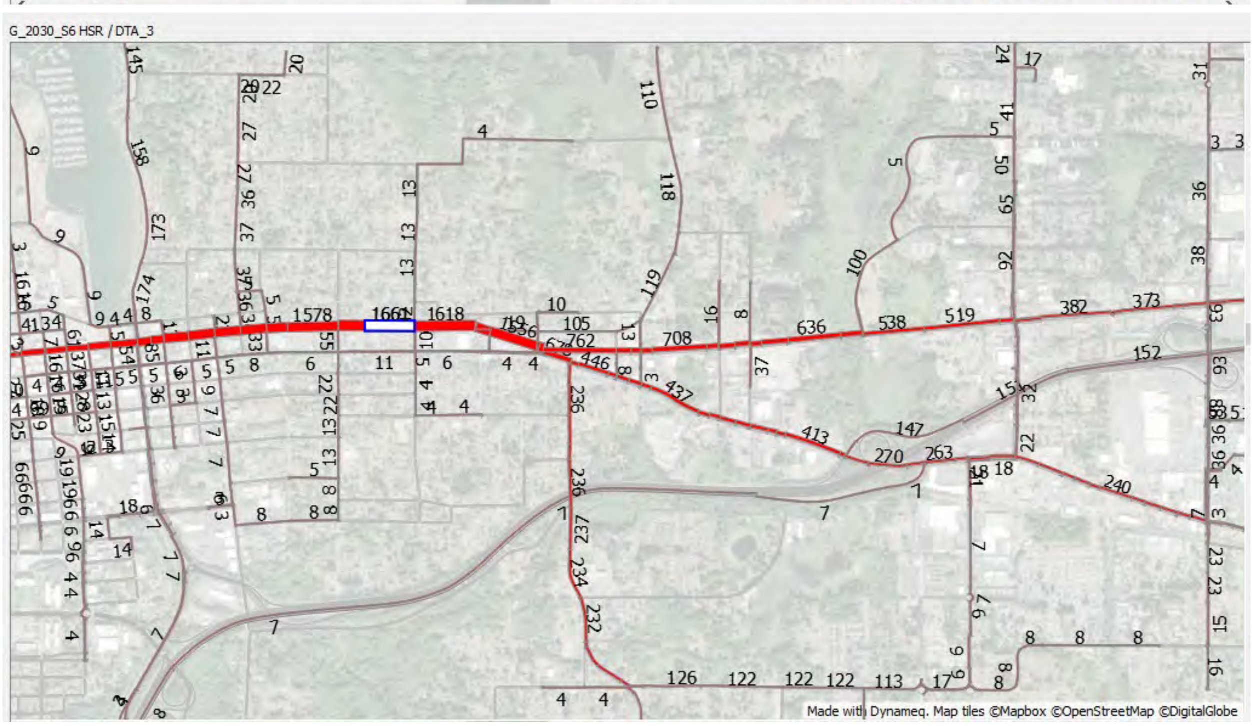
Images below shows traffic traveling southbound on I-5 just past the Pacific Way interchange where the improvement begins.



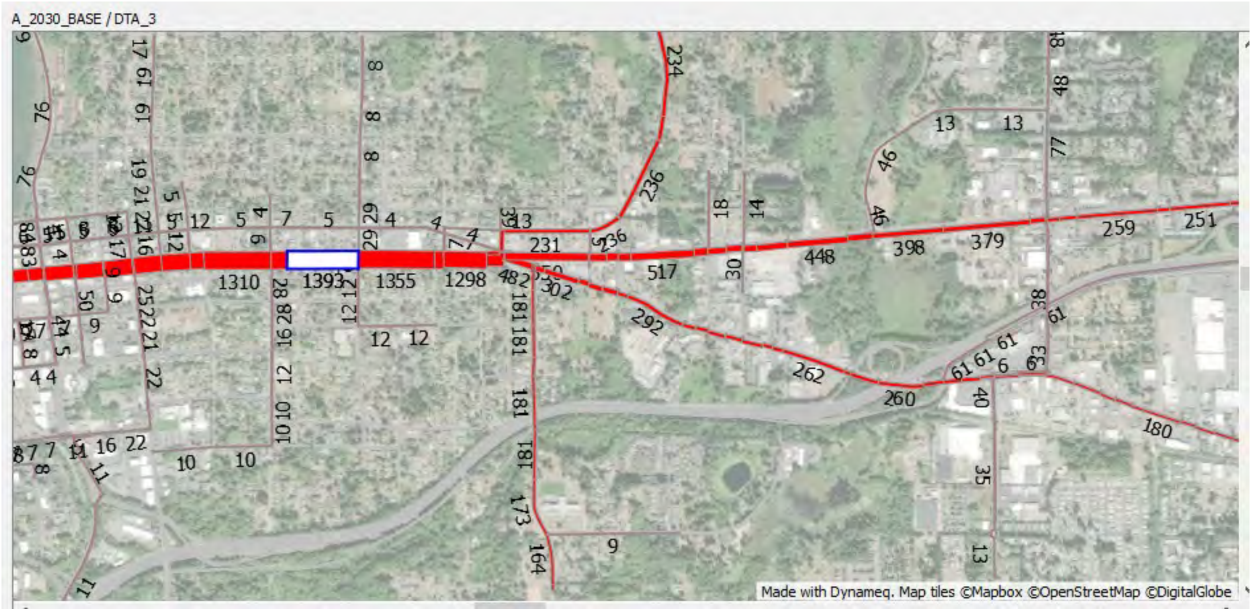


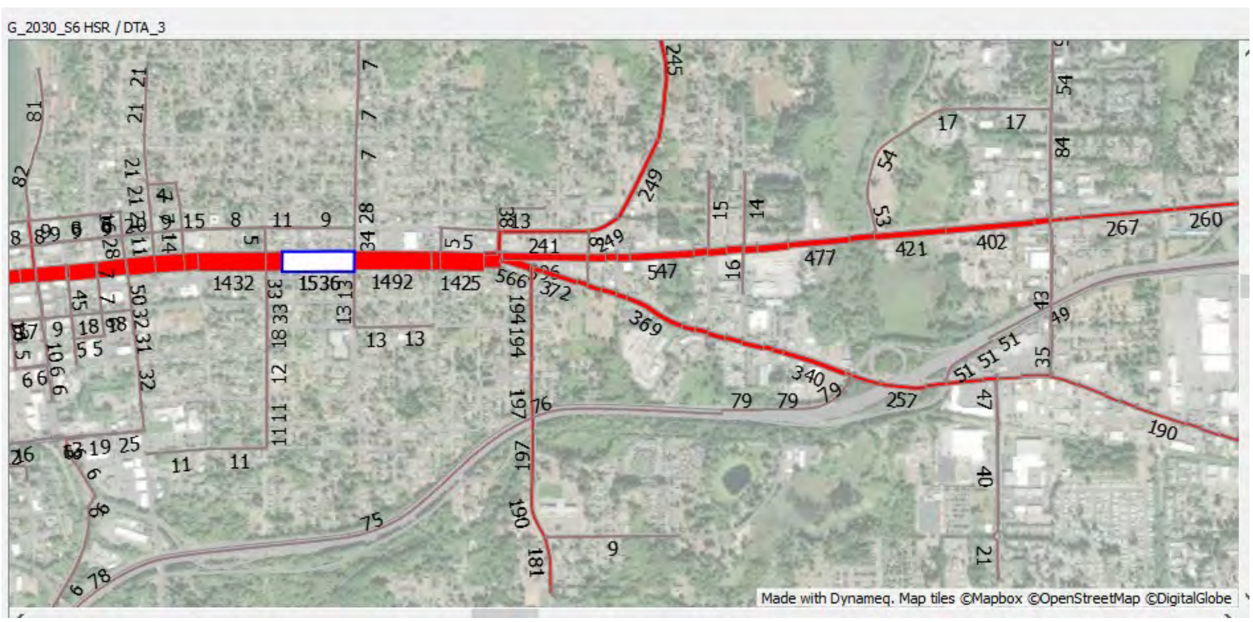
Images below shows traffic traveling eastbound on State Avenue by Fir Street.





Images below shows traffic traveling eastbound on 4th Avenue by Fir Street.





Observations:

Local Streets:

- The existing delays between Pacific Avenue and the Plum Street exit to US 101 are not causing much traffic to divert from I-5 onto local roads (first set of images).
- The additional lane on I-5 south of the Pacific Avenue interchange is drawing more traffic onto I-5 from Pacific Avenue (in both directions) (second set of images). This is resulting in an increase of volume of traffic on Pacific Avenue approaching the interchange, as well as on 4th Avenue (see 4th Avenue select links).
- The existing delays do appear to be causing some local traffic to stay on local roads (see State Street select link), rather than use I-5.
-

Interstate 5:

- The large increase of traffic volumes on I-5 with the additional lane is related to the additional capacity on I-5 allowing more vehicles to get through the section in a given hour (due to increased speeds and reduced delay).

Recommendation:

Move forward; include in 2045 Base Model.

Scenario 7 – 2030 – Perimeter Road

Description: Remove gate at Mounts Rd and Perimeter Rd to open to general traffic; add gate at Perimeter Dr and Center Dr; add a SB lane to Center Dr connecting over the weigh station ramp

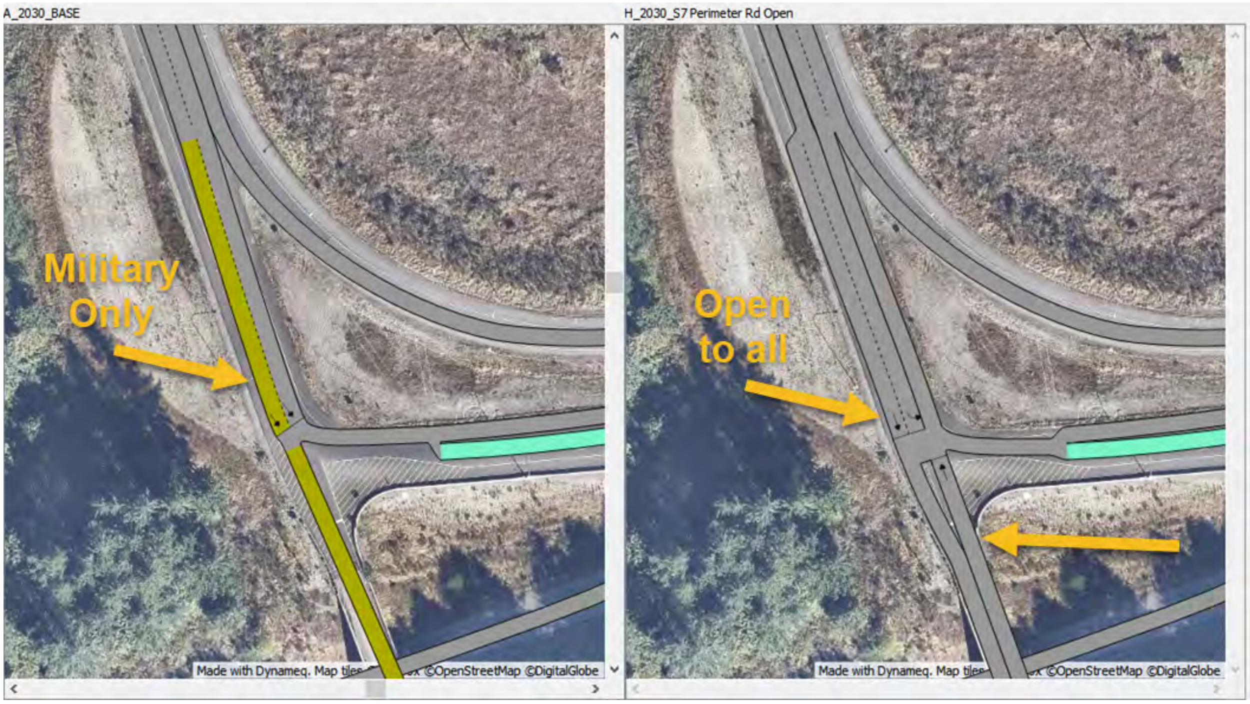
Vicinity Map:

Improvement:

Left: Base Model; Right: Improvement

Orange – restricted to Joint Base Lewis McChord Base traffic

Location – I-5 Off-Ramp

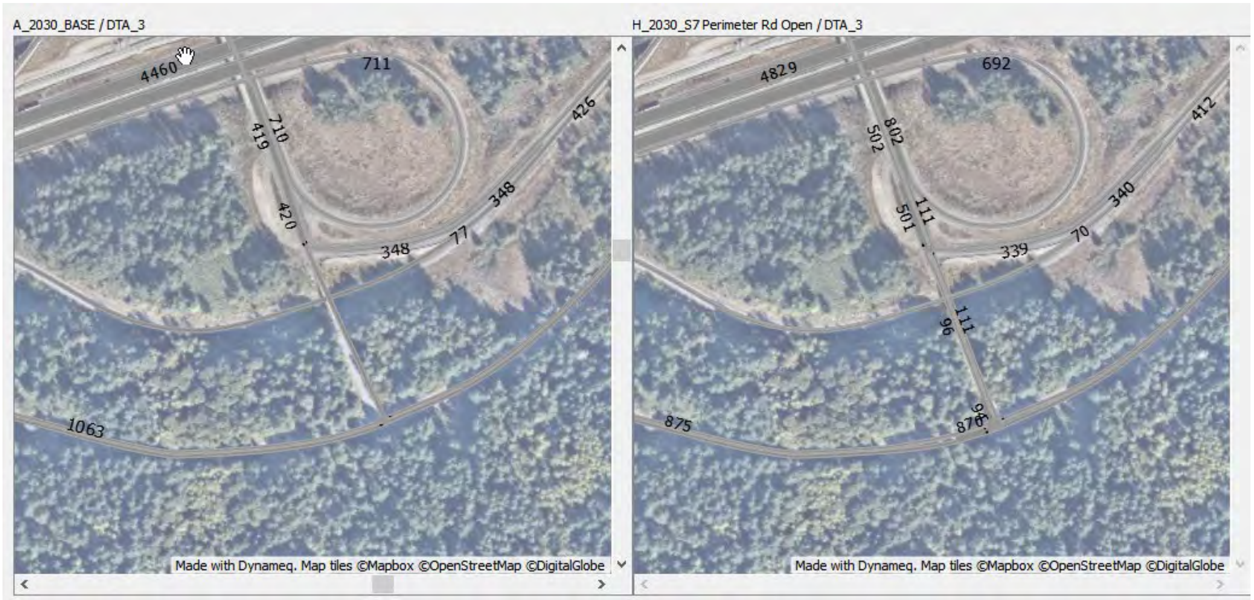


Location – Perimeter Road and Center Avenue

Volume:

Left: Base Model; Right: Improvement. Time period: 4 – 5 pm

Volume shown on road segments - number of trips per hour.



Speed and Delay:

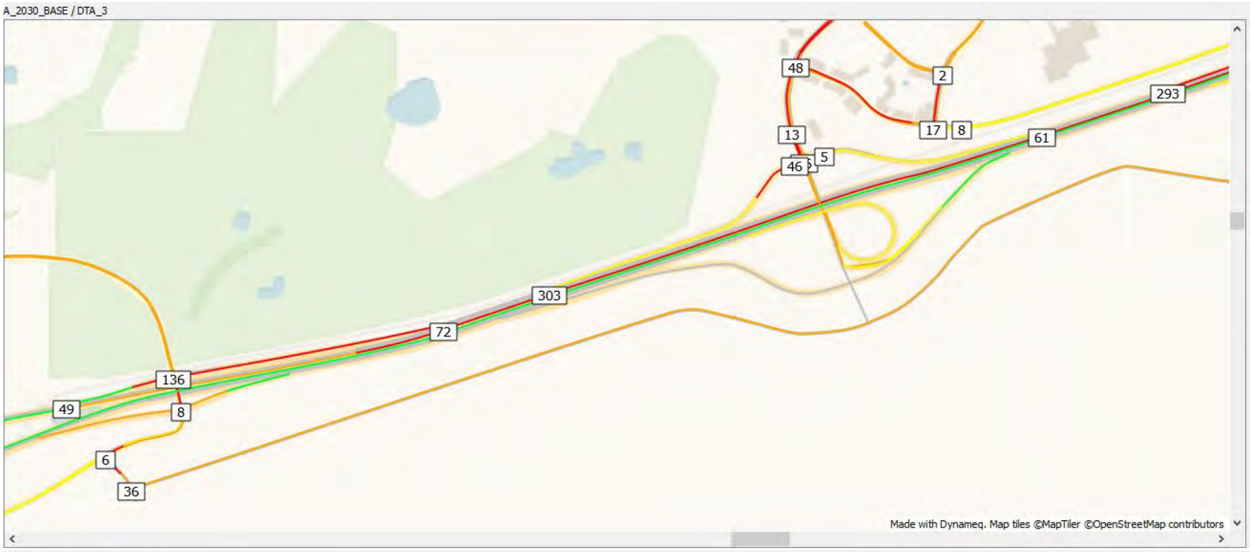
Left: Base Model; Right: Improvement. Time period: 4 – 5 pm.

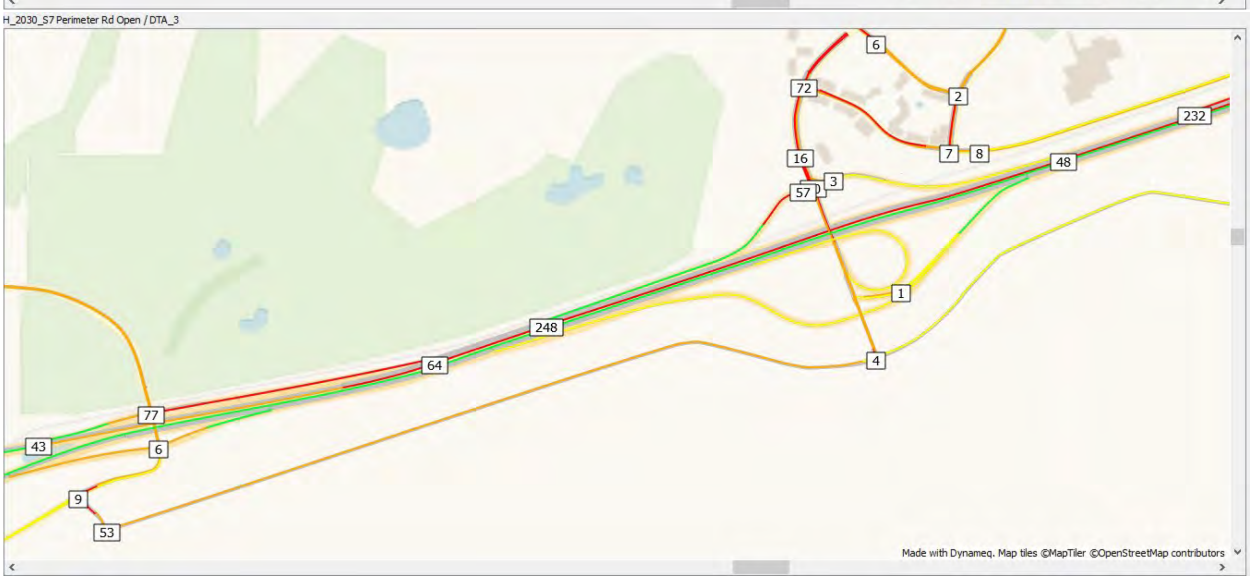
Speed shown on road segments – average m.p.h. Delay shown in white box – seconds.

Regional Delay:

Top: Base Model; Bottom: Improvement. Time period: 4 – 5 pm.

Number in white box shows delay in seconds.

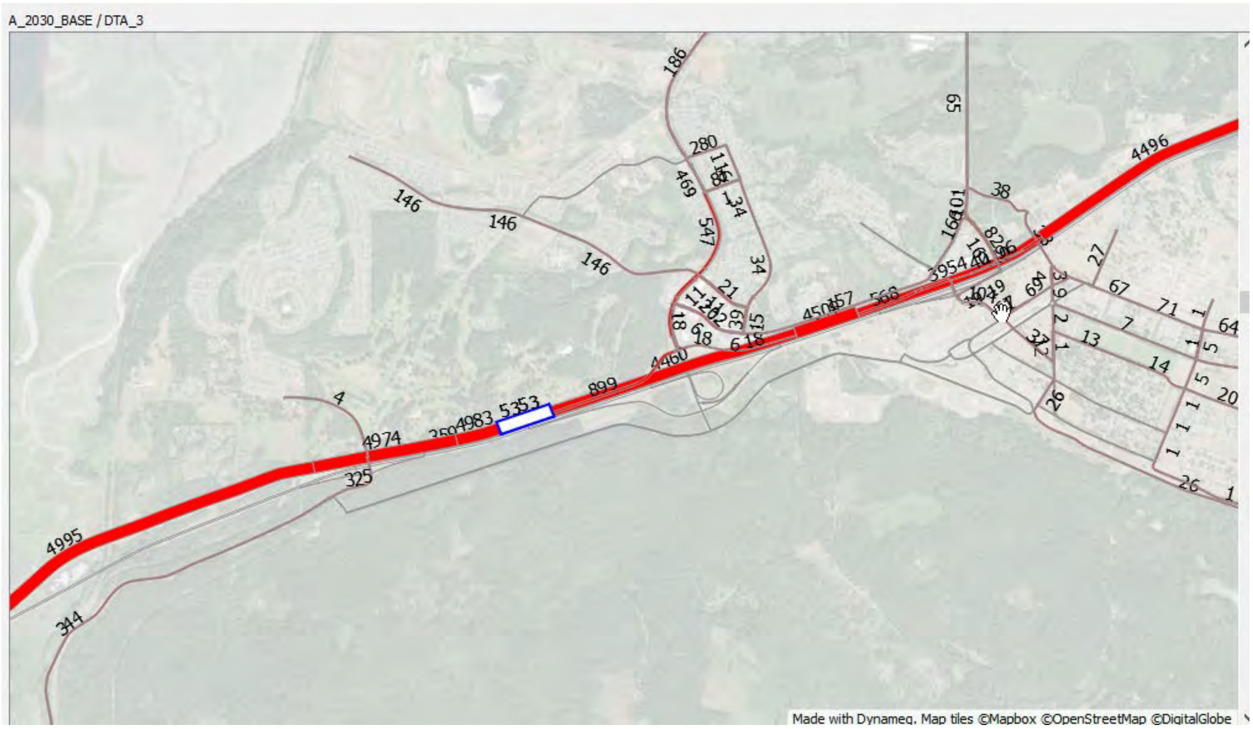


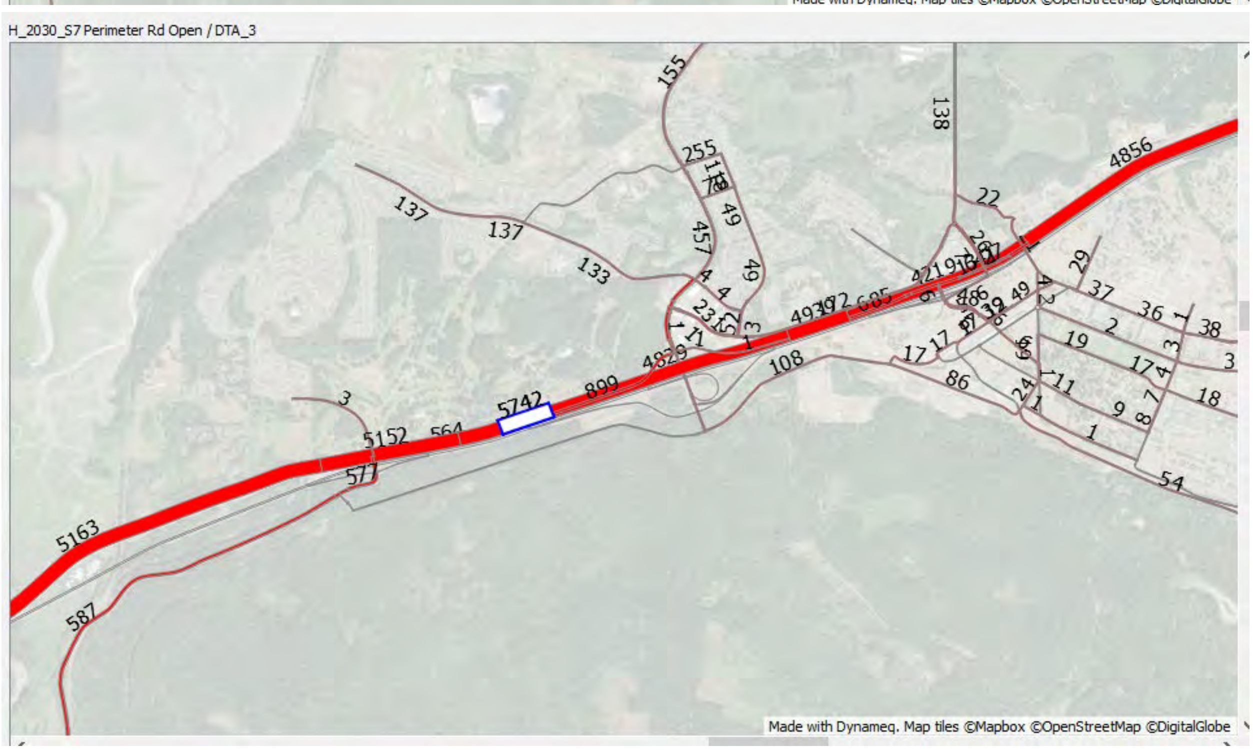


Regional Traffic Patterns:

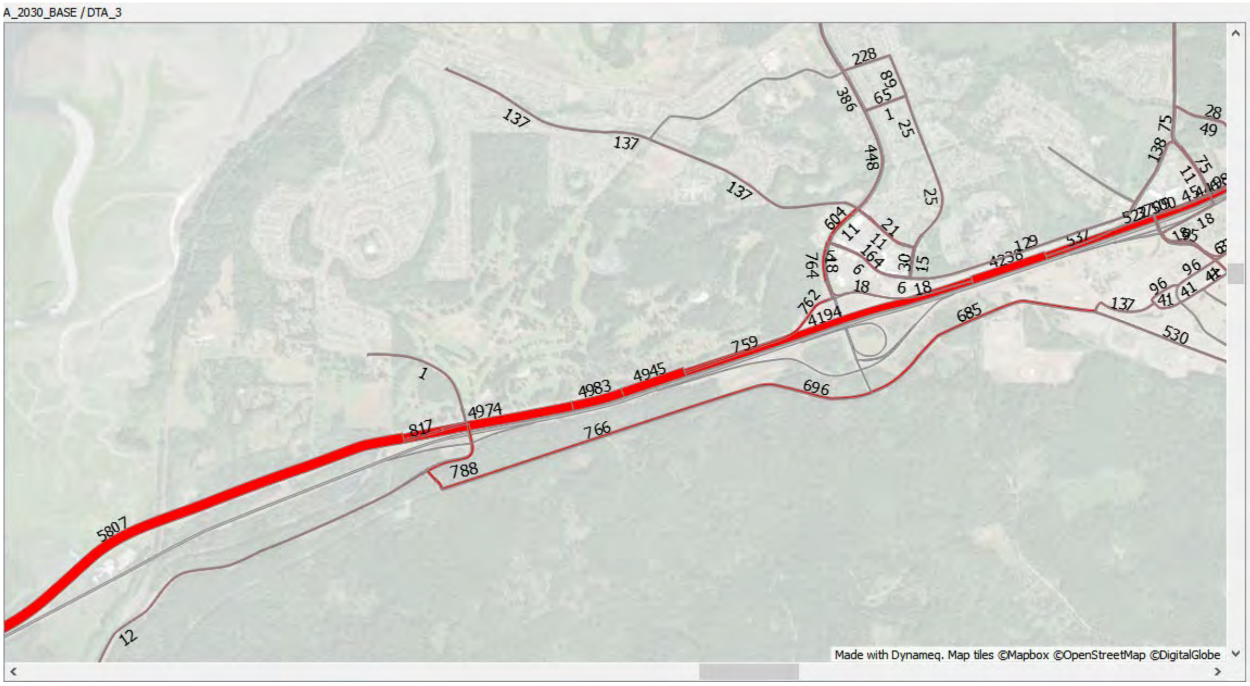
Top: Base Model; Bottom: Improvement. Time period: 4 – 5 pm.
Select link data shows traffic traveling through the link highlighted in white with a blue outline.
The traffic volumes traveling through the select link data shown in red and black text.

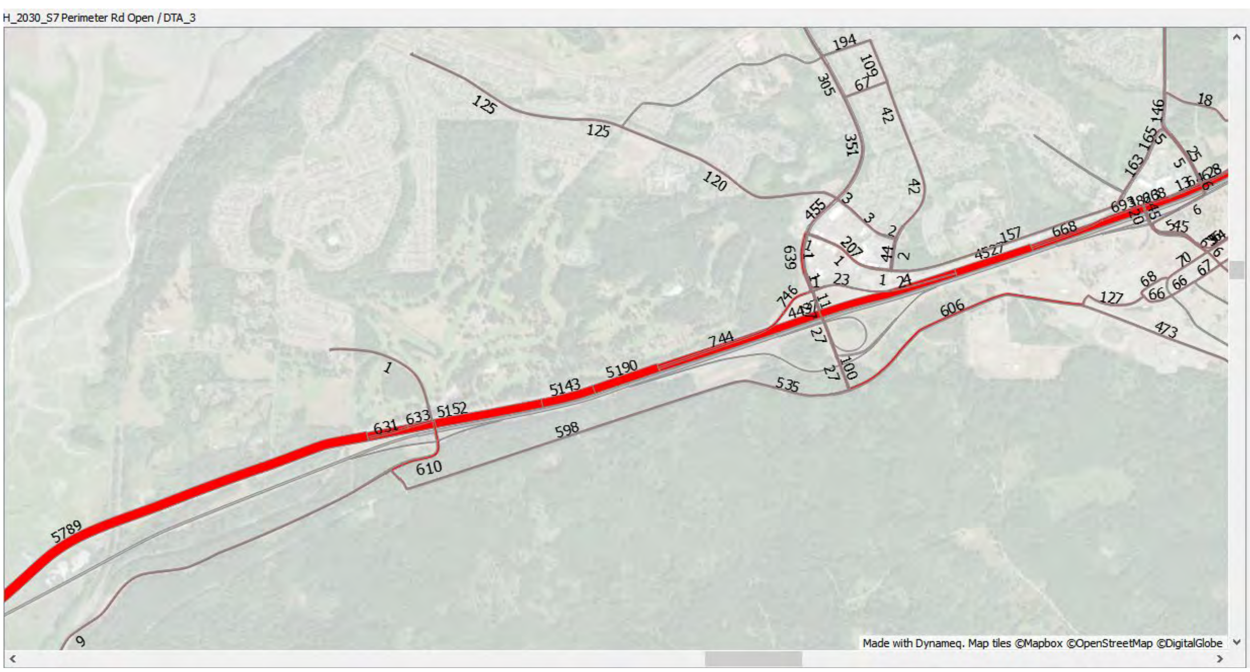
Images below shows traffic traveling southbound on I-5 between the Center Street and Mounts Road interchanges.



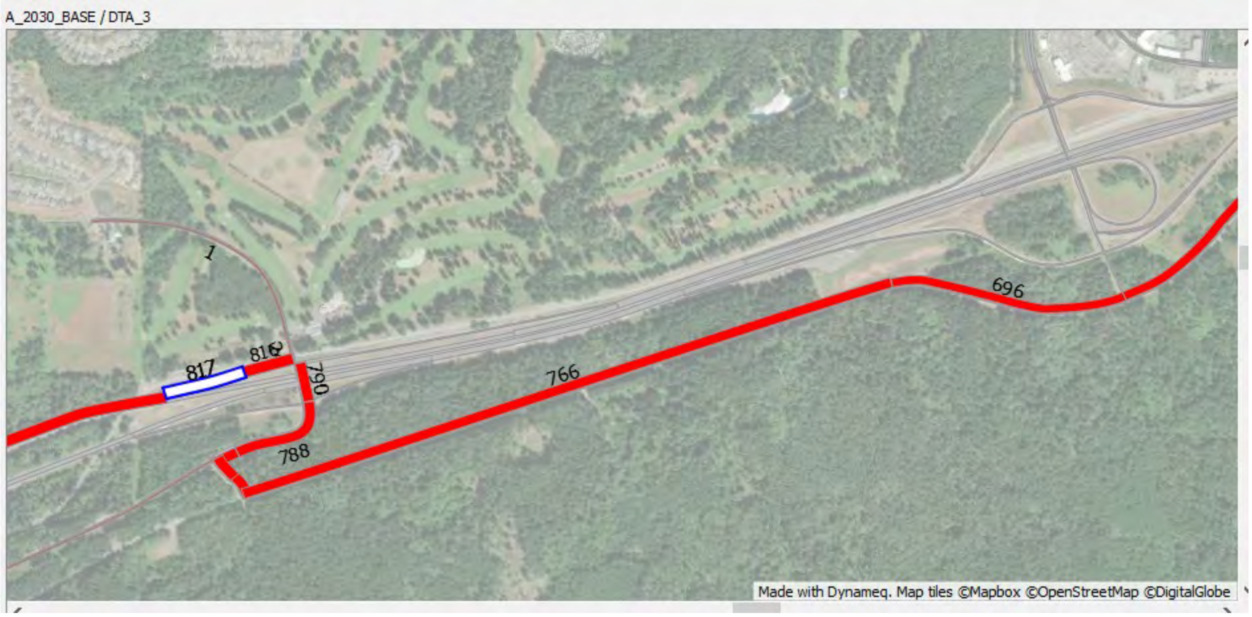


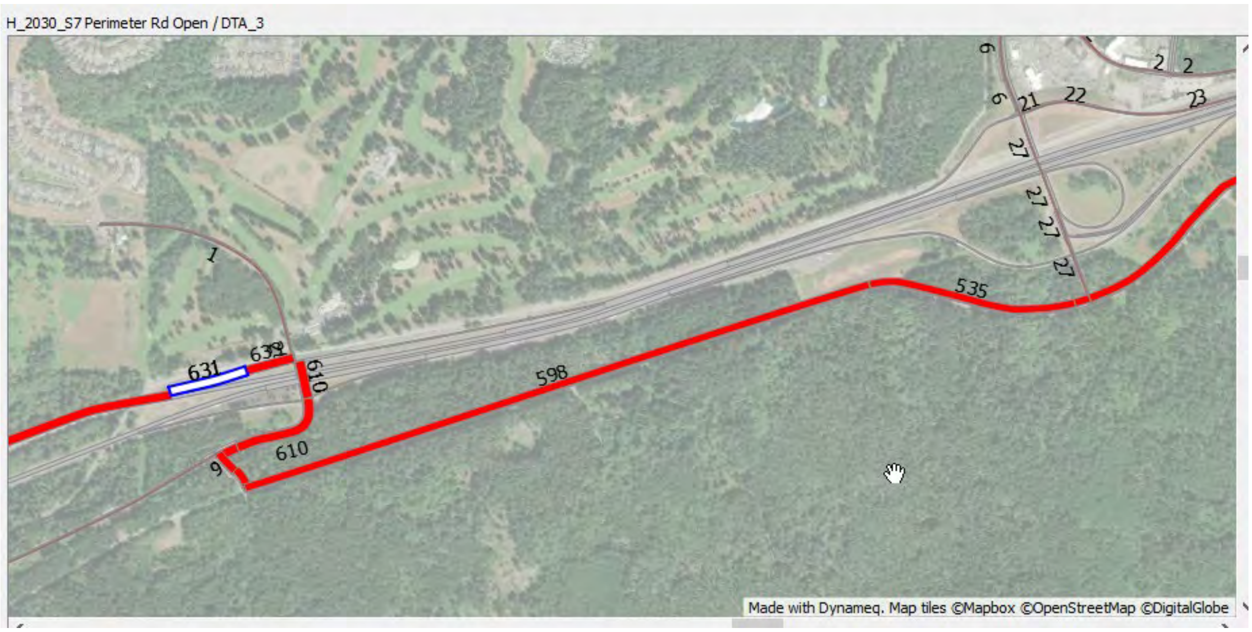
Images below shows traffic traveling southbound on I-5 through the section south of the Mounts Road interchange.



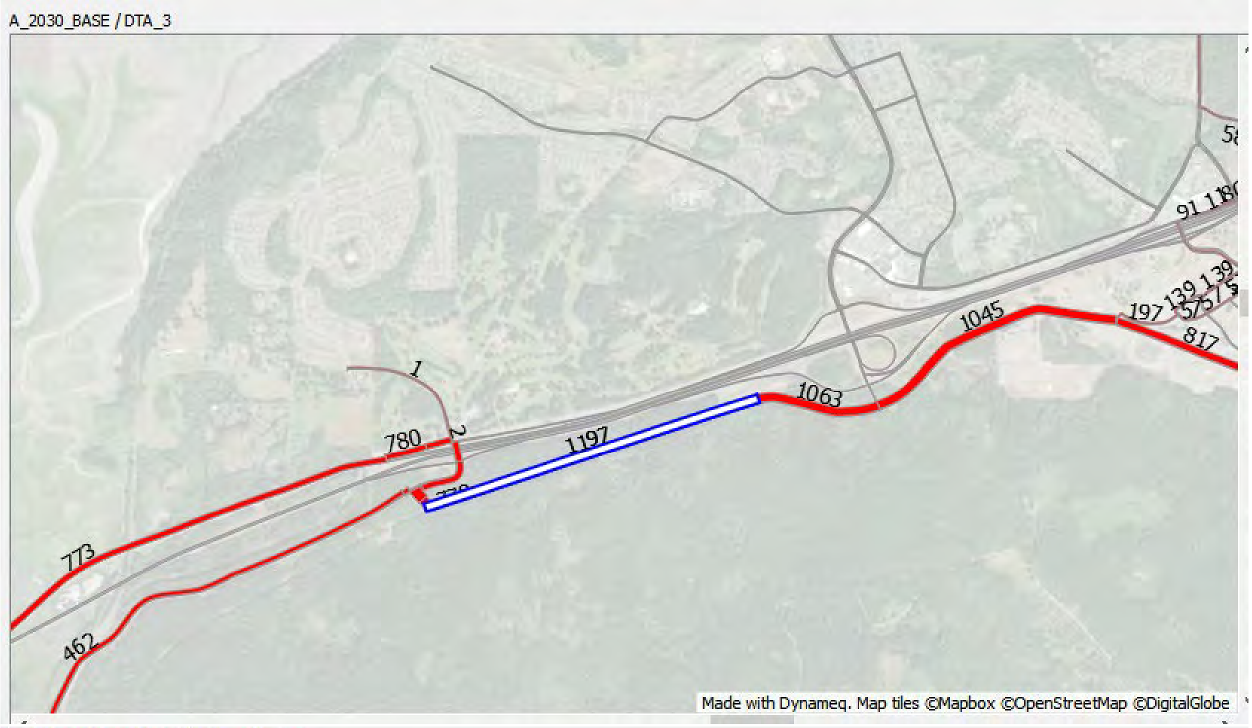


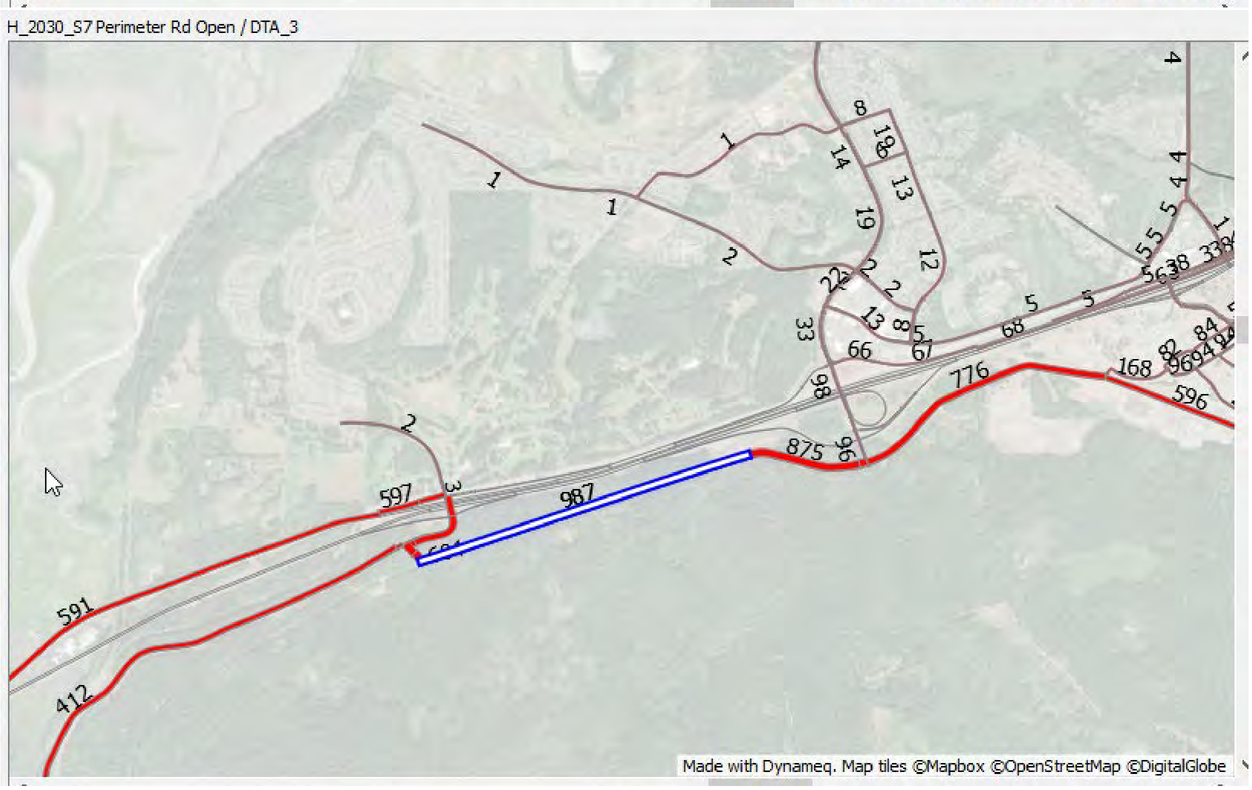
Images below shows traffic traveling southbound on I-5 through the section south of the Mounts Road interchange.





