

# The Regional Transportation Plan — 2018

## Appendix I State Facilities Action Plan





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# APPENDIX I: State Facilities Action Plan

## ***What is the State Facilities Action Plan?***

PSRC requested the Washington State Department of Transportation (WSDOT) to:

*“...document state efforts to develop an I-5 action plan identifying low cost operational improvements and a clear I-5 preservation plan, improve the flow of HOV lanes, and accelerate seismic retrofits. State plans for future projects beyond those in Connecting Washington will also be covered.”*

These are some of WSDOT’s most pressing strategic planning issues for highway facilities in the Puget Sound region. The State Facilities Action Plan describes background on these questions, discusses current activities to address them, and proposes a work program to resolve them before the next update of the Regional Transportation Plan expected four years from now.

While WSDOT has delivered one of its most aggressive improvement programs in its history over the past ten years, I-5 and local state highways have not had the same level of attention. As the region recovers from a lengthy recession and is now overtaken by rapid growth, a renewed planning emphasis is needed to keep the region’s most critical lifelines in good condition, resilient, operating efficiently and accommodating meeting the diverse transportation and economic needs of a growing region.

The document is organized into four sections that provide background and status of the specific issues raised by PSRC, and proposed work programs to resolve them, including:

- **WSDOT’s Approach**, including Practical Solutions and organizational change to implement it
- **High Occupancy Vehicle (HOV) Solutions and Congestion Management Strategies** addressing performance challenges in HOV lanes
- **I-5 Action Plan**, addressing roadway and bridge preservation needs, seismic preparedness, near-term operational improvements, and a framework for developing a longer-range vision for the corridor
- **Beyond Connecting Washington**, on how WSDOT will address emerging needs and solutions, refresh previously identified solutions, and collaborate with the region to obtain funding for local priority state highways.

The work programs described are preliminary, and require funding that has not yet fully been identified. Outcomes from these work efforts will be queued up for incorporation into the next update of the Regional Transportation Plan.

## **Comments are Welcome**

If you have questions or comments on the work program proposals included in this document, please contact Robin Mayhew, Management of Mobility Division Director, at (206) 464-1264 or [MayhewR@wsdot.wa.gov](mailto:MayhewR@wsdot.wa.gov).

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# 1. WSDOT's Approach

## Practical Solutions

WSDOT has adopted Practical Solutions as an organizing principle for all agency functions, including all elements of planning, design, engineering, and delivering transportation solutions.

WSDOT is using the Practical Solutions approach to increase the focus on transportation system performance and enable more flexible and sustainable transportation investment decisions. The approach includes increasing collaboration with communities and partners as we identify needs and develop coordinated strategies to address the needs. By using this approach, WSDOT can make transportation investments at the right place and time for the lowest cost.

## Introducing the Office of Urban Mobility and Access (UMA)

The Washington State Department of Transportation has set up a new office based in the central Puget Sound region to manage coordination of a significant number of projects coming online in the next six years. This includes close collaboration with cities, counties and other partners.

One of the main drivers for UMA is the enormous amount of transportation investment taking place in the Puget Sound region. At WSDOT alone, we're working on the Alaskan Way Viaduct, rebuilding Colman Dock, continuing major rehab of Interstate 5 in Seattle, finishing HOV on I-5 in Pierce County, extending express lanes on I-405, getting I-90 ready for light rail, re-paving Aurora Avenue and continuing work on the SR 167/SR 509 Puget Sound Gateway. In addition to this work, our transportation partners in the Seattle area are building bus rapid transit (RapidRide) lines, continuing construction in the bus tunnel, and let's not forget Sound Transit's new \$54 billion program. Much of this work will be happening all at the same time.

With so many projects overlapping and affecting multiple jurisdictions and stakeholders, we need significant coordination and consistent messaging. That's a key role and responsibility for UMA's three divisions: Management of Mobility, Toll Division, and Regional Transit Coordination.

The Management of Mobility (MoM) Division will play a significant role in coordinating and integrating transportation projects, traffic operations, incident response, and programs with internal and external partners in the Puget Sound region. The division will be responsible for planning and coordinating work operations in key corridors – to make sure that there is alignment between the various offices of WSDOT and between WSDOT and our partner jurisdictions. Operations review will include work being done by WSDOT, SDOT, King County and others within the central Puget Sound area. The division works closely with Mega Projects and regions to ensure operational features meet performance goals and staged implementation of projects align with the strategies and needs of the overall transportation system. The division will ensure that WSDOT partners appropriately – as lead agency or supporting other agencies in lead roles – in regional planning for transportation, land use and economic development. In addition, it will position WSDOT and its partners to take advantage of opportunities related to new technology, such as “smart” applications, autonomous vehicles, and system management innovations.

The Toll Division will have leadership and oversight responsibilities for all aspects of the state's tolling program, including operations, engineering, maintenance and issues relevant to customer service. The Toll Division is responsible for revenue collection on various toll facilities including: SR 16, SR 520, SR 167, I-405, SR 99 and others as requested.

The Regional Transit Coordination Division will work to coordinate and facilitate Sound Transit's light rail, bus, and commuter train modes of service within and adjacent to WSDOT's rights of way, including work along I-5 from Everett to DuPont, I-90 from Seattle to Issaquah, as well as SR 520, I-405, SR 522, SR 523 and SR 518. The RTC Division will also coordinate with King County Metro, Community Transit, Everett Transit, and Pierce Transit. Division staff will engage and coordinate with WSDOT's transit and local agency partners to support an integrated multimodal transportation network that utilizes all modes and reflects the needs of the customer. The division will work toward regional integration of transportation solutions, including use of technology, for seamless connections and accessibility for travelers.

## 2. HOV Solutions and Congestion Management Strategies

The HOV Policy/Managed Lanes Strategy section of the State Facilities Action Plan proposes a work plan to address declining speed and reliability in HOV and general-purpose lanes in the Puget Sound area. WSDOT envisions a regional dialogue that recognizes the limits of the HOV strategy and changing uses of HOV lanes, and which considers a range of alternative policy and strategy responses. Recognizing that more work is needed to develop agreement on HOV and managed lanes operation, WSDOT recommends that the Regional Transportation Plan be modeled to assume HOV lanes will be managed appropriately to achieve desired performance, coupled with a commitment to work together with regional partners on the best implementation approach to achieve that outcome.