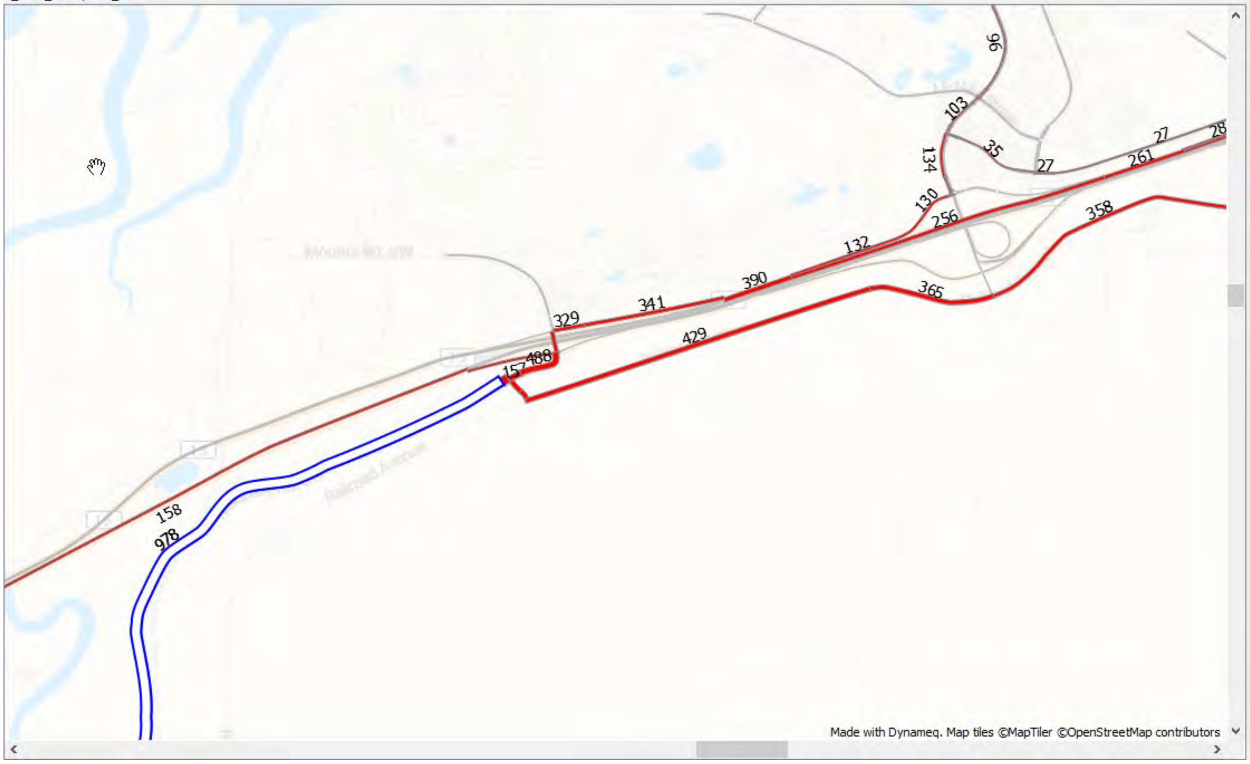
Images below shows traffic traveling southbound on Perimeter Road between the Center Street and Mounts Road interchanges.





Images below shows traffic traveling southbound on Old Pacific Highway/Nisqually Road just south of the intersection with Perimeter Road.

A_2030_BASE / DTA_3



H_2030_S7 Perimeter Rd Open / DTA_3

Observations:

Overall, this scenario appears to allow for greater throughput on I-5 between Center Street and Mounts Road.

This may be a result of some JBLM traffic directly accessing I-5 at Center Street (where the merge is less congested) rather than traveling down to Mounts Road on Perimeter Avenue (although the majority of vehicles still travel that way). Other vehicles exit at Center Street to use Perimeter Road to access Old Highway 99. This likely reduces delay at the merge at Mounts Road where there is a lane drop.

Opening up access to Perimeter Road from Center Street to general traffic also allows vehicles traveling from DuPont to Old Pacific Highway/Nisqually Road to avoid I-5.

Recommendation:

Move forward; include in 2045 Base Model as an alternative to I-5. This alternative will be increasingly important during heavy congestion.

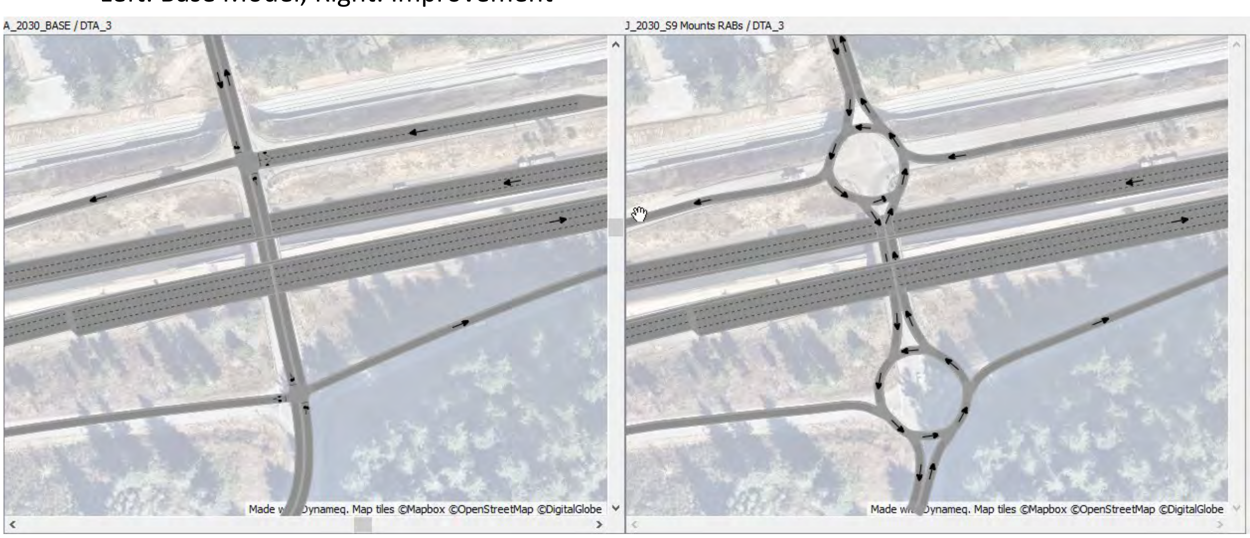
Scenario 8 – 2030 – Mounts Road Interchange

Description: Add roundabouts on both the northbound and southbound ramps. Move ramp meter slightly on southbound on-ramp

Vicinity Map:

Improvement:

Left: Base Model; Right: Improvement



Volume:

Left: Base Model; Right: Improvement. Time period: 4 – 5 pm

Volume shown on road segments - number of trips per hour.

Speed and Delay:

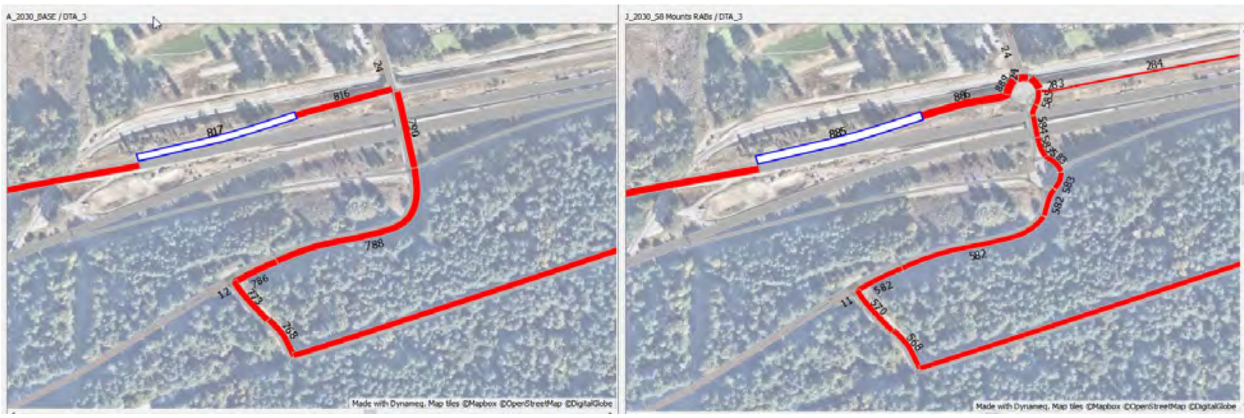
Left: Base Model; Right: Improvement. Time period: 4 – 5 pm.

Speed shown on road segments – average m.p.h. Delay shown in center of intersection–seconds.

Traffic Patterns:

Left: Base Model; Right: Improvement. Time period: 4 – 5 pm.
Select link data shows traffic traveling through the link highlighted in white with a blue outline.
The traffic volumes traveling through the select link data shown in red and black text.

Images below shows traffic traveling on the southbound on-ramp to I-5 at Mounts Road.



Observations:

The roundabouts do reduce delay at the intersection north of I-5 at Mounts Road. They do, however, allow for some traffic to use the ramps as an auxiliary lane during the peak period. There is very little difference in speed or volumes on I-5 with the roundabouts.

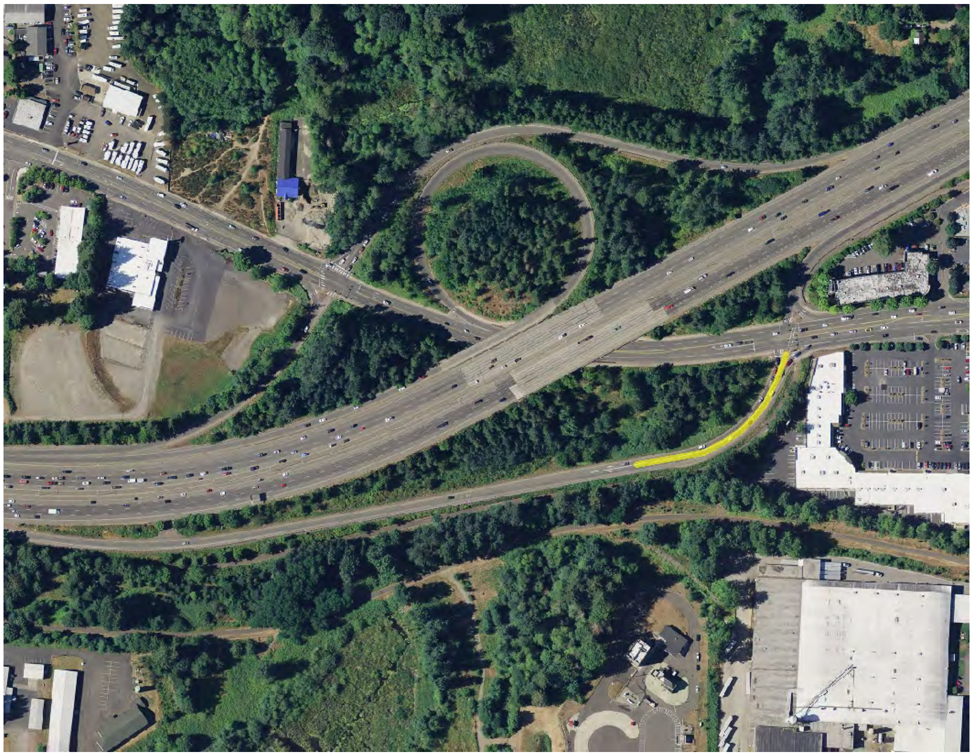
Recommendation:

Don’t move forward.

Scenario 9 – 2030 – Pacific Avenue Interchange

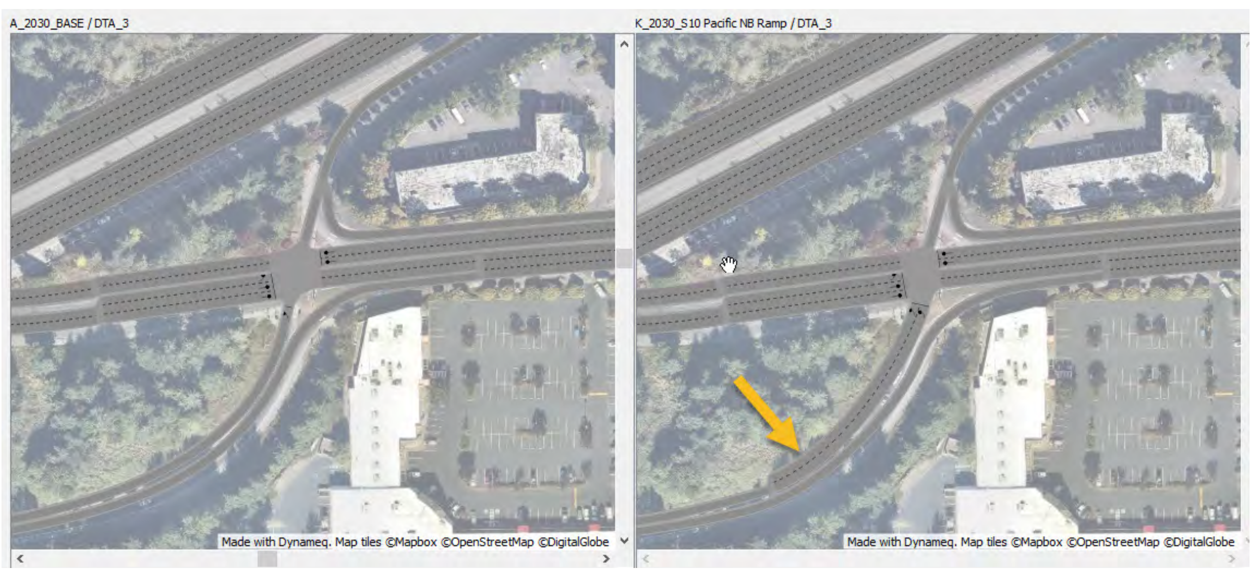
Description: Add a lane to northbound off-ramp

Vicinity Map:



Improvement:

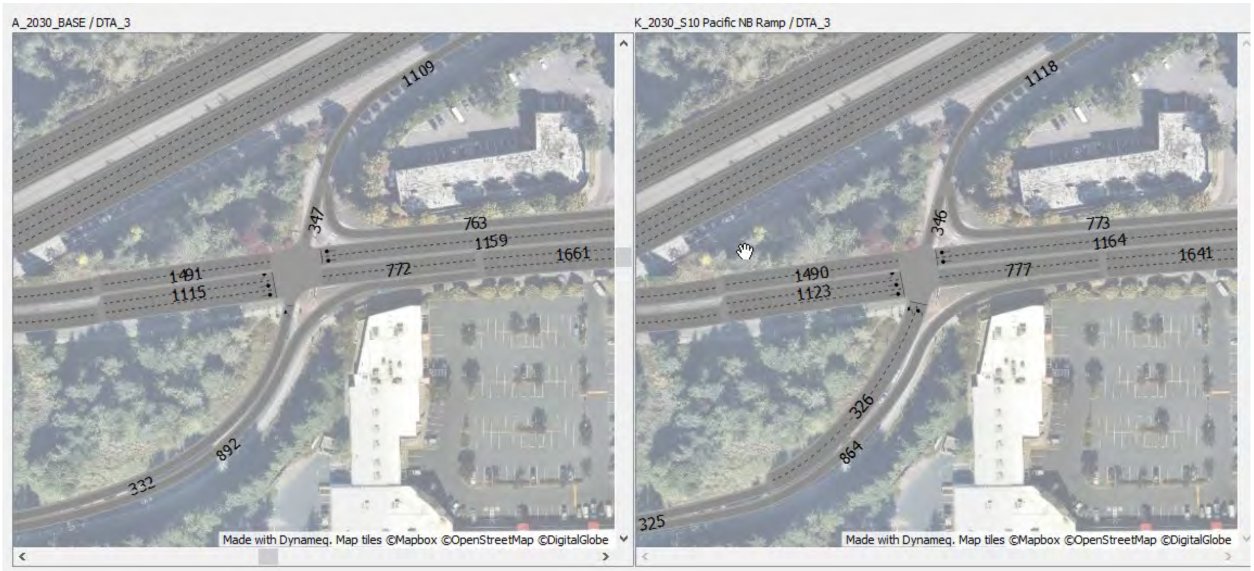
Left: Base Model; Right: Improvement



Volume:

Left: Base Model; Right: Improvement. Time period: 4 – 5 pm

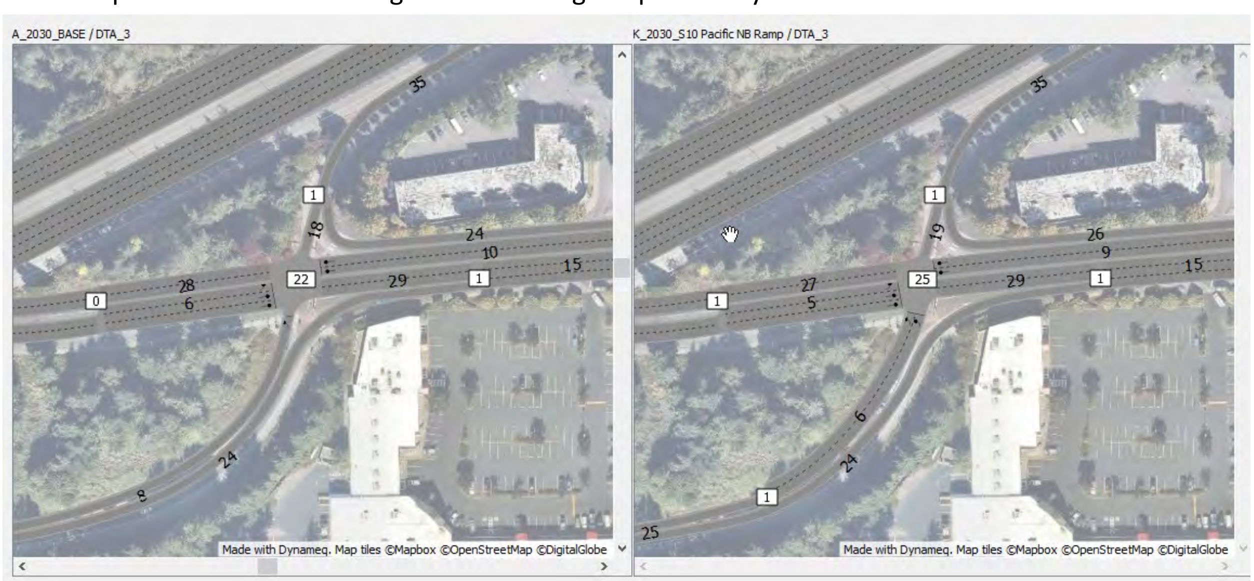
Volume shown on road segments - number of trips per hour.



Speed and Delay:

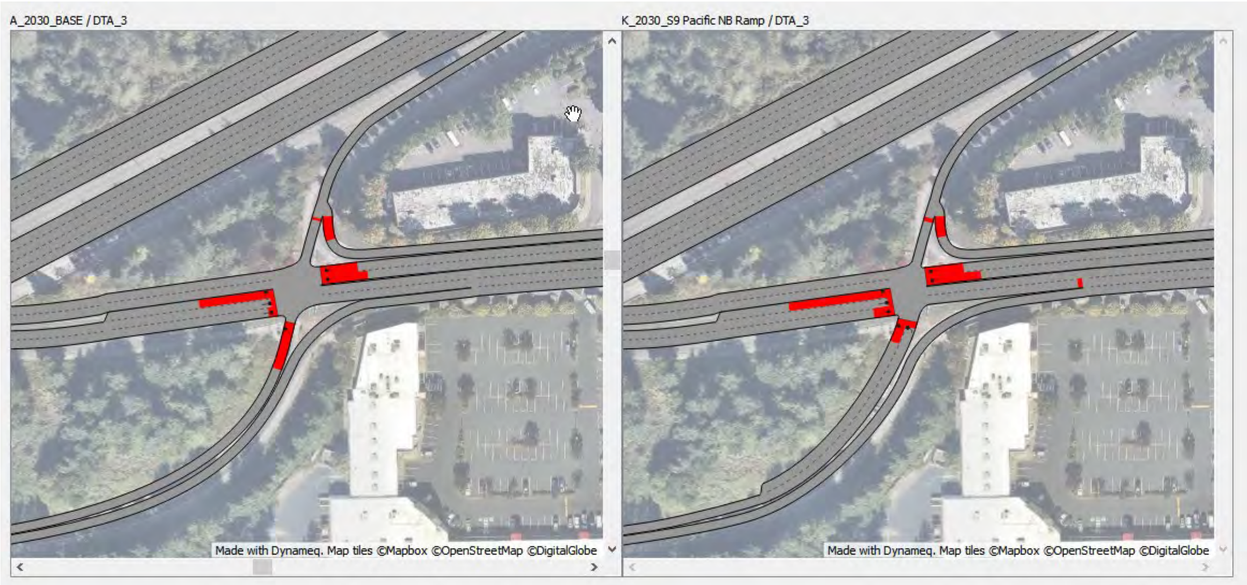
Left: Base Model; Right: Improvement. Time period: 4 – 5 pm.

Speed shown on road segments – average m.p.h. Delay shown in white box – seconds.



Queue Length:

Lane queues shown in red. Time period: 5:15 pm.



Observations:

There is very little difference in volume, delay, or queue length in this scenario.

Recommendation:

Don’t move forward.

Scenario 10 – 2030 – Part time shoulder use for northbound lane on I-5 approaching US 101

Description: Add a part time shoulder use lane between the Deschutes Way off-ramp and the US 101 off-ramp

Vicinity Map:

Improvement:

Left: Base Model; Right: Improvement

Volume:

Left: Base Model; Right: Improvement. Time period: 4 – 5 pm

Volume shown on road segments - number of trips per hour.

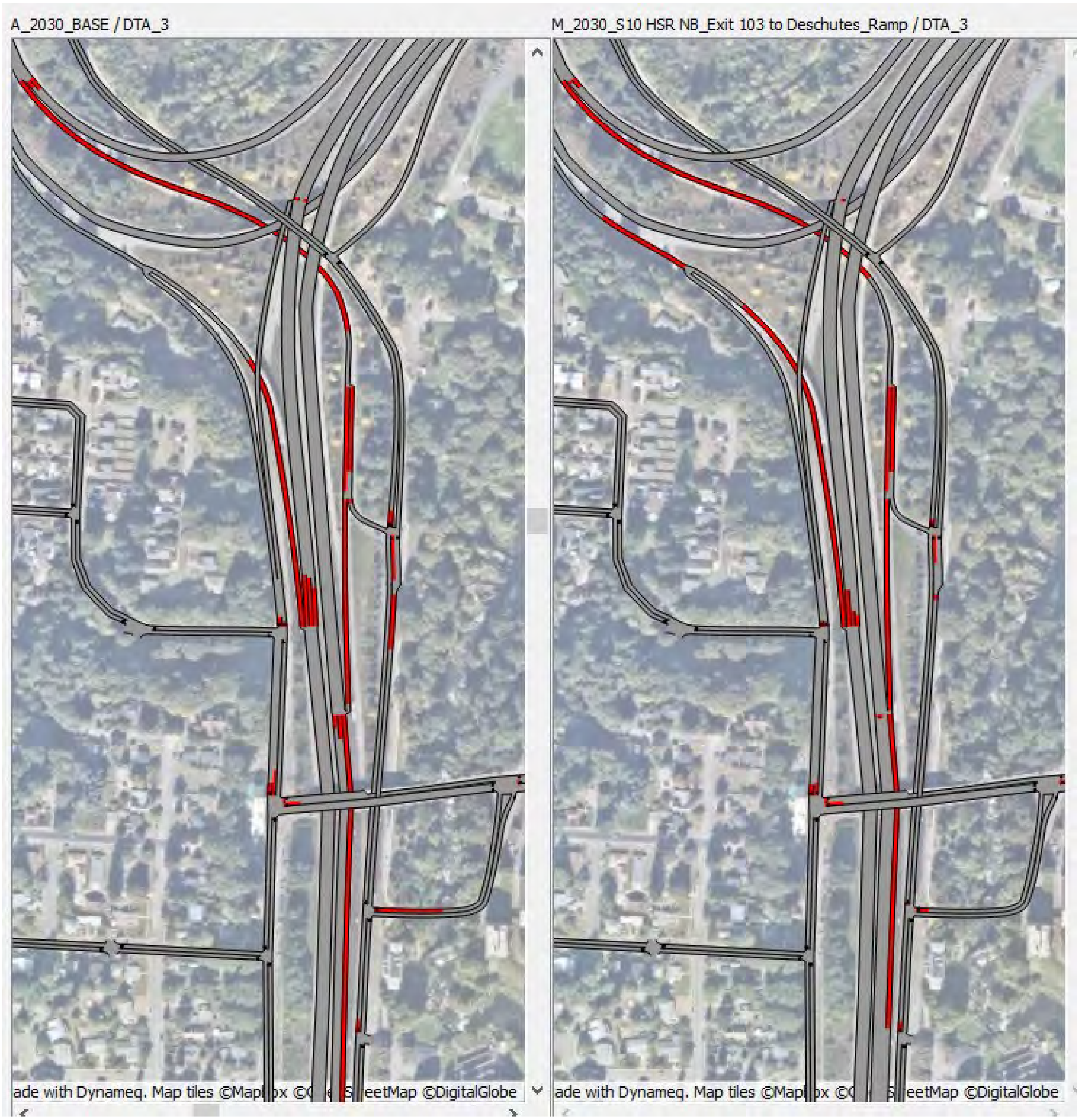
Speed:

Left: Base Model; Right: Improvement. Time period: 4 – 5 pm.

Speed shown on road segments – average m.p.h.

Queue Length:

Lane queues shown in red. Time period: 4:55 pm.



Observations:

This improvement was designed to reduce the queue in the right-hand lane caused by delays exiting I-5 to merge onto US 101. While the improvement did help reduce queue delay, over the one-hour time period delays were not severe.

Recommendation:

Don't move forward at this point in time.

2045 SCENARIOS

The study team identified 7 improvements, or groups of improvements, as long-term solutions based on improvements identified in the initial planning study. They were compared to a 2045 base year, which includes 2030 improvements that were identified to move forward. The model components for the base year are listed in Appendix C. The 2045 scenarios, including modeling results, are found in the following sections. It should be noted that performance measures were selected based on the geographic area of influence of each scenario.

List of 2045 Scenarios

The following is a list of scenarios for 2045. All were compared to 2045 Base Scenario.

Base 2045 includes Thorne Ln to 38th Ave general use land with retained HOV inside lane and Mounts Rd to Thorne Ln inside lane as HOV.

Model	Project	Description	Planning study cross reference
Scenario 1 - 2045	US 101 Braided Ramp Interchange	Exit at Plum Street to access braided ramp SB I-5	See Appendix G Interchange 4
Scenario 1 - 2045	I-5 Southbound - Pacific Ave to Plum St off-ramp	Add an auxiliary lane between Pacific Avenue and Capitol Way	See Appendix G Add Capacity 5
Scenario 2 - 2045	Martin Way Interchange	Partial Cloverleaf Interchange	See Appendix G Interchange 2
Scenario 3 - 2045	HOV Conversion	Convert existing general purpose inside lane to HOV on both NB and SB directions starting at MP 104.3 through Pierce Co to connect with new HOV lanes	See Appendix G HOV conversion 1
Scenario 3 - 2045	Add HOV que jumps on I-5 NB	Add HOV que jumps NB at Martin Way, Plum St, and Trosper	See Appendix G HOV conversion 2
Scenario 4 - 2045	US 101 Flyover Ramp	Add a flyover off-ramp linking NB I-5 to WB US 101, and merging in on the outside lane of US 101, retaining the Deschutes Parkway on-ramp to provide access from the local network to US 101	See Appendix G Add Capacity 7

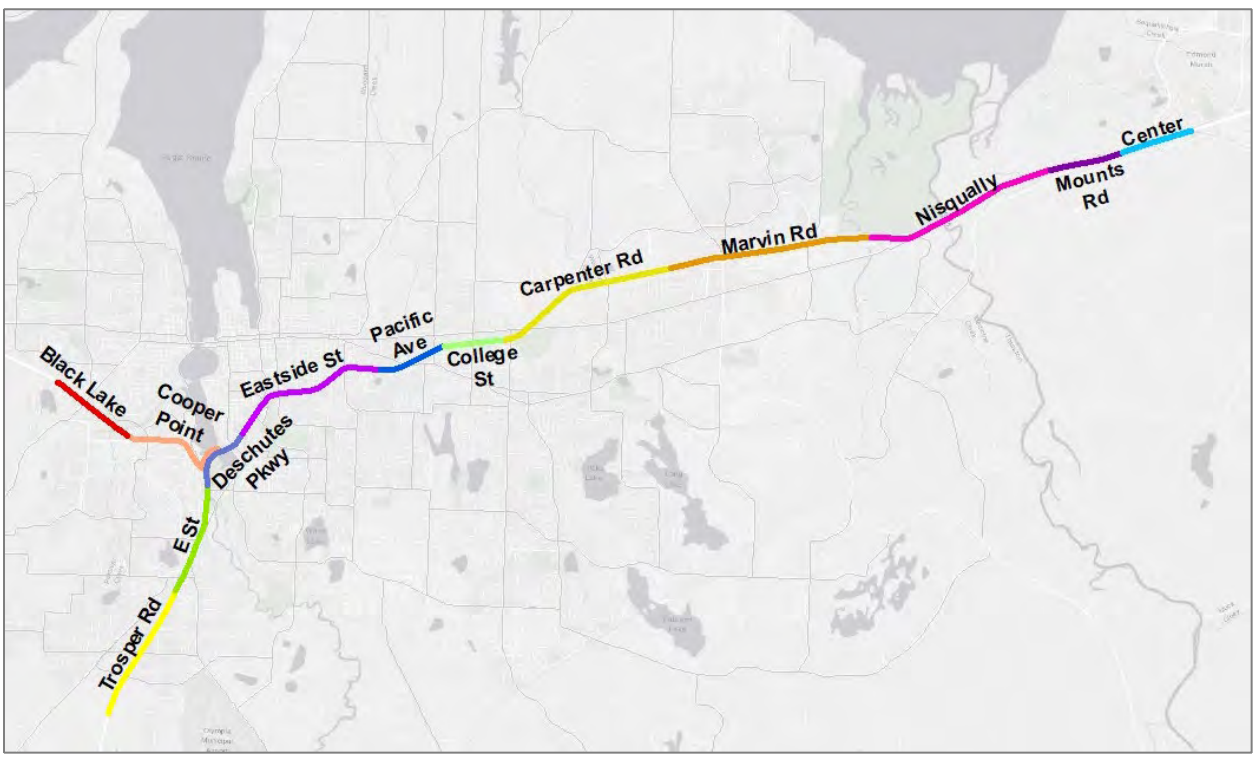
Model	Project	Description	Planning study cross reference
Scenario 5 - 2045	I-5 Northbound Widening	Add an auxiliary lane from US 101 on-ramp to 14th Avenue off-ramp, and from Plum Street on-ramp to Pacific Avenue off-ramp	See Appendix G Add Capacity 6
Scenario 6 - 2045	I-5 Widening with HOV	Add a lane with the HOV lane as the inside lane both directions I-5 from Deschutes on-ramp to Mounts Road	See Appendix G Add Capacity 4
Scenario 7 - 2045	Tumwater Boulevard Interchange	Increase travel lanes from 3 to 4 lanes on Tumwater Boulevard and construct bridge over I-5, install 2 roundabouts at the ramp connections, and modify and improve ramps to freeway	See Appendix G Interchange 7
Scenario 8 - 2045	All Improvements	Combination of widening (add a lane with the HOV lane as the inside lane both directions I-5 from Deschutes on-ramp to Mounts Road), US 101 braided ramp interchange, northbound flyover ramp, Martin Way interchange, Tumwater interchange, and HOV ramp improvements	
Scenario 9 - 2045	I-5 Widening with HOV at Marvin Road Interchange	Add a lane with the HOV lane as the inside lane both directions I-5 from Marvin Road on-ramp to Mounts Road	
Scenario 10 - 2045	I-5 Widening with HOV at Sleater-Kinney Interchange	Add a lane with the HOV lane as the inside lane both directions I-5 from Sleater-Kinney on-ramp to Mounts Road	
Scenario 11 - 2045	Combination of Improvements	Combination of widening (Add a lane with the HOV lane as the inside lane both directions I-5 from Sleater-Kinney (NB) and Plum St (SB) to Mounts Road), Martin Way interchange, US 101 Braided Ramp	

Model	Project	Description	Planning study cross reference
Scenario 12 - 2045	Modified Widening Improvements	Same as Scenario 6 (Add a lane with the HOV lane as the inside lane both directions I-5 from Deschutes on-ramp to Mounts Road) with an additional (5th lane) between Mounts Road and the Nisqually Interchange	

Corridor Segment Speed and Volume Comparisons

Speed and volume are presented in maps as well as tables. The corridor segments in Figure 5 the corridors reflected in the tables.

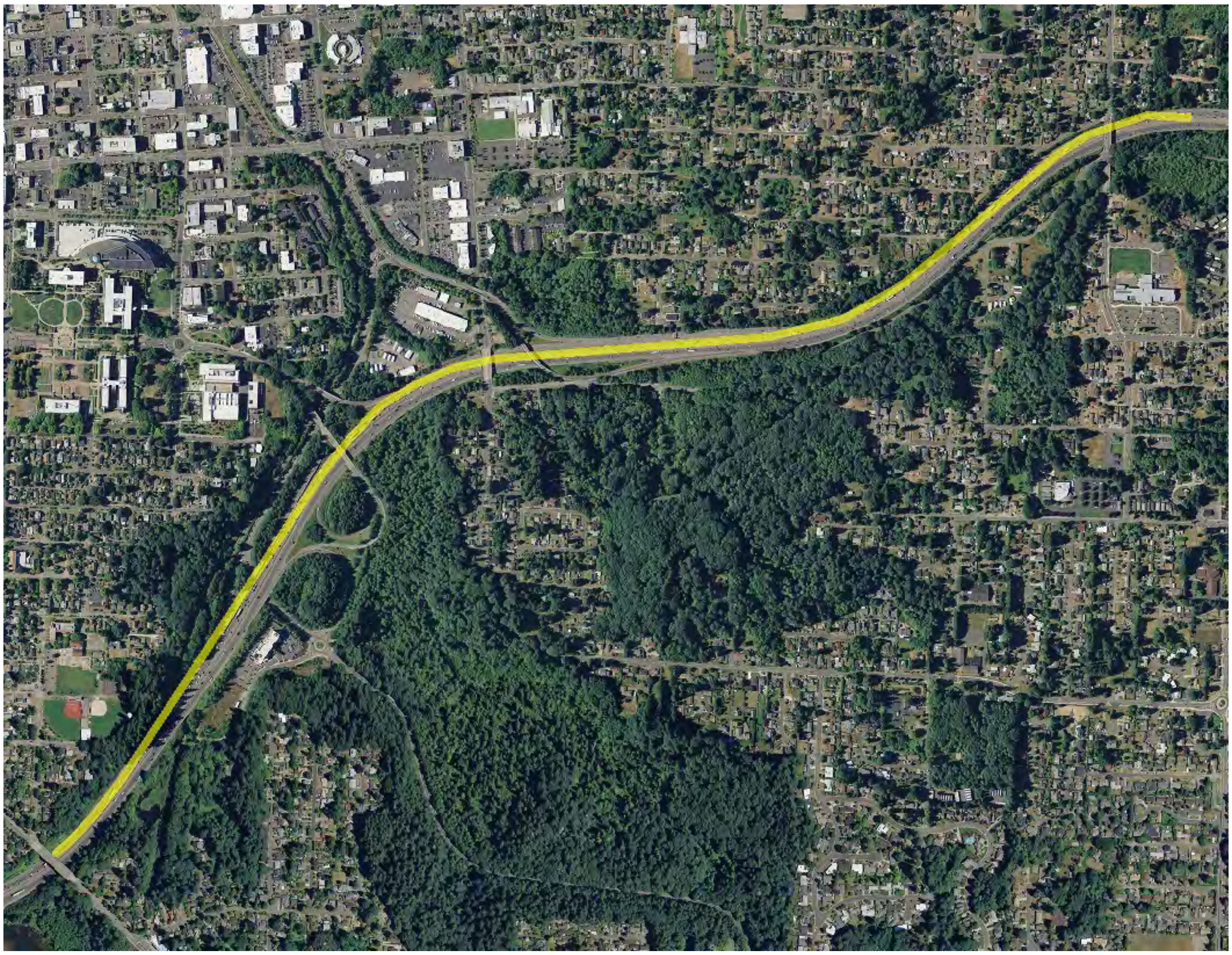
FIGURE 5: Corridor segments for free flow speed comparison



Scenario 1 – 2045 - US 101 Braided Ramp Interchange

Description: Exit at Plum Street to access braided ramp SB I-5 and add an auxiliary lane between Pacific Avenue and Capitol Way

Vicinity Map:



Improvement:

Left: Base Model; Right: Improvement

14th

Henderson

Capitol Blvd Bridge

Volume:

Top: Base Model; Bottom: Improvement. Time period: 4 – 5 pm

Volume shown on road segments - number of trips per hour.

Start of Braided Ramp

End Braided Ramp and US 101 Merge

B_2045_Base / FB

C_2045_Scen 1 Braided_Ramp / FB

Speed:

Top: Base Model; Bottom: Improvement. Time period: 4 – 5 pm.

Speed shown on road segments – average m.p.h.

Start of Braided Ramp

End Braided Ramp and US 101 Merge

B_2045_Base / FB

C_2045_Scen 1 Braided_Ramp / FB

Peak hour Volume and Speed by Corridor segment

Corridor Segment	Base 2045		Scenario 1 - Braided Ramp		
	Speed	Volume	Speed	Volume	*
Interstate 5 Southbound					
Center	19	6,510	19	6,460	
Mounts Rd	18	6,180	17	6,210	
Nisqually	54	5,690	55	5,760	
Marvin Rd	58	5,260	57	5,360	
Carpenter Rd	56	6,010	56	6,020	
College St	58	6,100	59	6,140	
Pacific Ave	57	6,740	58	6,770	
Eastside St	31	7,040	50	7,340	
Deschutes Pkwy	50	7,480	51	7,100	959
E St	55	5,400	56	5,520	
Trosper Rd	62	4,860	61	4,940	
US - 101 Westbound					
Cooper Point	37	4,980	30	5,080	
Black Lake	57	4,260	56	4,370	

* Additional volume on Braided ramp

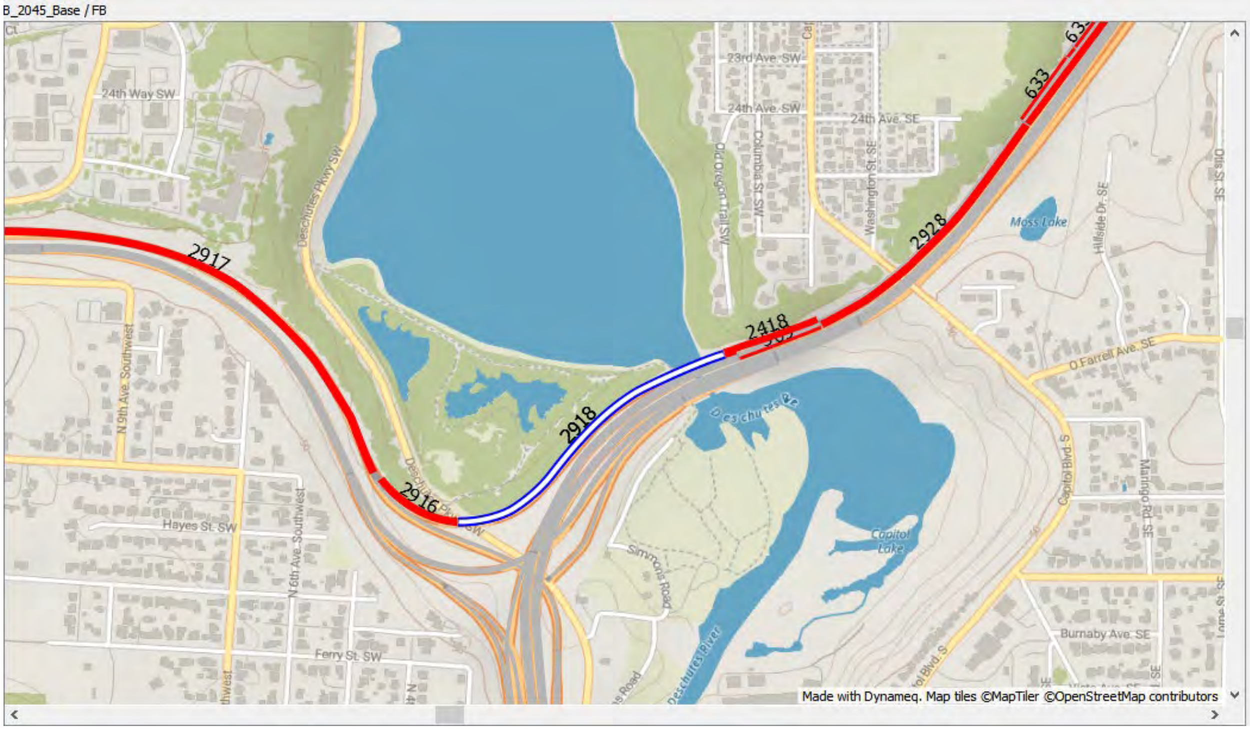
Corridor Segment	Base 2045		Scenario 1 - Braided Ramp	
	Speed	Volume	Speed	Volume
Interstate 5 Northbound				
Center	59	5,530	59	5,530
Mounts Rd	57	5,380	58	5,350
Nisqually	58	5,070	58	5,010
Marvin Rd	58	4,830	58	4,820
Carpenter Rd	42	5,500	43	5,480
College St	46	5,850	49	5,870
Pacific Ave	47	7,330	43	7,300
Eastside St	52	7,240	54	7,280
Deschutes Pkwy	56	7,030	56	7,060
E St	40	5,420	38	5,310
Trosper Rd	57	4,520	60	4,450
US - 101 Eastbound				
Cooper Point	43	5,190	45	5,160
Black Lake	59	3,710	59	3,700

Regional Traffic Patterns:

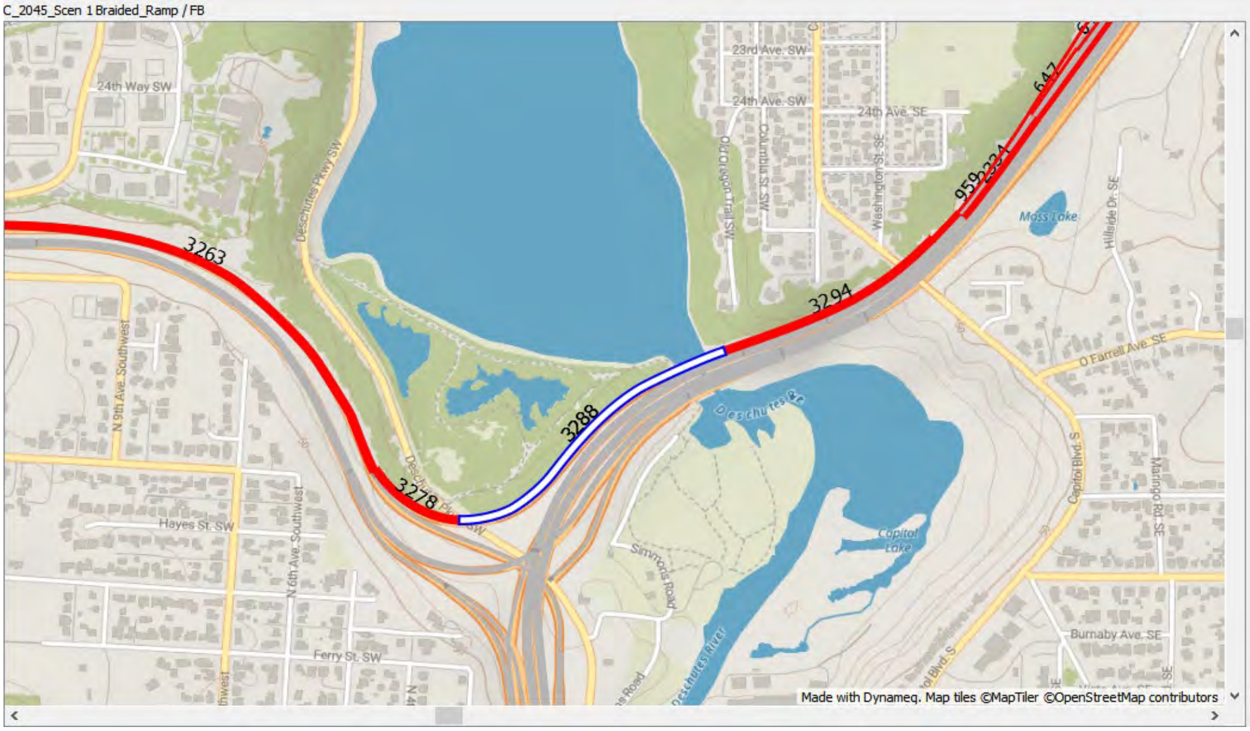
Top: Base Model; Bottom: Improvement. Time period: 4 – 5 pm.
Select link data shows traffic traveling through the link highlighted in white with a blue outline.
The traffic volumes traveling through the select link data shown in red and black text.

Images below shows traffic volume traveling westbound on US 101 off-ramp.

B_2045_Base / FB

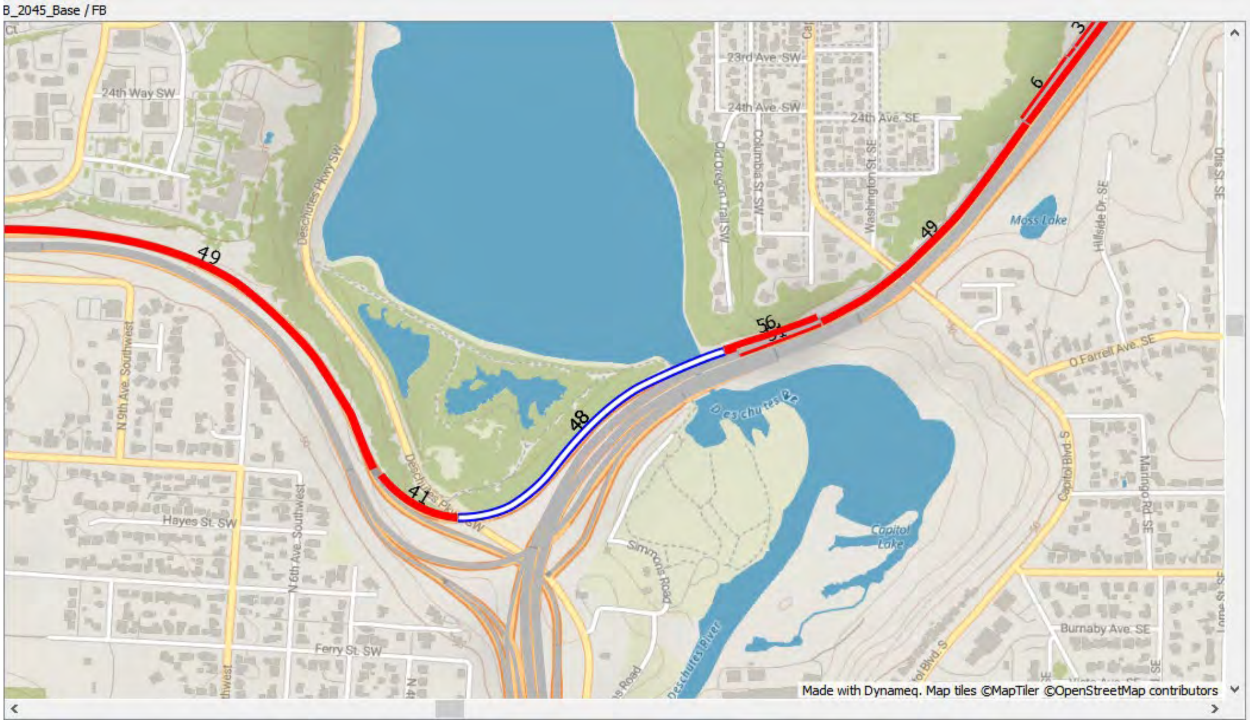


C_2045_Scen 1 Braided_Ramp / FB

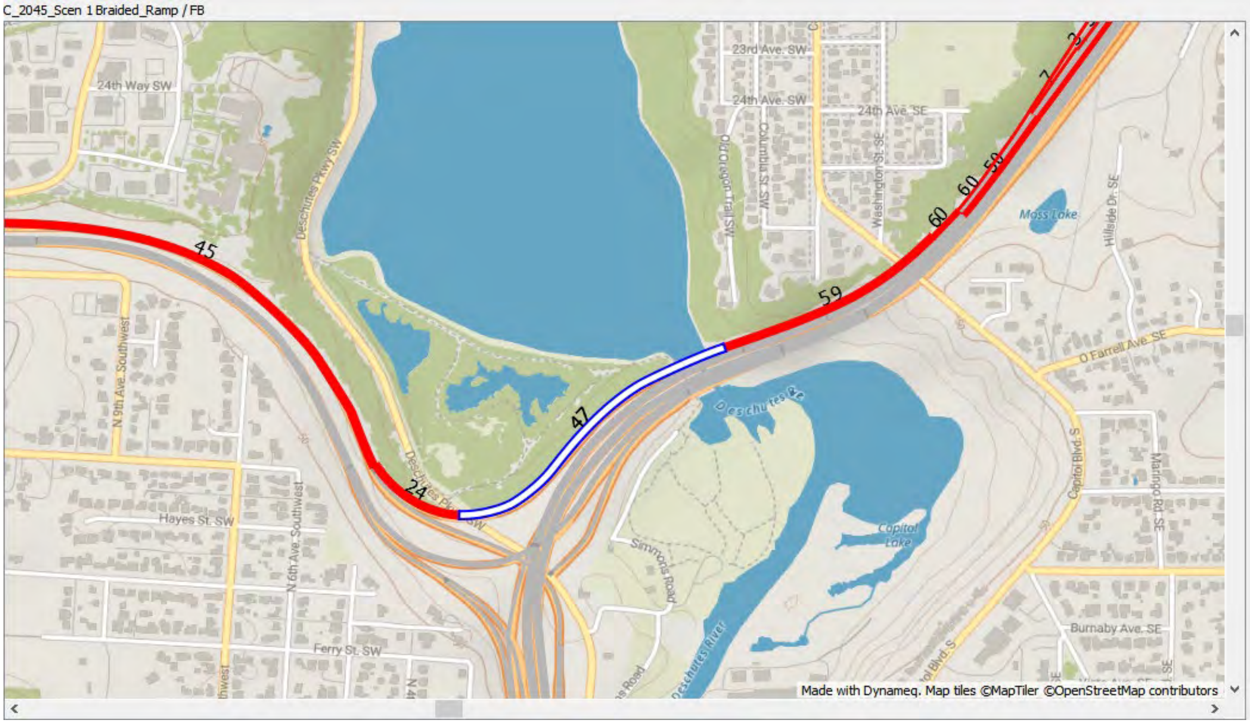


Images below shows traffic speed traveling westbound on US 101 off-ramp.

B_2045_Base / FB



C_2045_Scen 1 Braided_Ramp / FB



Observations:

- Delay was reduced (speed increased) in the Eastside segment of I-5 in the southbound direction.
- Throughput increased in the section with the braided ramp.
- The model showed much of the traffic still used the merge to US 101 just north of the US 101 off ramp (existing merge) rather than the braided ramp due to the lower speeds on the braided ramp, and likely capacity limitations on the exit at Plum Street. Perhaps this could be changed with signage and redesign of the Plum Street exit.
- Congestion in the I-5 northbound direction was increased, as was congestion on US 101 in the westbound direction, likely due to increased volumes on I-5 southbound to US 101 causing issues at the merge.

Scenario 2 – 2045 - Martin Way Interchange

Description: Partial Cloverleaf Interchange

Vicinity Map:

Improvement:

Left: Base Model; Right: Improvement

Volume:

Top: Base Model; Bottom: Improvement. Time period: 4 – 5 pm

Volume shown on road segments - number of trips per hour.

Speed and Delay:

Top: Base Model; Bottom: Improvement. Time period: 4 – 5 pm.

Speed shown on road segments – average m.p.h. Delay shown in white box – seconds.

Peak hour Volume and Speed by Corridor segment

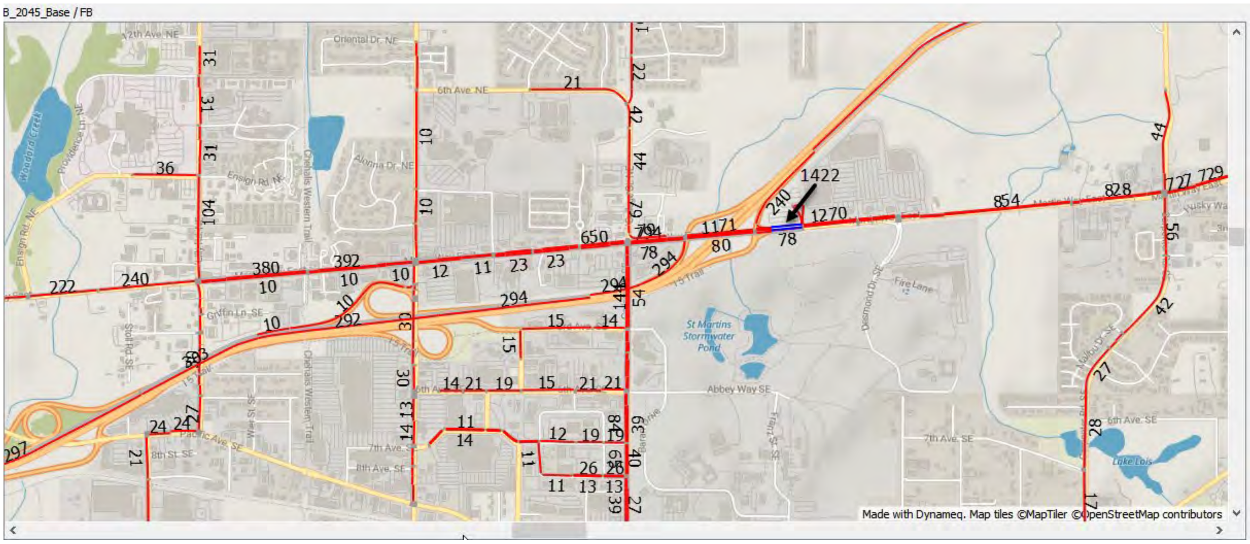
Corridor Segment	Base 2045		Scenario 2 - Martin	
	Speed	Volume	Speed	Volume
Interstate 5 Southbound				
Center	19	6,510	20	6,520
Mounts Rd	18	6,180	18	6,280
Nisqually	54	5,690	55	5,780
Marvin Rd	58	5,260	57	5,290
Carpenter Rd	56	6,010	56	6,010
College St	58	6,100	57	6,800
Pacific Ave	57	6,740	57	7,390
Eastside St	31	7,040	30	7,450
Deschutes Pkwy	50	7,480	48	7,680
E St	55	5,400	56	5,480
Trosper Rd	62	4,860	61	4,950
US - 101 Westbound				
Cooper Point	37	4,980	38	5,110
Black Lake	57	4,260	56	4,340

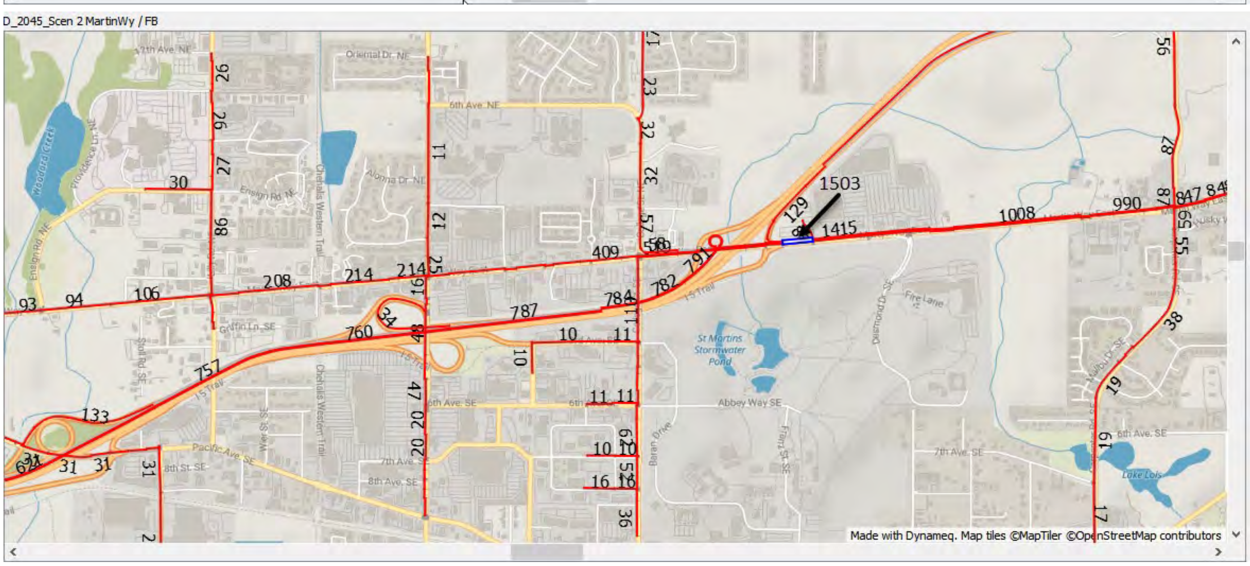
Corridor Segment	Base 2045		Scenario 2 - Martin	
	Speed	Volume	Speed	Volume
Interstate 5 Northbound				
Center	59	5,530	59	5,530
Mounts Rd	57	5,380	56	5,440
Nisqually	58	5,070	58	5,170
Marvin Rd	58	4,830	58	4,910
Carpenter Rd	42	5,500	42	5,580
College St	46	5,850	47	5,910
Pacific Ave	47	7,330	43	7,390
Eastside St	52	7,240	53	7,280
Deschutes Pkwy	56	7,030	56	7,030
E St	40	5,420	46	5,450
Trosper Rd	57	4,520	57	4,490
US - 101 Eastbound				
Cooper Point	43	5,190	45	5,150
Black Lake	59	3,710	59	3,680

Regional Traffic Patterns:

Top: Base Model; Bottom: Improvement. Time period: 4 – 5 pm.
Select link data shows traffic traveling through the link highlighted in white with a blue outline.
The traffic volumes traveling through the select link data shown in red and black text.

Images below shows traffic volume traveling westbound on Martin Way.

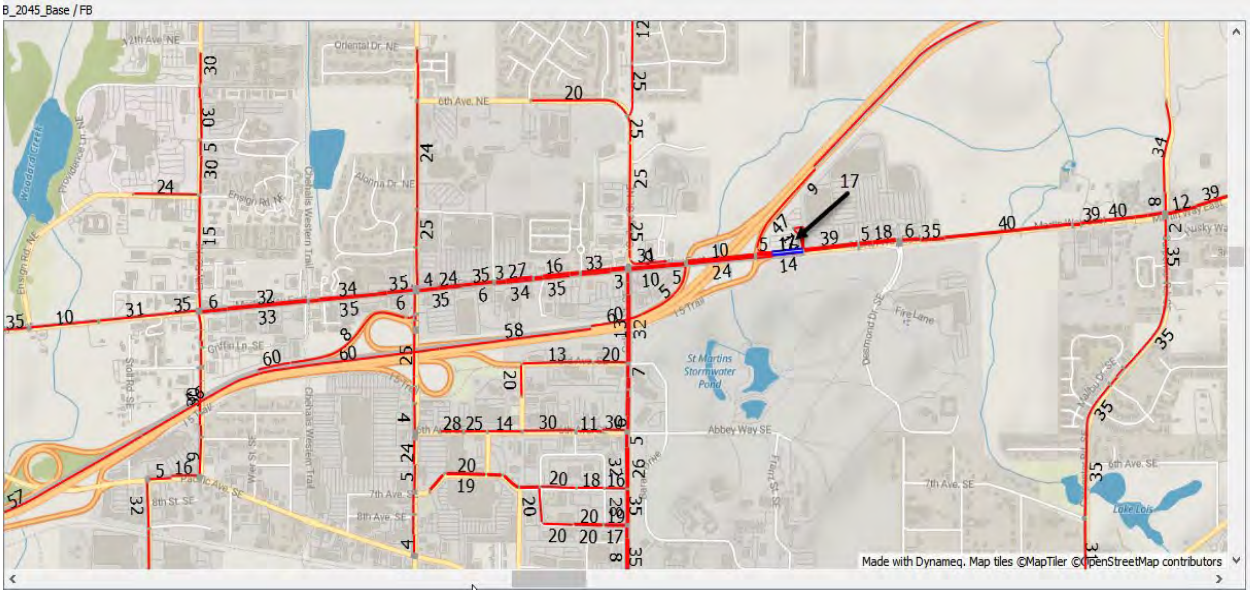




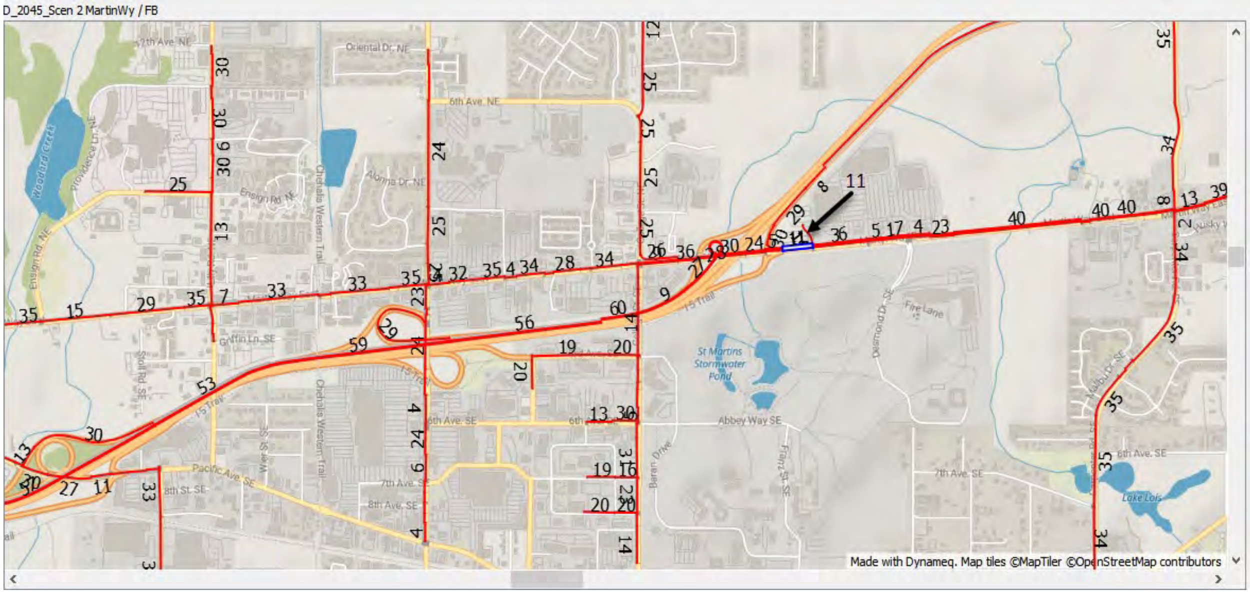
Speed

Top: Base Model; Bottom: Improvement. Time period: 4 – 5 pm
Select link speed shown on roads.

B_2045_Base / FB



D_2045_Scen 2 MartinWy / FB



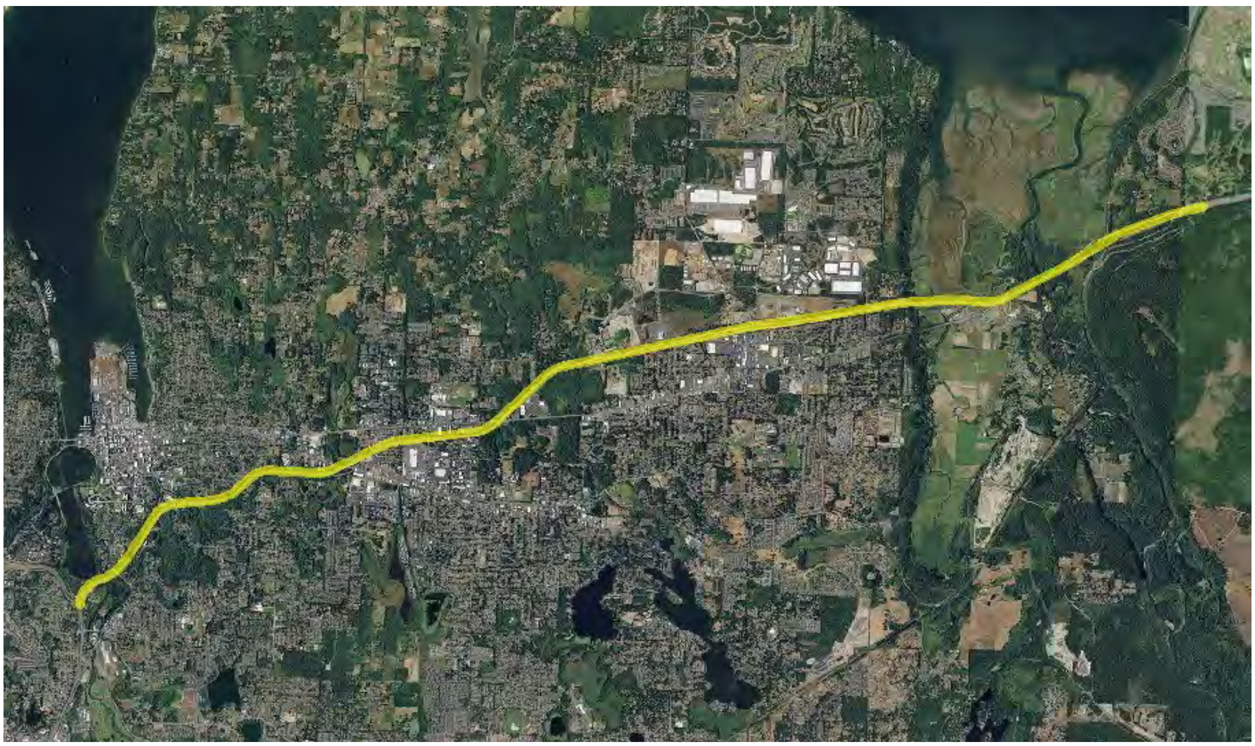
Observations:

- Delay was reduced on Martin Way at the Interchange as left turns were no longer needed to access the freeway.
- Volumes were decreased on Martin Way EB and increased on Martin Way WE and I-5 southbound.
- Volume/throughput increased on I-5 southbound without causing new delay.

Scenario 3 – 2045 - HOV Conversion

Description: Convert existing general purpose inside lane to HOV on both NB and SB directions starting at MP 104.3 through Pierce Co to connect with new HOV lanes and add HOV que jumps NB at Martin Way, Plum St, and Trosper

Vicinity Map:



Improvement:

Left: Base Model; Right: Improvement. Green is HOV lane.

Mounts Road Interchange connect SB HOV

Mounts Road Interchange connect NB HOV

Exit 104 Off and On-Ramp begin NB end SB HOV

Volume:

Top: Base Model; Bottom: Improvement. Time period: 4 – 5 pm
Volume shown on road segments - number of trips per hour.

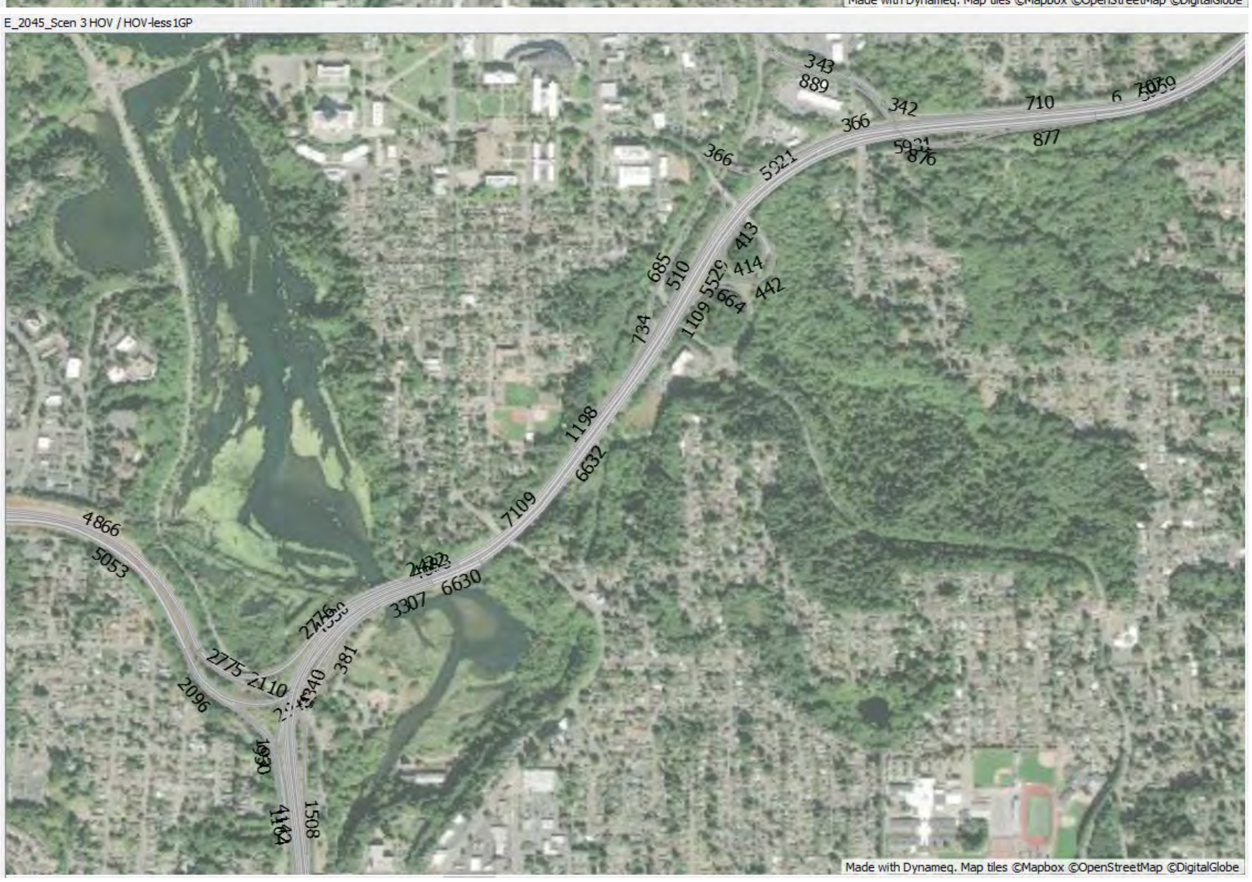
Mounts Road

Martin Way


B_2045_Base / FB
6009
5501
938
826
944
823
240
4583
1155
5201
900
1167
900
Made with Dynameq. Map tiles ©Mapbox ©OpenStreetMap ©DigitalGlobe


E_2045_Scen 3 HOV / HOV-less1GP
5272
4890
919
919
467
461
920
3996
237
1074
4780
896
1079
896

Plum Street Ramps to Exit 104



Speed:

Top: Base Model; Bottom: Improvement. Time period: 4 – 5 pm.
Speed shown on road segments – average m.p.h.

Mounts Road

Martin Way


B_2045_Base / FB
57
50
9
30
48
16
27
39
38
54
5
45
60


E_2045_Scen 3 HOV / HOV-less1GP
32
55
26
30
49
20
11
22
30
38
37
6
45
59

Plum Street Ramps to Exit 104

B_2045_Base / FB

E_2045_Scen 3 HOV / HOV-less1GP

Peak hour Volume and Speed by Corridor segment

Corridor Segment	Base 2045						Scenario 3 - HOV Conversion					
	SOV		HOV		All Traffic		SOV		HOV		All Traffic	
	Speed	Vol	Speed	Vol	Speed	Vol	Speed	Vol	Speed	Vol	Speed	Vol
Interstate 5 Southbound												
Center	16	4,930	50	1,580	19	6,510	9	3,880	47	1,710	11	5,590
Mounts Rd	17	4,660	18	1,520	18	6,180	13	3,920	51	1,630	17	5,560
Nisqually	54	4,400	54	1,300	54	5,690	58	3,890	59	1,480	58	5,360
Marvin Rd	57	4,070	58	1,190	58	5,260	29	3,460	54	1,340	33	4,800
Carpenter Rd	56	4,590	56	1,420	56	6,010	29	3,750	51	1,520	33	5,270
College St	58	4,730	59	1,370	58	6,100	58	4,170	59	1,520	58	5,680
Pacific Ave	57	5,320	58	1,430	57	6,740	43	4,810	57	1,570	46	6,390
Eastside St	29	5,560	38	1,490	31	7,040	26	5,040	44	1,640	29	6,680
Deschutes Pkwy	49	5,900	51	1,580	50	7,480	49	5,390	54	1,720	50	7,110
E St	55	4,120	56	1,280	55	5,400	56	3,950	56	1,350	56	5,300
Trosper Rd	62	3,700	62	1,160	62	4,860	62	3,470	63	1,240	62	4,720
US - 101 Westbound												
Cooper Point	37	4,180	39	810	37	4,980	39	4,000	39	870	39	4,870

Corridor Segment	Base 2045						Scenario 3 - HOV Conversion					
	SOV		HOV		All Traffic		SOV		HOV		All Traffic	
	Speed	Vol	Speed	Vol	Speed	Vol	Speed	Vol	Speed	Vol	Speed	Vol
Interstate 5 Northbound												
Center	59	4,350	59	1,260	59	5,530	59	4,070	59	1,280	59	5,350
Mounts Rd	57	4,230	58	1,260	57	5,380	58	3,950	59	1,260	59	5,220
Nisqually	58	3,970	58	1,160	58	5,070	53	3,710	58	1,190	55	4,890
Marvin Rd	58	3,790	58	1,110	58	4,830	57	3,450	58	1,150	57	4,600
Carpenter Rd	42	4,410	45	1,180	42	5,500	37	3,600	53	1,290	41	4,890
College St	46	4,680	51	1,220	46	5,850	31	3,720	49	1,360	35	5,070
Pacific Ave	46	5,930	48	1,460	47	7,330	22	4,400	51	1,690	26	6,090
Eastside St	52	5,870	52	1,510	52	7,240	53	5,160	56	1,610	54	6,770
Deschutes Pkwy	56	5,610	56	1,580	56	7,030	30	5,060	47	1,570	34	6,630
E St	40	4,230	46	1,320	40	5,420	39	3,940	44	1,330	40	5,270
Trosper Rd	57	3,450	57	1,170	57	4,520	58	3,260	59	1,170	58	4,430
US - 101 Eastbound												
Cooper Point	43	4,320	43	890	43	5,190	44	4,150	44	910	44	5,060
Black Lake	59	3,060	59	660	59	3,710	59	2,950	59	690	59	3,640

Observations:

- There was greater delay and reduced throughput/volume on I-5 in both directions for all traffic.
- Traffic in the HOV lane experienced little delay, unless caught in a queue while entering or exiting I-5.

Scenario 4 – 2045 - US 101 Flyover Ramp

Description: Add a flyover off-ramp linking NB I-5 to WB US 101, and merging in on the outside lane of US 101, retaining the Deschutes Parkway on-ramp to provide access from the local network to US 101

Vicinity Map:

Improvement:

Left: Base Model; Right: Improvement

NB Flyover near Custer Way

Deschutes US-101 On-ramp

Flyover Ramp Merge with Mainline WB US 101

Volume:

Top: Base Model; Bottom: Improvement. Time period: 4 – 5 pm

Volume shown on road segments - number of trips per hour.

Volume:

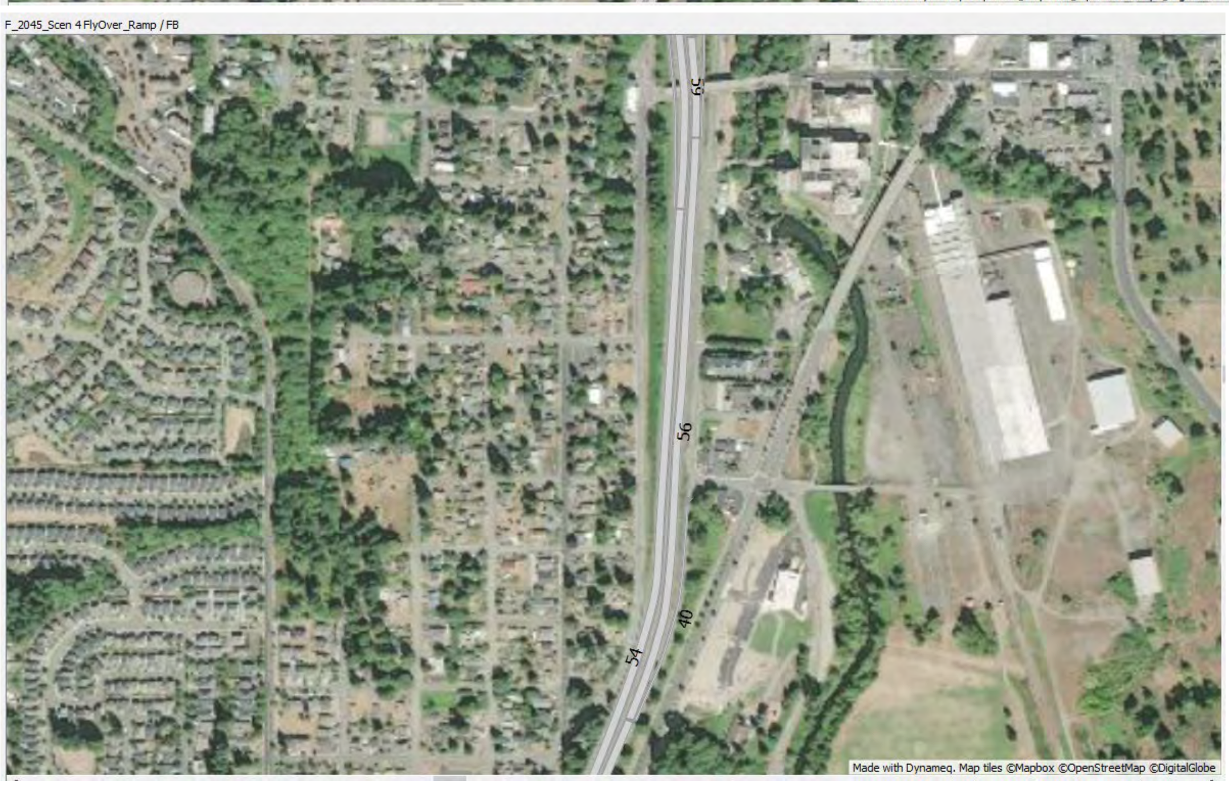
Top Base Model; Bottom: Improvement. Time period: 4 – 5 pm.

Volume shown on road segments - number of trips per hour.

Speed:

Top Base Model; Bottom: Improvement. Time period: 4 – 5 pm.

Speed shown on road segments – average m.p.h.



Speed:

Top Base Model; Bottom: Improvement. Time period: 4 – 5 pm.

Speed shown on road segments – average m.p.h.

Queue Length:

Left: Base Model; Right: Improvement.

Lane queues shown in red. Time period: 4:55 – 5:00 pm.

Peak hour Volume and Speed by Corridor segment

Corridor Segment	Base 2045		Scenario 4 - Flyover Ramp		
	Speed	Volume	Speed	Volume	*
Interstate 5 Southbound					
Center	19	6,510	18	6,550	
Mounts Rd	18	6,180	18	6,320	
Nisqually	54	5,690	54	5,790	
Marvin Rd	58	5,260	57	5,330	
Carpenter Rd	56	6,010	56	6,040	
College St	58	6,100	59	6,100	
Pacific Ave	57	6,740	57	6,720	
Eastside St	31	7,040	30	7,060	
Deschutes Pkwy	50	7,480	49	7,500	
E St	55	5,400	55	5,430	
Trosper Rd	62	4,860	61	4,880	
US - 101 Westbound					
Cooper Point*	37	4,980	50	5,060	1,403
Black Lake	57	4,260	56	4,330	

* Additional volume on Flyover

Corridor Segment	Base 2045		Scenario 4 - Flyover Ramp	
	Speed	Volume	Speed	Volume
Interstate 5 Northbound				
Center	59	5,530	59	5,450
Mounts Rd	57	5,380	57	5,320
Nisqually	58	5,070	58	5,070
Marvin Rd	58	4,830	58	4,830
Carpenter Rd	42	5,500	43	5,520
College St	46	5,850	42	5,880
Pacific Ave	47	7,330	34	7,370
Eastside St	52	7,240	51	7,360
Deschutes Pkwy	56	7,030	56	7,070
E St	40	5,420	47	5,460
Trosper Rd	57	4,520	56	4,510
US - 101 Eastbound				
Cooper Point	43	5,190	44	5,240
Black Lake	59	3,710	59	3,740

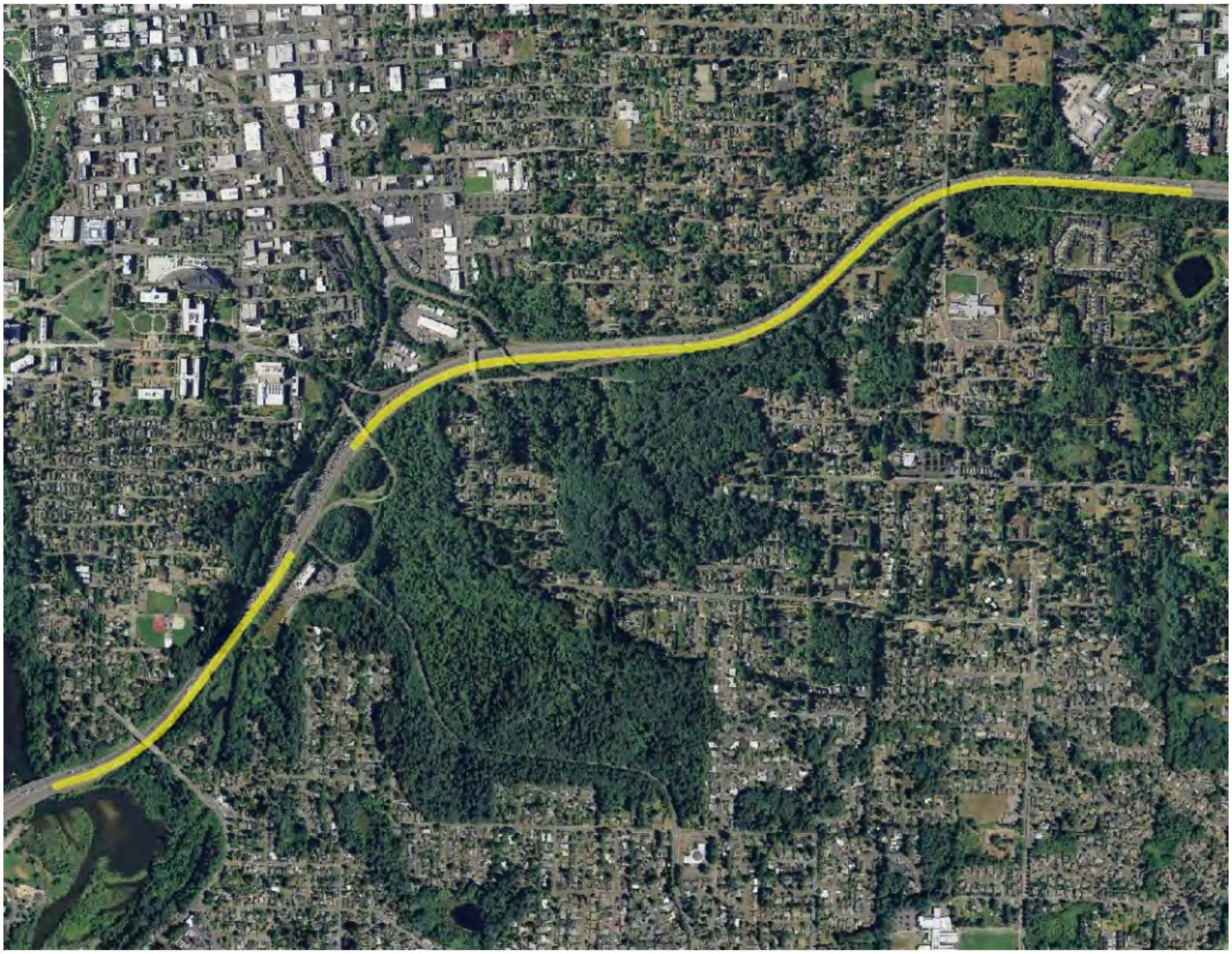
Observations:

- Throughput was increased slightly in the northbound direction.
- The queue to exit I-5 to merge to US 101 was reduced.
- I-5 volumes remained unchanged.