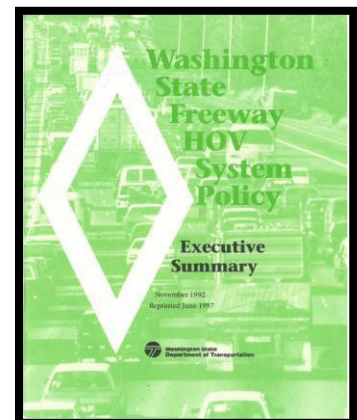
### Background

WSDOT implemented high occupancy vehicle (HOV) lanes in the 1980's decade to give "Blue Streak" park-and-ride express buses faster service on the new I-5 express lanes and to avoid congestion approaching the SR 520 Evergreen Point Floating Bridge. In the 1990's WSDOT planned a Core HOV program to add HOV lanes to primary freeways throughout the Puget Sound region. Express buses on HOV lanes have provided fast and reliable transit service to regional centers, and HOV lanes have supported carpooling and vanpooling programs resulting in the highest vanpool use in the United States.

While general-purpose freeway lane volumes have been constrained by capacity, HOV lane traffic volumes have continued to grow to the point where they are also near capacity. During the great recession traffic subsided, but more recent economic recovery and travel growth have brought new levels of congestion to both general purpose and HOV facilities. At the same time, the region has voted to replace many express bus routes with rail transit over the next decades.

### What are HOV speed and reliability standards (and are they always achievable?)

Originally, HOV lanes on I-5 and SR 520 were opened with a three- or-more (3+) person carpool definition, while I-90 and I-405 opened with a two-person (2+) carpool definition. In 1991, the Legislature added a proviso to the transportation budget directing WSDOT to reduce the carpool definition to 2+ on all facilities<sup>1</sup>. WSDOT argued at the time that a 3+ definition would be needed in the future, and a 3+ carpool definition was reflected in regional environmental documents, policies and plans. WSDOT worked with agency partners to develop comprehensive policies for HOV lanes, including an HOV lane speed and reliability standard to gauge when a switch to 3+ carpools should be considered.



WSDOT adopted HOV policies in 1992 that included an HOV speed and reliability standard requiring HOV lanes to operate at 45 mph during 90 percent of peak hours measured over a six-month period. Subsequently this same standard was adopted in federal law to define the conditions under which HOV lanes are considered to be degraded. When HOV lanes allow access to single-occupant users in either low-emission vehicles or high occupancy toll lanes, federal law requires certification that this standard continues to be met, or that an action plan be implemented to remedy degraded operation.

There have been serious challenges using this policy to trigger policy change:

- There are places where 45 mph cannot be achieved. Bus drivers are sometimes reticent to operate faster than adjacent traffic, so 45 mph is infeasible for buses if general traffic is in a stop and go condition. Some buses also cannot maintain 45 mph up steep hills.
- Once HOV lanes are congested, the impact of changing to 3+ has been considered unacceptable. Changing to 3+ would move most HOV traffic into congested general-purpose lanes, and leave the HOV lane seeming to be underutilized.

## How have HOV lanes been performing?

HOV lanes continue to provide a speed and reliability advantage to transit and carpools compared to general-purpose lanes. The Corridor Capacity Report shows that in some corridors HOV lanes are less congested than adjacent general-purpose lanes, and that the duration of congestion is shorter. HOV lanes continue to carry more people than an adjacent general-purpose lane due to the higher number of people in vehicles that are in HOV lanes.

However, achievement of WSDOT HOV speed and reliability standards has fallen significantly, particularly on I-5 and I-405, due to renewed economic and traffic growth as shown in the [2016 Corridor Capacity Report](#)<sup>2</sup>. Carpool violations are also a growing concern and contribute to reduced speed and reliability performance. The following table shows that HOV lanes are performing far below the 45 mph/90% of peak periods standard in most corridors.

**High occupancy vehicle lane speed and reliability performance on major central Puget Sound corridors**  
2011 through 2015; Goal is to maintain 45 mph for 90% of peak hour; Percent shown is percent of the time this goal was met during the morning and afternoon peak hour.

Commute routes	2011	2012	2013	2014	2015	Commute routes	2011	2012	2013	2014	2015
Morning commutes						Evening commutes					
I-5, Everett to Seattle SB	64%	54%	42%	28%	<b>26%</b>	I-5, Everett to Seattle NB	76%	68%	66%	46%	<b>36%</b>
I-5, Federal Way to Seattle NB	72%	51%	43%	30%	<b>18%</b>	I-5, Seattle to Federal Way SB	82%	63%	53%	40%	<b>32%</b>
I-405, Tukwila to Bellevue NB	98%	93%	65%	35%	<b>26%</b>	I-405, Bellevue to Tukwila SB	60%	43%	41%	26%	<b>21%</b>
I-90, Issaquah to Seattle WB	100%	100%	100%	98%	<b>98%</b>	I-90, Seattle to Issaquah EB	99%	100%	99%	100%	<b>99%</b>
SR 520, Redmond to Bellevue WB	97%	51%	50%	44%	<b>63%</b>	SR 520, Redmond to Bellevue WB	70%	54%	52%	52%	<b>73%</b>
SR 167, Auburn to Renton NB*	99%	96%	94%	86%	<b>66%</b>	SR 167, Renton to Auburn SB*	99%	98%	98%	98%	<b>95%</b>

<sup>1</sup> Governor Gardner vetoed this proviso, but directed WSDOT to implement the intent of the Legislature wherever feasible. WSDOT lowered the carpool definition on I-5 to 2+, but left the SR 520 standard at 3+ west of I-405.

<sup>2</sup> For full report, see <http://wsdot.wa.gov/publications/fulltext/graynotebook/CCR16.pdf>. Detailed performance information for specific HOV facilities can be found in the [Appendix](http://wsdot.wa.gov/publications/fulltext/graynotebook/CCR16_appendix.pdf) at [http://wsdot.wa.gov/publications/fulltext/graynotebook/CCR16\\_appendix.pdf](http://wsdot.wa.gov/publications/fulltext/graynotebook/CCR16_appendix.pdf)

Data source: Washington State Transportation Center.

Notes: The above HOV reliability performance standards are based on the peak hour, when average travel time is slowest. To meet the standard, an average speed of 45 mph must be maintained for 90% of five-minute periods during the peak hour on weekdays. Numbers represent the percentage of these periods when speeds are 45 mph or faster. The Washington State Transportation Center analyzes performance data for all complete



segments of HOV lanes that have a loop detector. In some cases, like southbound SR 167, data cannot be analyzed for the very beginning and ends of the lanes because there are no detectors at these locations. I-405 commutes between Lynnwood and Bellevue are no longer listed above, as they now have different legislatively mandated speed and reliability performance measures per RCW 47.56.880. For performance information, see [www.wsdot.wa.gov/tolling/405/library.htm](http://www.wsdot.wa.gov/tolling/405/library.htm).

\*High occupancy toll lanes replaced regular HOV lanes on SR 167 between Auburn and Renton in 2008.

## What strategies has WSDOT implemented to improve HOV speed and reliability?

HOV lanes are one form of a broader category of highway facilities called *managed lanes*, which manage volumes entering a roadway by (1) controlling where and when vehicles can access the roadway, (2) which vehicles can use the roadway, and/or (3) what price is required. HOV's are managed solely through limiting access to vehicles with a specified occupancy, sometimes during specific time periods.

Managing by occupancy alone does not allow for fine-tuning; either there are too many vehicles in the HOV lane (at 2+) or far too few (at 3+). HOV lanes are only over-utilized when adjacent traffic is congested, so shifting traffic from the HOV lane to general-purpose lanes makes this congestion worse while leaving HOV lanes seeming empty. Because of this dynamic, no known example exists of a transportation agency changing from 2+ to 3+ HOV.

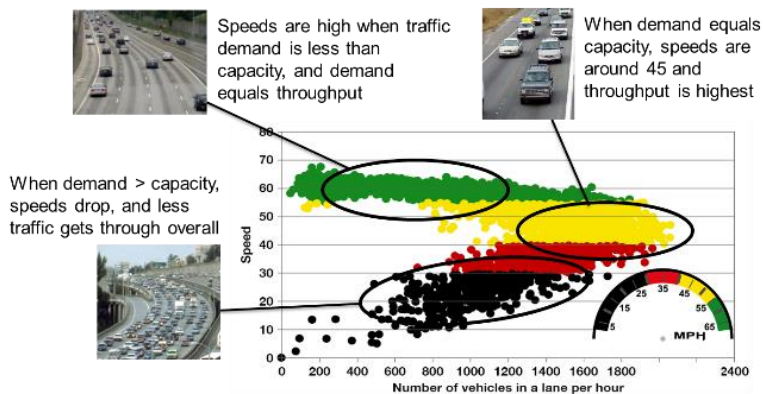
Like other transportation agencies across the country, WSDOT has proposed to evolve HOV lanes to manage volumes, speeds and throughput more effectively using all the management tools available, including access control and pricing as well as occupancy. WSDOT introduced HOT lanes in a pilot project in 2008 and express toll lanes opened on the north end of I-405 in 2015. WSDOT believes that transit and HOV benefits on highways rely on being able to manage traffic effectively in managed lanes.

## Are I-405 express toll lanes meeting HOV speed and reliability standards?

When traffic breaks down, the effective roadway capacity is reduced, collisions increase, and fewer vehicles get through. These effects worsens congestion and extends the rush hour.

### The theory: Price can manage traffic to achieve better speeds and throughput

- This graphic is based on observed traffic on I-405 in all lanes
- When demand > capacity, traffic slows and throughput is diminished
- On express toll lanes, price is used to manage demand and improve performance



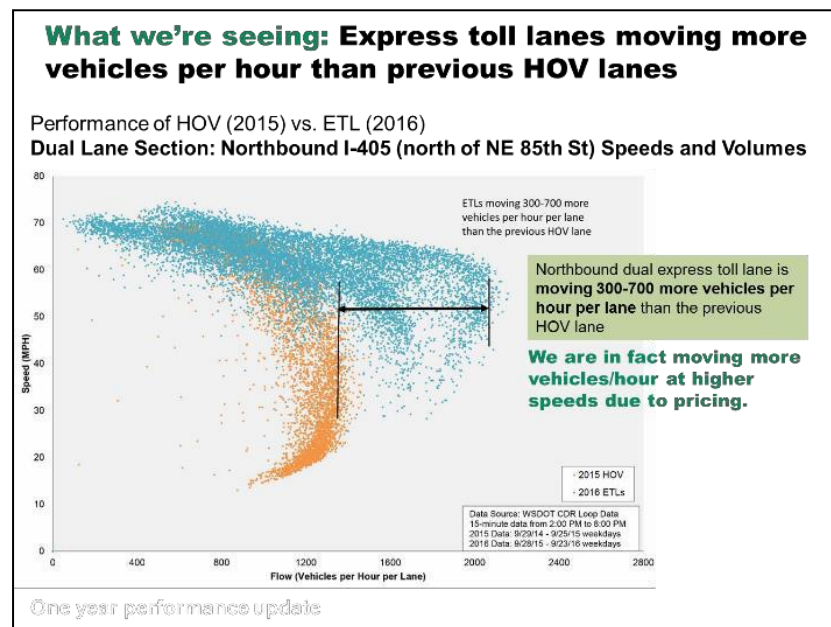
This dynamic is illustrated in the graphic at left, which shows actual values for volumes and speeds on I-405 in all lanes in afternoons over two years prior to implementing express toll lanes. When traffic is badly congested, lane throughput can be as little as half or less of theoretical capacity.

The theory behind express toll lanes is that the number of non-carpool users can be managed by changing the toll rate based on traffic conditions.

If the number of vehicles entering the facility can remain less than or equal to capacity, the roadway will operate most efficiently and the full theoretical capacity will be achieved at a reliable speed. By exempting carpools from tolls, express toll lanes also provide an incentive for transit and ridesharing to make better use of vehicle capacity and move the most people through the corridor. This approach to managing traffic volumes can only work if the number of toll-exempt carpools does not exceed lane capacity, so if an HOV lane that's too crowded will become an express toll lane, the number of carpools must be reduced or the number of lanes must be increased.

**The first two years of I-405 express toll lane operation have proven that the theory can work.** While tolling has been controversial, and added vehicles from widening the segment south of SR 522 exacerbated a general purpose lane bottleneck in the Bothell to Lynnwood segment, the express toll lanes have achieved better reliability and higher vehicle throughput than either the general purpose lanes or the HOV lane that existed previously.

The figure at right shows volume and speed data for the express toll lanes (in blue) and the HOV lane in the previous year (in brown) in the dual-lane segment of I-405 express toll lanes south of SR 522. While the prior HOV lane carried only 1300 cars per hour and were often below 45 mph, the blue dots show that the far left express toll lane is achieving the theoretical lane capacity of 2000 vehicles/hour most of the time, and the lane adjacent to general-purpose traffic is achieving around 1600, while remaining above 45 mph most of the time.