Scenario 5 – 2045 - I-5 Northbound Widening

Description: Add an auxiliary lane from US 101 on-ramp to 14th Avenue off-ramp, and from Plum Street on-ramp to Pacific Avenue off-ramp

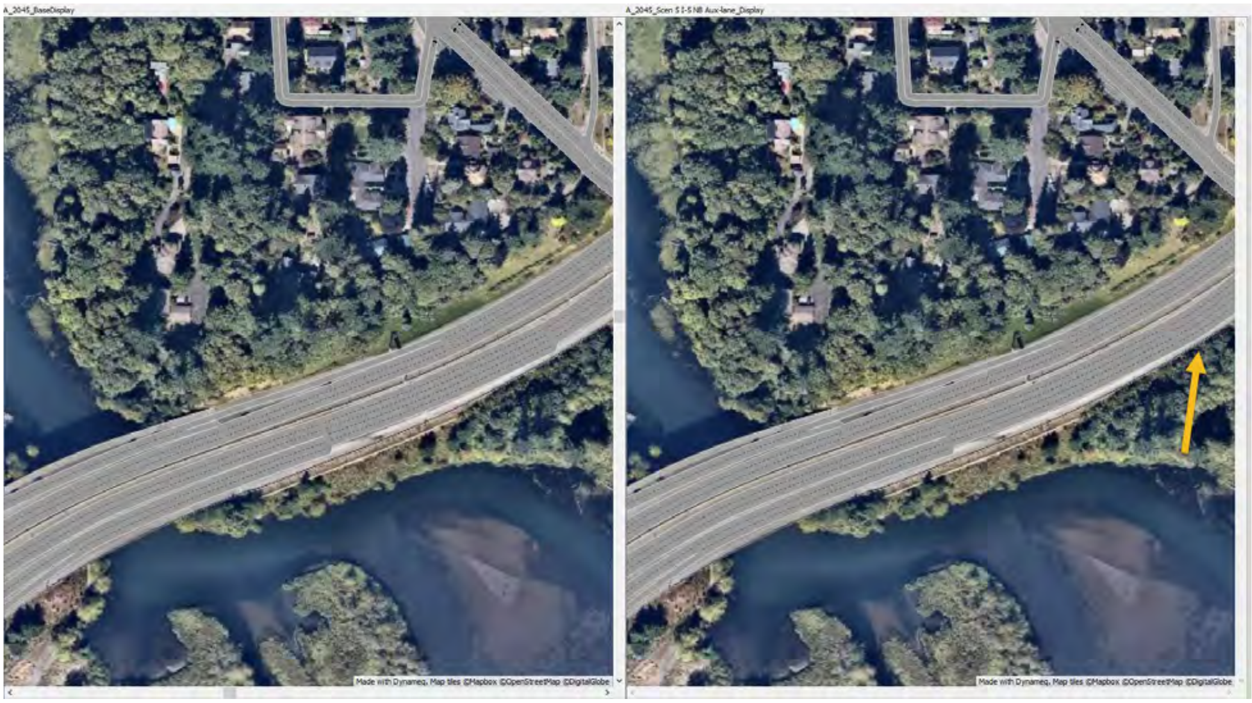
Vicinity Map:



Improvement:

Left: Base Model; Right: Improvement

Start of Auxiliary Lane NB after US 101 merge



Henderson Blvd

End at Pacific Off-Ramp

Volume:

Left: Base Model; Right: Improvement. Time period: 4 – 5 pm
Volume shown on road segments - number of trips per hour.

Start of Auxiliary Lane NB

End of Auxiliary-Lane at Pacific Off-Ramp

Speed:

Left: Base Model; Right: Improvement. Time period: 4 – 5 pm.
Speed shown on road segments – average m.p.h.

Start of Auxiliary Lane NB

End of Auxiliary-Lane at Pacific Off-Ramp

Peak hour Volume and Speed by Corridor segment

Corridor Segment	Base 2045		Scenario 5 - Northbound Widening	
	Speed	Volume	Speed	Volume
Interstate 5 Southbound				
Center	19	6,510	20	6,520
Mounts Rd	18	6,180	18	6,240
Nisqually	54	5,690	55	5,770
Marvin Rd	58	5,260	57	5,320
Carpenter Rd	56	6,010	56	6,030
College St	58	6,100	59	6,140
Pacific Ave	57	6,740	57	6,750
Eastside St	31	7,040	31	7,060
Deschutes Pkwy	50	7,480	50	7,440
E St	55	5,400	55	5,440
Trosper Rd	62	4,860	62	4,920
US - 101 Westbound				
Cooper Point	37	4,980	37	4,900
Black Lake	57	4,260	57	4,190

Corridor Segment	Base 2045		Scenario 5 - Northbound Widening	
	Speed	Volume	Speed	Volume
Interstate 5 Northbound				
Center	59	5,530	59	5,520
Mounts Rd	57	5,380	57	5,350
Nisqually	58	5,070	58	5,080
Marvin Rd	58	4,830	58	4,820
Carpenter Rd	42	5,500	44	5,520
College St	46	5,850	44	5,810
Pacific Ave	47	7,330	37	7,300
Eastside St	52	7,240	56	7,410
Deschutes Pkwy	56	7,030	57	7,020
E St	40	5,420	43	5,400
Trosper Rd	57	4,520	55	4,520
US - 101 Eastbound				
Cooper Point	43	5,190	44	5,200
Black Lake	59	3,710	59	3,740

Observations:

- Speeds were increased in various segments along northbound I-5 near the US 101 merge where the auxiliary lane smoothed out lane drops and adds. This was reflected in the larger Eastside St segment, where speeds and throughput/volume were increased.
- Delay was increased north of the auxiliary lane, with the lane drop.

Scenario 6 – 2045 - I-5 Widening with HOV

Description: Add a lane with the HOV lane as the inside lane both directions I-5 from Deschutes on-ramp to Mounts Road

Vicinity Map:

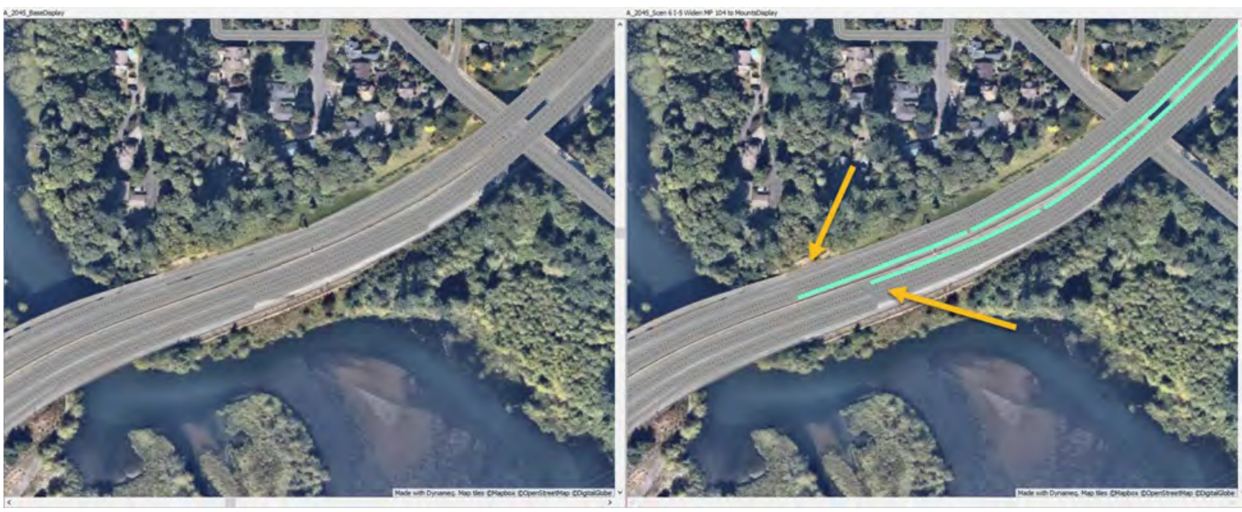
Improvement:

Left: Base Model; Right: Improvement. Green is HOV lane.

Mounts Road Interchange connect SB HOV

Mounts Road Interchange connect NB HOV

Exit 104 Off and On-Ramp begin NB end SB HOV

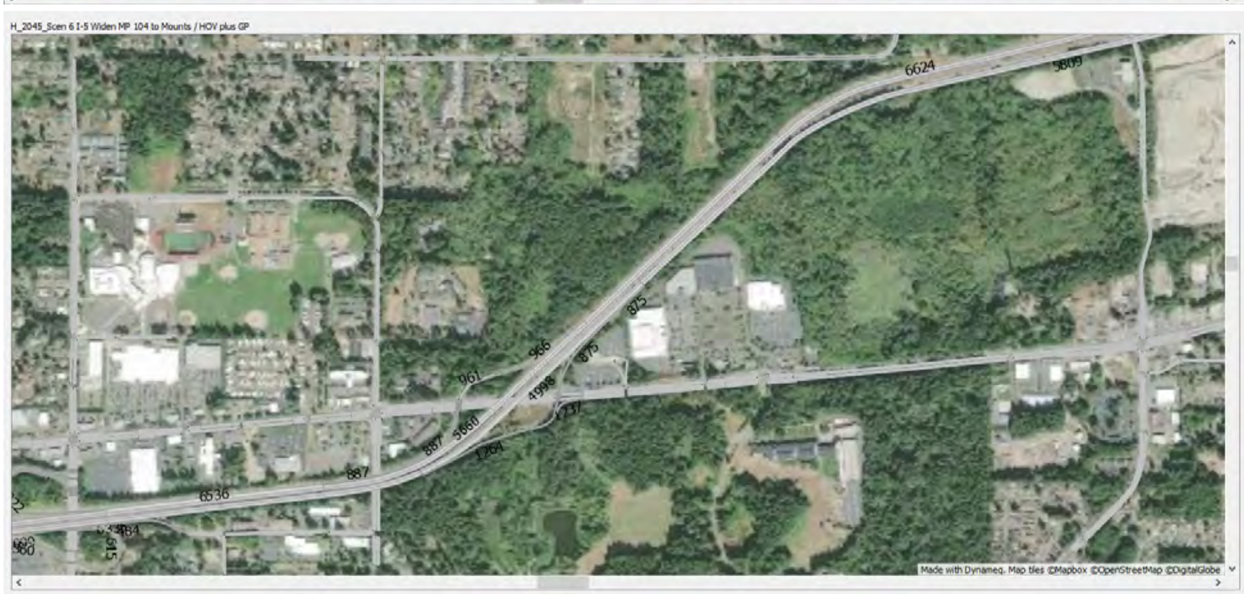


Volume:

Top: Base Model; Bottom: Improvement. Time period: 4 – 5 pm
Volume shown on road segments - number of trips per hour.

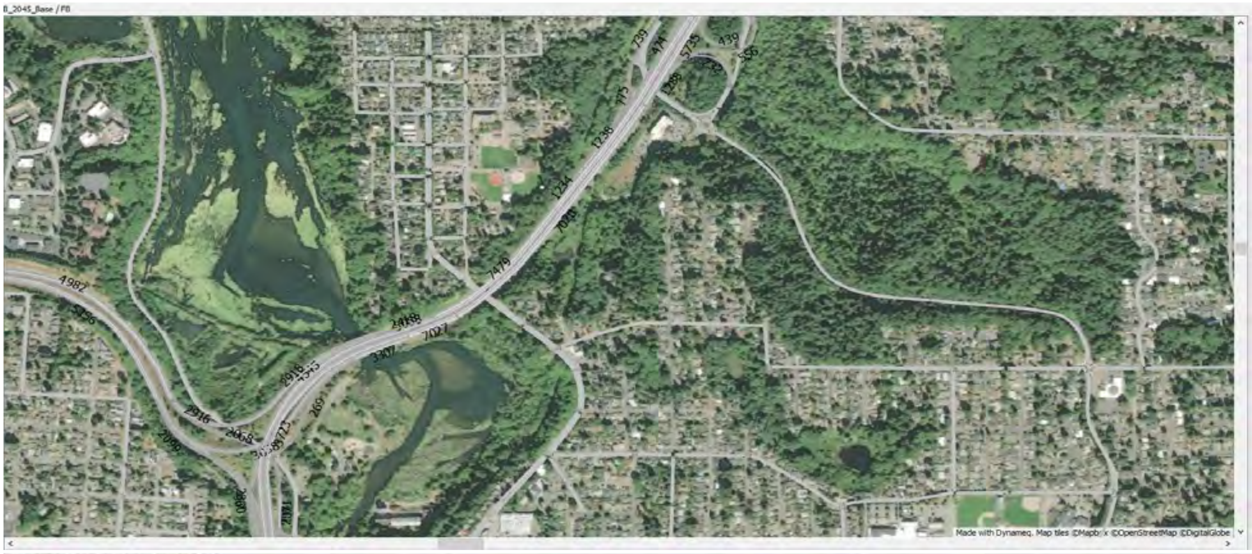
Mounts Road Interchange

Martin Way Interchange



Pacific Interchange

Henderson Blvd to Exit 104



Speed:

Left: Base Model; Right: Improvement. Time period: 4 – 5 pm.

Speed shown on road segments – average m.p.h.

Mounts Road Interchange

Martin Way Interchange

Pacific Interchange

Henderson Blvd to Exit 104

Peak hour Volume and Speed by Corridor segment

Corridor Segment	Base 2045						Scenario 6 - Widening with HOV					
	SOV		HOV		All Traffic		SOV		HOV		All Traffic	
	Speed	Vol	Speed	Vol	Speed	Vol	Speed	Vol	Speed	Vol	Speed	Vol
Interstate 5 Southbound												
Center	16	4,930	50	1,580	19	6,510	29	5,720	55	1,580	33	7,310
Mounts Rd	17	4,660	18	1,520	18	6,180	26	5,820	51	1,640	29	7,460
Nisqually	54	4,400	54	1,300	54	5,690	53	5,190	56	1,470	54	6,660
Marvin Rd	57	4,070	58	1,190	58	5,260	56	4,740	58	1,360	56	6,100
Carpenter Rd	56	4,590	56	1,420	56	6,010	55	5,040	56	1,580	55	6,620
College St	58	4,730	59	1,370	58	6,100	58	5,040	59	1,500	58	6,540
Pacific Ave	57	5,320	58	1,430	57	6,740	58	5,670	59	1,540	58	7,220
Eastside St	29	5,560	38	1,490	31	7,040	36	6,050	50	1,630	38	7,680
Deschutes Pkwy	49	5,900	51	1,580	50	7,480	44	6,360	51	1,740	45	8,100
E St	55	4,120	56	1,280	55	5,400	56	4,360	57	1,400	56	5,760
Trosper Rd	62	3,700	62	1,160	62	4,860	61	3,890	62	1,300	61	5,190
US - 101 Westbound												
Cooper Point	37	4,180	39	810	37	4,980	38	4,300	38	870	38	5,170
Black Lake	57	3,610	56	650	57	4,260	56	3,640	56	760	56	4,400

Corridor Segment	Base 2045						Scenario 6 - Widening with HOV					
	SOV		HOV		All Traffic		SOV		HOV		All Traffic	
	Speed	Vol	Speed	Vol	Speed	Vol	Speed	Vol	Speed	Vol	Speed	Vol
Interstate 5 Northbound												
Center	59	4,350	59	1,260	59	5,530	58	4,490	59	1,290	59	5,760
Mounts Rd	57	4,230	58	1,260	57	5,380	59	4,440	60	1,300	59	5,740
Nisqually	58	3,970	58	1,160	58	5,070	58	4,220	59	1,200	59	5,420
Marvin Rd	58	3,790	58	1,110	58	4,830	58	4,300	59	1,240	59	5,540
Carpenter Rd	42	4,410	45	1,180	42	5,500	44	4,550	52	1,260	46	5,810
College St	46	4,680	51	1,220	46	5,850	53	5,040	55	1,300	53	6,340
Pacific Ave	46	5,930	48	1,460	47	7,330	54	6,260	58	1,570	55	7,830
Eastside St	52	5,870	52	1,510	52	7,240	52	6,090	55	1,550	52	7,640
Deschutes Pkwy	56	5,610	56	1,580	56	7,030	51	5,720	56	1,600	52	7,310
E St	40	4,230	46	1,320	40	5,420	47	4,160	49	1,340	47	5,490
Trosper Rd	57	3,450	57	1,170	57	4,520	54	3,390	55	1,170	54	4,550
US - 101 Eastbound												
Cooper Point	43	4,320	43	890	43	5,190	46	4,370	46	900	46	5,280
Black Lake	59	3,060	59	660	59	3,710	59	3,060	59	680	59	3,740

Observations:

Southbound I-5

- While speeds at the Nisqually Delta were increased, delay caused by the lane end (5th lane) at Mounts road, caused delay to through traffic. Alternative improvements should be identified for this interchange to see if the delay could be reduced.

- Speeds increased through the remainder of the I-5 corridor.

- There was still some delay in the Eastside segment. It should be noted that this scenario does not contain the Braided Ramp exit to US 101.

- There was a slight decrease in speeds at the Deschutes Parkway segment where there was a lane drop back to three lanes.

- Throughput (volume) increased throughout the corridor.

- HOV traffic experienced very little delay through the corridor.

Northbound

- Throughput increased throughout the corridor

- Speeds increased throughout the corridor with the exception of the E Street / Deschutes Parkway segments. It should be noted that this scenario does not contain the Flyover ramp to US 101.

Scenario 7 – 2045 - Tumwater Boulevard Interchange

Description: Increase travel lanes from 3 to 4 lanes on Tumwater Boulevard and construct bridge over I-5, install 2 roundabouts at the ramp connections, and modify and improve ramps to freeway

Vicinity Map:

Improvement:

Left: Base Model; Right: Improvement

Volume:

Left: Base Model; Right: Improvement. Time period: 4 – 5 pm
Volume shown on road segments - number of trips per hour.

Speed:

Left: Base Model; Right: Improvement. Time period: 4 – 5 pm.
Speed shown on road segments – average m.p.h.

Peak hour Volume and Speed by Corridor segment

Corridor Segment	Base 2045		Scenario 7 - Tumwater Boulevard Interchange	
	Speed	Volume	Speed	Volume
Interstate 5 Southbound				
Center	19	6,510	19	6,460
Mounts Rd	18	6,180	18	6,380
Nisqually	54	5,690	55	5,790
Marvin Rd	58	5,260	57	5,400
Carpenter Rd	56	6,010	56	6,120
College St	58	6,100	59	6,190
Pacific Ave	57	6,740	58	6,830
Eastside St	31	7,040	33	7,200
Deschutes Pkwy	50	7,480	49	7,590
E St	55	5,400	56	5,460
Trosper Rd	62	4,860	61	4,900
US - 101 Westbound				
Cooper Point	37	4,980	37	4,990

Corridor Segment	Base 2045		Scenario 7 - Tumwater Boulevard Interchange	
	Speed	Volume	Speed	Volume
Interstate 5 Northbound				
Center	59	5,530	59	5,570
Mounts Rd	57	5,380	57	5,360
Nisqually	58	5,070	58	5,050
Marvin Rd	58	4,830	58	4,880
Carpenter Rd	42	5,500	42	5,500
College St	46	5,850	40	5,920
Pacific Ave	47	7,330	47	7,400
Eastside St	52	7,240	52	7,270
Deschutes Pkwy	56	7,030	56	7,110
E St	40	5,420	47	5,450
Trosper Rd	57	4,520	56	4,520
US - 101 Eastbound				
Cooper Point	43	5,190	44	5,150
Black Lake	59	3,710	59	3,680

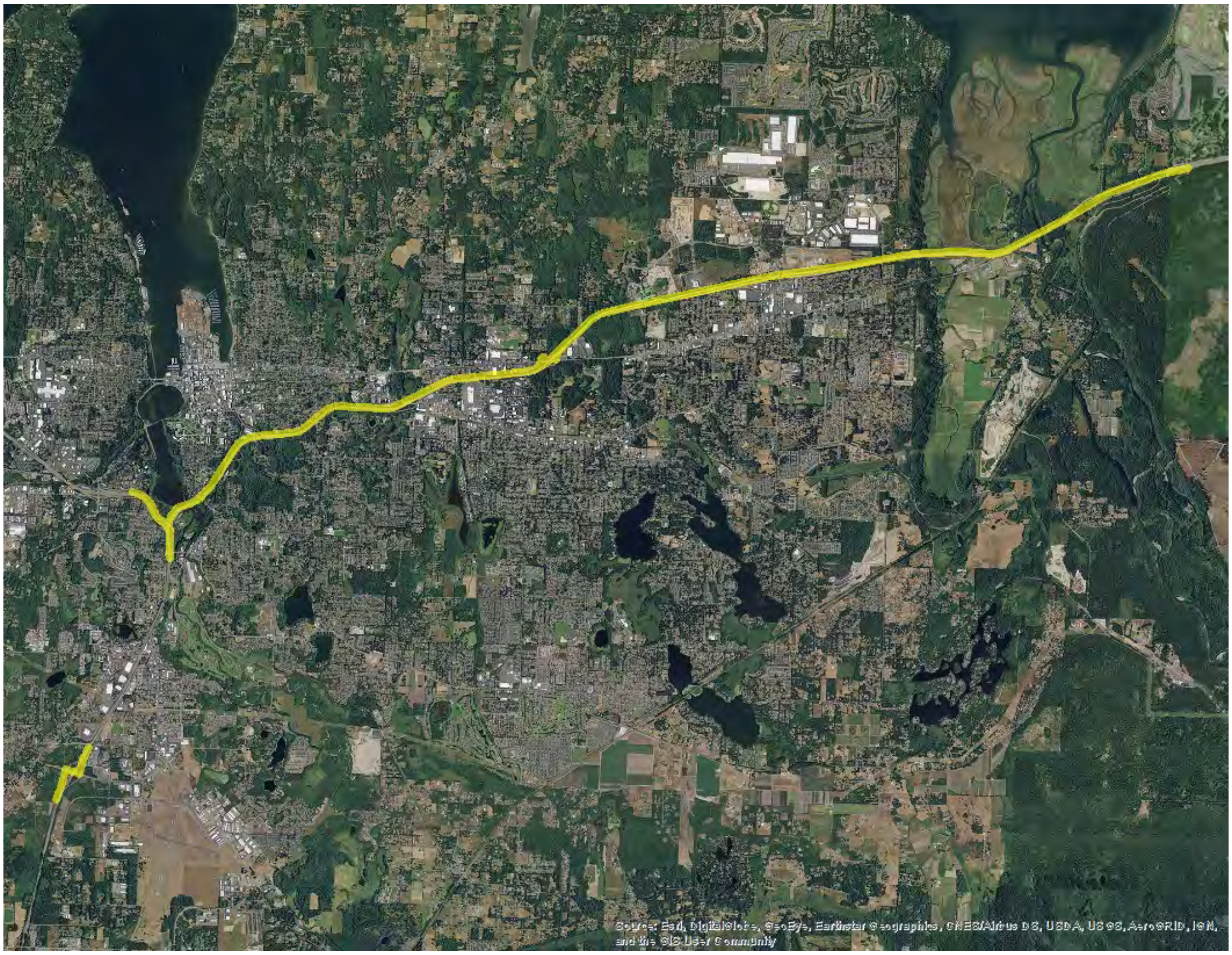
Observations:

This improvement assists with traffic flow on Tumwater Boulevard and reduces the left turns but does not make a large difference on I-5.

Scenario 8 – 2045 – All Improvements

Description: Combination of widening (add a lane with the HOV lane as the inside lane both directions I-5 from Deschutes on-ramp to Mounts Road), US 101 braided ramp interchange, northbound flyover ramp, Martin Way interchange, Tumwater interchange, and HOV ramp improvements.

Vicinity Map:



Improvements:

Left: Base Model; Right: Improvement

Mounts Road - New Lane and HOV Lane Green

Martin Way Partial Cloverleaf Interchange – Transit Lane in Orange and HOV Lane Green

Plum Street On-Ramp HOV By-pass Lane

Braided Ramp and End New Lane and HOV Lane

Flyover Ramp Merge at US 101 Westbound

Tumwater Interchange

Volume:

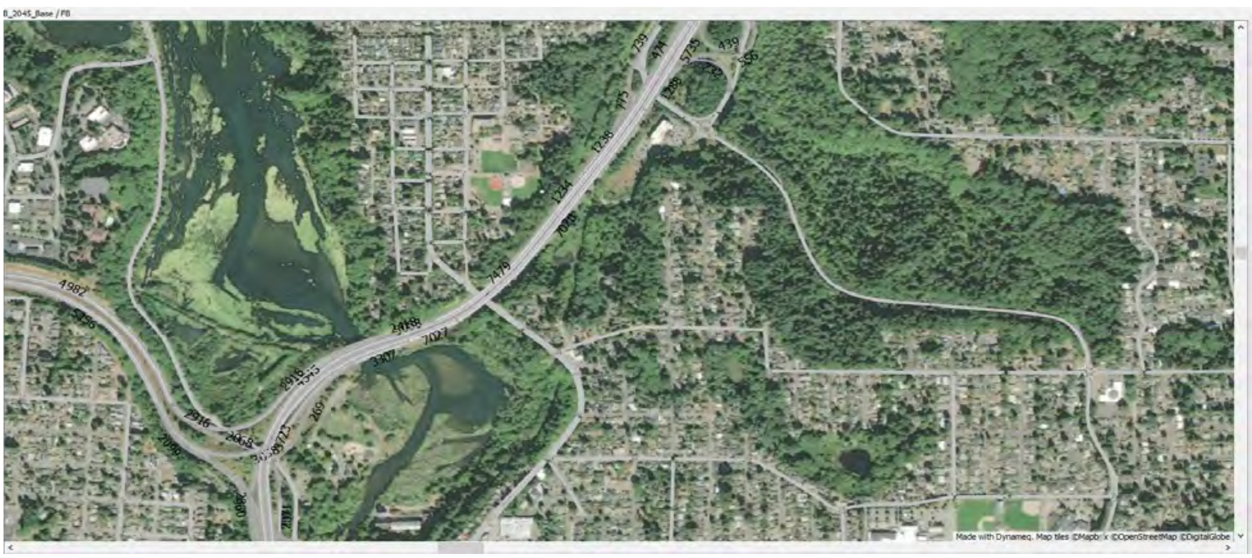
Left: Base Model; Right: Improvement. Time period: 4 – 5 pm
Volume shown on road segments - number of trips per hour.

Mounts Road Interchange

Martin Way Interchange

Pacific Interchange

Henderson Blvd to Exit 104



Speed and Delay:

Left: Base Model; Right: Improvement. Time period: 4 – 5 pm.
Speed shown on road segments – average m.p.h. Delay shown in white box – seconds.

Mounts Road Interchange

Martin Way Interchange

Pacific Interchange

Henderson Blvd to Exit 104

Peak hour Volume and Speed by Corridor segment

Corridor Segment	Base 2045						Scenario 8 - All Improvements					
	SOV		HOV		All Traffic		SOV		HOV		All Traffic	
	Speed	Vol	Speed	Vol	Speed	Vol	Speed	Vol	Speed	Vol	Speed	Vol
Interstate 5 Southbound												
Center	16	4,930	50	1,580	19	6,510	26	5,778	53	1,585	29	7,360
Mounts Rd	17	4,660	18	1,520	18	6,180	25	5,742	51	1,652	28	7,392
Nisqually	54	4,400	54	1,300	54	5,690	53	5,127	56	1,495	54	6,620
Marvin Rd	57	4,070	58	1,190	58	5,260	57	4,617	59	1,384	57	5,999
Carpenter Rd	56	4,590	56	1,420	56	6,010	55	5,025	57	1,613	55	6,636
College St	58	4,730	59	1,370	58	6,100	56	5,688	58	1,619	56	7,304
Pacific Ave	57	5,320	58	1,430	57	6,740	54	6,285	58	1,648	55	7,930
Eastside St	29	5,560	38	1,490	31	7,040	53	6,496	56	1,667	54	8,160
Deschutes Pkwy	49	5,900	51	1,580	50	7,480	41	5,888	44	1,755	42	7,643
E St	55	4,120	56	1,280	55	5,400	56	4,473	56	1,391	56	5,864
Trosper Rd	62	3,700	62	1,160	62	4,860	61	4,019	62	1,317	61	5,335
US - 101 Westbound												
Cooper Point	37	4,180	39	810	37	4,980	48	4,605	48	890	48	5,495
Black Lake	57	3,610	56	650	57	4,260	56	3,926	56	765	56	4,691

Corridor Segment	Base 2045						Scenario 8 - All Improvements					
	SOV		HOV		All Traffic		SOV		HOV		All Traffic	
	Speed	Vol	Speed	Vol	Speed	Vol	Speed	Vol	Speed	Vol	Speed	Vol
Interstate 5 Northbound												
Center	59	4,350	59	1,260	59	5,530	58	4,516	59	1,340	58	5,852
Mounts Rd	57	4,230	58	1,260	57	5,380	59	4,451	59	1,316	59	5,763
Nisqually	58	3,970	58	1,160	58	5,070	58	4,229	59	1,232	59	5,457
Marvin Rd	58	3,790	58	1,110	58	4,830	58	4,275	59	1,273	58	5,544
Carpenter Rd	42	4,410	45	1,180	42	5,500	42	4,558	51	1,290	44	5,844
College St	46	4,680	51	1,220	46	5,850	52	4,965	55	1,327	53	6,292
Pacific Ave	46	5,930	48	1,460	47	7,330	54	6,213	58	1,617	55	7,827
Eastside St	52	5,870	52	1,510	52	7,240	53	6,014	56	1,583	54	7,593
Deschutes Pkwy	56	5,610	56	1,580	56	7,030	53	5,728	55	1,566	54	7,294
E St	40	4,230	46	1,320	40	5,420	47	4,203	49	1,287	48	5,490
Trosper Rd	57	3,450	57	1,170	57	4,520	56	3,437	57	1,133	56	4,570
US - 101 Eastbound												
Cooper Point	43	4,320	43	890	43	5,190	44	4,393	44	898	44	5,291
Black Lake	59	3,060	59	660	59	3,710	59	3,083	59	664	59	3,747

Observations:

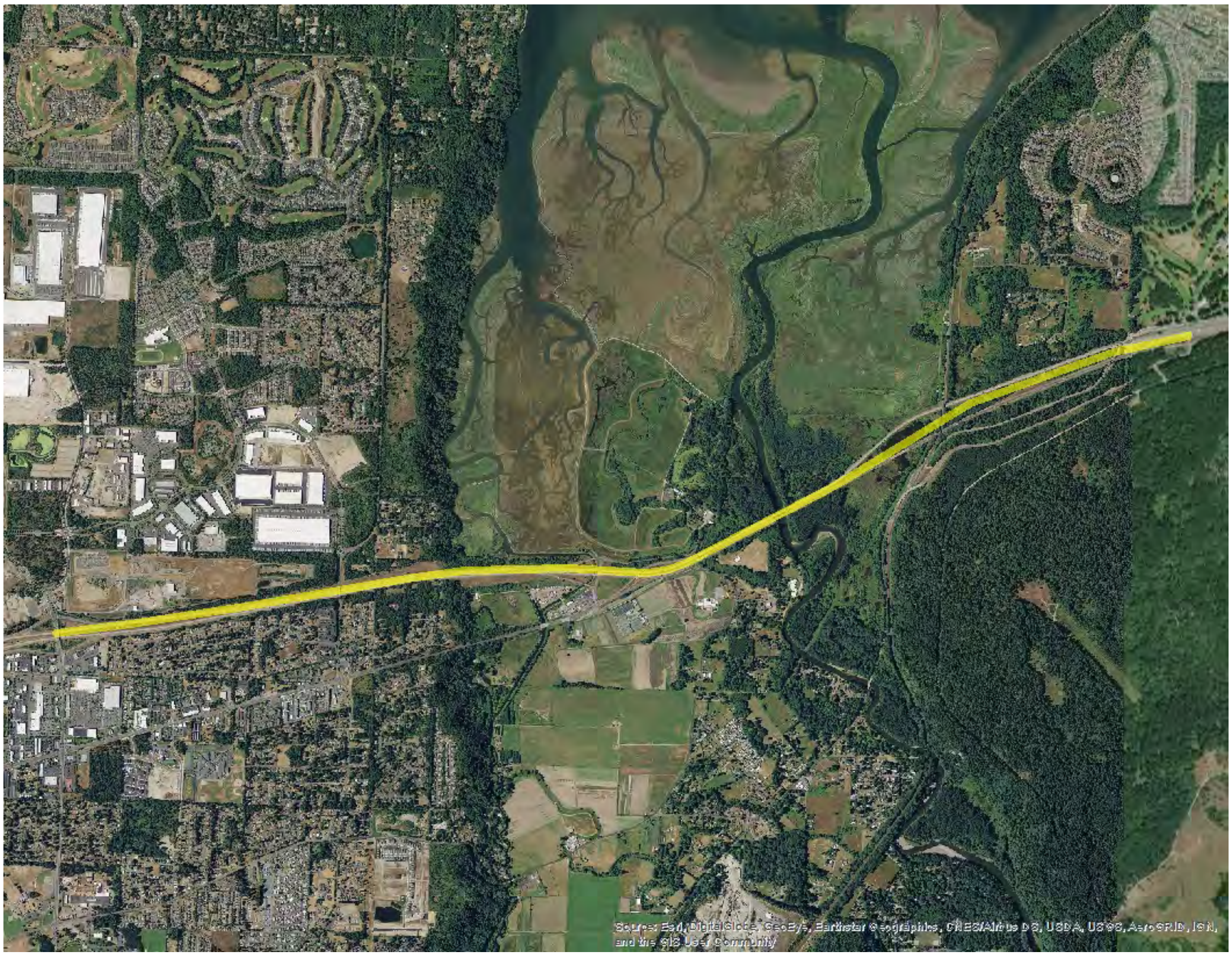
This scenario:

- Increases speeds and volumes throughout the I-5 corridor. The only remaining areas of congestion in the southbound direction are at Mounts Road and in the Deschutes Parkway segment due to the exit to the Braided Ramp.

Scenario 9 – 2045 - I-5 Widening with HOV at Marvin Road Interchange

Description: Add a lane with the HOV lane as the inside lane both directions I-5 from Marvin Road on-ramp to Mounts Road

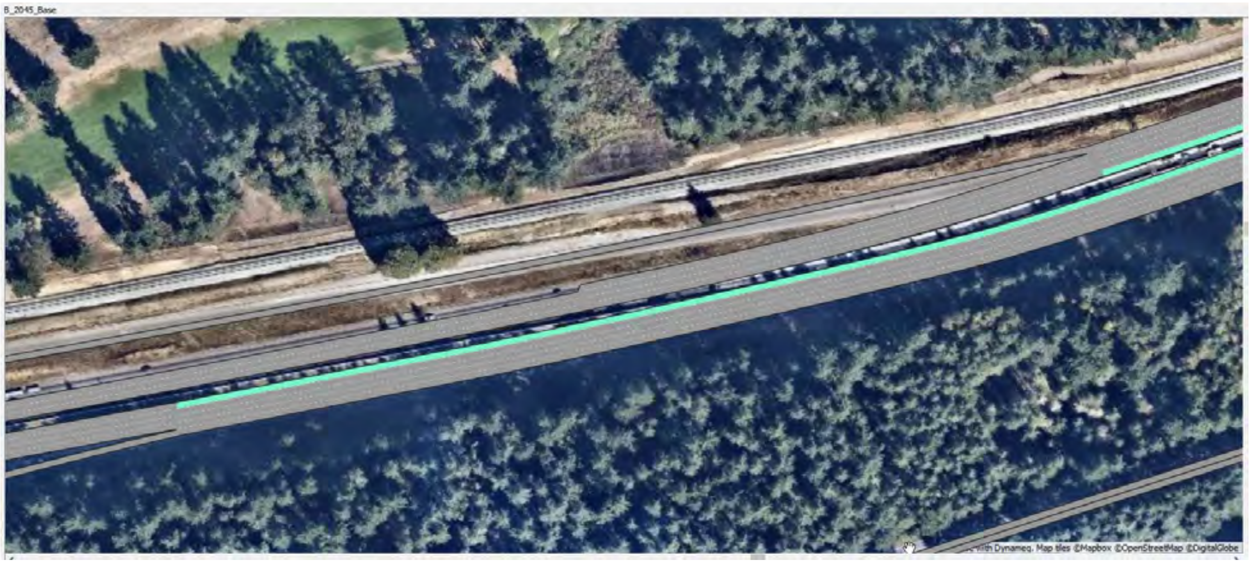
Vicinity Map:



Improvement:

Top: Base Model; Bottom: Improvement

Approaching Mounts Road Interchange



After Marvin Road Interchange

Peak hour Volume and Speed by Corridor segment

Corridor Segment	Base 2045						Scenario 9 - Widening north of Marvin Rd					
	SOV		HOV		All Traffic		SOV		HOV		All Traffic	
	Speed	Vol	Speed	Vol	Speed	Vol	Speed	Vol	Speed	Vol	Speed	Vol
Interstate 5 Southbound												
Center	16	4,930	50	1,580	19	6,510	27	5,761	55	1,514	30	7,275
Mounts Rd	17	4,660	18	1,520	18	6,180	26	5,800	52	1,581	29	7,381
Nisqually	54	4,400	54	1,300	54	5,690	53	5,155	55	1,409	53	6,564
Marvin Rd	57	4,070	58	1,190	58	5,260	51	4,666	51	1,253	51	5,919
Carpenter Rd	56	4,590	56	1,420	56	6,010	54	4,835	54	1,431	54	6,266
College St	58	4,730	59	1,370	58	6,100	58	4,897	58	1,387	58	6,284
Pacific Ave	57	5,320	58	1,430	57	6,740	57	5,471	58	1,448	57	6,919
Eastside St	29	5,560	38	1,490	31	7,040	33	5,774	41	1,494	35	7,268
Deschutes	49	5,900	51	1,580	50	7,480	48	6,236	50	1,592	49	7,828
E St	55	4,120	56	1,280	55	5,400	56	4,325	56	1,283	56	5,608
Trosper Rd	62	3,700	62	1,160	62	4,860	61	3,846	62	1,187	61	5,033
US - 101 Westbound												
Cooper Point	37	4,180	39	810	37	4,980	35	4,182	35	812	35	4,994
Black Lake	57	3,610	56	650	57	4,260	56	3,573	56	682	56	4,255

Corridor Segment	Base 2045						Scenario 9 - Widening north of Marvin Rd					
	SOV		HOV		All Traffic		SOV		HOV		All Traffic	
	Speed	Vol	Speed	Vol	Speed	Vol	Speed	Vol	Speed	Vol	Speed	Vol
Interstate 5 Northbound												
Center	59	4,350	59	1,260	59	5,530	59	4,344	59	1,184	59	5,528
Mounts Rd	57	4,230	58	1,260	57	5,380	59	4,264	60	1,161	59	5,425
Nisqually	58	3,970	58	1,160	58	5,070	59	4,023	60	1,103	59	5,126
Marvin Rd	58	3,790	58	1,110	58	4,830	59	3,836	59	1,063	59	4,899
Carpenter Rd	42	4,410	45	1,180	42	5,500	36	4,424	38	1,136	36	5,560
College St	46	4,680	51	1,220	46	5,850	52	4,764	52	1,206	52	5,970
Pacific Ave	46	5,930	48	1,460	47	7,330	46	6,049	47	1,417	46	7,465
Eastside St	52	5,870	52	1,510	52	7,240	52	5,916	53	1,425	53	7,341
Deschutes Pkwy	56	5,610	56	1,580	56	7,030	55	5,650	56	1,454	56	7,104
E St	40	4,230	46	1,320	40	5,420	45	4,183	47	1,193	46	5,376
Trosper Rd	57	3,450	57	1,170	57	4,520	57	3,415	58	1,057	57	4,472
US - 101 Eastbound												
Cooper Point	43	4,320	43	890	43	5,190	44	4,361	44	887	44	5,248
Black Lake	59	3,060	59	660	59	3,710	59	3,097	59	641	59	3,738

Observations:

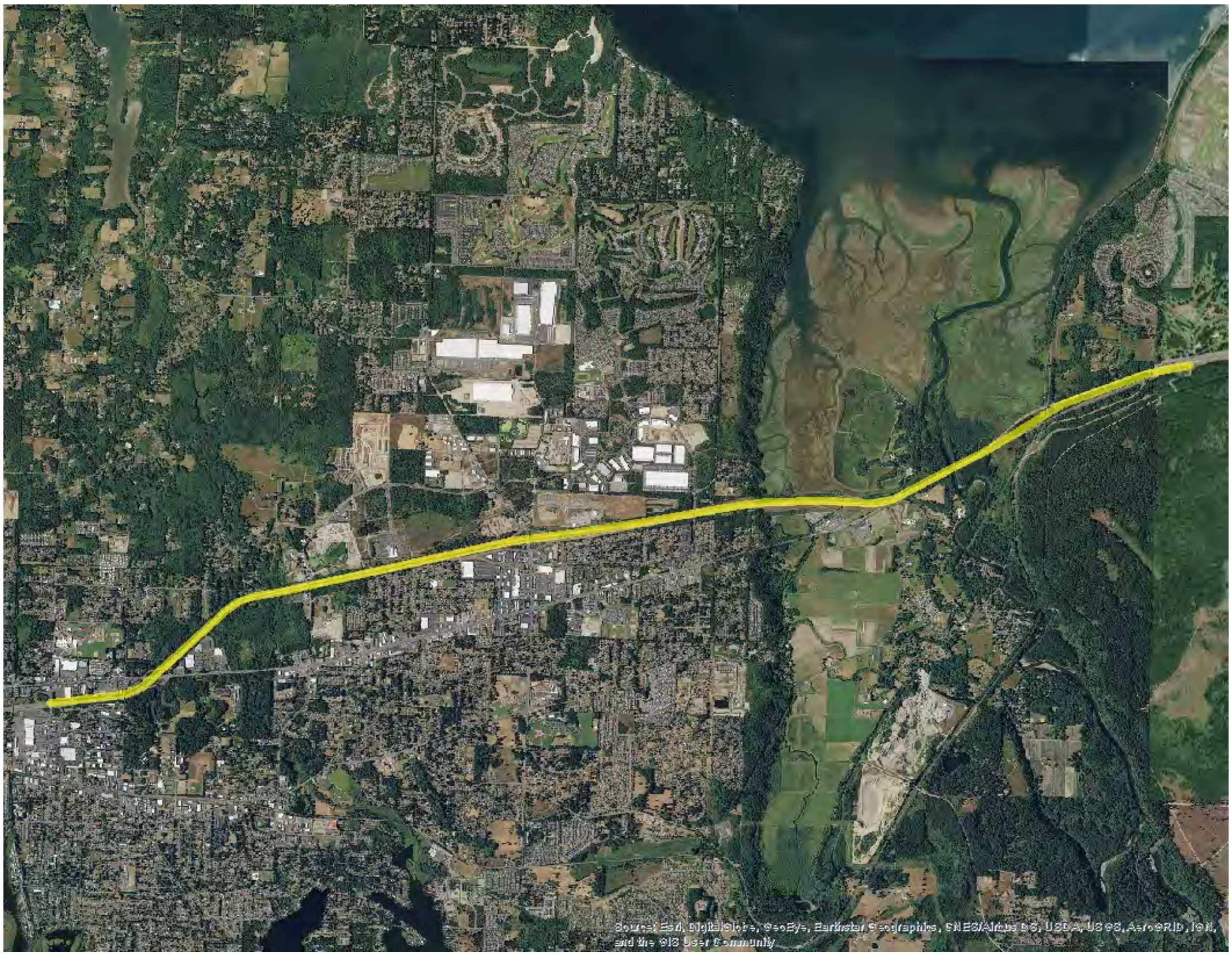
This scenario was developed to observe if a bottleneck occurred at Marvin Road if widening ended there in the southbound direction.