In the dual-lane segment, express toll lanes achieve the 45 mph, 90 percent standard. In the single lane segment, express toll lanes are achieving the standard northbound, but dropping below this standard southbound. Express toll lane speeds and reliability are significantly better than the previous HOV lane, but for the single lane section to meet the current standard, a second express toll lane, a higher toll rate, improved enforcement, or increased separation from general-purpose traffic may be needed.

## Proposed Work Program to Address HOV Speed and Reliability

When the HOV lanes were planned, it was assumed that the carpool definition would be adjusted as needed over time to ensure that a reliable speed advantage would be maintained. Regional and corridor-specific plans and environmental documents made long-range projections assuming a three-person carpool definition. Implementing that policy has been more difficult than expected at the time.

After over 35 years of HOV program development and operation, it is important to conduct a comprehensive policy review to develop a more workable strategy to maintain HOV lane effectiveness, and to reflect adoption of the Sound Transit program to replace regional express bus service with rail. With I-405 express toll lanes in operation in the north end of the corridor and

under development in the south, the biggest remaining issues regarding HOV lanes apply to I-5.

These issues must be resolved prior to making other long-range plans for the I-5 corridor. Considering this, WSDOT will address HOV lane policy issues and congestion management strategies concurrently with regional consultation on the future of I-5. WSDOT is at the initial stage of developing plans and scope for these efforts, discussed in more detail in the next section. The Department will consult with key regional legislators, policy-makers, technical specialists, stakeholders and partner agency staff to develop our approach to the efforts described below.

### **Proposed Work Plan for Developing a Regional Managed System Plan**

Section 3 of this document discusses a proposed work plan for a long range I-5 corridor vision. As part of this look at the I-5 corridor, this project will also evaluate opportunities for improving the regional HOV system. WSDOT will work with PSRC to convene a working group in 2018 comprised of elected officials, stakeholders and technical experts to develop a future vision for I-5. Their work will include the evaluation of alternative policies to improve system-wide HOV lane speed and reliability, and other approaches to operating the state's highway network in the Puget Sound.

This effort is anticipated to assist in identifying near term actions that will improve or sustain HOV facilities performance, and lead to additional work to develop an integrated transition plan for regional corridors ultimately to implement the overall regional managed system plan.

### 3. I-5 Action Plan

I-5 is the most critical transportation asset for economic development in the state. It is also the state's most congested roadway, and has the greatest share of bridges and concrete pavement preservation needs. I-5 serves many of the fastest growing centers in the Puget Sound, and provides a lifeline for freight and transit service. This section describes the current status of I-5 infrastructure and performance, and WSDOT's proposed approach for developing strategies to manage and maintain mobility and a longer-term vision for the corridor.

#### Asset Management and Preservation

Interstate 5 through the Puget Sound region is the busiest route in the state, with its busiest sections carrying over 200,000 vehicles per day between Kent and Shoreline, and over 250,000 through downtown Seattle. This corridor is the most important north-south freight corridor in the Puget Sound region, moving the highest volumes of freight in the state. The preservation of this vital route is critical to the state's economic well-being.

I-5 through the Puget Sound region was built in the 1960s as a result of the Federal-Aid Highway Act of 1956 (National Interstate and Defense Highways Act). On the mainline, there are over 800 lane miles of roadway and 147 bridges from the southern Pierce county border to the northern Snohomish county border. Additionally, there are multiple interchanges adding an additional 200 lane miles and 178 bridge structures.

Five decades later, much of this infrastructure is nearing the end of its service life, while the rapid growth in the region is adding additional demand on the transportation system in the region. These combined factors mean planning to preserve the infrastructure must also occur in conjunction with regional planning to improve overall system performance. A balanced delivery that avoids excessive delays for its users, also called construction fatigue, is essential.

#### What is the current age and condition of I-5 through the Puget Sound region?

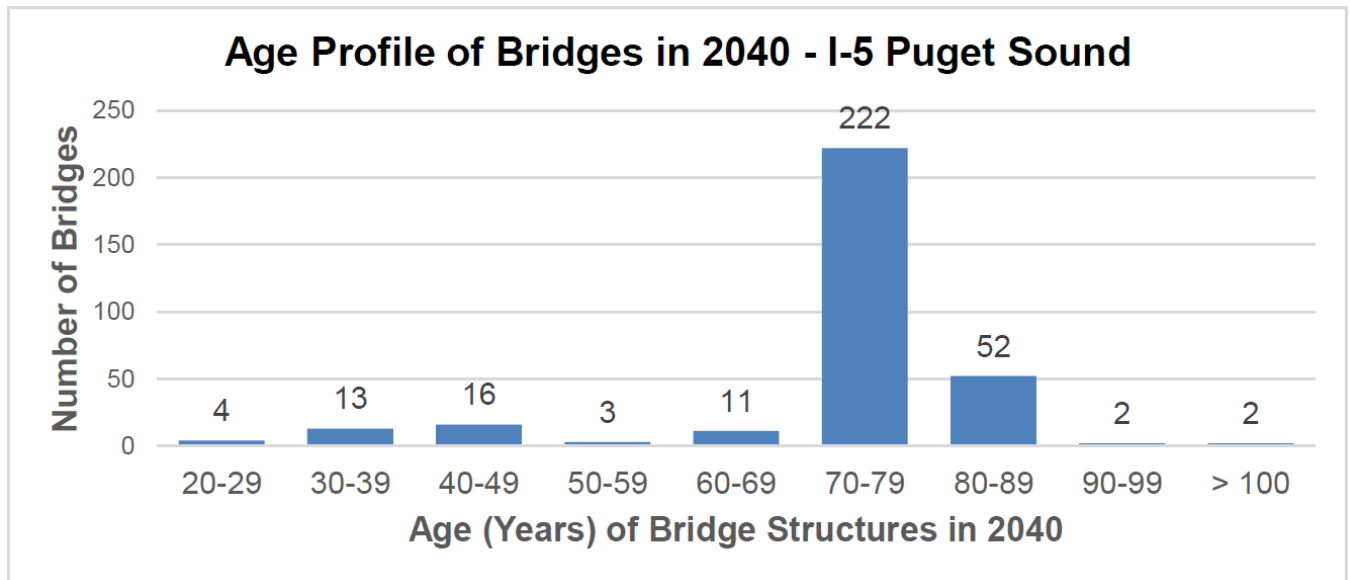
The majority of I-5 pavement was constructed with Portland Cement Concrete Pavement. When constructed in the 1960s, engineers estimated its service life to be 20 years before needing rehabilitation or replacement. Concrete used in Washington is exceptionally strong, and this pavement has performed much better than anticipated. The vast majority of the pavement built in the 1960s through this corridor is still in service today.