- Compared to Scenario 6, there is increased congestion at Marvin Road, but it is still at an acceptable LOS (see appendix A)
- There is congestion starting in the Pacific Avenue segment in the southbound direction.

Scenario 10 – 2045 - I-5 Widening with HOV at Sleater-Kinney Interchange

Description: Add a lane with the HOV lane as the inside lane both directions I-5 from Sleater-Kinney on-ramp to Mounts Road

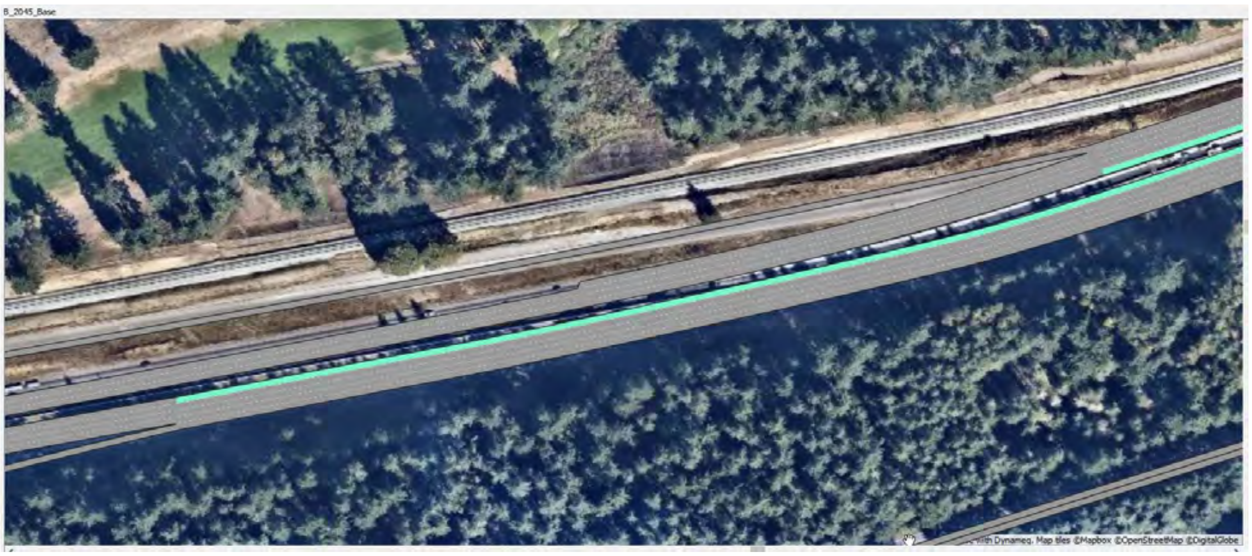
Vicinity Map:



Improvement:

Top: Base Model; Bottom: Improvement

Approaching Mounts Road Interchange



After Sleater-Kinney Interchange

Peak hour Volume and Speed by Corridor segment

Corridor Segment	Base 2045						Scenario 10 - Widening north of Sleater-Kinney					
	SOV		HOV		All Traffic		SOV		HOV		All Traffic	
	Speed	Vol	Speed	Vol	Speed	Vol	Speed	Vol	Speed	Vol	Speed	Vol
Interstate 5 Southbound												
Center	16	4,930	50	1,580	19	6,510	27	5,705	54	1,512	30	7,217
Mounts Rd	17	4,660	18	1,520	18	6,180	24	5,625	51	1,573	28	7,198
Nisqually	54	4,400	54	1,300	54	5,690	52	5,036	54	1,416	53	6,452
Marvin Rd	57	4,070	58	1,190	58	5,260	57	4,580	59	1,242	57	5,822
Carpenter Rd	56	4,590	56	1,420	56	6,010	55	5,002	57	1,476	55	6,478
College St	58	4,730	59	1,370	58	6,100	58	4,991	59	1,436	58	6,427
Pacific Ave	57	5,320	58	1,430	57	6,740	54	5,537	57	1,477	55	7,014
Eastside St	29	5,560	38	1,490	31	7,040	34	5,870	44	1,545	36	7,415
Deschutes Pkwy	49	5,900	51	1,580	50	7,480	44	6,279	47	1,635	45	7,914
E St	55	4,120	56	1,280	55	5,400	55	4,278	55	1,281	55	5,559
Trosper Rd	62	3,700	62	1,160	62	4,860	61	3,846	62	1,188	61	5,034
US - 101 Westbound												
Cooper Point	37	4,180	39	810	37	4,980	35	4,213	35	835	35	5,048
Black Lake	57	3,610	56	650	57	4,260	56	3,606	56	706	56	4,312

Corridor Segment	Base 2045						Scenario 10 - Widening north of Sleater-Kinney					
	SOV		HOV		All Traffic		SOV		HOV		All Traffic	
	Speed	Vol	Speed	Vol	Speed	Vol	Speed	Vol	Speed	Vol	Speed	Vol
Interstate 5 Northbound												
Center	59	4,350	59	1,260	59	5,530	59	4,388	59	1,197	59	5,585
Mounts Rd	57	4,230	58	1,260	57	5,380	59	4,276	60	1,170	59	5,446
Nisqually	58	3,970	58	1,160	58	5,070	59	4,007	60	1,107	59	5,114
Marvin Rd	58	3,790	58	1,110	58	4,830	59	4,209	59	1,150	59	5,359
Carpenter Rd	42	4,410	45	1,180	42	5,500	48	4,491	53	1,174	49	5,665
College St	46	4,680	51	1,220	46	5,850	52	4,856	55	1,255	53	6,111
Pacific Ave	46	5,930	48	1,460	47	7,330	36	5,690	43	1,405	37	7,095
Eastside St	52	5,870	52	1,510	52	7,240	51	5,793	52	1,419	51	7,212
Deschutes Pkwy	56	5,610	56	1,580	56	7,030	56	5,568	56	1,426	56	6,994
E St	40	4,230	46	1,320	40	5,420	40	4,160	42	1,177	40	5,337
Trosper Rd	57	3,450	57	1,170	57	4,520	55	3,398	56	1,082	55	4,480
US - 101 Eastbound												
Cooper Point	43	4,320	43	890	43	5,190	45	4,314	44	877	45	5,191
Black Lake	59	3,060	59	660	59	3,710	59	3,065	59	629	59	3,694

Observations:

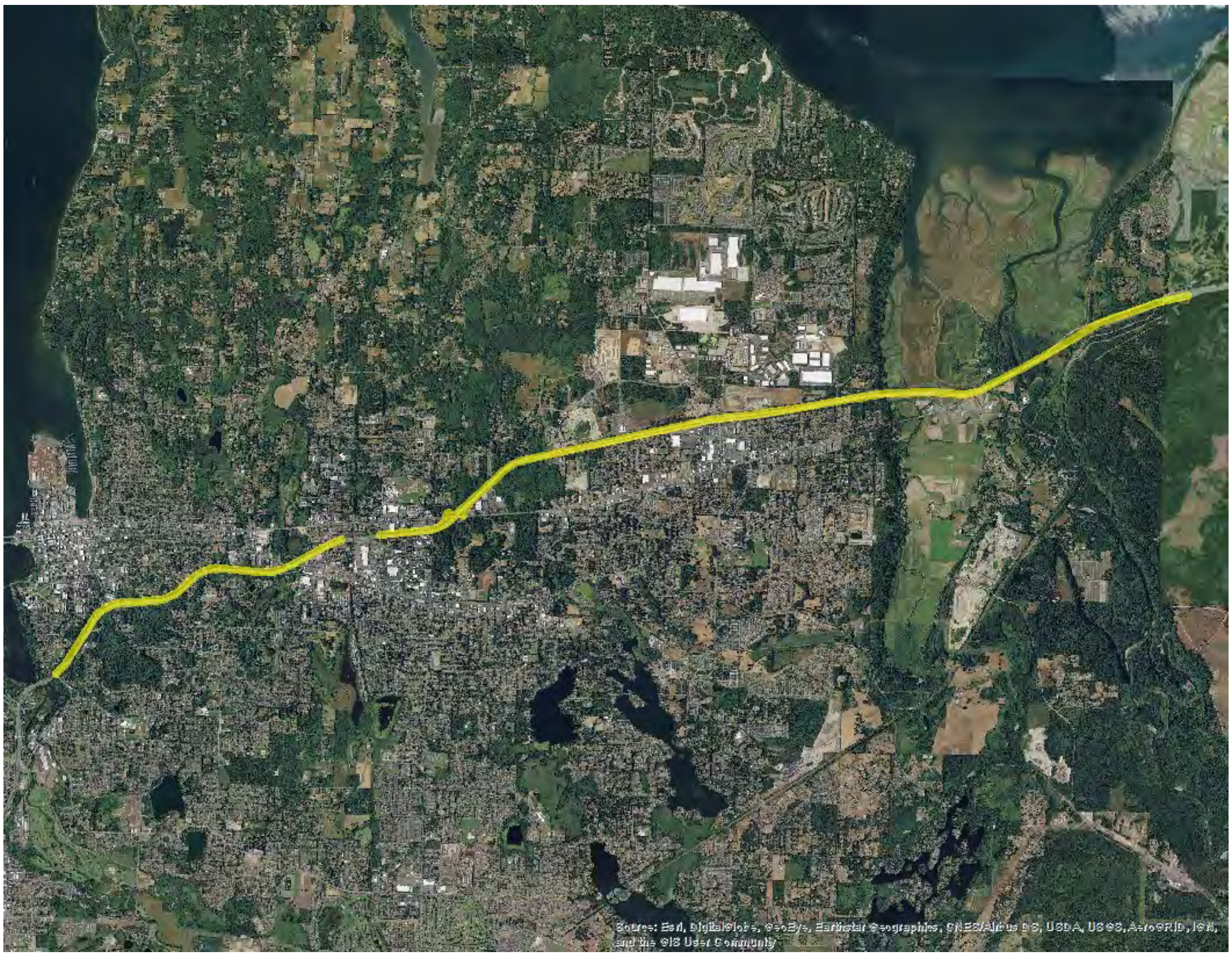
This scenario was developed to observe if a bottleneck occurred at Sleater-Kinney Road if widening ended there in the southbound direction.

- Compared to Scenario 6, there is increased congestion at the Eastside segment, but it is still at an acceptable LOS (see appendix A)
- There is congestion starting in the Pacific Avenue segment in the southbound direction, but both are at an unacceptable LOS.

Scenario 11 – 2045 – Combination of Improvements

Description: Combination of widening (Add a lane with the HOV lane as the inside lane both directions I-5 from Sleater-Kinney (NB) and Plum St (SB) to Mounts Road), Martin Way interchange, US 101 Braided Ramp

Vicinity Map:



Peak hour Volume and Speed by Corridor segment

Corridor Segment	Base 2045						Scenario 11 – Combination of Improvements					
	SOV		HOV		All Traffic		SOV		HOV		All Traffic	
	Speed	Vol	Speed	Vol	Speed	Vol	Speed	Vol	Speed	Vol	Speed	Vol
Interstate 5 Southbound												
Center	16	4,930	50	1,580	19	6,510	27	5,725	55	1,517	30	7,242
Mounts Rd	17	4,660	18	1,520	18	6,180	25	5,735	52	1,580	28	7,315
Nisqually	54	4,400	54	1,300	54	5,690	54	5,078	56	1,406	54	6,484
Marvin Rd	57	4,070	58	1,190	58	5,260	57	4,589	59	1,247	57	5,836
Carpenter Rd	56	4,590	56	1,420	56	6,010	55	4,956	57	1,470	55	6,426
College St	58	4,730	59	1,370	58	6,100	55	5,563	58	1,508	55	7,071
Pacific Ave	57	5,320	58	1,430	57	6,740	55	6,144	56	1,540	55	7,684
Eastside St	29	5,560	38	1,490	31	7,040	49	6,387	52	1,589	50	7,976
Deschutes Pkwy	49	5,900	51	1,580	50	7,480	46	5,850	49	1,605	46	7,455
E St	55	4,120	56	1,280	55	5,400	56	4,423	56	1,321	56	5,744
Trosper Rd	62	3,700	62	1,160	62	4,860	61	3,916	62	1,218	61	5,134
US - 101 Westbound												
Cooper Point	37	4,180	39	810	37	4,980	26	4,292	26	789	26	5,081
Black Lake	57	3,610	56	650	57	4,260	56	3,666	56	684	56	4,350

Corridor Segment	Base 2045						Scenario 11 – Combination of Improvements					
	SOV		HOV		All Traffic		SOV		HOV		All Traffic	
	Speed	Vol	Speed	Vol	Speed	Vol	Speed	Vol	Speed	Vol	Speed	Vol
Interstate 5 Northbound												
Center	59	4,350	59	1,260	59	5,530	58	4,534	59	1,286	59	5,814
Mounts Rd	57	4,230	58	1,260	57	5,380	59	4,459	59	1,294	59	5,753
Nisqually	58	3,970	58	1,160	58	5,070	59	4,233	59	1,208	59	5,441
Marvin Rd	58	3,790	58	1,110	58	4,830	58	4,281	59	1,242	58	5,523
Carpenter Rd	42	4,410	45	1,180	42	5,500	44	4,583	51	1,273	45	5,856
College St	46	4,680	51	1,220	46	5,850	53	4,962	56	1,307	53	6,269
Pacific Ave	46	5,930	48	1,460	47	7,330	38	5,792	45	1,492	39	7,284
Eastside St	52	5,870	52	1,510	52	7,240	47	5,906	49	1,525	48	7,431
Deschutes Pkwy	56	5,610	56	1,580	56	7,030	55	5,654	56	1,586	55	7,237
E St	40	4,230	46	1,320	40	5,420	48	4,038	50	1,291	48	5,329
Trosper Rd	57	3,450	57	1,170	57	4,520	58	3,255	59	1,137	58	4,392
US - 101 Eastbound												
Cooper Point	43	4,320	43	890	43	5,190	45	4,285	45	884	45	5,169
Black Lake	59	3,060	59	660	59	3,710	59	3,008	59	660	59	3,668

Observations:

This scenario was developed to observe if the Braided Ramp at US 101 functioned better than widening I-5 through US 101 merge corridor.

- In general, this scenario functioned better than Scenario 6 through the US 101 merge area.

Scenario 12 – 2045 - Modified Widening Improvements

Description: Same as Scenario 6 (Add a lane with the HOV lane as the inside lane both directions I-5 from Deschutes on-ramp to Mounts Road) with an additional (5^{th} lane) between Mounts Road and the Nisqually Interchange.

Vicinity Map:

Improvement:

Top: Base Model; Bottom: Improvement

North of Nisqually Interchange approaching Meridian Road NE Overpass

Peak hour Volume and Speed by Corridor segment

Corridor Segment	Base 2045						Scenario 12 – Modified Widening Improvements					
	SOV		HOV		All Traffic		SOV		HOV		All Traffic	
	Speed	Vol	Speed	Vol	Speed	Vol	Speed	Vol	Speed	Vol	Speed	Vol
Interstate 5 Southbound												
Center	16	4,930	50	1,580	19	6,510	56	6,307	58	1,534	57	7,841
Mounts Rd	17	4,660	18	1,520	18	6,180	56	6,828	58	1,641	56	8,469
Nisqually	54	4,400	54	1,300	54	5,690	56	5,907	58	1,491	57	7,398
Marvin Rd	57	4,070	58	1,190	58	5,260	49	5,075	57	1,361	51	6,436
Carpenter Rd	56	4,590	56	1,420	56	6,010	55	5,282	56	1,583	55	6,865
College St	58	4,730	59	1,370	58	6,100	57	5,228	59	1,512	58	6,740
Pacific Ave	57	5,320	58	1,430	57	6,740	58	5,866	59	1,542	58	7,408
Eastside St	29	5,560	38	1,490	31	7,040	38	6,214	52	1,619	41	7,833
Deschutes Pkwy	49	5,900	51	1,580	50	7,480	41	6,475	48	1,745	43	8,220
E St	55	4,120	56	1,280	55	5,400	56	4,429	56	1,381	56	5,810
Trosper Rd	62	3,700	62	1,160	62	4,860	61	3,928	62	1,316	61	5,244
US - 101 Westbound												
Cooper Point	37	4,180	39	810	37	4,980	34	4,266	35	862	34	5,128
Black Lake	57	3,610	56	650	57	4,260	56	3,625	56	753	56	4,378

Corridor Segment	Base 2045						Scenario 12 – Modified Widening Improvements					
	SOV		HOV		All Traffic		SOV		HOV		All Traffic	
	Speed	Vol	Speed	Vol	Speed	Vol	Speed	Vol	Speed	Vol	Speed	Vol
Interstate 5 Northbound												
Center	59	4,350	59	1,260	59	5,530	58	4,441	59	1,286	59	5,727
Mounts Rd	57	4,230	58	1,260	57	5,380	59	4,446	60	1,296	59	5,742
Nisqually	58	3,970	58	1,160	58	5,070	59	4,207	60	1,194	60	5,401
Marvin Rd	58	3,790	58	1,110	58	4,830	58	4,264	59	1,230	58	5,494
Carpenter Rd	42	4,410	45	1,180	42	5,500	46	4,567	53	1,250	48	5,817
College St	46	4,680	51	1,220	46	5,850	53	4,964	54	1,294	53	6,258
Pacific Ave	46	5,930	48	1,460	47	7,330	54	6,225	58	1,564	55	7,789
Eastside St	52	5,870	52	1,510	52	7,240	53	6,050	55	1,550	53	7,600
Deschutes Pkwy	56	5,610	56	1,580	56	7,030	54	5,641	56	1,587	54	7,219
E St	40	4,230	46	1,320	40	5,420	37	4,062	41	1,316	38	5,378
Trosper Rd	57	3,450	57	1,170	57	4,520	56	3,356	57	1,163	57	4,519
US - 101 Eastbound												
Cooper Point	43	4,320	43	890	43	5,190	44	4,375	44	897	44	5,272

Black Lake	59	3,060	59	660	59	3,710	59	3,063	59	669	59	3,732

Observations:

This scenario was developed to observe if widening to a fifth lane through the Nisqually Delta (Mounts Road to the Nisqually Interchange could help with the congestion north of Mounts Road in the southbound direction.

- Congestion was relieved through the Nisqually delta with the additional lane in the southbound direction.

SUMMARY

This report documents the transportation modeling of a set of mid (2030) and long-term (2045) scenarios developed to relieve congestion in the I-5 corridor between Mounts Road and Tumwater.

Each proposed improvement, or set of related proposed improvements, was evaluated individually in order to eliminate any that did not have a positive effect on I-5 mobility. All 2030 proposed improvements with a measurable effect were moved forward to the 2045 base model.

An additional set of 2045 scenarios (8 through 12) were developed to evaluate alternatives to full widening in the I-5 corridor (2045 Scenario 6).

As summary of 2030 Scenario recommendations is provided below:

2030 Scenarios	Project	Recommendation
Scenario 1 - 2030	Martin Way and Sleater-Kinney	Move forward 2045 Model Base
Scenario 2 - 2030	Nisqually / Martin Way at Nisqually Cut Off Road SE	Move forward 2045 Model Base
Scenario 3 - 2030	Sleater-Kinney Interchange	Move forward 2045 Model Base
Scenario 4 - 2030	Deschutes Parkway	Do not move forward
Scenario 5 - 2030	SR 507 Roundabout in Yelm area	Move forward 2045 Model Base
Scenario 6 - 2030	Part time shoulder use for southbound lane on I-5	Move forward 2045 Model Base
Scenario 7 - 2030	Perimeter Road	Move forward 2045 Model Base
Scenario 8 - 2030	Mounts Road Interchange	Do not move forward
Scenario 9 - 2030	Pacific Avenue Interchange	Do not move forward
Scenario 10 - 2030	Part time shoulder use for northbound lane on I-5 approaching US 101	Do not move forward

The 2045 scenarios were larger interchange or corridor widening, new lane, projects along I-5 evaluated to for congestion relief along the corridor. I-5 and US 101 within the study area were broken into segments, with one-hour peak speeds and volumes reported for each segment. Speeds were compared to the segment's freeflow (FF) speed to determine a corridor LOS, which can be used to measure the effectiveness of an improvement at reducing congestion. A summary of the speed data converted to LOS is shown in the table that follows.

2045 Scenarios	Project	LOS Observations – Compared to Funded Base
2045 Funded Base		I-5 SB– Corridors failing LOS: Center St and Mounts Road, Eastside I-5 NB– None US 101 - None
Scenario 1 - 2045	US 101 Braided Ramp Interchange	I-5 SB - Improved LOS to C (right on the edge of A/B) for Eastside segment I-5 NB & US 101– New LOS (E) issue at E St corridor and US 101 EB – Cooper Point (F) due to increased volumes using the Braided Ramp and merging onto US 101
Scenario 2 - 2045	Martin Way Interchange	I-5 SB – no change in LOS with increased volumes south of the interchange I-5 NB – greater congestion in the Pacific Avenue segment (likely due to greater volumes at NB merge at interchange) however still meets LOS D
Scenario 3 - 2045	HOV Conversion	Improves HOV LOS in both directions I-5 SB – results in additional LOS failures in Marvin Rd and Carpenter Rd segments for all traffic I-5 NB – Pacific Ave LOS failure for all traffic
Scenario 4 - 2045	US 101 Flyover Ramp	I-5 SB – no changes in LOS I-5 NB – improvement in LOS in E St segment (D to C) US 101 – improvement in WB direction (D to A/B)
Scenario 5 - 2045	I-5 Northbound Widening	I-5 SB – no changes in LOS I-5 NB – decrease in LOS in Pacific and College segments due to increased volumes in Eastside St segment
Scenario 6 - 2045	I-5 Widening with HOV	I-5 SB – improvement in speeds in Center and Mounts Rd segments, but still at LOS F; improvement in LOS in Eastside St segment (from F to E) I-5 NB – Improvement in College and Carpenter segments from D to C US 101 – no change

2045 Scenarios	Project	LOS Observations – Compared to Funded Base
Scenario 7 - 2045	Tumwater Boulevard Interchange	I-5 SB – no change I-5 NB – minor changes (from C to D or vice versa)
Scenario 8 - 2045	All Improvements	I-5 SB – improvement in speeds in Center and Mounts Rd segments, but still at LOS F; improvement to LOS A/B in Eastside segment (with widening and braided ramp), decrease in LOS in Deschutes Pkwy segment (from C to D) with increased volumes I-5 NB – All segments operating at LOS C or above except Carpenter Rd (LOS D) US 101 – All segments operating at LOS A/B
Scenario 9 - 2045	I-5 Widening with HOV at Marvin Road Interchange	I-5 SB – improvement in speeds in Center and Mounts Rd segments, but still at LOS F; slight decrease in speeds at Marvin Rd segment (but not enough for a LOS drop) with lane drop; no other changes. Compared to full widening (S6), major drop in LOS starting at Eastside segment I-5 NB – slight decrease in LOS at Carpenter Road (as vehicles navigate the lane add). Compared to full widening (S6), drop in LOS in Pacific segment. US 101 – no changes from funded base
Scenario 10 - 2045	I-5 Widening with HOV north of Sleater-Kinney Interchange	I-5 SB - improvement in speeds in Center and Mounts Rd segments, but still at LOS F; slight changes in the Eastside and Deschutes Parkway segments due to increased volumes I-5 NB – slight decrease in LOS at Pacific Ave segment due to lane add and changes to the north. This is not observed in the full widening scenario (S6) US 101 – no changes from funded base
Scenario 11 - 2045	Combination of Improvements	I-5 SB - improvement in speeds in Center and Mounts Rd segment, but still at LOS F; improvement in LOS through the

2045 Scenarios	Project	LOS Observations – Compared to Funded Base
		Eastside segment due to the Braided ramp I-5 NB - slight decrease in LOS at Pacific Ave segment due to lane add and changes to the north. This is not observed in the full widening scenario (S6) US 101 – no changes from funded base
Scenario 12 - 2045	Modified Widening Improvements	I-5 SB: improvement to LOS A/B in the Center and Mounts Road segments due to the addition of a fifth lane I-5 NB: Similar to S6, improvement throughout the corridor US 101 – no change

Summary of Level of Service by Corridor Segment

	FF	FB	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12
I-5 Southbound														
Center	60	19	19	20	11	18	20	33	19	29	30	30	30	57
Mounts Rd	60	18	17	18	17	18	18	29	18	28	29	28	28	56
Nisqually	60	54	55	55	58	54	55	54	55	54	53	53	54	57
Marvin Rd	60	58	57	57	33	57	57	56	57	57	51	57	57	51
Carpenter Rd	60	56	56	56	33	56	56	55	56	55	54	55	55	55
College St	60	58	59	57	58	59	59	58	59	56	58	58	55	58
Pacific Ave	60	57	58	57	46	57	57	58	58	55	57	55	55	58
Eastside St	60	31	50	30	29	30	31	38	33	54	35	36	50	41
Deschutes Pkwy	60	50	51	48	50	49	50	45	49	42	49	45	46	43
E St	60	55	56	56	56	55	55	56	56	56	56	55	56	56
Trosper Rd	64	62	61	61	62	61	62	61	61	61	61	61	61	61
I-5 Northbound														
Center	60	59	59	59	59	59	59	59	59	58	59	59	59	59
Mounts Rd	60	57	58	56	59	57	57	59	57	59	59	59	59	59
Nisqually	56	58	58	58	55	58	58	59	58	59	59	59	59	60
Marvin Rd	60	58	58	58	57	58	58	59	58	58	59	59	59	58
Carpenter Rd	60	42	43	42	41	43	44	46	42	44	36	49	46	48
College St	60	46	49	47	35	42	44	53	40	53	52	53	53	53
Pacific Ave	60	47	43	43	26	34	37	55	47	55	46	37	36	55
Eastside St	60	52	54	53	54	51	56	52	52	54	53	51	51	53
Deschutes Pkwy	60	56	56	56	34	56	57	52	56	54	56	56	56	54
E St	60	40	38	46	40	47	43	47	47	48	46	40	44	38
Trosper Rd	65	57	60	57	58	56	55	54	56	56	57	55	57	57
US - 101 Westbound														
Cooper Point	52	37	30	38	39	50	37	38	37	48	35	35	26	34
Black Lake	60	57	56	56	56	56	57	56	57	56	56	56	56	56
US - 101 Eastbound														
Cooper Point	50	43	45	45	44	44	44	46	44	44	44	45	44	44
Black Lake	60	59	59	59	59	59	59	59	59	59	59	59	59	59

Level of service key

A/B	C	D	E	F

Other observations:

- The Martin Way, Sleater-Kinney Road, and Pacific Avenue interchanges are closely spaced, and the transportation model consistently shows that any small changes in volume or delay at those intersections can result in large backups. It is recommended that a future study of those three interchanges be conducted.
- Preliminary modeling shows that five lanes are necessary through the Nisqually Delta in the southbound direction in order to not have a level of service failure in the future, and after the JBLM project is completed (which brings four lanes and an auxiliary lane to the Dupont interchange). This should be re-examined in the EIS as there may be ways of smoothing out the merge in this area improvements in the Nisqually Delta area that does not require two additional lanes (currently there are three lanes through the Nisqually Delta).
- While the Braided Ramp at the US 101 interchange functions well, as long as there is an auxiliary lane starting at Sleater-Kinney interchange southbound to alleviate the exit at Plum Street, the increased volumes of traffic may cause a LOS decrease on US 101 in the westbound direction. The merge onto US 101 should be re-examined if this moves forward.

Appendix A: 2030 Base Year Model Components

The following elements were included in the 2030 Base model.

General

Telework Assumption: Five percent reduction in state/professional employees per day (25% overall)

Transit:

- IT Long Range Plan
- BRT Light
- Fare Free

Landuse: TRPC Adopted forecast – 2030 Interpolation

Operational Improvements

Number	Area/Jurisdiction	Location	Extent/Limits	Improvement
1	Chehalis Tribe	Old Hwy 99 at 198th Avenue SW	Intersection	New roundabout
2	Lacey	College Street and 22nd Avenue SE	Intersection	New roundabout
3	Lacey	Britton Parkway and Carpenter Road	Intersection	New roundabout
4	Lacey	Willamette Drive / Campus Glen Drive	Intersection	New roundabout
5	Lacey	College Street and 29th Avenue	Intersection	New roundabout
6	Lacey	Marvin Road and 31st Avenue (along with extension from 31st to Carpenter)	Intersection	New roundabout
7	Lacey	Marvin Road and Hawks Prairie	Intersection	New roundabout
8	Olympia	Martin Way and Pattison Street	Intersection	New signal
9	Olympia	Henderson Boulevard and Eskridge Boulevard	Intersection	New roundabout
10	Olympia	Cain Road and North Street	Intersection	New roundabout
11	Olympia	Wiggins Road and 37th/Herman Avenue	Intersection	New roundabout
12	Olympia	Capital Way Road Diet	State to Union	Lane reduction
13	Private Developer	Mullen Road at Marvin Road	Intersection	New roundabout
14	Rainier	SR-507 and Centre Street	Intersection	New roundabout

Number	Area/Jurisdiction	Location	Extent/Limits	Improvement
15	Thurston County	Sargent Road SW at SR 12	Intersection	New roundabout to connect Sargent Road with SR 12
16	Thurston County	Marvin Road at Evergreen Forest Drive	Intersection	New roundabout
17	Thurston County	Yelm Highway and Meridian Road	Intersection	New roundabout
18	Thurston County	15th Avenue and Marvin Road	Intersection	New compact roundabout
19	Thurston County	Johnson Point Road and Hawks Prairie Road	Intersection	New roundabout
20	Thurston County	Marvin Road and 19th Avenue	Intersection	New roundabout
21	Thurston County	Yelm Hwy. at Spurgeon Creek Rd SE Intersection	Intersection	New roundabout (assumed)
22	Thurston County (Grand Mound)	Old Highway 99 at intersections of Sargent Rd and 201st Ave	Intersection	New roundabout
23	Thurston County (Grand Mound)	196th Avenue SW & Elderberry Street SW Intersection Improvements	Intersection	New roundabout
24	Thurston County/ Private Developer	Marvin Road at Union Mills Road/19th Avenue	Intersection	New roundabout and access management
25	Tumwater	Trosper Boulevard and Capitol Way	Intersection	Construct 3 adjacent roundabouts
26	Tumwater	X street and Capital Boulevard	Intersection	New roundabout
27	Tumwater	Capitol at the realigned Tumwater Valley Drive	Intersection	New signal
28	Tumwater	Barnes Avenue and Crosby Avenue	Intersection	Compact roundabout
29	Yelm	Burnett Avenue and 93rd Avenue	Intersection	Realignment and New signal
30	Yelm	Longmire Road and SR 510	Intersection	New signal
31	WSDOT	US12 at Anderson Road	Intersection	Intersection
32	WSDOT	I5 Southbound ramp meters	Henderson/14th Avenue, Pacific Avenue, Sleater-Kinney Road, Martin Way and Marvin Road	Add ramp meters
33	WSDOT	Mounts Road Interchange	Interchange	Revise southbound off-ramp from off-ramp stop to all-way stop

Number	Area/Jurisdiction	Location	Extent/Limits	Improvement
34	WSDOT	Near Nisqually Interchange	Interchange	Two through lanes on north side of Martin Way through the intersection
35	WSDOT	Mounts Road Interchange - Mounts Road/Old Nisqually Road at the SB I-5 on-ramp	Interchange	Stop sign

Capacity Projects

Number	Area/Jurisdiction	Location	Extent/Limits	Improvement
36	Lacey	Campus Glen Drive NE	Campus Glen Drive NE from Salish Middle School to Hogum Bay Road	New street connection
37	Lacey	Carpenter Road	Pacific Avenue to Shady Lane	Major Widening: 4/5 lane section, 3/4 lane section with 2 lane NB /1 lane SB, & 2/3 lane section
38	Lacey	Marvin Road	Britton Parkway NE to Columbia Way NE	Widen to 4 lanes with median treatment. Roundabout at Hawks Prairie and Marvin. Three lane section north of the roundabout.
39	Lacey	31st Avenue NE	Hogum Bay Road to Gateway	Street Extension
40	Lacey	Marvin Road I-5 Interchange Improvements	Marvin Road at I-5	Reconstruct Freeway Interchange to diverging diamond design
41	Olympia	Fones Road	Pacific Avenue to 18th Avenue	Add a lane in select locations
42	Thurston County	Mullen Road	Lacey City Limits to Carpenter	Channelization for Mullen Rd, and roundabout at Carpenter and Mullen
43	WSDOT	510 Yelm Loop North Section Y3 - SR510 Spur Yelm Loop	Cullens Rd. SE to SR-507 at Walmart Boulevard Intersection	New 2/3 lane limited access road

Number	Area/Jurisdiction	Location	Extent/Limits	Improvement
44	WSDOT	I-5 Corridor Improvements	Steilacoom-Dupont Road to Thorne Lane Interchange	Add one lane in each direction; Auxiliary lanes NB between Berkeley St to Gravelly Lake Dr, SB between Gravelly Lake Dr to Thorne Lane, and from Berkeley St to JBLM Main Gate.
45	Yelm	Tahoma Boulevard Extension - South	Dotson Street to SR 507	New street connection
46	Yelm	Mosman Avenue Phase 2	Railroad Street to Longmire Street	New street connection
47	Yelm	Tahoma Boulevard Extension - North	93rd Avenue SE to Tahoma Boulevard	New street connection
48	Private Developer	19th Ave SE Extension and roundabout at 19th and Marvin	Lochton Court SE to Lake Forest Drive	New street extension

Note: there were no changes compared to the 2018 base for north of Thorne Ave (no HOV or diverging diamond at SR 512)

Appendix B: 2045 Base Year Model Components

The following elements were included in the 2030 Base model.

General

Telework Assumption: See Updated Telework/Compressed Work Week and Online Shopping and Service Assumptions, TRPC, April 2021. (www.trpc.org).

Transit:

- Same as 2030

Landuse: TRPC Adopted forecast – 2045

Interstate 5 Improvements

Number	Area/Jurisdiction	Location	Extent/Limits	Improvement
1	WSDOT	Interstate 5	North of Mounts Road	New lane with HOV on inside lane
2	WSDOT	Interstate 5 and SR 512	SR 512	Diverging Diamond

Operational Improvements

Number	Area/Jurisdiction	Location	Extent/Limits	Improvement
3	Thurston County	196th Avenue SW and Sargent Road SW	Intersection	New roundabout
4	Thurston County	Old Highway 9 and Old Highway 99	Intersection	New Signal
5	WSDOT	US 12 and 183rd Ave	Intersection	New roundabout
6	Tenino	Sussex Ave E/SR 507 and Old Highway 99	Intersection	New roundabout
7	Thurston County	15th Ave NE and Draham Rd	Between Sleater-Kinney Road and Britton Parkway	Dual left turn center lane and turn pockets at intersections.
8	Thurston County	Pacific Ave and Steilacoom Road Roundabout	Intersection	New roundabout
9	Thurston County	Old Pacific Hwy and 7th Avenue to 6th Avenue - Green Tee	Intersection	Green Tee

Number	Area/Jurisdiction	Location	Extent/Limits	Improvement
10	Thurston County	Old Hwy 99 / 79th Ave Roundabout	Intersection	New roundabout

Capacity Projects

Number	Area/Jurisdiction	Location	Extent/Limits	Improvement
11	City of Lacey	College Street NE	College Street NE, from Martin Way to 15th Avenue NE	Extend College Street north from 6th Avenue NE to 15th Avenue NE, with significant re-channelization from Martin Way to 6th Avenue. The improvements will include bicycle lanes and sidewalks.
12	City of Yelm	Coates Avenue	Coates Avenue SW, from Cullen Road NW to Killion Road SE	Construct new commercial collector connection with 2 lanes and a left turn lane at the Coates/Killion intersection.
13	City of Lacey	Rainier Road	Rainier Road, Yelm Highway to Lacey's South Urban Growth Boundary (vicinity of 62nd Avenue)	Widen Rainier Road to a 4/5 lane arterial from Yelm Highway to the old south city limits near 62nd Avenue SE. The project includes bike lanes, planter strips, and sidewalks for the length of the project limits.
14	City of Lacey	Britton Parkway	Britton Parkway, Gateway Boulevard to Carpenter Road	Add one general purpose lane in each direction.
15	Thurston County	Elderberry Road	Elderberry Road, SR 12 to 196th Avenue	Widen Elderberry Road to 4/5 lanes, urban improvements, access management, intersection improvements at 196th and SR12, and improved transitions to adjoining roadways.

B APPENDIX B: UPDATED TELEWORK/ COMPRESSED WORK WEEK AND ONLINE SHOPPING AND SERVICE ASSUMPTIONS

Thurston Regional Planning Council

UPDATED TELEWORK/COMPRESSED WORK WEEK AND ONLINE SHOPPING AND SERVICE ASSUMPTIONS

FOR THURSTON REGIONAL PLANNING COUNCIL 2045 TRAVEL DEMAND MODELS
April 2021

1. BACKGROUND

This document provides documentation on TRPC's transportation model assumptions for telework/compressed work week participation, and online shopping and services. The purpose of the update is to:

- Develop updated assumptions for telework/compressed work week for the 2045-time horizon, anticipating that a "new normal" will be achieved after recovery from the COVID-19 pandemic on the acceptance and desire to telework.
- Develop updated assumptions for online shopping and services.
- Tie the model results to "real life" changes due to COVID-19

While it is difficult to predict the future, the COVID-19 pandemic, and associated change in travel behavior has given us additional data to test how TRPC's travel demand models in the EMME and Dynameq platforms can mimic resulting changes in travel patterns.

The updated assumptions will be used in the ongoing I-5 Planning and Environmental Linkages Study that is looking at a range of mid- and long-term improvements to increase mobility on the I-5 corridor from Tumwater to Mounts Road. They will also be used in various studies that utilize TRPC's travel demand models.

2. PREVIOUS ASSUMPTION

The model assumption used previously was that 25 percent of both government and service workers would telework or work from home at least one day a week by 2045. This resulted in an overall trip reduction of 0.5 percent. There were no assumptions for changes to online shopping or online access to services.

3. VARIABLES AND ALTERNATIVES

The study team put together a range of alternatives to see if the models could better capture the effects of telework and compressed work schedules and online shopping and services on trip reduction. The alternatives ranged from the previous assumption, a 5 percent reduction for telework/compressed work weeks, to a full-COVID shutdown alternative, as outlined in Table A1. The goal was to try to mimic both full-COVID shutdown and Phase 2/3 recovery, and a post-recovery scenario.

Telework and Compressed Work Week Assumptions

A range of telework and compressed work week assumptions were tested to gauge the sensitivity of the model (Alternatives 2-4). Telework/compressed work week participation is often collected on surveys in two parts, what percent of the work force, and how often. Table 1 shows the relationship of those two factors and the percent reduction factor applied in the travel demand models.

Table 1: Relationship of percent of work force and frequency to reduction factor

What Percent of Work Force?	How Often?	Applied as Percent reduction to workers
25% of workers telework or have a compressed work week	1 day a week	5% reduction
25% of workers telework or have a compressed work week	3 day a week	15% reduction
50% of workers telework or have a compressed work week	3 day a week	30% reduction
66% of workers telework or have a compressed work week	3 day a week	40% reduction
80% of workers telework or have a compressed work week	3 day a week	48% reduction
80% of workers telework or have a compressed work week	5 days a week	80% reduction
90% or workers telework or have a compressed work week	5 days a week	90% reduction

Trips Associated with Commute Trips

Trip making characteristics from the TRPC household travel survey show that that reducing the number of home to work trips would also lead to reduction in other types of trips, such as home to shopping or home to other (stops on the way to and from work), or non-home based trips (trips from work to eat or do errands) trips (see Figures 1 and 2). Recognizing that reductions in commute trips also had an impact on associated trips, the study team adjusted these trips as indicated by data from TRPC's household travel survey. TRPC's Household Travel shows that during the day, on average, for every work trip there are 0.65 non-home based trips generated:

- 21% are work related
- 9% are school related
- 16% are shopping related
- 54% are related to other purposes

Online Shopping and Access to Services

The COVID-19 Pandemic has also led to an increase in online shopping and access to online services such as medical appointments or obtaining building permits or renewing driver's licenses. A series of alternatives were developed to test the sensitivity of the models to these changes.

The model alternatives incorporate the changes by decreasing home-based shopping and home-based other trip attractions.

Remote Learning

The COVID-19 Pandemic also led to a replacement of in-school learning to online learning. Two alternatives were developed to reflect those conditions by reducing home-based school and home-based college trips.

Figure 1: Example travel day without telework. Each leg is a trip in the travel demand model

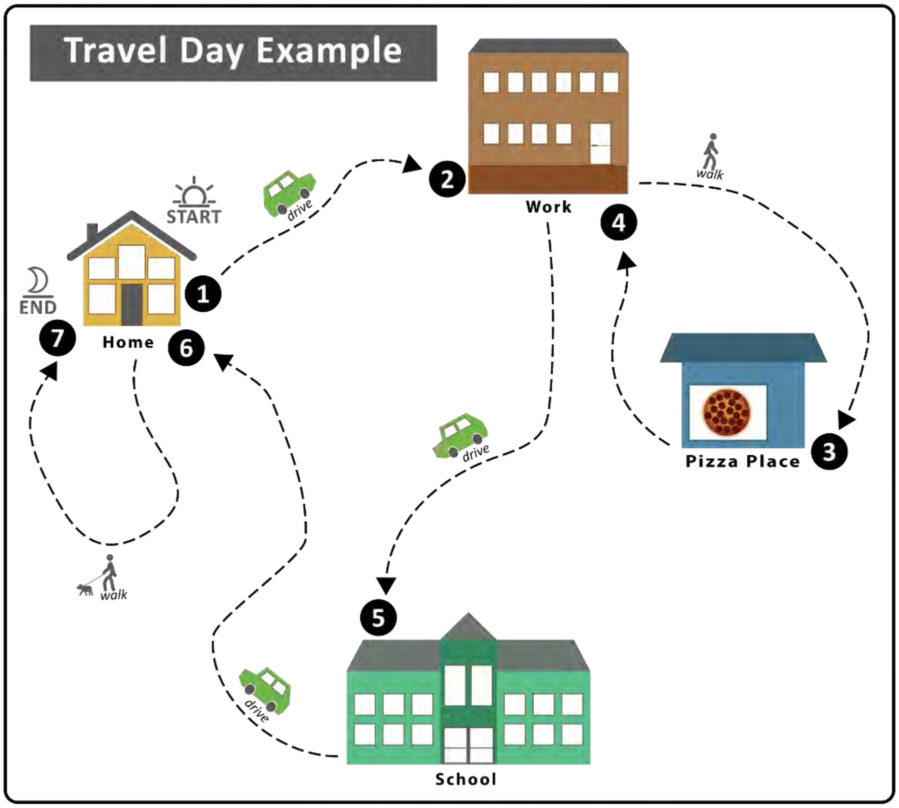
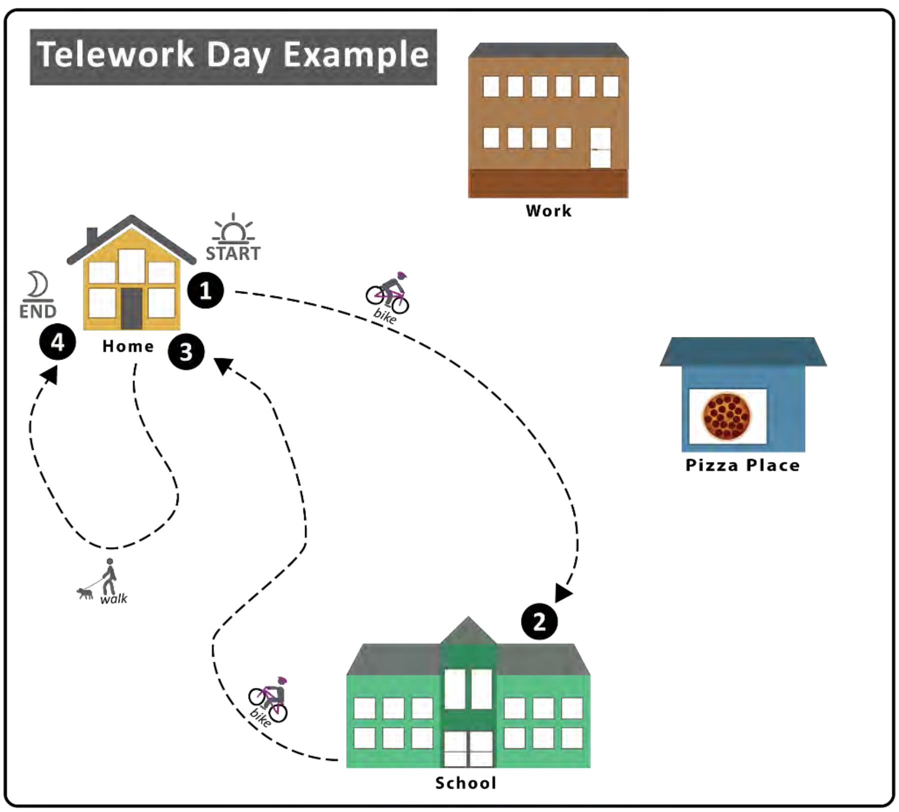


Figure 2: Example travel day with telework. Each leg is a trip in the travel demand model



4. CALIBRATION TO COVID-19 TRAVEL PATTERNS

Overall Reductions

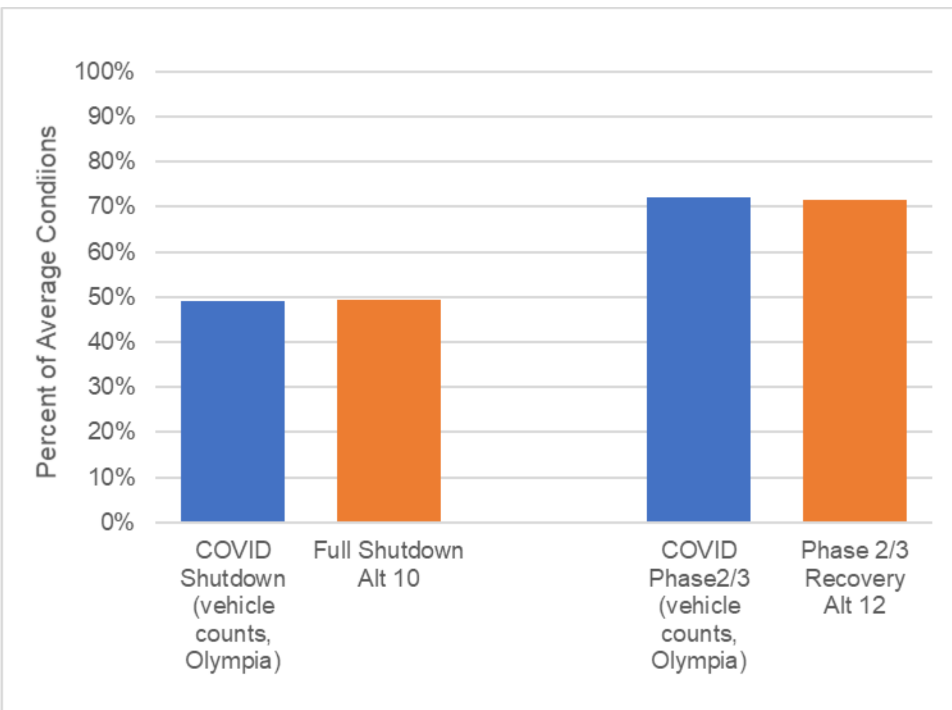
Figure 3 shows two model alternatives that were built to mimic COVID Full Shutdown and Phase 2/3 Recovery conditions.

Transportation models are traditionally calibrated/validated to traffic counts. Traffic counts taken during the changing travel patterns resulting from the COVID-19 Pandemic and subsequent stay at home orders and recovery plans, provided the study team data for additional model calibration/validation. As the focus of this effort was to develop 2045 Model Assumptions, all differences between normal conditions and COVID-19 traffic patterns are reported as percentages, either percent reductions, or percent of normal conditions.

As the first screening, the study team compared percent reduction in model total daily trips to traffic counts. Both were compared to “normal” conditions:

- Normal model conditions 2045 Land use with no additional telework or compressed work week assumptions measured in total daily trips (all modes) for the entire model (Thurston County, Lewis County, Grays Harbor County, and parts of Mason and Pierce Counties)
- Normal traffic count conditions were average weekday volumes for the respective month for either 2019, collected by the City of Olympia for the city extents. City data were used rather than Interstate 5 data because they were felt to better represent total daily trips as generated by the model, as Interstate trips tend to have a lot of through trips.

Figure 3. Percent of trips for each alterative compared to base conditions



COVID Phase 2/3 Recovery Scenario

During COVID full shutdown conditions (April 2020), traffic volumes dropped across the region, ranging from a 37 percent to 58 reduction, with an average of 49 percent. There was no noticeable difference between reductions on state freeways and local roads.

In comparison, by September 2020, as things opened up and the region was in Phase 2/3 recovery, there was a marked difference between traffic reductions between state freeways and local roads. On US 101 and I-5, reductions averaged around 13 percent, while on local Olympia roads, the reductions averaged 28 percent.

September 2020 is the most recent period counts were available. The COVID Phase 2/3 scenario (Alternative 12) was assigned to the transportation model network to see if the model reflected the reductions in the correct locations. Figures 6 and 7 and Table 3 show the results.

Some of the key components of this scenario include:

For Thurston, Pierce, and Lewis Counties

- 80% reduction in government job commute trips due to telework and compressed work weeks
- 25% reduction in service job commute trips due to telework and compressed work weeks, and shut down of services
- Reduction in trips related to commute trips (based on household survey relationships)
- 100% reduction in college and school trips due to remote learning and associated reduction in teachers and staff
- 15% reduction in retail (shopping) trips due to restrictions and increased online shopping and an associated reduction in work commute trips for retail employees
- 65% reduction in trips to government locations to receive government services
- 25% reduction in trips to non-government services

These reductions include both telework and remote learning, and related trips, as well as an increase in on-line shopping and on-line access to services such as medical appointments, as well as a reduction in shopping, eating out, or accessing services due to the pandemic.

For Grays Harbor and Mason Counties, reductions were less aggressive (cut by 80 percent) for trips related to telework/compressed work week and accessing government and general services. This was a reflection that Thurston County was the seat of State government and continued to implement telework more robustly than adjacent counties during Phase 2/3 recovery.

Time of Day

The model reports data for the afternoon (PM) peak period. The I-5 and US 101 traffic counts were available hourly, and the data indicates very little difference in the time of day pattern in September 2020, as compared to September 2019/2018.

Figure 4: Northbound I-5 September Mid-Week Average Hourly Volumes

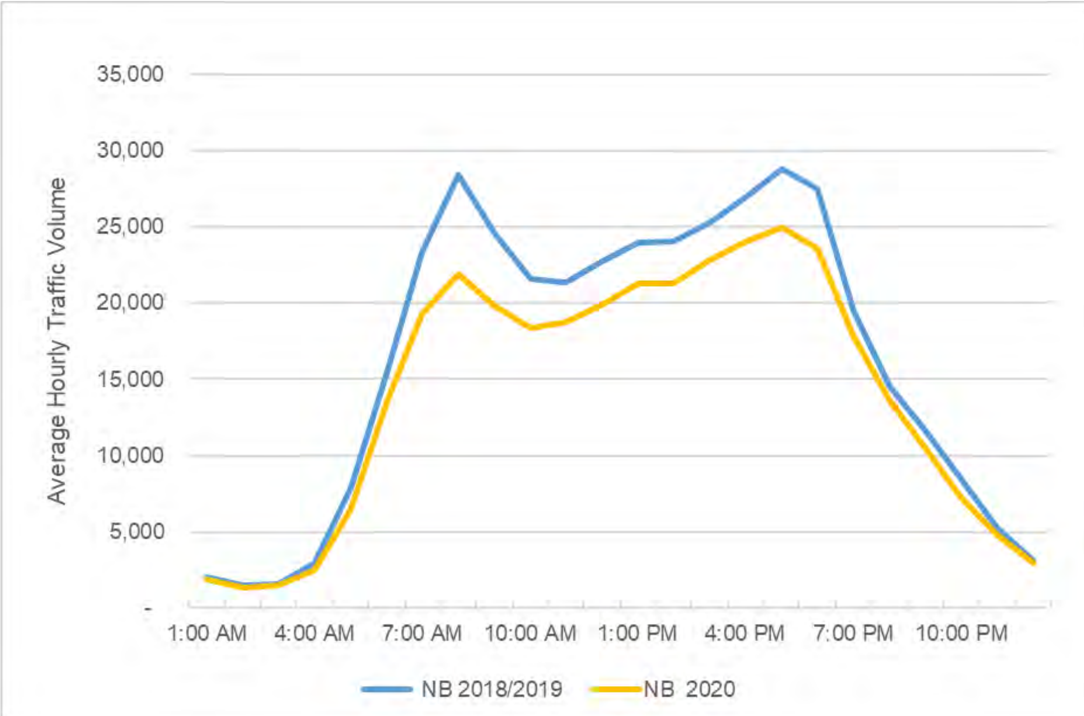


Figure 5: Southbound I-5 September Mid-Week Average Hourly Volumes

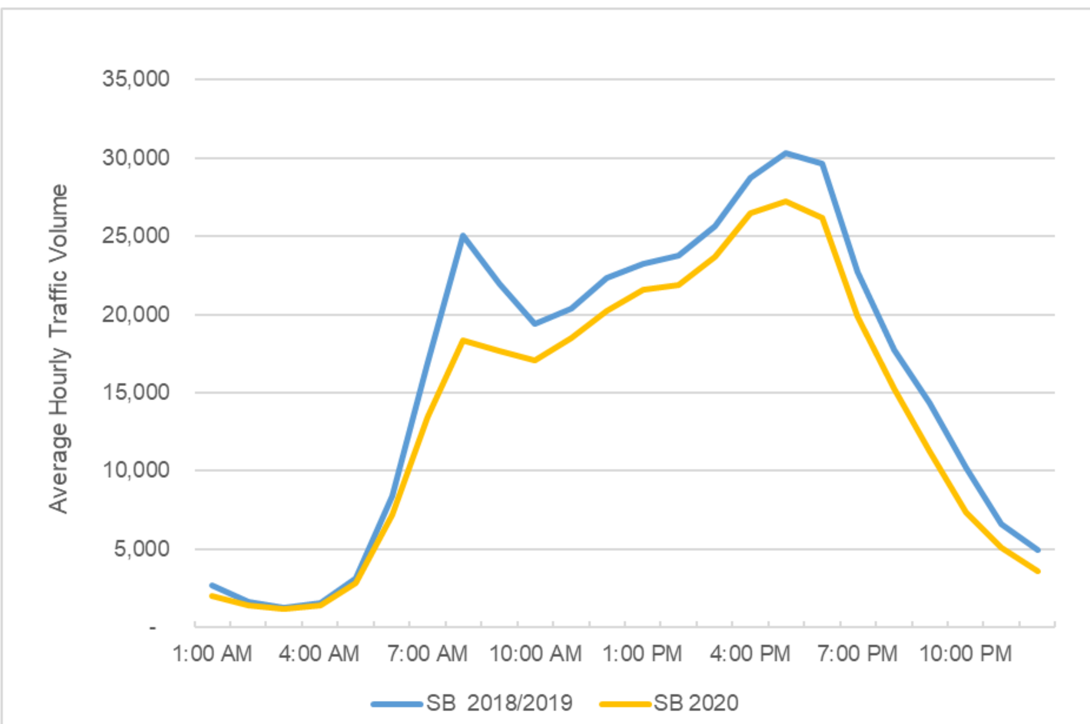


Figure 6: COVID Phase 2/3 Recovery conditions – reductions in traffic counts compared to model volumes (Alternative 12) for I-5 and US 101

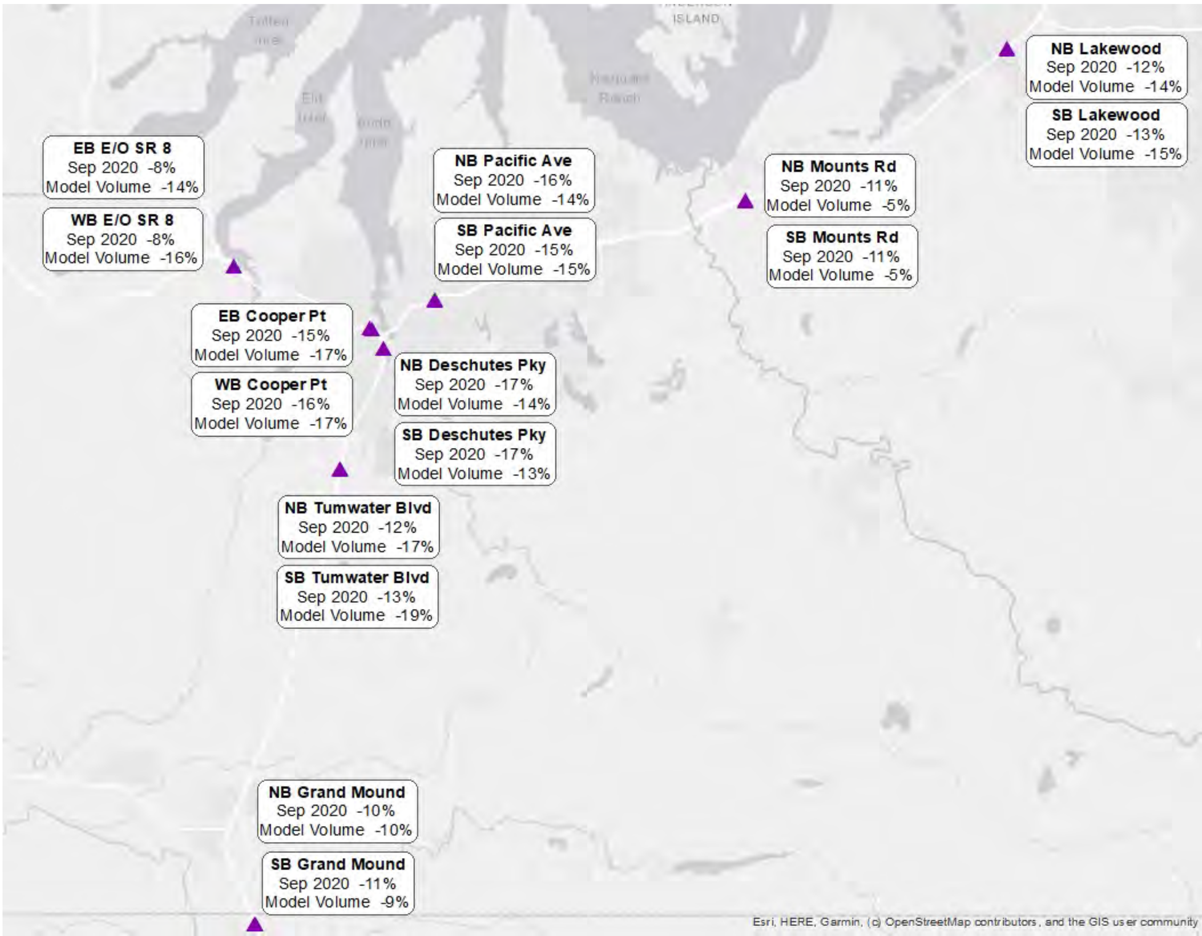
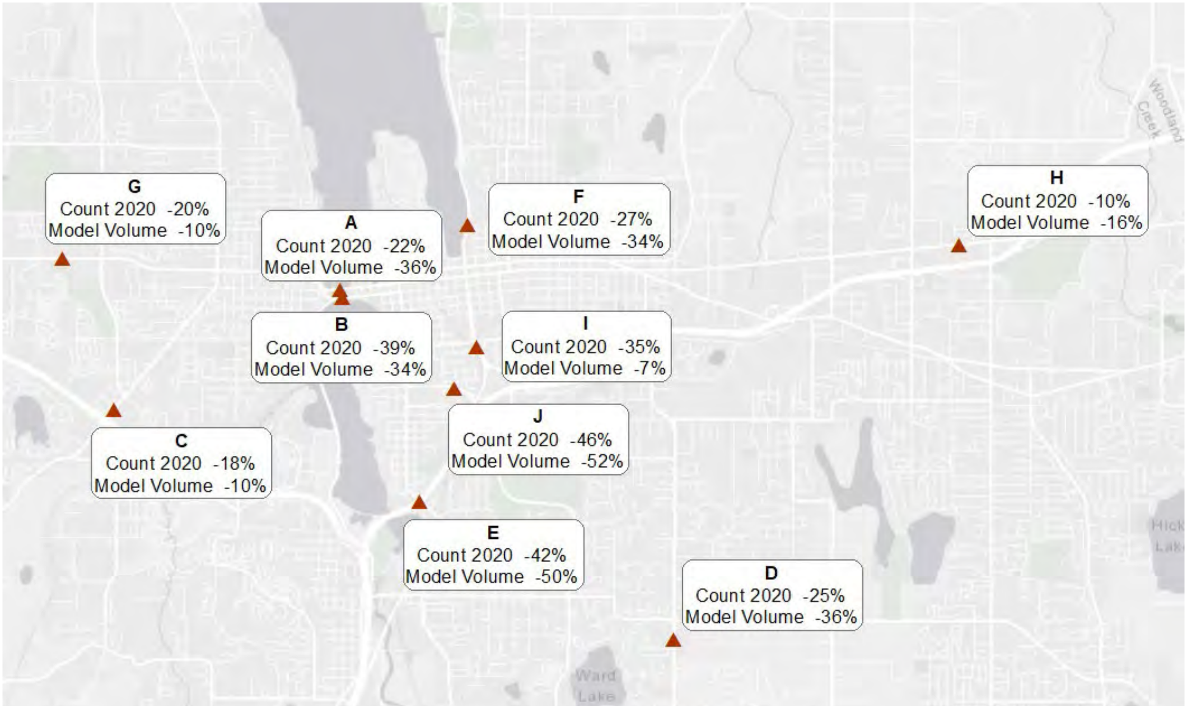


Figure 7: COVID Phase 2/3 Recovery conditions – reductions in traffic counts compared to model volumes (Alternative 12) for local roads



MAP KEY	
ID	**Location**
A	4th Ave Bridge
B	5th Ave Bridge
C	Black Lake Blvd north of US 101
D	Boulevard Rd south of Log Cabin Rd
E	Capitol Blvd @ I-5 Overpass
F	East Bay Dr north of Glass Ave
G	Harrison Ave east of Yauger Way
H	Martin Way east of Sleater-Kinney Rd
I	Plum St South of Union Ave
J	14th east of Jefferson Ave

Table 3: COVID Phase 2/3 Recovery conditions – reductions in traffic counts compared to model volumes (Alternative 12)

Interstate 5 and US 101		**Reduction in Traffic Count**	**Model Reduction**
US 101 @ east of SR 8	EB	-8%	-14%
	WB	-8%	-16%
US 101 @ Cooper Point Road	WB	-15%	-17%
	EB	-16%	-17%
I - 5 @ Grand Mound	NB	-10%	-10%
	SB	-11%	-9%
I - 5 @ Tumwater Boulevard	NB	-12%	-17%
	SB	-13%	-19%
I - 5 @ Deschutes Parkway	NB	-17%	-14%
	SB	-17%	-13%
I - 5 @ Pacific Avenue	NB	-16%	-14%
	SB	-15%	-15%
I - 5 @ Mounts Road	NB	-11%	-5%
	SB	-11%	-5%
I - 5 @ Lakewood (SR 512)	NB	-12%	-14%
	SB	-13%	-15%
I-5 and US 101 Average		**-13%**	**-13%**
City of Olympia			
4th Avenue Bridge		-22%	-36%
5th Avenue Bridge		-39%	-34%
Black Lake Boulevard north of SR-101		-18%	-10%
Boulevard Road south of Log Cabin Road		-25%	-36%
Capitol Boulevard at I-5 Overpass		-42%	-50%
East Bay Drive north of Glass Avenue		-27%	-34%
Harrison Avenue east of Yauger Way		-20%	-10%
Martin Way east of Sleater-Kinney Road		-10%	-16%
Plum Street south of Union Avenue		-35%	-7%
Jefferson and 14th Avenue		-46%	-52%
Olympia Average		**-28%**	**-29%**
Overall Average		**-19%**	**-19%**

Summary

Overall, the model reflects traffic counts quite well. One of the exceptions was the Plum Street (south of Union Avenue) location, where the traffic counts showed a much greater reduction than the model. In the 2045 Average Conditions model, the Plum Street onramp onto southbound I-5 was showing a great deal of delay, which was not in Alternative 12, mainly due to traffic volumes coming from the State Capitol Campus being greatly reduced for that alternative. The change in delay at this location led to a re-distribution of travel patterns, leading to more traffic on Plum Street than anticipated.

5. RECOMMENDATION FOR 2045 TELEWORK/COMPRESSED WORK WEEK SCENARIO

Alternative 13 was developed by modifying the assumptions in Alternative 12 (Phase 2/3 COVID-19 Recovery scenario) to reflect a return to a “new normal.” It represents an overall 9 percent reduction in total trips, compared to 2045 Assumptions without additional telework or compressed work week reductions. For comparison, the original model assumption resulted in less than one percent reduction.

This alternative leads to an overall:

- 25% increase in trips compared to Base 2018 conditions
- 7% increase in trips compared to Base 2030 conditions

Some of the key components of this scenario include:

For Thurston, Pierce, and Lewis Counties

- 40% reduction in government job commute trips due to telework and compressed work weeks. As a comparison, in a survey of Washington State employees (fall 2020), a commute reduction rate of 54% was indicated (See Appendix C). No comparable surveys have been conducted for federal or local employees.
- 15% reduction in service job commute trips due to telework and compressed work weeks, and shut down of services
- Reduction in trips related to commute trips (based on household survey relationships)
- No reduction in college and school trips due to remote learning and associated reduction in teachers and staff, the assumption being that local schools, colleges, and universities will return to in-person teaching.
- 10% reduction in retail (shopping) trips due to restrictions and increased online shopping and an associated reduction in work commute trips for retail employees
- 20% reduction in trips to government locations to receive government services
- 10% reduction in trips to non-government services

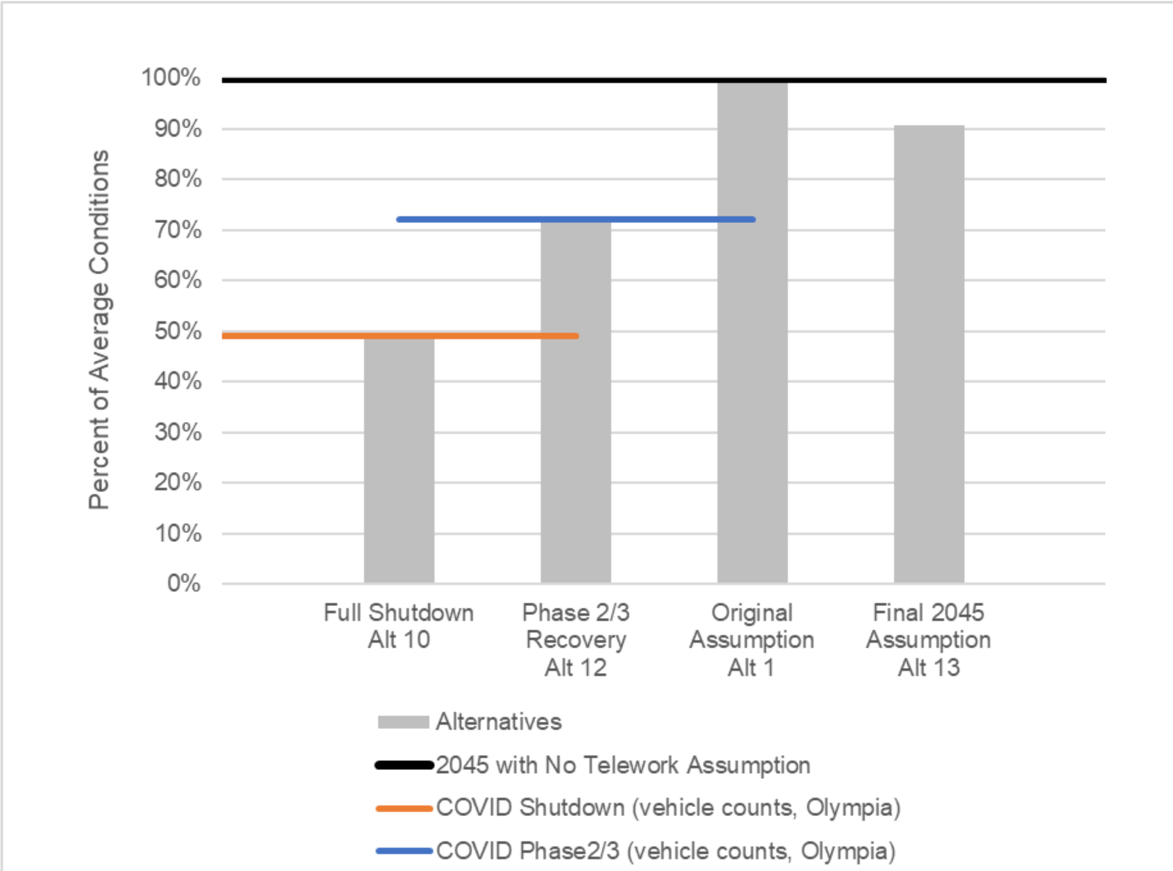
The final 2045 assumptions compared to the Phase 2/3 Recovery Scenario and the original 2045 Assumptions were as follows.

Table 4: Comparison of assumptions for various scenarios

	Alternative 1 Funded Base Original 2045 Percent reduction*	**Alternative 13** Final 2045 Assumptions "Post COVID New Normal" Percent reduction*	**Alternative 12** COVID Phase 2/3 Recovery Scenario Percent reduction*
1) Government Telework Rates (excluding education)	5%	40%	80%
2) Other telework eligible type of jobs telework rates	5%	15%	25%
3) Shopping trends unrelated to work trips, such as online shopping	None	10%	15%
4) Online access to government services	None	20%	65%
5) Online access to other services (medical, etc.)	None	10%	25%
6) Online school	None	0%	100%
7) Online college (higher education)	None	0%	100%
Overall Reduction in Trips	**0.05%**	**9%**	**29%**

*Reductions are compared to 2045 baseline conditions with no telework/compressed work week reductions.

Figure 8: Overall trip reductions for the various scenarios



APPENDIX A: SCENARIO DETAILS

Several variables were used in developing the alternatives, including:

- The percent of workers teleworking or having a compressed work week schedule
- The number of times a week they telework or do not work due to a compressed work week schedule
- The percent of shopping and access to services that shifted from in-person to online, and an associated reduction in employment
- The type of employment classification (landuse/jobs)
    - Government
    - Service
    - Retail
- The trip purpose
    - Home based work (HBW)
    - Home based college (HBCol)
    - Home based shopping (HBShp)
    - Home based other (HBO)
    - Non-home based (NHB)
    - Home based school (HBSch)

Table A1: Alternatives and Purpose

Alternative	Brief Description	Purpose
1	Existing assumption	
2-3	Staff estimate reduced alternatives	Developed to test sensitivity of initial telework assumptions
4	Initial Staff Estimate: Estimate from WSDOT and TRPC Commute Trip Reduction staff	Starting point
5-9 and 11	Estimate between initial staff estimate and COVID Full Shutdown scenario (10)	More aggressive scenarios developed
10	COVID – Full shutdown	To calibrate against full shut-down reductions
12	COVID – Phase 2/3 Conditions	To calibrate against Phase 2/3 traffic reductions
13	Final Scenario	Recommended 2045 Scenario (based on a combination of alternatives)

Table A2. Trip Reduction Assumptions - Percent by Employment Classification

Trip Purpose	Funded Base Alt 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6	Alternative 7	Alternative 8	Alternative 9*
Home based work (HBW)	5%Govt 5%Service	15%Govt 5%Service	30%Govt 5%Service	48%Govt 5%Service	48%Govt 15%Service	48%Govt 25%Service	48%Govt 48%Service	48%Govt 25%Service	48%Govt 25%Service
Home based college (HBCol)	0%	0%	0%	0%	0%	0%	0%	0%	0%
Home based shopping (HBShp)	0%	0%	0%	0%	15%Retail	25%Retail	25%Retail	25%Retail	25%Retail
Home based other (HBO)	0%	0%	0%	0%	15%Govt 15%Service	25%Govt 25%Service	48%Govt 48%Service	48%Govt 38%Service	48%Govt 38%Service
Non-home based (NHB)	0%	0%	0%	0%	18%	18%	30%	23%	23%
Home based school (HBSch)	0%	0%	0%	0%	0%	0%	0%	0%	0%

Trip Purpose	Alternative 10	Alternative 11	Alternative 12*	Alternative 13*
Home based work (HBW)	90%Govt 70%Service	48%Govt 15%Service	80%Govt 25%Service	40%Govt 15%Service
Home based college (HBCol)	100%	0%	100%	0%
Home based shopping (HBShp)	40%Retail	15%Retail	15%Retail	10%Retail
Home based other (HBO)	90%Govt 70%Service	48%Govt 15%Service	65%Govt 25%Service	20%Govt 10%Service
Non-home based (NHB)	42%	18%	20%	10%
Home based school (HBSch)	100%	0%	100%	0%

Note: * Grays Harbor County, Mason County - HBW 20% of Thurston County and HBO 20% of Thurston County.

Table A3: Trip Reduction by Purpose

Trip Purpose	2045 Trips	Funded Base Alt 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7	Alt. 8	Alt. 9*	Alt. 10	Alt 11	Alt. 12*	Alt. 13*
HBW	724,778	20,543	31,599	48,184	68,085	113,182	153,248	222,313	153,248	130,142	346,954	113,182	170,614	106,517
HBCol	54,672	0	0	0	0	0	0	0	0	0	54,672	0	54,672	0
HBShp	391,156	0	0	0	0	57,416	97,789	97,789	97,789	97,789	156,462	57,416	57,416	38,314
HBO	1,288,645	0	0	0	0	138,717	231,194	421,223	356,225	319,307	621,560	204,992	263,785	93,333
NHB	1,352,470	0	0	0	0	182,174	247,861	407,573	313,440	284,214	566,376	216,949	276,914	130,434
HBSch	372,178	0	0	0	0	0	0	0	0	0	372,178	0	372,178	0
Total	4,183,899	20,543	31,599	48,184	68,085	491,489	730,093	1,148,898	920,702	831,453	2,118,202	592,539	1,195,579	372,178
% Total		0%	1%	1%	2%	12%	17%	27%	22%	20%	51%	14%	29%	9%

Note: * Grays Harbor County, Mason County - HBW 20% of Thurston County and HBO 20% of Thurston County.
Trips are daily person trips, all modes.

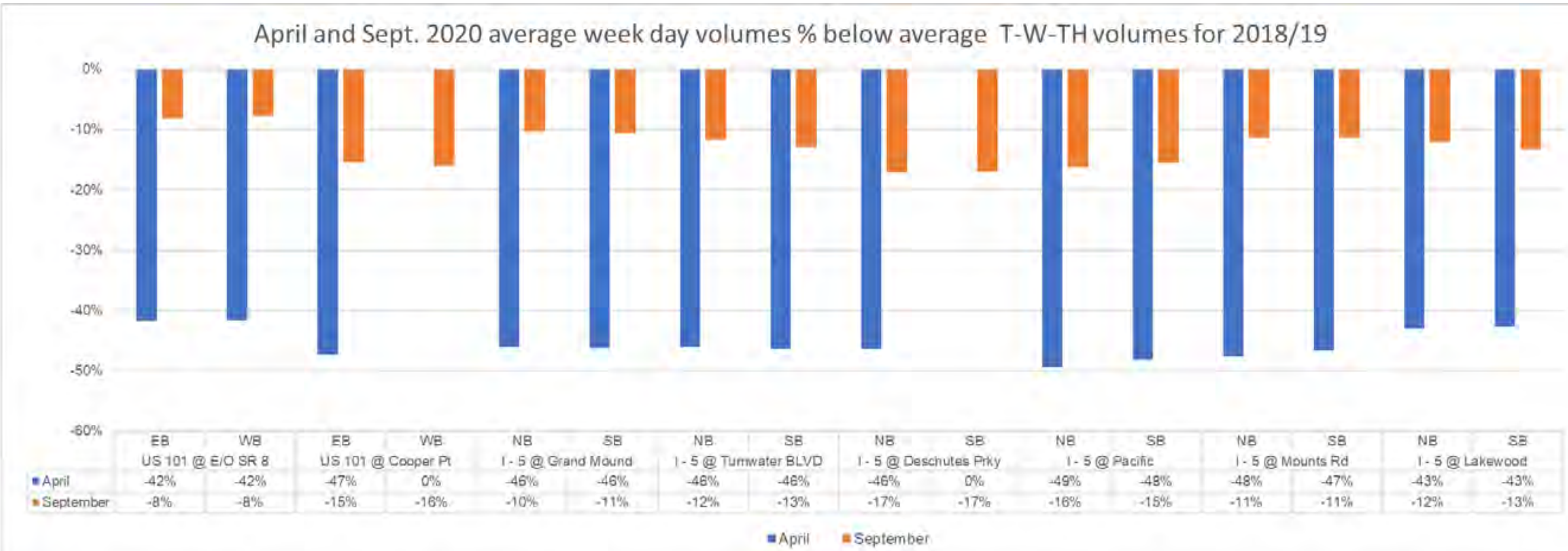
APPENDIX B: TRAFFIC COUNTS

The study team collected traffic counts from the Washington State Department of Transportation's online portal, the City of Olympia, and Thurston County, to see what the reduction in traffic was for April (COVID-19 Shut down) and September 2020 (COVID Phase 2/3) compared to the previous year.