However, this pavement is nearing the end of its service life. As of 2015, 9% was rated in poor or worse condition, which indicates a rough and cracked structure. More pavement would be rated as poor if not for proactive preservation. WSDOT has been actively preserving this pavement through dowel bar retrofit, select panel replacement, and diamond grinding, correcting rough road and cracked panels since the late 1990s.

The majority of bridge structures in this corridor were also constructed in the 1960s, although some bridge structures were constructed earlier, especially structures that are part of the interchanges and cross-over routes.



The figure below shows the age profile of Puget Sound bridges along the I-5 corridor in 2040.



In 2016, 1.4% of bridges were rated in poor condition. Bridges in poor condition have advanced deficiencies such as section loss, deterioration, scour or seriously affected structural components. However, bridges in poor condition are still safe for travel. Safety for travel is a separate assessment<sup>3</sup>.

### **What are strategies and estimates for maintaining a state of good repair?**

WSDOT uses similar strategies for preserving assets across its network. It does this by properly timed, cost-effective activities.

#### ***Pavement Assets***

For pavements, WSDOT will continue to use select panel replacement and diamond grinding to preserve concrete pavement, allowing much of it to reach a service life of 55 to 70 years. Once sections reach the end of their life and need replacement, WSDOT compares replacement alternatives using Life Cycle Cost Analysis (LCCA). This methodology accounts for the initial construction costs and user delay costs plus O&M lifecycle costs over a 50-year design life. Resulting strategies include remove and replace with asphalt; remove and replace with concrete; or crack, seat and overlay (CSOL) with asphalt. Using CSOL, the existing concrete pavement is broken up to settle into cracks and crevices in the roadway foundation to form a solid base for a layer of asphalt above.

For sections of asphalt pavement throughout the corridor, WSDOT will use properly timed resurfacing, usually occurring between 15 and 18 years. This is where the top two inches of asphalt are removed and replaced, preserving the whole asphalt structure, usually eight or more inches, for many decades. This is the lowest-cost life-cycle methodology for preserving this type of pavement. Using these strategies, an estimated \$1.2 billion is needed to preserve pavements through 2040.

<sup>3</sup> See Gray Notebook ([http://www.wsdot.wa.gov/Accountability/GrayNotebook/gnb\\_archives.htm](http://www.wsdot.wa.gov/Accountability/GrayNotebook/gnb_archives.htm)) #62 pg. 14-22 for more information on statewide bridge assessment.

## ***Bridge Assets***

WSDOT estimates an 80-year service life for bridges. Once a bridge is approaching 80 years in age, it is necessary to plan for its replacement. As many of the bridges in this corridor were built in the late 1950s and early 1960s, a number of them will be nearing the time of replacement in the 2040 timeframe. However, in the decade after 2040, over 75% of the I-5 bridges will turn 80 years old, creating a much higher need than within the 2040 timeframe.

Additionally, the 80-year life assumes properly timed preservation activities including expansion joint replacement, bridge deck overlays, and steel bridge painting. Expansion joint replacement is necessary as failed joints can cause vehicle damage and emergency work, leading to long traffic delays. Bridge deck overlays are necessary to keep the driving surface in adequate condition and to protect the sub-structure from further damage. Steel-bridge painting extends the steel truss life by preventing corrosion and preserving its structural integrity. Using these strategies, an estimated \$675 million is needed to preserve bridges through 2040.

## ***Other Highway Assets***

In addition to pavements and bridges, several other types of assets make this highway function properly. The three major types are drainage, electrical, and barriers.

Major drainage includes culverts and storm water systems. There are approximately 600 culverts identified through this corridor and 94 fish passage structures. There are over \$100 million identified needs of fish barriers to correct along this corridor. WSDOT is working to develop life cycle management plans for the culvert and storm water systems assets through this corridor as part of its asset management implementation in 2017.

Major electrical includes illumination, signals, and Intelligent Transportation Systems (ITS). Often, these types of structures are monitored until they need to be replaced. There are over 1,700 different inventoried assets as part of these systems in the corridor, with an estimated \$468 million preservation need through 2040.

Barriers include guardrail, cable median barriers, concrete barriers and impact attenuators. Similar to major drainage assets, WSDOT is working to develop life cycle management plans for these barrier assets.

## ***Total Preservation Need***

When accounting for all the assets within the corridor, an estimated \$2.5 billion is needed through 2040. Compare this with approximately \$14 billion of estimated statewide preservation need through 2040, and I-5 in the Puget Sound corridor is 18%, or almost one fifth of the total statewide preservation needs. It is important to note that these needs do not include estimated costs of seismic retrofit, mobility or other improvements.

The table below summarizes the breakdown of need by asset type. Estimated need is based on current dollars and is not inflated to year of expenditure, because year of expenditure is unknown at this time. The final State Facilities Action Plan will address what portion of these needs are likely to be funded under current revenue assumptions.

## I-5 Puget Sound Preservation Needs through 2040

Asset Type	Estimated Preservation Need through 2040 (millions of dollars)
Pavement	\$ 1,200
Bridges	\$ 675
Major Drainage – Including Fish Barriers	\$ 100+
Major Electrical	\$ 468
Barriers	TBD
<b>Total</b>	<b>Approximately \$ 2.5 Billion</b>

### What are risks or challenges associated with these strategies?

There are several risks and challenges to preserving the Puget Sound I-5 corridor. The three greatest risks are lack of funding, balanced delivery, and regional transportation system demand. The primary way to mitigate these risks is through a Practical Solutions approach built on robust asset management practices, and proactive public communications.

As shown in the table above, there are substantial needs for preservation through this corridor. Limited funding jeopardizes opportunities to minimize life cycle costs because the proper timing for treatments may be missed. Asset management through Practical Solutions will help to mitigate this risk by identifying lowest life cycle costs and communicating this information in a timely manner that allows for better financial planning.

These preservation needs must be delivered in a balanced manner that considers regional transportation system demand. First, needs across years must be planned so that excessive needs do not come due at the same time. Second, needs across assets must be balanced so that cross-asset considerations lower overall preservation costs. Third, needs across the region must be planned and balanced so that construction fatigue is minimized. Construction along the I-5 corridor must not just balance the delivery along I-5, but also consider projects planned on adjacent routes.

Practical Solutions and asset management will ensure a balanced delivery for these considerations. Needs across years will be balanced by life cycle planning and forecasting. For example, the WSDOT Pavement Office is already developing a 30-year concrete plan to manage the state's aging concrete pavements<sup>4</sup>. Needs across asset types will be made more visible by robust inventories necessary for asset management, allowing WSDOT more time to plan to deliver several preservation activities simultaneously, increasing construction cost efficiency and reducing construction fatigue. Finally, the Corridor Sketch Initiative will give planners early information to develop strategies along corridors. Having this information available will allow WSDOT to quickly compare the identified strategies of adjacent corridors and plan a more balanced delivery.