I-5 and US 101 locations

- Average mid-week volumes - 2020 volumes % below average average mid-week volumes for 2018/19
- 2020 % below 2018/19 AVG
- Data Source: WSDOT Traffic GeoPortal, permanent traffic recorder data (PTR)
- https://www.wsdot.wa.gov/data/tools/geoportal/?config=traffic

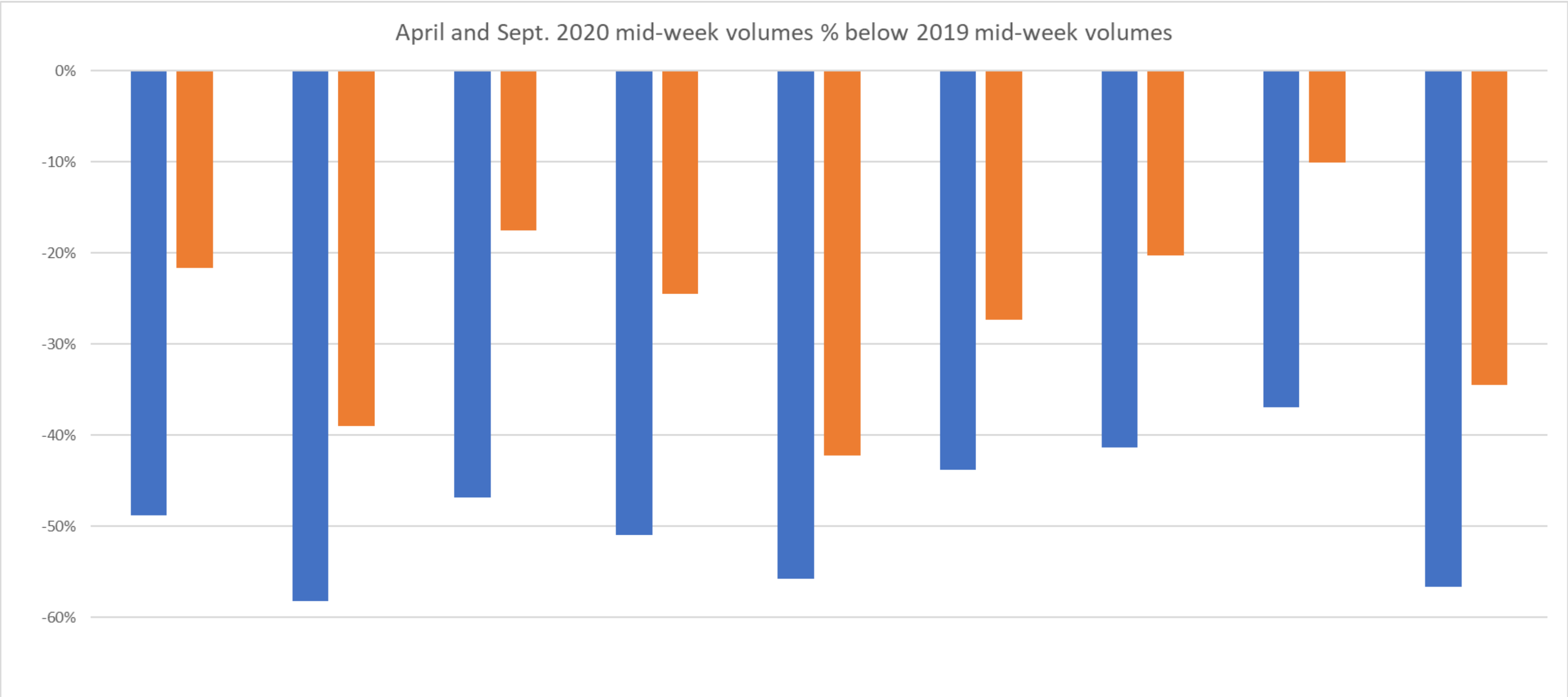
Figure B1: Reduction in I-5 and US 101 traffic counts compared to previous years



	EB	WB	EB	WB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB
	US 101 @ E/O SR 8		US 101 @ Cooper Pt		I - 5 @ Grand Mound		I - 5 @ Tumwater BLVD		I - 5 @ Deschutes Prky		I - 5 @ Pacific		I - 5 @ Mounts Rd		I - 5 @ Lakewood	
April	-42%	-42%	-47%	0%	-46%	-46%	-46%	-46%	-46%	0%	-49%	-48%	-48%	-47%	-43%	-43%
September	-8%	-8%	-15%	-16%	-10%	-11%	-12%	-13%	-17%	-17%	-16%	-15%	-11%	-11%	-12%	-13%

City of Olympia Traffic Data - Average Daily Traffic (Average of three (3) midweek days)

Figure B2: Reduction in City of Olympia traffic counts compared to previous years



	A. 4th Avenue Bridge	B. 5th Avenue Bridge	C. Black Lake Blvd north of SR-101	D. Boulevard Rd south of Log Cabin Rd	E. Capitol Blvd at I-5 Overpass	F. East Bay Dr north of Glass Ave	G. Harrison Ave east of Yauger Way	H. Martin Way east of Sleater-Kinney Rd	I. Plum St south of Union Ave
April	-49%	-58%	-47%	-51%	-56%	-44%	-41%	-37%	-57%
Sept.	-22%	-39%	-18%	-25%	-42%	-27%	-20%	-10%	-35%

Thurston County daily traffic counts (one day).

Caution use Thurston County data sparingly as traffic counts are collected as needed for specific project, locations and time of year may not coincide

Figure B3: Reduction in Thurston County traffic counts compared to previous years

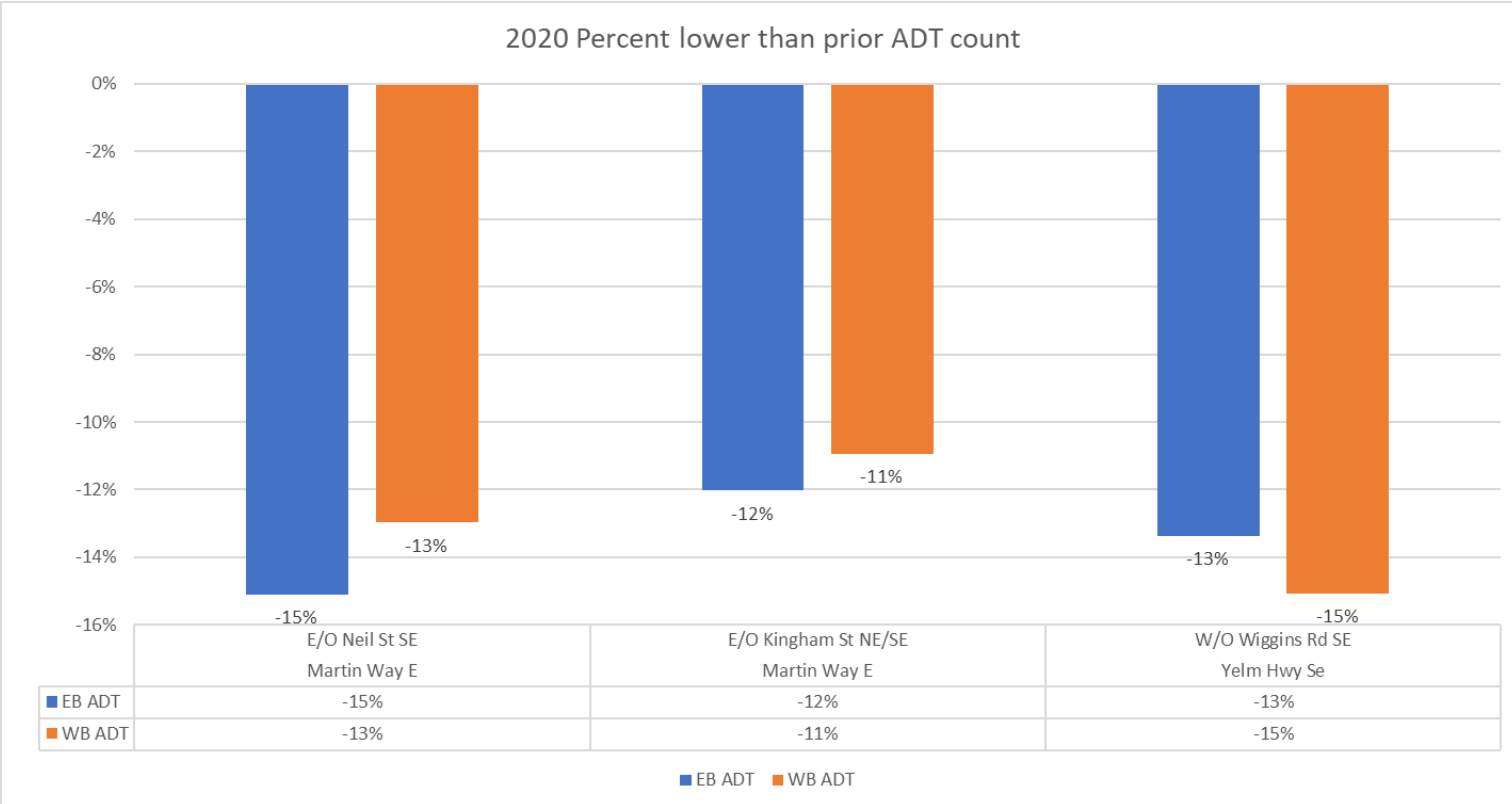


Table 3A. Reduction in traffic counts, 2020 compared to 2018/2019 averages. Average weekday conditions

		January	February	March	April	May	June	July	August	September
Interstate 5 and US 101										
US 101 @ east of SR 8	EB	-4%	12%	-20%	-42%	-27%	-14%	-8%	-8%	-8%
	WB	-2%	13%	-20%	-42%	-26%	-13%	-8%	-8%	-8%
US 101 @ Cooper Point Road	WB	-4%	8%	-24%	-47%	-35%	-21%	-13%	-14%	-15%
	EB	-5%	7%	-24%	n/a	-36%	-20%	-12%	-13%	-16%
I - 5 @ Grand Mound	NB	0%	10%	-24%	-46%	-30%	-21%	-13%	-13%	-10%
	SB	-1%	11%	-26%	-46%	-31%	-20%	-14%	-13%	-11%
I - 5 @ Tumwater Boulevard	NB	-2%	9%	-24%	-46%	-31%	-21%	-14%	-14%	-12%
	SB	0%	10%	-24%	-46%	-31%	-21%	-14%	-15%	-13%
I - 5 @ Deschutes Parkway	NB	-3%	8%	-23%	-46%	-32%	-23%	-16%	-18%	-17%
	SB	-4%	7%	-23%	n/a	n/a	-22%	-15%	-18%	-17%
I - 5 @ Pacific Avenue	NB	-3%	8%	-25%	-49%	-35%	-23%	-15%	-17%	-16%
	SB	-3%	8%	-25%	-48%	-34%	-20%	-12%	-14%	-15%
I - 5 @ Mounts Road	NB	-3%	9%	-26%	-48%	-30%	-18%	-13%	-13%	-11%
	SB	-3%	12%	-23%	-47%	-30%	-18%	-13%	-13%	-11%
I - 5 @ Lakewood (SR 512)	NB	-4%	9%	-23%	-43%	-28%	-18%	-11%	-12%	-12%
	SB	-5%	7%	-23%	-43%	-26%	-16%	-11%	-11%	-13%
I-5 and US 101 Average		**-3%**	**10%**	**-24%**	**-46%**	**-31%**	**-20%**	**-13%**	**-14%**	**-13%**
City of Olympia										
4th Avenue Bridge		-2%	-3%	-3%	-49%	-40%	-31%	-23%	-19%	-22%
5th Avenue Bridge		0%	-4%	-3%	-58%	-52%	-42%	-34%	-31%	-39%
Black Lake Boulevard north of SR-101		-2%	-8%	2%	-47%	-41%	-23%	-16%	-11%	-18%
Boulevard Road south of Log Cabin Road		-7%	2%	2%	-51%	-40%	-31%	-23%	-17%	-25%
Capitol Boulevard at I-5 Overpass		-1%	3%	-1%	-56%	-44%	-32%	-34%	-33%	-42%
East Bay Drive north of Glass Avenue		-4%	-2%	0%	-44%	-39%	-20%	-14%	-13%	-27%
Harrison Avenue east of Yauger Way		-2%	-4%	1%	-41%	-33%	-22%	-17%	-13%	-20%
Martin Way east of Sleater-Kinney Road		1%	-4%	-2%	-37%	-31%	-16%	-14%	-8%	-10%
Plum Street south of Union Avenue		-6%	-5%	10%	-57%	-50%	-38%	-33%	-29%	-35%
Jefferson Avenue and 14th Avenue		n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	-46%
Olympia Average		**-3%**	**-3%**	**1%**	**-49%**	**-41%**	**-28%**	**-23%**	**-19%**	**-28%**
Average		**-3%**	**5%**	**-15%**	**-47%**	**-35%**	**-23%**	**-16%**	**-16%**	**-19%**

APPENDIX C: RESULTS OF OCTOBER 2020 WASHINGTON STATE EMPLOYEE ENGAGEMENT SURVEY

Table C1: Results of State Employee Engagement Survey telework question

When the workplace is safe (such as low case counts, vaccine) to reopen for employees, I would be interested in teleworking:	Number of Respondees	Conversion factor per week	Telework days per week
100% every week	12,976	1.0	12,976
3-4 days a week	11,153	0.7	7,807
1-2 days a week	7,951	0.3	2,385
Less than one day a week	1,198	0.0	0
Not telework at all	2,376	0.0	0
N/A doesn't apply to my position	7,259	0.0	0
Total	**42,913**		**23,168**
Overall Rate			**54%**

C APPENDIX C: EXAMPLE ENVIRONMENTAL REVIEW SUMMARY (ERS) FORM

Olympic Region Planning Office

PEL Environmental Review Summary (PEL ERS)	
Category	**Responses/Comments**
Part 1 - Project Description	
Title	Cap 4.3 I-5 Marvin to Mounts Road *Widen, Add Capacity Marvin Rd NE Interchange to Mounts Rd*
Description of Work	Widen I-5, add capacity by adding one HOV lane and maintaining the three existing general purpose lanes, add multimodal accommodations, and upgrade existing bridges through Nisqually Delta to be consistent with current codes and guidance and to improve climate change resiliency.
PEL Purpose & Need	**Background** There are concerns around growing transportation issues such as congestion along this section of I-5. I-5 passes directly through the Nisqually River valley near the river's estuary, an environmentally important place, the traditional home of the Nisqually Indian Tribe, and habitat for Endangered Species Act listed Chinook salmon and steelhead. **PEL Purpose and need:** • Additional analysis of the proposed alternative was developed in the previous study. • Additional modeling of the alternatives, resulting in a deeper understanding of the built and natural environment constraints on the proposed alternatives, highlighting potential fatal flaws. • Provide the necessary evaluation to transition the alternatives into projects and provide necessary documentation to move the projects from the PEL study to environmental review.
Strategy Purpose	Add one HOV lane and multimodal accommodations to increase capacity, including multimodal accommodations and relieve congestion through this section of I-5. Upgrade the existing bridges through the Nisqually Delta to improve geomorphic processes and habitat functions for fish and wildlife (including ESA listed salmon and steelhead), meet current water crossing codes and guidance, and improve climate change resiliency.
Project Location	
SR	Interstate 5
Begin and End MP	111.7-116.7
County/Counties	Thurston
Right of Way; Legal	
Will ROW acquisition be needed for this project?	Likely, though possibly temporary.
Will people and/or businesses be relocated and/or displaced?	None anticipated
ROW Comments	ROW acquisition may only be temporary during construction
Section, Township, Range	T18N, R1E, Sections: 3, 4, 6, 7, 37, 38, 39, 43 T18N R1W, Sections: 11, 12 T19N R1E, Section 34
Will a haul road or detour be required? List Jurisdiction	Likely for bridge replacements. City of Lacey, Thurston County, Pierce County, Joint Base Lewis McChord

Note: Parts 2-4 responses are based on WSDOT Environmental Services guidance including GIS Workbench resource information and data accessed March-August 2020, except where noted.

Part 2 - Project Environmental Documentation		
Category	**Responses/Comments**	**Further review or discipline report required?**
NEPA/SEPA		
Anticipated NEPA Classification (Cite Subsection)	Environmental Impact Statement (EIS) - 23 CFR 771.115(a)	Yes
SEPA Classification (Cite Subsection)	Not exempt due to increase in capacity per WAC 197-11-800(26)(b) Adopt NEPA for SEPA	
Federal Agency Concurrence required?	Yes	
Endangered Species Act		
Anticipated USFWS Consultation Type	Formal; May Effect, Not Likely to Adversely Affect	Biological Assessment
Anticipated NOAA Consultation Type	Formal; May Effect, Not Likely to Adversely Affect	Biological Assessment
National Historic Preservation Act: Section 106		Cultural/historic resource review
Are there any National Register-eligible historic bridges within the project limits? If yes, list	No WISAARD database (DAHP) Bridges were determined not eligible by SHPO	No
Are there any National Register-eligible properties within the project limits? If yes, list	No WISAARD database (DAHP) Road segment was determined not eligible by SHPO	Inadvertent Discovery Plan Likely. Suggest consultation with Nisqually Tribe.
Is the project on tribal lands? If yes, list tribe	Likely (if work off ROW)- Nisqually land adjacent Parcels: 11811210400, 11811120201, 11811120400 Parcel 09700028000 and 21805000000 is WA HE LUT Indian School	Inadvertent Discovery Plan Likely. Suggest consultation with Nisqually Tribe.
Is the project on Forest Service or other Federal land? If yes, list	Likely (if work off ROW)- Billy Frank Jr. Nisqually National Wildlife Refuge adjacent. Joint Base Lewis McChord also adjacent.	No
Is the project exempt from further review under the 2018 Programmatic Agreement with FTA, FHWA and SHPO?	No	
Will a cultural resources survey and discipline report be required?	Likely due to location in the Nisqually Tribe's Usual and Accustomed Fishing Area and adjacency to Tribal land	Inadvertent Discovery Plan Likely. Consultation with Nisqually Tribe.
Anticipated Determination of effect	May Effect/LAA	

Part 3 - Permits & Approvals		
Category	**Responses/Comments**	**Further review or discipline report required?**
FEDERAL		
☒US Army Corps of Engineers	☐Section 404 ☒Section 10 ☐Nationwide Type: ☒Individual	Yes
☒US Coast Guard	☒General Bridge Act ☐Private Aids to Navigation (non-bridge project)	Yes, NIR will be required
☒Authorization for use of Federal Land Issuing Agency: US Department of the Interior (USFWS); Department of the Army	Will depend on work off ROW. Likely work off ROW: Traffic bypass, access roads, haul routes, river bypass, channel work, bank protection	N/A
TRIBAL		
Tribe Name: Nisqually	Work adjacent to Tribal lands and within U & A	Likely
List of permits and approvals	Need to consult with Nisqually Tribe to determine	Inadvertent Discovery Plan likely
OTHER PLANS/APPROVALS		
☒ Migratory Bird Treaty Act (MBTA) Permit Required	Likely- Nisqually National Wildlife Refuge is a breeding area for migratory birds	
☒Bald Eagle (BE) Permit Required or Bird Management Plan Required	Likely- Nisqually National Wildlife Refuge is a foraging area for bald eagles	
☒Incidental Harassment Authorization	Likely- it will likely be impossible to accommodate sensitive windows for all species of fish, wildlife, and birds.	
☐Other		
STATE		
☒Hydraulic Project Approval (HPA) (individual) (WDFW) <u>OR</u> ☐General Hydraulic Project Approval Type:	Individual HPA will be needed for bridges, culverts, bank protection, channel work, intertidal work, fill or fill removal, outfalls to waters of the state, flood control, or other hydraulic work.	Mitigation plan may be needed
☒Section 401 Water Quality Certification Certifying Entity: Ecology Certification Type: Letter of Verification	Yes	Pre-Filing Request Form (optional); 401 Request Form
☒Aquatic Use Authorization (WDNR)	Likely- projects on or over state owned aquatic lands require authorization. Riverbeds are commonly state owned aquatic lands.	JARPA and Attachment E
☒Coastal Zone Management Certification (CZM) County: Thurston, Pierce		Federal Consistency Certification form
☐Forest Practice Approval / Tree removal Agency Name:	Unlikely	Unlikely
☒NPDES Construction Stormwater Permit ☒ General ☐ Individual	WSDOT Municipal Stormwater Phase II permit; Olympia	
☒Temporary Erosion Sediment Control Plan (TESC)	Yes	SWPPP
☒ Gov. Executive Order 05-05 (DAHP Review)	Yes	Inadvertent Discovery Plan Likely. Suggest

Part 3 - Permits & Approvals		
Category	**Responses/Comments**	**Further review or discipline report required?**
		consultation with Nisqually Tribe.
LOCAL		
☒Critical Areas Ordinance Compliance (CAO) Issuing Agency: Lacey, Thurston County, Pierce County List CAO permits Wetland review, Fish And Wildlife Habitat Conservation Areas, Aquifer Recharge, Geologic Hazard, Seismic Hazard, Flood assessment	Yes	Yes: Wetland Report, Habitat Management Plan, Geotechnical Report, No Net Rise Analysis and Flood Report
☒Shoreline Management Program Issuing Agency: Thurston County, Pierce County	Likely Shoreline Substantial Development permit (if work outside existing road prism)	SSDP Application, plus Critical Areas permits above
☒Flood Plain Development Permit Issuing Agency: Thurston County, Pierce County Permit Type: building permit	Yes	Construction Elevation Certificate, No Net Rise Analysis
☒Jurisdictional Stormwater Manual Issuing Municipality: Lacey, Pierce County, Thurston County	Yes	
☒Noise Variance (e.g. nighttime construction or maintenance) Issuing Agency: Pierce County, Thurston County, potentially City of Lacey	Likely due to capacity increase and likely need for pile driving at bridges. May also require nighttime construction to meet sensitive timing windows for fish and wildlife species	Noise Assessment

Part 4 - Environmental Context		
Category	**Responses/Comments**	**Further review or discipline report required?**
4a) Air Quality		
1. Is the project located in a maintenance or nonattainment area? If yes: a. Is the project exempt from conformity per WAC 173-420-110? If No, then conformity is not required. b. For which pollutant(s) is the project area in maintenance or nonattainment? ☐ CO ☐ $PM_{2.5}$ ☐ PM_{10}	No	
2. Is the project likely to have > 140,000 AADT?	Likely (2020 ADT ranged from 73,000 to 106,000 through this section of I-5.)	
4b) Wetlands/Critical Areas/Resource Lands		Biology Review for

Part 4 - Environmental Context		
Category	**Responses/Comments**	**Further review or discipline report required?**
		Fish, Wildlife Species, and Wetlands due to possible presence in project vicinity
Is a project/site review required by a wetland specialist or biologist?	Yes- Nisqually Delta in project area	Nisqually Delta wetlands, Nisqually River, McAllister Creek, Red Salmon Creek
WETLANDS Will wetlands be impacted by the project?	Yes likely. Long term impacts may be beneficial if project results in net fill removal	Yes- wetland delineation, report, and mitigation plan. Habitat Management Plan.
Will a wetland delineation and discipline report be required?	Yes	Yes
Estimated wetland impacts (acres):	Yes. Long term impacts may provide a net benefit. Too difficult to determine without design and field work. There will most likely be wetland conversion from fresh water to salt water in the Nisqually Delta.	Yes. But will be difficult before having a conceptual design. Consultation with regulatory agencies is recommended
• Temporary:	TBD	
• Permanent:	TBD	
• Permanent buffer:	TBD	
Will wetland mitigation be required?	Likely, but project may be **partially** self mitigating if it results in net decrease of wetland fill and improves tidal interchange and geomorphic process.	Yes. Detailed analysis will be needed.
FISH, WILDLIFE, HABITAT Is a project/site review required by a biologist?	Yes	Habitat Management Plan
ESA (listed, threatened, candidate)	Threatened IPaC (IPAC may include species that are outside the urbanized project area, i.e., Wolverine, Gray wolf, and Fisher): Gray wolf, Olympia pocket gopher, Roy Prairie pocket gopher, Tenino pocket gopher, Yelm pocket gopher, marbled murrelet, northern spotted owl, streaked horned lark, yellow-billed cuckoo, Oregon spotted frog, bull trout, golden paintbrush Endangered IPaC: Marsh sandwort Threatened PHS: Mazama pocket gopher Threatened NMFS: Puget Sound Chinook, Puget Sound Steelhead	Biological Assessment
Critical Habitat	Designated for Bull trout, Puget Sound Chinook, Puget Sound steelhead	Biological Assessment
State listed	State Endangered- Western Pond Turtle State Threatened- Western gray squirrel	Habitat Management Plan
Bald Eagle	Likely (foraging habitat in Nisqually delta)	
Migratory Bird Treaty Act	Likely (waterfowl concentrations in Nisqually delta)	
Other (PHS, Thurston Co., etc.)	PHS: Oregon vesper sparrow, wood duck, waterfowl concentrations, Western pond turtle, great blue heron, mountain quail, purple martin, western gray squirrel, big brown bat, little brown bat, Yuma myotis, biodiversity areas and corridors, coho salmon, sockeye salmon, pink salmon, cutthroat	Habitat Management Plan should incorporate WDFW PHS Management Recommendations for these species.

Part 4 - Environmental Context		
Category	**Responses/Comments**	**Further review or discipline report required?**
Are there known fish barriers present within the project Area? List ID	Tributary to Red Salmon Creek (WDFW Fish Passage site ID 933313) culvert is a known fish passage barrier at I-5 northbound. Culvert at I-5 southbound status is unknown (WDFW FP Site ID 933314). Existing Nisqually River and McAllister Creek bridges are mapped as fish passable, but most likely do not meet current state water crossing standards. WDFW Fish Passage ID for those crossings are: 933322, 997525, 933323, 997524, 997523, 997526, 933324, 997522, 997527. Additionally, mapping and lidar review indicates there may be additional water crossings that are not mapped through the delta.	Further review needed. The site should be surveyed to identify and assess additional unmapped crossings.
Is the project within the US v WA Injunction Case Area Boundary	Yes	
Is the project located in a Sole Source Aquifer?	Yes- the eastern project limit is located in the Central Pierce County Aquifer Area SSA	Likely
Will the project impact a geologically hazardous area	Yes. The bluffs overlooking the Nisqually delta have numerous documented landslides, as shown on the WA DNR Geologic Information Portal. The project is also located within the channel migration zone of the Nisqually River and McAllister Creek. The Nisqually Delta area is mapped by DNR as high and moderate to high liquefaction susceptibility.	Yes geotechnical report and soils investigation
Will the project require work in water or below the estimated OHWM? If yes list waterbodies:	Yes. Nisqually River, McAllister Creek, Red Salmon Creek, Nisqually delta and associated freshwater and estuarine wetlands.	Yes
Is the project located in a 100-year Floodway?	Yes	Flood report, no net rise analysis
Is the project located in a 100-year Floodplain?	Yes	Flood report, no net rise analysis
Will other resource land (i.e. agriculture, forest lands, mineral resource lands) be impacted?	Yes the project could potentially impact agricultural lands, either directly or indirectly by altering tidal exchange and river flow dynamics. Mineral resource lands not identified per Thurston County GIS. This area is not considered forest lands.	Yes- potential indirect farmland conversion
4c) Hazardous Materials		
Does the project require excavation below the native ground surface? Is the project located within 300 feet radius of any Ecology listed sites that have the potential of impacting the project during construction?	Yes Yes, the Marvin Rd NE interchange is located adjacent to the Pacific Pride contaminated site, as identified by Thurston County GIS.	Hazmat analysis likely, including for culvert work
Does the project require excavation below the existing roadway prism? Will groundwater be encountered in an area of known contamination?	Yes Unknown- the vicinity of this contaminated site is not mapped as a high groundwater hazard by Thurston County GIS.	
Will any properties be acquired as part of this project?	TBD	
Does the project anticipate conducting modifications (renovation or demolition) to any	Yes- the project anticipates modifying all existing water crossings in this section of I-5.	

Part 4 - Environmental Context		
Category	**Responses/Comments**	**Further review or discipline report required?**
WSDOT structures? (Ex. bridges)		
Based on the information above and the project specific activities, is there a potential for the project to acquire any known or potentially contaminated properties, or encounter contaminated soils, groundwater or surface water? If yes, then a right sized Hazardous Materials Analysis Report is required.	Yes- this possibility exists at the Marvin Rd NE interchange where the Pacific Pride site is located, identified by Thurston County GIS.	Hazmat analysis likely, including for culvert work
4d) Noise		
Is this project a Type 1 noise project?	Yes because it increases the number of through-traffic lanes.	Noise Assessment
Are sensitive receptors located within or adjacent to the project?	Yes- Buddhist temple, Nisqually tribal school, environmentally National wildlife refuge	Noise Assessment
Do previous noise mitigation commitments exist within or adjacent to the project limits?	There is an existing noise barrier located just east of the Marvin Rd NE interchange along the northbound lane, from Queets Dr NE to East Tanglewild. Washington Geospatial Open Data Portal-WSDOT- Noise Walls	
Is a noise study required?	Likely	Likely
4e) Land Use		
Are there any Section 4(f) Parks, Schools, recreation areas, wildlife refuges and/or 6(f) (Land & Water Conservation Fund Act) resources impacted/used within the project limits?	Yes. Billy Frank Jr. Nisqually National Wildlife Refuge. Nisqually River Public Access water access site. Eagle's Pride Golf Course (near eastern project limits). Wa-He-Lute Indian School. Restoration at the Billy Frank Jr. Nisqually National Wildlife Refuge was funded by: U.S. Fish and Wildlife Service, Ducks Unlimited, the Nisqually Tribe, Puget Sound Acquisition and Restoration (PSAR) funds, Salmon Recovery Funding Board (SRFB) funds, Estuary and Salmon Restoration Program (ESRP) funds, the National Fish and Wildlife Foundation, and the National Oceanic and Atmospheric Administration.	Likely
Do any impacts/uses fit a Section 4(f) exemption? List	Some parts of the project may be exempt- trails, and bridges. But majority of the project will likely not be exempt.	TBD
Are any impacts/uses *de minimis*? If yes, attach form for each resource impacted/used	No	TBD
Is an Individual Section 4(f) Evaluation required If yes, attach Evaluation document	Likely	Likely
Is there a Wild and Scenic River (state or federally designated, "study river", or on the National Rivers Inventory) in or near the project area.	No; No wild and scenic rivers within Pierce/Thurston Counties. NWSRS https://www.rivers.gov/washington.php	No further review
Is the project located on a Scenic Byway?	No; This section of I-5 is not designated a Scenic Byway, No further review. WSDOT GIS Workbench	No further review
Is the project located on a State Scenic & Recreational Highway?	No; This section of I-5 is not designated a Scenic & Recreational Highway	No further review

Part 4 - Environmental Context		
Category	**Responses/Comments**	**Further review or discipline report required?**
Will farmland be converted for the project	Yes the project could potentially impact agricultural lands, either directly or indirectly by altering tidal exchange and river flow dynamics.	Yes
4f) Title VI/Environmental Justice		
Will the project require detailed EJ analysis. If no, list exemption # and description	Yes, if detour	Further review needed-EJ analysis
4g) Water Quality/Stormwater		
Will the project increase runoff?	Yes	Addressed during project design
Will water quality treatment be required per the HRM or a more stringent manual local stormwater management manual? If no, explain how not affect through treatment.	Highway Runoff Manual	
Does a TMDL waterbody have the potential to receive a discharge? If yes, list water bodies and pollutants of concern.	Yes, Nisqually River; bacteria and dissolved oxygen	
Does a 303d waterbody have the potential to receive a discharge? If yes, list waterbodies and pollutants of concern.	Yes- Nisqually River; temperature McAllister Creek; temperature and pH Red Salmon Creek; bacteria	
4h) Visual Quality/Roadside Policy Manual/Aesthetics		
Will the project disturb the roadside? (e.g. Cuts, fills, new lighting, clearing & grading, realignment, structures) Is review by Landscape Architect required?	Yes Likely	Further review needed
Will the project disturb Resource Conservation Areas? (See Roadside Policy Manual M 3110)	No WSDOT GIS Workbench Resource Conservation Areas	

Prepared by: BG
Reviewed by: _______TMT___________

D APPENDIX D: ENVIRONMENTAL REVIEW SUMMARY (ERS) MATRICES

Environmental Matrix: Operations Strategies

	GENERAL INFO			POTENTIAL IMPACTED RESOURCES WITHIN FOOTPRINT OR VICINITY													
Strategy Number	Strategy	Description	Milepost	Section 4f	Section 6f	Ag Land Conversion	Section 106, historic bridge	Wetland	Fish, Wildlife, Veg, ESA	Fish Passage Barrier (in vicinity)	Key Species: Gopher Soils	Noise Type 1 Project	Noise Wall (existing, proposed)	Hazardous Materials (Level 1 Assessment)	Air Quality (Q#2 MSAT required)	Visual	Environmental Justice
	Operations																
Ops 1	Sleater-Kinney Double Left turn lanes from Martin Way E to Sleater-Kinney Road SE	Add left turn lane from Martin Way East onto Sleater-Kinney Road SE	local system	NO	NO	NO	Exempt	NO	No Effect	NO	Combo	NO	NO	LIKELY	NO	NO	YES
Ops 2	SR 507 and Centre Street Roundabout	New roundabout	22.7	NO	NO	NO	No Effect	NO	No Effect	NO	More preferred	NO	NO	UNLIKELY	NO	NO	YES
Ops 3	SR 507 Sussex Ave E / SR 507 and Old Hwy 99	New roundabout	14.7	NO	NO	NO	No Effect	NO	No Effect	NO	More Preferred	NO	NO	LIKELY	NO	LIKELY	YES
Ops 5	Steilacoom Road and SR 510	New roundabout	3.3-3.5	NO	LIKELY	UNLIKELY	No Effect	UNLIKELY	No Effect	NO	More Preferred	UNLIKELY	NO	UNLIKELY	NO	UNLIKELY	YES
Ops 6	Nisqually / Martin Way at Nisqually Cut Off Road SE	Extra lane approaching ramp meter for northbound ramp	114.1-114.5	Likely	NO	NO	Likely	NO	No Effect	NO	NO	NO	NO	UNLIKELY	NO	NO	YES
Ops 7	Deschutes Parkway Extended Taper	Extend taper on on-ramp	104.1-104.2	NO	NO	NO	Exempt	Likely	No Effect	YES	More Preferred	NO	YES	UNLIKELY	NO	Unlikely	YES
Ops 8	Sleater-Kinney new signal at NB off-ramp	Construct signal at intersection of I-5 northbound off-ramp and Sleater-Kinney Road. Only southbound lane will be signalized; separate northbound with curbing	108.2-108.4	NO	NO	NO	Exempt	NO	No Effect	NO	Combo	NO	NO	UNLIKELY	NO	NO	UNLIKELY
Ops 9	SR 507 in Yelm (SR 507 and SR 702)	Replace intersection with roundabout	31.1	NO	NO	NO	No Effect	NO	No Effect	NO	More preferred	NO	NO	LIKELY	NO	UNLIKELY	YES
Ops 10.1	SR 507 and Vail Road- replace intersection with roundabout	Replace intersection with roundabout	30.5	NO	NO	YES	LIkely	NO	No Effect	YES	More preferred	NO	NO	UNLIKELY	NO	UNLIKELY	YES
Ops 10.2	SR 507 and Bald Hill Road- replace existing signal with a roundabout	Replace intersection with roundabout	29.2	NO	NO	NO	No Effect	NO	No Effect	NO	Combo	NO	NO	UNLIKELY	NO	UNLIKELY	YES
Ops 11	US 12 and 183rd Ave Roundabout	New roundabout	42.7-43.0	NO	NO	LIKELY	No Effect	LIKELY	No Effect	NO	More preferred	YES	NO	UNLIKELY	NO	LIKELY	YES

Environmental Matrix: Interchange Strategies

	General Info				POTENTIAL IMPACTED RESOURCES WITHIN FOOTPRINT OR VICINITY												
Strategy Number	Strategy	Description	Milepost	Section 4f	Section 6f	Ag Land Conversion	Section 106, Historic bridge	Wetland	Fish, Wildlife, Veg, ESA	Fish Passage Barrier (in vicinity)	Key Species: Gopher Soils	Noise Type 1 Project	Noise Wall (existing, proposed)	Hazardous Materials (Level 1 Assessment)	Air Quality (Q#2 MSAT required)	Visual	Environmental Justice
	Interchange																
Int 1	Mounts Road Interchange	Roundabouts on both the northbound and southbound ramps. Move ramp meter slightly on southbound on-ramp.	116.6 -116.7	NO	NO	NO	LIKELY	UNLIKELY	No Effect	YES	TBD	UNLIKELY	NO	LIKELY	NO	UNLIKELY	YES
Int 2	Martin Way Interchange	Partial cloverleaf interchange.	109.0 -109.6	UNLIKELY	NO	NO	LIKELY	YES	No Effect	YES	Less preferred	YES	NO	YES	NO	YES	YES
Int 3	Pacific Ave Interchange NB off ramp	Add a lane to northbound off ramp.	107.1-107.5	NO	NO	NO	Exempt	LIKELY	No Effect	YES	Less preferred	YES	NO	LIKELY	NO	YES	YES
Int 4	US 101 Interchange revision with braided on ramps	Exit at Plum Street to access braided ramp SB I-5 and add an auxiliary lane between Pacific Ave and Capitol Way	104.7-105.7	LIKELY	NO	NO	LIKELY	YES	No Effect	YES	More preferred	LIKELY	NO	YES	NO	YES	YES
Int 5	US 101 and I-5 (NB PTSU I-5 to US 101)	Add a part time shoulder use lane between the Deschutes Way off ramp and the US 101 off ramp.	103.6 - 104.1	NO	NO	NO	Exempt	NO	No Effect	YES	More preferred	UNLIKELY	YES	LIKELY	NO	UNLIKELY	YES
Int 6	Trosper northbound on-ramp	Construct 3 adjacent roundabouts	102.7 -102.9	NO	NO	NO	UNLIKELY	NO	No Effect	NO	More preferred	UNLIKELY	YES	LIKELY	NO	UNLIKELY	YES
Int 7	Tumwater Boulevard Interchange	Increase travel lanes from 3 to 4 lanes on Tumwater Blvd and construct bridge over I-5, install 2 roundabouts at ramp connections, and modify and improve ramps to freeway	101.3 -101.3	NO	NO	NO	UNLIKELY	No	No Effect	NO	More preferred	YES	NO	UNLIKELY	NO	UNLIKELY	YES

Environmental Matrix: PTSU and HOV Conversion Strategies

	GENERAL INFO				POTENTIAL IMPACTED RESOURCES WITHIN FOOTPRINT OR VICINITY												
Strategy Number	**Strategy**	**Description**	**Milepost**	**Section 4f**	**Section 6f**	**Ag Land Conversion**	**Section 106 Historic bridge**	**Wetland**	**Fish, Wildlife, Veg, ESA**	**Fish Passage Barrier (in vicinity)**	**Key Species: Gopher Soils**	**Noise Type 1 Project**	**Noise Wall (existing, proposed)**	**Hazardous Materials (Level 1 Assessment)**	**Air Quality (Q#2 MSAT required)**	**Visual**	**Environmental Justice**
	PTSU																
PTSU	Southbound existing shoulder between Sleater-Kinney on-ramp and Henderson on-ramp	Allow hard shoulder running (also called part time shoulder use) on the existing southbound I-5 shoulder between the Sleater-Kinney Rd NE on-ramp and the Henderson Blvd SE on-ramp	105.0-108.0	NO	NO	NO	No Effect	NO	No Effect	YES	Combo	UNLIKELY	YES	LIKELY	NO	YES	UNLIKELY
	HOV Conversion																
HOV 1	HOV Conversion US 101 to Mounts Road	Convert existing general purpose inside lane to HOV on both NB and SB directions starting at MP 104.3 through Pierce Co to connect with new HOV lanes and add HOV que jumps NB at Martin Way, Plum St, and Trosper	104.3 -117.0	NO	NO	NO	Exempt	NO	No Effect	YES	Combo	NO	YES	NO	TBD	NO	UNLIKELY
HOV 2.1	HOV Martin Way Northbound Ramp	Add HOV que jumps NB at Martin Way, Plum St, and Trosper	109.2 -109.6	NO	NO	NO	No Effect	NO	No Effect	YES	Less preferred	UNLIKELY	NO	UNLIKELY	NO	UNLIKELY	YES
HOV 2.2	Plum Street Northbound HOV on-ramp	Add HOV que jumps NB at Martin Way, Plum St, and Trosper	105.7 -105.8	NO	NO	NO	No Effect	YES	No Effect	YES	Less preferred	UNLIKELY	YES	UNLIKELY	NO	NO	YES
HOV 2.3	Trosper Northbound Metering HOV	Add HOV que jumps NB at Martin Way, Plum St, and Trosper	102.5 -103.2	NO	NO	NO	No Effect	NO	No Effect	NO	More preferred	UNLIKELY	YES	NO	NO	UNLIKELY	YES

Environmental Matrix: Capacity and Misc Strategies

Strategy Number	Strategy	Description	Milepost	Section 4f	Section 6f	Ag Land Conversion	Section 106, historic bridge	Wetland	Fish, Wildlife, Veg, ESA	Fish Passage Barrier (in vicinity)	Key Species: Gopher Soils	Noise Type 1 Project	Noise Wall (existing, proposed)	Hazardous Materials (Level 1 Assessment)	Air Quality (Q#2 MSAT required)	Visual	Environmental Justice
	GENERAL INFO				POTENTIAL IMPACTED RESOURCES WITHIN FOOTPRINT OR VICINITY												
	Add Capacity																
Cap 4.1	Widen, Add Capacity Pacific Ave SE Interchange to US 101 Interchange	Portions are already four lanes; add a lane where there are only three lanes, with the HOV lane as the inside lane both directions I-5 from Pacific Ave SE interchange to US 101 interchange	104.3-107.1	YES	YES	NO	YES	YES	Formal	YES	YES	YES	YES	YES	YES	YES	YES
Cap 4.2	Widen, Add Capacity Marvin Rd NE Interchange to Pacific Ave SE Interchange	Portions are already four lanes, add a lane where there are only three lanes, with the HOV lane as the inside lane both directions I-5 from Marvin Rd NE interchange to Pacific Ave SE interchange	107.1-111.7	YES	YES	NO	YES	YES	Formal (likely)	YES	YES	YES	YES	YES	YES	YES	YES
Cap 4.3	Widen, Add Capacity Marvin Rd NE Interchange to Mounts Rd	Widen I-5, add capacity by adding one HOV lane and maintaining the three existing general purpose lanes, and provide multimodal accommodations.	111.7-117.0	YES	YES	YES	YES	YES	Formal	YES	YES	YES	YES	YES	YES	YES	YES
Cap 5	I-5 Southbound - Pacific Ave to Plum St off ramp	Add an auxiliary lane between Pacific Avenue and Capitol Way.	106.1 -107.2	YES	UNLIKELY	NO	LIKELY	YES	No Effect	YES	NO	YES	YES	YES	NO	YES	YES
Cap 6	I-5 Northbound US 101 on-ramp to Pacific Ave off-ramp	Add an auxiliary lane from US 101 on-ramp to 14th Avenue off-ramp, and from Plum Street on-ramp to Pacific Avenue off-ramp.	104.6 -107.1	YES	YES	NO	YES	YES	Informal	YES	Less preferred	YES	YES	UNLIKELY	NO	YES	YES
Cap 7	I-5 Northbound at US 101 - flyover ramp	Add a flyover off ramp linking NB I-5 to WB US 101, and merging in on the outside lane of US 101. Retain the Deschutes Parkway on-ramp to provide access from the local network to US 101.	104.1 -104.4; 366.9-367.3	YES	LIKELY	NO	YES	YES	Informal	YES	Combo	YES	YES	YES	NO	LIKELY	YES
	Misc.																
Misc- Per	Perimeter Rd	Remove gate; add SB lane over weigh station ramp; widen bridge over ramp	116.5 -118.0	NO	NO	NO	LIKELY	UNLIKELY	No Effect	LIKELY	TBD	NO	NO	LIKELY	NO	YES	YES

E

APPENDIX E: PLANNING AND ENVIRONMENTAL LINKAGES (PEL) QUESTIONNAIRE

Planning Environmental Linkages Questionnaire

Planning and Environment Linkage (PEL) is a collaborative and integrated approach to transportation decision-making authorized by 23 CFR 168. PEL considers environmental, community, and economic goals early in the transportation planning process, generally at the corridor sketch or plan level. The information, analysis, and products developed during planning will then inform your environmental review process (NEPA) and will help you meet agency requirements of least cost planning and practical design.