<sup>4</sup> See Gray Notebook ([http://www.wsdot.wa.gov/Accountability/GrayNotebook/gnb\\_archives.htm](http://www.wsdot.wa.gov/Accountability/GrayNotebook/gnb_archives.htm)) #64 pg. 18 for an explanation of Practical Solutions and the concrete preservation plan

## Seismic Preparedness and Resilience

Washington State is susceptible to and has experienced earthquakes for millennia. It is considered one of the five states facing the greatest seismic hazards in the United States. Of the ten active faults in western Washington State, seven are most likely to impact the main roadways that run through heavily populated urban areas. While earthquakes and tsunamis cannot be prevented, we can be better prepared to respond and recover quickly when these natural disasters occur. Washington State and WSDOT are actively engaged in making sure the state is resilient when these seismic events occur.

### What has WSDOT done to date in regards to seismic preparedness?

WSDOT has engaged in seismic preparedness in three primary ways; bridge seismic retrofit<sup>5</sup>, Washington State Ferries (WSF) seismic retrofit, and active participation in several emergency management and resilience programs. In general, WSDOT is not creating a distinction between the Puget Sound region and the statewide resilience effort. Therefore, numbers presented in this section are statewide, except where noted. However, due to the geographic features and population concentration in the Puget Sound region, the nature of most of the seismic preparedness work is focused on the Puget Sound region.

#### ***Bridge Seismic Retrofit***

The first step in seismic retrofit is to perform an engineering analysis to determine if an existing bridge can resist a design level earthquake. Computer models are used to apply a force to each bridge pier. This is also called a “Push-Over” analysis. The capacity of the bridge pier is then compared to the demand of the design level earthquake forces.

WSDOT uses the American Association of State Highway and Transportation Officials (AASHTO) adopted 1,000-year “return period” seismic standard (7% probability of exceeding in 75 years) to determine the forces (stress) the bridge must resist. Structures in the Puget Sound and coastal region are expected to experience the most stress, based on peak ground motion analysis during such an event. See the Seismic Lifeline Routes folio<sup>5</sup> for a map that shows the peak ground motion based on a 1,000-year return period analysis for Washington.

WSDOT has addressed bridge seismic retrofit needs for the past two decades, including identifying and retrofitting all or part of more than 400 bridges<sup>6</sup>. The agency has invested more than \$195 million to strengthen our bridges in order to better withstand major earthquakes.

Accomplishments as of March 2017 include:

- 316 bridges have been seismically retrofit with one currently under contract
- Another 119 have been partially retrofit, but require more work to meet current standards
- Invested more than \$195 million on projects to strengthen bridges
- Construction of all new bridges to 1,000-year seismic standards
- Constructed the following bridges to incorporate Cascadia Subduction Zone (CSZ) 2,500-year earthquake event seismic standards: the new SR 99 Tunnel, SR 520 floating bridge, and the new Tacoma Narrows Bridge

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<sup>5</sup> More information is found at the [Seismic Lifeline Routes folio](http://www.wsdot.wa.gov/Bridge/Reporting/SeismicRetrofitProgram.htm) and the Bridge Seismic Retrofit Program at <http://www.wsdot.wa.gov/Bridge/Reporting/SeismicRetrofitProgram.htm>.

<sup>6</sup> A little less than one third of WSDOT's over 3,100 vehicular bridge structures have been or are in need of seismic retrofit.



These accomplishments followed a three-phase seismic retrofit plan.

- Phase 1: Secure the superstructures to piers/columns to withstand horizontal movement
- Phase 2: Address single column bridges since there is no redundant support for the structure, primarily with steel jacketing
- Phase 3: Address multi-column bridge piers by jacketing the column with steel

Phases 1 and 2 have mostly been completed, while there is still substantial work to complete Phase 3. An initial estimate for retrofitting all 594 bridges in need of seismic retrofit is \$1.5 billion, with \$1.1 billion of this work focused in the Puget Sound region.

### ***Seismic Lifeline Routes***

To manage this large need and provide a resilience goal of providing or restoring essential services within 3-7 days and be fully operational within 3 months, WSDOT identified a network of mainline routes that can provide the critical corridors needed. This network is called the Seismic Lifeline routes.

The routes initially were identified in 2012 with priority travel from JBLM to Everett, with a main focus of ground transportation routes between airfields: McChord Field, Paine Field, SeaTac and Moses Lake. These airfields are essential in providing emergency services and supply relief in the event of a major earthquake in the Puget Sound region. Within this defined Seismic Lifeline, 49 bridges are identified as critically important and 22 of them have been retrofitted at a cost of \$39 million. The cost estimate to address the remaining bridges identified in the current Seismic Lifeline is \$161 million.

The map on the following page shows the current status of the Seismic Lifeline. This includes:

- The portion of the lifeline that is mostly complete today (**brown** sections).
  - From the south, I-5 from JBLM to the junction of I-5 and I-405. The Puyallup River bridges will be completed soon, and other key overcrossings are planned for retrofit.
  - From the north, SR 529 from the Port Everett to the northern junction of I-5 and I-405.
- The portion of the lifeline that is planned to be complete by 2027 (**orange** sections).
  - Retrofitting two remaining structures on SR 518 for SeaTac airport.
  - Retrofitting SR 526, to complete the segment between Paine Field and I-5.
  - Retrofit I-405, in conjunction with the other construction in the I-405 corridor.
  - Retrofit I-90 from the junction with I-405 east to Snoqualmie Pass.
- The I-5 High Cost Corridor (**black** sections). At this time, this corridor is not funded for retrofit because of the high cost, estimated at over \$550 M, to do so.
- Potential Lifeline additions (**pink** sections). This includes an SR 99 alternate to the High Cost Corridor and I-90 from its beginning to the junction with I-405. More analysis is required to properly assess the strategy and estimate the cost of adding these to the seismic lifeline.

**Bridge Seismic Lifeline Routes - June 2017**

**Lifeline Status**

- Lifeline - 95% Complete\*
- Lifeline - Planned to Complete by 2027
- High Cost Corridor Segments
- Potential Lifeline - Requires More Analysis

**Liquefaction Susceptibility**

- High
- Moderate to high

**Legend:**

- Ports (P)
- Airports (A)
- Ferry Routes

\* The Puyallup River bridges on I-5 are currently under or planned for construction. Additionally, a few key overcrossings are also planned to be retrofitted in these segments.

**Map Labels:** Langley, Everett, Mukilteo, Paine Field, Port of Everett, Edmonds, Shoreline, Bothell, Kirkland, Bellevue, Mercer Island, Renton, Tukwila, SeaTac Airport, Kent, Federal Way, Auburn, Puyallup, Port of Tacoma, Tacoma, University Place, Lakewood, St. Helens, JBLM, McChord Field, Issaquah, Moses Lake Airport, 160 Miles.

\* The Puyallup River bridges on I-5 are currently under or planned for construction. Additionally, a few key overcrossings are also planned to be retrofitted in these segments.

## ***Washington State Ferries Seismic Retrofit Program***

Washington State Ferries has had a Seismic Retrofit program for almost a decade. Accomplishments to date (March 2017) include:

- The Vashon terminal has been modified to structurally withstand a 1,000-year event earthquake.
- Both the Vashon and Point Defiance terminals can remain operational immediately after a 100-year event earthquake.
- The Mukilteo Ferry Terminal scheduled to open in 2019 will be able to remain operational after a level 100-year event earthquake, and able to structurally withstand a level 1,000-year event earthquake.
- The Seattle Terminal currently under design is funded to address the critical life safety elements of an occupied facility. This funding only partially addresses the need to remain in operation after a 100-year event, and only partially addresses the code requirements for a 1000-year event. Construction will be completed by 2022.

WSF has a two-stage Seismic Retrofit Plan:

- Phase 1: Design the superstructure bridge seat piers to handle horizontal movement from seismic events.
- Phase 2: Prioritize deficiencies in the ferry terminal foundation structures including effects of liquefaction.

WSF has completed Phase 1 at all terminals. WSF is in the process of identifying, prioritizing and estimating costs for Phase 2.

## ***Participation in Emergency Management and Resilience Programs***

WSDOT is very actively participating in emergency management and resilience programs. This allows WSDOT to coordinate with federal, other state, regional and local stakeholders and collaborate to maximize resilience across modes and networks. This coordination includes:

- **WA State Emergency Management Department** – WSDOT is a member of several planning efforts and work groups with EMD, including development of a Catastrophic Incident Plan, the Statewide Catastrophic Incident Planning Team, and the Infrastructure Resilience Sub-Committee. (<https://www.mil.wa.gov/emergency-management-division>)
- **Seismic Safety Committee** – WSDOT is a participant of the multi-jurisdictional committee under the guidance of the Emergency Management Council. (<https://www.mil.wa.gov/emergency-management-division/emergency-management-council>)
- **Washington CSZ Transportation Systems Regional Resiliency Assessment Program** which includes the Department of Homeland Security IP Region 10, WA EMD, FEMA Region 10, US Coast Guard District 13, and USDOT Region 10. (<https://www.dhs.gov/transportation-systems-sector>)
- **Local emergency planners** – coordinating with King County, City of Seattle, Snohomish County, and Pierce County on seismic retrofit and identification of local lifeline corridors.

### **Planning and Preparedness:**

- WSDOT's Continuity of Operations Plan and Emergency Operations Plan both identify seismic response and recovery.
- WSDOT has regional support to devolve during a seismic incident, with 10 available Emergency Operations Centers (EOCs) located statewide. All six WSDOT Regions and WSF have Incident Management Team (IMT) personnel to staff regional EOCs and support seismic response actions.

### **What is WSDOT doing to increase seismic preparedness?**

WSDOT is increasing seismic preparedness by continuing the work of bridge seismic retrofit and its participation in emergency management and resilience programs.

For bridge seismic retrofit, in 2016 the state legislature provided approximately \$170 million for stand-alone seismic retrofit work in a 16-year investment plan. This investment will allow WSDOT to continue to address seismic retrofit needs within the Seismic Lifeline. As noted previously, all new bridges are constructed to 1,000-year event seismic standards, following standards adopted by AASHTO and implemented by WSDOT in 2007.

WSDOT continues its participation in emergency management and resilience programs. One primary way it is doing this is by providing input to update Recommendation #6, Strengthen regional transportation networks, of the 2012 Resilient Washington report. This is in direct response to the Governor's Directive 16-19 issued November 4, 2016.

Recommendation #6 includes the following four priority actions, of which WSDOT is reviewing items 6a through 6c:

<b>6. Priority Actions to strengthen regional transportation networks:</b>		<b>Responsibility</b>
<b>6a.</b> Further define critical state routes into and out of ports, airports, and other key areas (e.g. the Kent/Duwamish Valley) and identify priority routes for retrofitting/hardening as a systematic approach that includes 6b. Decisions about these routes should be made in consultation with all necessary administrative levels/jurisdictions.		<b>WSDOT</b>
<b>6b.</b> Facilitate collaboration between state and local jurisdictions to identify regional lifeline routes and prioritize retrofitting of city and county roads and bridges. Incorporate this into the Transportation Improvement Program.		<b>WSDOT; Regional &amp; Metropolitan Transportation Planning Organizations</b>
<b>6c.</b> Develop interagency agreements between WSDOT and local jurisdictions to facilitate the rerouting of traffic following an earthquake.		
<b>6d.</b> Require that transit agencies (both large and small) develop robust continuity of operations plans.		<b>State Legislature</b>

### **What additional study or action could increase seismic preparedness?**

As WSDOT prepares input to update Resilient Washington, gaps have been identified that inform policy makers where to focus attention. The primary gaps include:



1. Research for the specific impacts from a CSZ event (2,500- year event) are limited and not incorporated into the current seismic retrofit plan.
2. No retrofit work has been done to address liquefaction. This includes both the retrofit work and estimates.
3. There is still a need to expand efforts on the identification of Tsunami threats and impacts to transportation facilities
4. Locally-owned roadways will also need to be utilized for response in a seismic event. More coordination needs to occur with local agencies, especially the development of additional lifeline routes and written interagency agreements for traffic routing in emergency events.
5. The WSDOT Catastrophic Incident Plan has not been completed. Current plans do not explicitly account for a catastrophic level event. The Catastrophic Incident Plan is planned for completion in summer 2018.
6. Lifeline routes have focused on structures, as they are the most vulnerable points during these events. More work needs to be done across all components of the transportation system, including WSF, to ensure resiliency.