The PEL questionnaire is a tool that state DOTs and MPOs WSDOT can use to ensure that planning studies and decisions consider environmental discipline and are documented so that they can inform the environmental review process. Planners can use the Questionnaire, as a checklist to summarize the approach to addressing environmental and project development issues as part of the planning study in anticipation of a future NEPA study. The Questionnaire can be “handed off” to the NEPA practitioner as a starting point for the environmental review process that considers the past work that was done, and helps avoid re-doing certain analysis or decisions made in planning.

The questionnaire is intended to:

1) Provide planners a “checklist” detailing the requirements and options to consider when developing a planning study with a goal to inform the NEPA process; and

2) Document and share relevant planning information with NEPA practitioners to build understanding about a project – both the information studied and areas that require more analysis.

*Instructions: **These questions should be used as a guide throughout the planning process, not just answered near completion of the process**. When a planning study is started, this questionnaire will be given to the project team. Some of the basic questions to consider are: “What did you do?,” “What didn't you do?,” and “Why?”. When the team submits a planning study to FHWA for review, the completed questionnaire will be included with the submittal. FHWA will use this questionnaire to assist it in determining if the study meets the requirements of 23 CFR §§ 450.212 or 450.318. The questionnaire should be included in the planning document as an executive summary, chapter, or appendix.*

I-5: Tumwater to Mounts Road
Planning and Environmental Linkages
PEL Questionnaire

NOTE: *Blue italic = draft response*

1. Background:

A. Who is the sponsor of the planning study? (state DOT, Local Agency, Other)

Washington State Department of Transportation (WSDOT)
Olympic Region Multimodal Planning Office

B. What is the name of the planning study/document and other identifying project information (e.g., sub-account or STIP numbers, long-range plan, or transportation improvement program years)?

Interstate 5 - Tumwater to Mounts Road Planning and Environmental Linkages Study

C. Who was included on the study team (Name and title of agency representatives, consultants, etc.)?

The following WSDOT staff were part of the study team:
Joseph Perez, Olympic Planning and Program Manager (former)
Gaius Sanoy, Olympic Planning and Program Manager
Dennis Engel, Multimodal Planning Manager
Theresa Turpin, Multimodal Development Manager
Ariel Heckler, Transportation Engineer
Roger Baugh, Transportation Engineer
Kate Fauver, Transportation Planner
Debi Freudenthal, Transportation Planner
Brittany Gordon, Transportation Planner
Jeff Sawyer, Environmental Program Manager
Victoria Book, Assistant Environmental Manager
Carol Lee Roalkvam, Policy Branch Manager
Chris Regan, former OR NEPA/SEPA Program Manager
Justin Zweifel, NEPA/SEPA Program Manager
Lucy Temple, Transportation Planner
Michael Macdonald, Transportation Planner

The following Thurston Regional Planning Council (TRPC) representatives were part of the study team:
Marc Daily, Executive Director
Veena Tabbutt, Deputy Director
Aaron Grimes, Senior Transportation Modeler

Scott Carte, GIS & Modeling Manager
Theressa Julius, Transportation Modeler
Clyde Scott, Transportation Modeler

D. Provide a description of the existing transportation facility within the corridor being studied, including project limits, modes, functional classification, number of lanes, shoulder width, access control and type of surrounding environment (urban vs. rural, residential vs. commercial, etc.)

Interstate-5 (I-5) is the major north-south highway and is a national highway of strategic importance. Just north of the project area is Joint Base Lewis McChord (JBLM), and I-5 is a critical corridor for the military.

This I-5 section (approximate mileposts 102.5-118.0) through western Washington State is a major freight (T-1) and commuter corridor. Additionally, a portion of I-5 within the study area allows bicycle travel because it is the most direct route between Tacoma and Lacey. Travel demand in the area is expected to increase due to: population growth; increase in employment; increase in freight; and economic growth. Population in the cities surrounding this section of I-5 (Lakewood, Dupont, Steilacoom, Lacey, Olympia and Tumwater) continue to grow. The corridor is an important link to Joint Base Lewis McChord (JBLM) for workers and for supplies.

I-5 is a limited access, full-control highway and the study area limits are generally from SR 121 in Tumwater (Exit 99) and Mounts Road (Exit 116), Milepost 99 to 117 near DuPont, WA. The highway varies from 3 to 4 lanes each direction in this segment. Typical outside shoulders through this segment are approximately 10 feet wide and paved, although this varies in some areas such as on the Nisqually River bridges, where there is little to no shoulder. This segment of I-5 is mostly urban, with government (state capitol), commercial, residential, Tribal lands (Nisqually Indian Reservation) and industrial uses, along with segments that have rural and agricultural land uses, military use, and the Billy Frank Jr. Nisqually Wildlife Refuge. The corridor segment also passes through the cities of Lacey and Olympia. Within the study area, there are 12 interchanges and 64 bridges over roadways, waterways and railroads.

The study also includes a goal to improve system resiliency. As such, the study area includes segments off I-5 at US-12 and 183rd in Rochester and at SR-507 in Yelm. Yelm and Rochester are small but growing rural cities with residential and commercial centers, some industrial areas, and surrounding rural and agricultural lands. Modes in these areas are primarily single occupancy vehicles but also include carpools, buses, bicycles, and freight to varying degrees. There are wide walkable shoulders, shared pathways, and sidewalks available sporadically in these off and adjacent to some I-5 segments.

E. Provide a brief chronology of the planning activities including the year(s) the studies were completed.

WSDOT has completed studies previously within the study area that provided data and ideas for strategies to improve system performance. WSDOT and its partners considered the strategies and data from these studies when developing strategies to test.

The PEL is a continuation of the Interstate 5: Tumwater to Mounts Road mid- and long- Range Strategies; April 2020 (Corridor Study). Working with local partners WSDOT completed the Corridor Study for this same stretch of I-5 in 2019-2020, before the PEL Study began. The Corridor Study developed goals and performance measures and a suite of mid and long term strategies aimed at achieving those goals. The strategies were sorted into scenarios, which were ranked for effectiveness. These strategies were incorporated into the Corridor Study's traffic modeling to determine their system performance and contribution for decreasing congestion.

Throughout the PEL process in 2020 and 2021, WSDOT continued to coordinate with partners, stakeholders, Tribes, and regulatory agencies. These include but are not limited to the Nisqually Tribe, the Squaxin Island Tribe, FHWA, the Services (US Fish and Wildlife Service and National Marine Fisheries Service), Thurston Regional Planning Council (TRPC), and the South Sound Military and Communities Partnership (SSMCP). In August 2021, the U.S. Geological Survey (USGS) provided a draft hydrologic study of the Nisqually River delta at I-5, which was funded by WSDOT and the Nisqually Tribe. TRPC provided traffic modeling reports in March and September 2021. The Squaxin Island Tribe reached out to WSDOT in October 2021 expressing an interest in the project and WSDOT staff coordinated with Squaxin Island Tribal representatives.

In addition, WSDOT reviewed the following studies relevant to the corridor:

- *I-5/US101 Interchange Study (2013) – This study developed solutions to be modeled later for addressing operational issues at the US 101 interchange.*
- *Martin Way & Marvin Road Interchange Justification Report (IJR) (2015) – The City of Lacey in association with WSDOT and FHWA prepared an IJR, looking into alternatives for improving operations at the I-5 interchanges with Martin Way (Exit 109) and Marvin Road (Exit 111).*
- *West Olympia Access Study (2016) – The City of Olympia and WSDOT jointly evaluated transportation needs on Olympia's west side. The City completed an IJR to investigate alternative solutions for US 101 near I-5.*
- *Corridor Sketch Initiative (2016-2017) – WSDOT worked with local partners to develop high-level, baseline studies for highways around the state. A summary was developed for each corridor that documents strategies and solutions to address performance issues and manage system assets.*
- *HOV Feasibility Study I-5: JBLM to 38th Street (2017) – This study investigated possible approaches to extending HOV lanes from 38th Street in Tacoma to/through the JBLM area, north of the corridor.*
- *I-5 Near term Solutions Study (2018) – This study developed solutions to be modeled later for addressing operational issues at the US 101 interchange.*
- *Tumwater to Marysville Study (2019-) – The I-5 System Partnership was formed by a stakeholder group made up of representatives from transportation agencies, community organizations, businesses and jurisdictions for a 107-mile study area crossing four counties between Tumwater and Marysville. The study identifies I-5 as the spine of a complex system that includes local streets, highways, transit, freight, and emergency response. The efforts will result in an I-5 System Master Plan that will identify solutions to support and meet challenges of future growth that are consistent with the regional goals of the Puget Sound Regional Council and Thurston Regional Planning Council.*

- *I-5 JBLM EA (2013 – 2016) – A FONSI was issued in 2017 for this project, which is at the northern portion of this corridor and is currently being constructed.*
- *Draft Environmental Impact Statement, Capitol Lake-Deschutes Estuary (June 2021)- This draft EIS is for removal of the 5th Avenue Dam in the City of Olympia, which impounds Capitol Lake, to restore the Deschutes River Estuary.*

F. Are there recent, current, or near future planning studies or projects in the vicinity? What is the relationship of this project to those studies/projects (e.g., Are corridor connections described in local transportation plans? Do those plans identify elements incorporated into the current plan? How might WSDOT planning modify local plans, or vice versa?)?

Most of the studies listed above are relatively recent studies that are related to this project. Most directly related is the Interstate 5: Tumwater to Mounts Road mid- and long- Range Strategies; April 2020 (Corridor Study) completed by WSDOT and the Thurston Regional Planning Council. This study identified strategies and solutions to address system performance and incorporated stakeholder and community input. Beginning in 2020, the I-5: Tumwater to Mounts PEL study began as a continuation of this previous study to further analyze the effectiveness and potential environmental impacts of the strategies and solutions and recommend strategies to move forward into NEPA.

As stated above, the I-5 JBLM is a project under construction at the northern area of this corridor. WSDOT is coordinating with internal and external partners on the work.

The Capitol Lake-Deschutes Estuary Draft EIS is related to the PEL Study because removing the 5th Avenue Dam at the outlet of Capitol Lake will impact hydrology, including tidal action, at the I-5 crossing of Capitol Lake. WSDOT will continue following this EIS as it is finalized and consider its findings in the design of projects in that section.

2. Methodology used:

A. What was the scope of the study and the reason for completing it?

The I-5 Tumwater to Mounts Road PEL study builds on the efforts in the previous Corridor Study. The scope of that study was to alleviate congestion on I-5 by working with stakeholders to develop strategies that would: Improve travel time and reliability; Increase the ability to safely, efficiently and equitably move all people (multimodal) and goods, and manage the corridor capacity as an asset; Maintain accessibility to industrial areas and job sites; improve the transportation and habitat constraints related to the Nisqually River Bridges and Delta; and Improve the availability or capacity of alternate routes to I-5. The Corridor Study was after a significant shut down occurred on this section of I-5.

In the PEL study, WSDOT analyzed the strategies for environmental constraints, worked with TRPC to determine each individual strategy's benefits to the transportation system; and sought strategies that will provide the most benefit once there is funding to implement them.

A planning-level environmental analysis was used to inform the development of concepts, consistent with FHWA and WSDOT guidelines. The study completed preliminary environmental screening for each of the strategies, using publicly available data from local, regional, state, and federal agencies. The PEL Study did not conduct any field reviews. From this screening it appears many strategies proposed have independent utility and logical termini.

General methodology:

- *Identified the purpose and need and project limits for the PEL study*
- *Used the existing list of strategies from previous study and completed environmental screening for each strategy using publicly available information (no field reviews were conducted).*
    - *Environmental screening was done using the Environmental Review Summary (ERS) form, an existing tool used by WSDOT.*
- *USGS completed draft hydrology report for I-5 Nisqually River crossing*
- *Modeled each strategy for years 2030 and 2045 (where possible)*
- *Compiled modeling results and recommended strategies to move forward to NEPA*
- *Coordinated with tribes and stakeholder groups (continuation from the previous study)*
- *Coordinated with regulatory agencies for early input on potential impacts and permit processes*
- *Conducted public outreach via online open house*
- *Compiled results*

B. Did you use NEPA-like language? Why or why not?

The I-5 Tumwater to Mounts Road PEL study used a combination of planning and NEPA terms that primarily allowed for recognition and continuation of the terms and language from the previous Corridor Study, in addition to those used by WSDOT Environmental Offices. WSDOT staff avoided making assumptions about what level of NEPA would be required for each strategy due to the lack of conceptual design information for the strategies. The audience for the PEL study is broad and includes the general public, and WSDOT aimed to use plain language to the extent possible.

Crosswalk of Terminology between Planning and NEPA and I-5 PEL Study

Planning Term	NEPA Term	I-5 PEL Study
Project Statement, Vision, Goal	*Purpose and Need*	*Purpose and Need*
Project or Study area limits	*Logical Termini and Independent Utility*	*Project or study area limits; Project footprint*
Alternatives, solutions	*Preliminary range of alternatives*	*Strategies*
Highly rated concepts	*Alternatives considered but rejected*	*Strategies evaluated and not moving forward*
Ranking of concepts	*Screening of alternatives analysis*	*Strategies moving forward*
Recommended or selected alternative	*Preferred Alternative*	*N/A*
Existing conditions; environmental considerations	*Affected Environment*	*Environmental screening conducted using the Environmental Review*

		Summary (ERS) form; includes existing conditions

C. What were the actual terms used and how did you define them? (Provide examples or list)

As noted above, the main reason for use of the terms in the PEL study was to maintain continuity to the previous Corridor Study especially for the Tribes and stakeholder group to efficiently review and provide feedback. In addition, planning terms were preferred for this 'high-level' review along with the already developed terminology from the environmental screening (via the Environmental Review Summary Forms). The PEL study was written for a broad audience, including the public, and as such, terminology was simplified and plain talk used.

D. How do you see these terms being used in NEPA documents?

The non-NEPA terms could be referenced in background documents. These terms can be replaced by the appropriate NEPA language in the future NEPA phases without loss of the knowledge gained in the PEL Study. For example, future NEPA phases would consider the strategies as reasonable alternatives.

E. Attach the project schedule and describe the planning process. Specifically: What were the key steps and coordination points in the PEL decision-making process? Who were the decision-makers and who else participated in those key steps? For example, for the corridor vision, "the decision was made by state DOT and the local agency, with buy-in from FHWA, the USACE, and USFWS and other resource/regulatory agencies".

The general initial planning process had the following key steps in the PEL study.

- *Purpose and Need – Continuation from the Corridor Study and input from the stakeholder group*
- *Study limits – Continuation from the Corridor Study*
- *Modeling the strategies for years 2030 and 2045; A total of 30 strategies from the Corridor Study were modeled and reviewed –some of the strategies made more sense to group together and model as one strategy.*
- *Environmental Screening completed and reviewed by WSDOT environmental subject matter experts*
- *Technical Advisory Group review*
- *Public outreach and input*
- *Final Report*

Through discussions with the Stakeholders group during the PEL study, key review and recommendations were made by the Technical Advisory Group and FHWA, which included representatives (invited and/or participated) from the following jurisdictions and agencies:

Technical Advisory Group (Invitees)

Tribal Governments	Local Agencies	Other
Chehalis	City of DuPont	Joint Base Lewis-McChord
Cowlitz	City of Lacey	South Sound Military Community Partners
Nisqually	City of Lakewood	Port of Olympia
Puyallup	City of Olympia	Intercity Transit
Squaxin Island	Town of Steilacoom	Pierce Transit
Yakama	City of Tumwater	Sound Transit
	City of Yelm	Puget Sound Regional Council
	Pierce County	Thurston Regional Planning Council
	Thurston County	Thurston Chamber of Commerce
	Federal Agency	Thurston Economic Development Council
	Federal Highways Administration	WSDOT Headquarters and Region Staff

During the process, it was determined that NEPA-equivalent discipline reports could not be done for the PEL study and that additional screening of strategies that may have environmental impacts would be completed once additional design information was known for that strategy. This decision was made in coordination with FHWA.

During the process, it was also decided to split one very long strategy into three separate sections with independent utility and logical termini. This decision was also made in coordination with FHWA.

F. What should be taken into consideration when presenting the PEL information in NEPA?

There is a considerable amount of information that will be needed to move the PEL strategies to NEPA. More detail on the strategy footprints, bridges, detours, and construction methodologies will be needed. For some strategies, specific discipline reports will be needed, such as wetlands, geotechnical, noise, hydraulic, and biological assessment reports. Without a higher level of design, it is difficult to determine the impacts from the strategies.

3. Agency coordination:

A. Provide a synopsis of coordination with Federal, tribal, state and local environmental, regulatory and resource agencies. Describe their level of participation and how you coordinated with them.

Agency and Tribal coordination throughout the Corridor Study and PEL study has been extensive and is detailed in the PEL study report.

Corridor Study Agency Coordination:
Outreach and coordination began early in 2018 with letters from WSDOT to six potentially interested Tribal Nations: the Chehalis Confederated Tribes, Cowlitz Tribe, Nisqually Tribe, Puyallup Tribe,

Squaxin Island Tribe, and Yakama Tribe. Because there were system resiliency strategies as far south as 183rd and US 12; the Cowlitz and the Chehalis Confederated Tribes were included on the invite list.

Coordination continued through formation of an Executive Group that met twice in 2018 and three times in 2019. A total of 24 entities, including six Tribal nations, seven cities, two counties, one federal military institution, and various planning and transportation groups were invited to participate in the Executive Group and its associated Technical Advisory Group. The Technical Advisory Group met three times in 2018 and five times in 2019. A full list of entities invited to the Executive Group and their participatory status is provided in the Corridor Study.

PEL Study Agency Coordination:

WSDOT continued the agency coordination that started with the Corridor Study, meeting with stakeholders throughout completion of the PEL Report. ***With the publication of this PEL study, WSDOT presents the results of screening to the public and agencies for their review.*** *The coordination that occurred prior to the release of this study is summarized below.*

WSDOT coordinated with FHWA at key milestones during the development of the PEL study. WSDOT met with FHWA for guidance in June 2020 and March, August, and October 2021.

Thurston Regional Planning Council (TRPC) and WSDOT closely coordinated on the traffic modelling throughout 2020 and 2021. WSDOT presented to the TRPC Executive committee in July 2020 and other stakeholders in May, July, and August 2021.

Twenty-four entities (of which six were tribes) were invited to participate in the PEL process. Stakeholder coordination was targeted toward entities that had participated in the Executive Group during the Corridor Study and included participation from the South Sound Military and Communities Partnership (SSMCP); FHWA; the Cities of Lakewood, Olympia, and Lacey; Joint Base Lewis-McChord; Pierce County; Thurston County Public Works; and the Nisqually Tribe. In late May 2021, after a stakeholder presentation, the PEL Draft Purpose and Need was sent to all stakeholders for review and comment; no edits were received. During the PEL study, WSDOT hosted one meeting of the stakeholder group and actively responded to questions and comments in between meetings.

The Nisqually Tribe was an active participant during the Corridor Study and also participated in the PEL stakeholder meeting in May 2021. The Nisqually Tribe and WSDOT also cooperated on the USGS report. USGS, the Nisqually Tribe, and WSDOT met on September 4, 2020 to discuss the hydrologic modeling of the Nisqually River.

In October 2021 the Squaxin Island Tribe contacted WSDOT staff expressing an interest in the project. WSDOT staff met with representatives from the Squaxin Island Tribe on October 20, 2021 and specifically discussed concerns over the Deschutes River estuary/ Capitol Lake.

In October and November 2021, WSDOT staff coordinated with the WSDOT liaison to the National Marine Fisheries Service (NMFS) and US Fish and Wildlife Service (USFW)S to identify initial Endangered Species Act (ESA) concerns for listed species. Given the conceptual nature of the PEL study and agency workloads, WSDOT was not able to arrange briefings with or participation from state or federal resource agencies. WSDOT will invite local, state and federal resource and regulatory agencies *to review the PEL study report. Agencies and tribes will be consulted on all future project-specific actions.*

B. What transportation agencies (e.g. for adjacent jurisdictions) did you coordinate with or were involved during the study?

Transportation agency coordination throughout the Corridor Study and PEL included:
The Cities of Dupont, Lacey, Lakewood, Olympia, Tumwater, and Yelm
Pierce and Thurston Counties
Federal Highway Administration (FHWA)
Intercity Transit
Pierce Transit
Thurston Regional Planning Council (TRPC), and
Sound Transit.

C. What steps will need to be taken with each agency during NEPA scoping?

From the environmental screening contained in this PEL review, WSDOT recommends a wide range of strategies that will provide incremental improvements across the corridor. The PEL study also identifies the detailed reviews that will be needed to move the more complex selected strategies forward. As funding becomes available to further develop the strategies, WSDOT will initiate formal environmental review and reach out to the Tribes, agencies and the public. The level of engagement is generally tailored to the level of environmental documentation (categorical exclusion, environmental assessment, or environmental impact statement).

WSDOT is committed to government-to-government consultation with the Tribes. Coordination with local, state and federal agencies and the Tribes will help future refine future project actions and environmental mitigation approaches. WSDOT will also ensure that public outreach is inclusive so that we reach out to and actively engage with environmental justice populations.

4. Public coordination:

A. Provide a synopsis of your coordination efforts with the public and stakeholders. Provide information regarding dates, level of involvement, issues identified and how the Public coordination affected the planning process.

Public Coordination: Corridor Study
Public comment on the Corridor Study was solicited during the spring and summer of 2019. To encourage a diverse, equitable response, WSDOT sought feedback using both paper and online surveys. Paper surveys were provided at foodbanks and to the Nisqually Tribe to ensure overburdened populations had an equal opportunity to provide feedback. Based on the demographics of the first online survey, a second online survey was conducted, focusing on obtaining input from overburdened populations.

WSDOT also hosted two in-person open house events in January 2020 (prior to COVID) and one online open house using an interactive story map. A project webpage was developed for the Corridor Study

and PEL Study. The PEL web page included both the Corridor Study and the online story map so they were available for public viewing throughout the PEL process.
Public Coordination: PEL Study

Public Coordination: PEL Study

The PEL Study will include an online open house and public comment period. Public comments will be documented according to the strategy to which they apply, and will be incorporated during the NEPA review for that strategy.

5. Purpose and Need for the study:

A. What was the scope of the study and the reason for completing it?

The PEL study scope was to take the strategies identified in the Corridor Study and further analyze the effectiveness and potential environmental impacts of those strategies to recommend which strategies should be moved forward into NEPA. The PEL study also provided an opportunity to continue coordination with stakeholders and to initiate contact with regulatory agencies. During the PEL study, the team obtained additional traffic modeling, conducted high level environmental screening, and obtained input from federal, state, local agencies, Tribes, and the community.

B. Provide the purpose and need statement, or the corridor vision and transportation goals and objectives to realize that vision.

PEL Purpose and Need

The PEL Study purpose is to identify and prioritize strategies that improve the transportation performance of the I-5 Tumwater to Mounts Road corridor, address safety and resilience, and incorporate environmentally-sound practical solutions.

*The PEL study **purpose** is to build upon the previous I-5: Tumwater to Mounts Road study.*
*There is the **need** for:*

- *Additional analysis of the proposed strategies developed in the previous study*
- *Gain more insight on the Nisqually River Delta through the hydrology study (a continuation of the corridor study)*
- *Additional modeling of strategies; a deeper understanding of the built and natural environment constraints on the proposed strategies, highlighting any potential fatal flaws*
- *Provide the necessary evaluation to transition the strategies into projects and provide the necessary documentation to move the projects from PEL to environmental review*

The PEL study purpose and need was presented to the stakeholder group for review and edits. No changes were received from the stakeholder group.

What steps will need to be taken during the NEPA process to make this a project-level purpose and need statement?

The PEL study evaluates 30 different strategies, 16 of which were selected to move forward due to their contribution to the PEL purpose and need. During the NEPA process, those strategies would be moved forward either individually or in groups. Each strategy or group of strategies would be analyzed once funding is determined. As part of the NEPA process, a project-level purpose and need statement would be developed for each strategy or group of strategies.

6. Range of alternatives: Planning teams need to be cautious during the alternative screen process; alternative screening should focus on purpose and need/corridor vision, fatal flaw analysis, and possibly mode selection. This may help minimize problems during discussions with resource agencies. Alternatives that have fatal flaws or do not meet the purpose and need/corridor vision will not be considered reasonable alternatives, even if they reduce impacts to a particular resource. Detail the range of alternatives considered, screening criteria, and screening process, including:

A. What types of alternatives were looked at? (Provide a one or two sentence summary and reference document.)

This PEL study is not presenting a range of alternatives to meet a project-specific Purpose and Need, instead it looks at practical solutions and environmental screening of conceptual strategies. The PEL study looked at 30 strategies that were categorized into scenarios as part of the previous Corridor Study as follows:

- *Operations*
- *Interchange*
- *Part Time Shoulder Use*
- *High Occupancy Vehicle and*
- *Widen I-5/Add Capacity*

B. How did you select the screening criteria and screening process?

The Corridor Study developed goals and performance measures using a public process. As detailed in that study, the goals were ranked by the technical advisory group. The Corridor Study also conducted initial feasibility screening of the strategies and sorted the strategies into scenarios. The scenarios were ranked for effectiveness toward the goals. 30 strategies were considered feasible and selected to move forward to the PEL Study.

In the PEL Study, the 30 strategies from the Corridor Study underwent Environmental Screening using the ERS process outlined by FHWA and WSDOT to identified potential environmental issues and impacts for each strategy. Transportation modeling of the strategies was also conducted. Strategies were recommended or not recommended for moving forward to NEPA review based on traffic modeling results. Some strategies were determined to be under the jurisdiction of another agency and were not recommended for moving forward by WSDOT, although they could be pursued by other entities. Environmental screening results will be used to guide NEPA documentation but were not used to eliminate any strategies.

C. For alternative(s) that were screened out, briefly summarize the reasons for eliminating the alternative(s). (During the initial screenings, this generally will focus on fatal flaws.)

Of the 30 strategies evaluated in the PEL, 14 were not recommended to move forward. The majority of these were not moved forward because the traffic modeling showed little to no improvement from the strategy to mobility on I-5 (and in some cases, the strategy was detrimental to mobility on I-5), thus not meeting the PEL purpose and need. A few of the strategies were not moved forward by WSDOT because they were determined to be under the jurisdiction of another agency. Environmental screening results will be used to guide NEPA documentation but were not used to eliminate any strategies. For more details, see Chapter 6 of the PEL Study.

D. Which alternatives should be brought forward into NEPA and why?

Sixteen strategies from the PEL are recommended for moving forward into NEPA because these strategies were determined to meet the PEL purpose and need. These strategies range in complexity from likely categorical exclusions (CEs) to likely environmental impact statement (EIS) level review. For more details, see Chapter 6 of the PEL Study.

E. Did the public, stakeholders, and agencies have an opportunity to comment during this process?

Yes. Stakeholders and agencies were consulted throughout the planning process, as described in Question 4 above. Additionally, this process will include an online open house and public comment period.

F. Were there unresolved issues with the public, stakeholders, and/or agencies?

To WSDOT's knowledge, there were no unresolved issues with the public, stakeholders, and/or agencies. In October 2021, the Squaxin Island Tribe expressed concern that the Corridor Study and PEL seemed to not include the Deschutes Estuary. Therefore, additional research was done on the Deschutes River estuary and Capitol Lake, and information from this was added to the PEL. Coordination with all tribes will continue throughout the remainder of the PEL process and during the NEPA process for each individual strategy.

7. Planning assumptions and analytical methods:

A. What is the forecast year used in the study?

The project team in coordination with TRPC used 2030 and 2045 as the forecast years in modeling of the strategies.

B. What method was used for forecasting traffic volumes?

TRPC used the integrated Travel Demand Model (TDM) and Dynamic Traffic Assignment (DTA) platforms.

C. Are the planning assumptions and the corridor vision/purpose and need statement consistent with each other and with the long-range transportation plan? Are the assumptions still valid?

Yes, these are consistent and still valid. Several improvements were assumed to be completed by local governments and thus incorporated into the base model. The traffic modeling also assumed 5 percent teleworking for 2030 and 9 percent teleworking for 2045, which is anticipated even after the pandemic. For more details on modeling assumptions, see the I-5 Tumwater to Mounts Road Planning and Environmental Linkages Study – Modeling Report.

D. What were the future year policy and/or data assumptions used in the transportation planning process related to land use, economic development, transportation costs, and network expansion?

Land use and growth assumptions were based on projections for year 2040. Transportation assumptions are detailed in the I-5 Tumwater to Mounts Road Planning and Environmental Linkages Study – Modeling Report. TRPC's Greater Thurston Regional Model (GTRM), a macro model developed in the EMME modeling platform, and the Dynamic Traffic Assignment Model developed for the planning study were used to build the modeling framework. A series of elements were included in the 2030 and 2045 base year traffic models, which could be considered assumptions. These base year elements are outlined in Appendices A and B of the Modeling Report.

8. Environmental resources (wetlands, cultural, etc.) reviewed. For each resource or group of resources reviewed, provide the following:

A. In the study, at what level of detail was the resource reviewed and what was the method of review? *Environmental screening was conducted at a high-level and will need to be refined during NEPA. Detailed information on project footprints, detours, and construction methods was not available and thus not considered in this review. Environmental screening was conducted using the ERS forms and publicly available information, including online resources such as the WSDOT workbench GIS data, and Thurston County GIS mapping. For more information, see Tables 1 and 2 below and Chapter 5 of the PEL study.*
B. Is this resource present in the area and what is the existing environmental condition for this resource? *See Tables 1 and 2 below and Chapter 5 of the PEL Study.*
C. What are the issues that need to be considered during NEPA, including potential resource impacts and potential mitigation requirements (if known)? *See Tables 1 and 2 below.*
D. How will the planning data provided need to be supplemented during NEPA?

The planning data is high level and will need to be supplemented with more detailed information on strategy footprint, detours, and construction methods. Discipline reports, such as wetland and geotechnical reports, will be needed for many strategies during the NEPA process. Preliminary design plans will likely be needed to accurately assess environmental impacts for many of the strategies.

9. List environmental resources you are aware of that were not reviewed in the PEL study and why. Indicate whether or not they will need to be reviewed in NEPA and explain why. *See Tables 1 and 2 below.*

Additional response to Questions 8(A-D) and 9:

The I-5 Tumwater to Mounts Road PEL study built upon the efforts from the previous Corridor Study, whereby WSDOT reviewed key environmental assets/resources that WSDOT must maintain in good condition, and other long-term considerations.. Table 1 lists the eight resources reviewed as part of the previous Corridor Study and summarizes its findings, issues (context) and method of review (initial evaluation approach) for that study. Table 1 also provides an update of the review and findings of these eight resources from the PEL study. Table 2 lists the additional resources reviewed during the PEL study and its findings.

Table 1. Resources Reviewed and Initial Findings; Additional PEL Study Findings

Resource	Context / Findings	Initial Evaluation Approach	Evaluation approach for PEL study
Findings from previous study (Chapter 4 and Appendix C-Environmental Assessment)			**Findings from PEL**
Climate vulnerability impacts	Designated as an area of low vulnerability in the majority of the study area, except for near Exit 99, SR 121 which is moderate vulnerability.	Assessed at the baseline sea level rise-about two feet using the University of Washington Climate Impacts Group - Climate Impacts Vulnerability Assessment (2011)	The Nisqually River Delta and I-5 crossing were assessed for climate vulnerability in the USGS Hydrologic Study. This study found the I-5 crossing of the Nisqually River is not resilient to sea level rise and other impacts from climate change.
Chronic Environmental Deficiencies	None present in the study area.	Used WSDOT Geospatial Open Data Portal Chronic Environmental Deficiency map	Not further reviewed in PEL study.
Fish passage barriers	Six documented fish passage barriers on the corridor which are in the federal injunction area, and one unknown barrier status. However, review of hydrology and LIDAR maps indicates there are likely other crossings. Also, there are 13 water crossings identified as "passable," but these should be re-assessed, as several appear to be undersized and were identified as at risk of becoming barriers.	Used existing fish passage inventory data.	Further reviewed in PEL including available WSDOT Fish Passage data and USCG navigability determination.
Habitat connectivity priorities	Three one-mile corridor segments are identified as high-priority for investing in improvements to reduce collisions with wildlife. There are also three segments with medium priority for ecological stewardship, one near the Deschutes River in Olympia and two near the Nisqually River delta. The segment adjacent to the Billy Frank Jr. Nisqually National Wildlife Refuge has a high ecological stewardship priority rank. In addition, pollinator priorities were identified high ranking segments for both pollinators and urban gateway pollinator enhancement.	Mapping effort to identify one mile segments to designate wildlife habitat connectivity using deer collision data. Additionally one-half mile segments to designate habitat enhancement potential for pollinators.	Not further reviewed in PEL study except for gopher soil type habitat that are identified for each strategy.

Resource	Context / Findings	Initial Evaluation Approach	Evaluation approach for PEL study
Findings from previous study (Chapter 4 and Appendix C-Environmental Assessment)			**Findings from PEL**
Noise reduction	Several noise walls exist in the corridor.	Used GIS information that identified existing and proposed noise walls.	Further reviewed in PEL to identify existing noise wall location for each strategy. No additional noise walls were identified. In addition, the PEL initially screened whether the proposed strategy is considered a Type 1 project requiring a noise study. However, this may change based on strategy design details.
Historic bridges/sites	Two resources were identified as eligible for National Register of Historic Places: Upper Custer Way Bridge (5/316) at MP 103.98 and the Olympia Freeway (five mile segment between due to engineering and social history from MP 104.2-109.2 which is Trosper Road and Martin Way)	Used GIS and inventory information.	Further reviewed in PEL to identify historic bridges/sites for each strategy using WSDOT GIS data that identified all bridges over 25 years old that may be designated in the future.
Environmental Justice (EJ)	EJ populations are present in the study area.	See the Corridor Study, Chapter 3 Study Process-Community Engagement and Chapter 4 Existing Conditions	Not further reviewed in PEL study. Indicated strategies that may have detour which would most likely trigger further EJ analysis once additional design information known.
Stormwater retrofits	There are five segments identified as a high-priority for stormwater retrofits and two segments as medium-priority. These segments occur in the Nisqually River valley, near Carpenter Road, and near the Pacific Avenue Interchange. The corridor crosses multiple watersheds with Total Maximum Daily Load (TMDL) requirements for pollutants including the Upper Chehalis, Deschutes, Henderson Inlet, and Nisqually TMDL zones. Furthermore, there are several water bodies along the corridor on the state's 303(d) list, meaning their "beneficial uses are impaired by pollutants".	Used existing data and GIS information.	Stormwater retrofits were not further reviewed in PEL study. Review for TMDL and 303d listed water bodies was reviewed for the entire corridor and noted in each strategy.
Wetland mitigation sites	There is also one wetland mitigation site identified at Woodard Creek between MP 107 and 108. No wetland mitigation banks were identified.	Used existing GIS information.	Not further reviewed in PEL study.

Table 2. Additional Resources and findings reviewed in the I-5 PEL Study

Resource	Context /Findings	Evaluation Approach for PEL study
Findings from PEL review of Additional Key Resources		
Right of Way Acquisition	Identified 18 strategies with ROW acquisition likely needed and 12 with no acquisition likely to be needed.	Used estimates and footprints developed for each strategy to help determine the potential NEPA classification and if Section 4(f) or Section 6(f) properties may be affected.
NEPA classification	30 Strategies reviewed: 27 Categorical Exclusions; 2 Environmental Assessment; 1 Environmental Impact Statement	Determined anticipated classification for each strategy per 23 CFR 117 and WSDOT Environmental Manual
Section 106 / Archaeological sites	Identified potential sensitive areas within or adjacent to footprint on multiple strategies with anticipated determinations as follows: 6 exempt, 12 likely to be no effect and 12 likely requiring review	Further reviewed in PEL to identify sensitive sites for each strategy using WSDOT GIS data, Thurston County GIS mapping and WISAARD database. Identified potential anticipated determination of effect for each strategy.

Resource	Context /Findings	Evaluation Approach for PEL study
Findings from PEL review of Additional Key Resources		
Wetlands	Identified 12 strategies with potential wetland impacts and 18 unlikely to have impacts	Potential impacts to wetlands, including streams and buffer impacts, and associated mitigation will be evaluated quantitatively in future NEPA review upon further design information. Used NWI Inventory and Thurston County Permitting maps.
Fish, wildlife, vegetation	Identified potential fish, wildlife and vegetation resources within the project corridor with anticipated ESA consultations of 3 Formal, 2 Informal and 25 No Effect (with some possibly programmatic).	Identified in PEL Study. Will be reevaluated in future NEPA phases given new study area limits. Adverse impacts will be avoided, minimized and/or mitigated as alternatives are developed in accordance with regulations. Endangered Species Act (ESA) - listed species and areas that provide habitat for them are present within 500 feet of the project area. Identified anticipated ESA consultation type for each strategy. Streams – Used WSDOT GIS data and Thurston Co Permitting Maps Also reviewed IPac for USFWS species and WDFW Priority Habitats and Species for state species and NMFS species.
Gopher habitat	Identified 21 strategies with more preferred gopher soils, 7 less preferred and 2 TBD	Identified if more or less preferred soils are identified in the footprint. Thurston County Permitting maps.
Floodways, floodplains	Identified multiple strategies that were within designated floodway/floodplain.	Used WSDOT GIS data and Thurston County GIS data. Identified if designation present in the footprint. Not reviewed further as requires more design information.
Hazardous Materials	Identified 16 strategies with an identified HAZMAT site within 300 ft or otherwise anticipated to require HAZMAT review and 14 strategies with no identified HAZMAT site within 300 feet or otherwise not anticipated to require HAZMAT review.	Identified strategies with potential hazardous material sites within the footprint or within 300 feet of the strategy. Requires more design information in order to determine effects. Ecology's Facility/Site Atlas includes a tabular or map based search to identify Ecology regulated facilities (i.e. Federal Superfund/NPL sites, SHWS/CSCS, LUST and USTs) and solid waste facilities (i.e. landfills and transfer stations). Compiled findings in: **I-5 Mounts Rd to Tumwater Ecology Site Report.**
Land Use, Section 4f / Section 6f, Farmland conversion	Section 4f: Identified 8 strategies likely requiring review for 4f impacts and 22 strategies unlikely to require review. Section 6f: Identified 6 strategies likely requiring review for 6f resources and 24 strategies unlikely to require review Farmland conversion: Identified 3 strategies with potential for farmland conversion and 27 strategies unlikely to result in farmland conversion.	Identified adjacent land uses for potential 4f, 6f or farmland conversion using Major Lands in WSDOT Workbench GIS data and Thurston County Permitting maps.
Visual	Identified 13 strategies likely to require visual impact reviews and 17 strategies unlikely to require visual impact reviews.	Identified which strategies would likely require additional review for potential visual impacts. Requires more design information.
Air Quality, Resource Lands (Agriculture, Forest, Mineral), Sole Source Aquifer, Geologically hazardous areas, Scenic Rivers, Scenic Byway	*N/A*	*Not further reviewed as requires more design information.* *There are no scenic byways or rivers in the study area.*
Permit applications /types needed	Federal, state and local	Identified potential permit applications needed for each strategy.

**Note: All resource impacts are preliminary and subject to field verification, design details, and construction methodologies.*

10. Were cumulative impacts considered in the study? If yes, provide the information or reference where the analysis can be found.

Cumulative impacts were not considered in the PEL study. This will be addressed in the NEPA documentation.

11. Describe any mitigation strategies discussed at the planning level that should be analyzed during NEPA.

Mitigation strategies were not discussed in the PEL study. This will be addressed in the NEPA documentation.

12. What needs to be done during NEPA to make information from the study available to the agencies and the public? Are there study products which can be used or provided to agencies or the public during the NEPA scoping process?

All of the Corridor Study and PEL Study report materials and appendices can be made available to the agencies and the public. During the NEPA scoping process, the table summarizing the results of Environmental Review Summary forms will be particularly useful, as will the USGS hydrologic Study (once finalized; entitled <u>Vulnerability of the Lower Nisqually River and Delta to Compound Flooding from Rising Sea Level and Stream Flooding to Inform Regional Planning</u>) and the PEL study report.

13. Are there any other issues a future project team should be aware of?

A. Examples: Controversy, utility problems, access or ROW issues, encroachments into ROW, problematic land owners and/or groups, contact information for stakeholders, special or unique resources in the area, etc.

The Capitol Lake-Deschutes Estuary Draft EIS is related to the PEL Study because removing the 5th Avenue Dam at the outlet of Capitol Lake will impact hydrology, including tidal action, at the I-5 crossing of Capitol Lake. WSDOT should continue following this EIS as it is finalized and consider its findings in the design of projects in that section (in particular, strategy Cap 4.1).

The Nisqually Delta is also a unique resource in the project area. There are several bridges through the Nisqually Delta area that should be evaluated as part of the NEPA process. Additionally there is a bend in the Nisqually River that has been slowly moving towards I-5.


WSDOT