## Near-Term Operational Efficiency and Demand Management Actions

This section provides an overview of operational and demand issues on I-5 in the Puget Sound region and work currently underway to assess and recommend near-term actions that could be implemented to address them. In this context, operational improvements and demand management generally refer to changes to use available highway, street and transit capacity to better meet the needs of people and communities served by I-5. Operational issues specific to HOV lanes are described in the previous section.

Examples of operational and demand management improvements include:

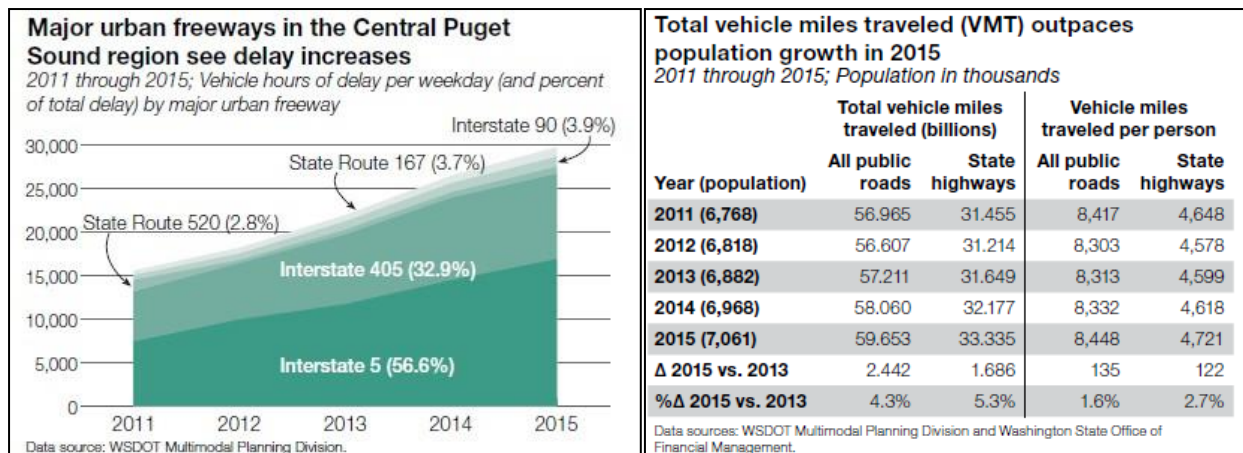
- **Ramp meters** to reduce delay and collisions due to merging traffic, improve traffic flow and, in some locations, provide a time and reliability advantage to transit and other high occupancy vehicles
- **Active traffic management** to help manage traffic flow coming into congested areas or around blocked lanes
- **Commute trip reduction** to engage local communities and employers to increase the number of people who ride transit, carpool, vanpool, bicycle, walk, telework and shift their work schedules
- **Incident response** to clear blockages to reduce duration of congestion
- **Buffer separation of portions of the HOV lane system**
- **Technology to support HOV monitoring and enforcement**
- **Enforcement collaboration enhancements with the Washington State Patrol**
- **Integrated corridor management** to coordinate traffic controls on parallel roadways to help manage diversion around incidents

- **Traveler information** to advise drivers to use less congested routes, transit, carpools, vanpools, bicycles, walking, telework, shift their travel time, etc.
- **Increased transit, vanpools and carpools** to move more people in fewer vehicles
- **Changes in geometrics or striping** to limit weaving, improve safety and smooth the flow of transit
- **Hard Shoulder Running (paved and reinforced shoulders) or auxiliary lanes** to provide added capacity in spot locations to remove bottlenecks, improve transit speed and reliability, and/or improve safety
- **Peak period managed lanes** to provide improved speed, reliability and person throughput by limiting demand to within available capacity and improving transit, vanpool, and 3+ carpool speed and reliability

### How are central Puget Sound freeways performing operationally?

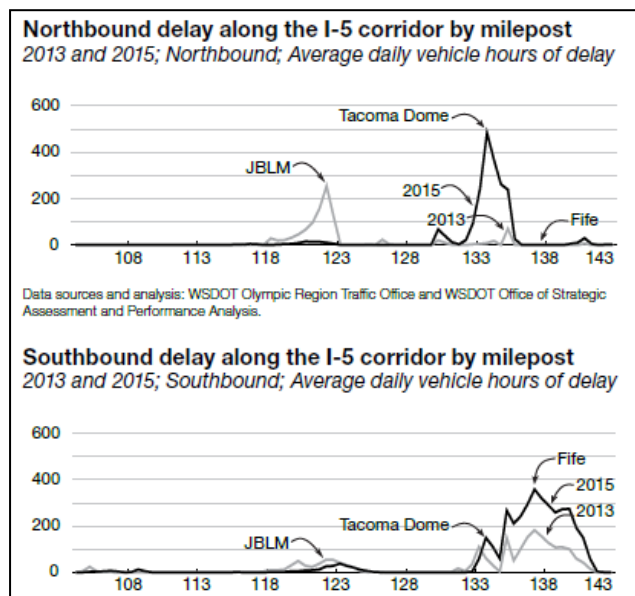
During the recession from 2007 to 2011, traffic volumes decreased throughout the Puget Sound region, but since then traffic has increased rapidly as the economy recovered. Traffic and associated delay grew rapidly in the region, and the greatest share of congestions was on I-5.

In 2015, I-5 experienced an average of 16,810 vehicle hours of delay each weekday, or 56.6% of all delay on the major urban freeways in the region. The graph below shows the significant increases in regional freeway vehicle miles traveled and delay from 2011 to 2015.



Average daily weekday delay on freeway corridors (Interstate 5, I-405, I-90, State Route 520 and SR 167) in King and Snohomish counties grew roughly 35.7% from 21,855 daily vehicle hours of delay in 2013 to 29,656 hours in 2015. This growth can be partially attributed to growing population and employment during this period.

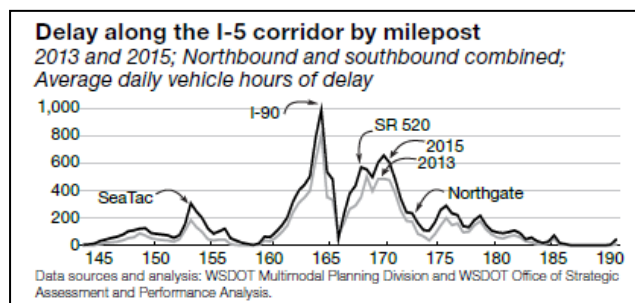
## Pierce County corridor conditions



From 2013 to 2015, the Tacoma Dome and Fife areas experienced increases in delay of about 375% and 140%, respectively. Construction on I-5 in this area led to higher than normal traffic friction in 2015, which contributed to the delay increases. Despite these growth challenges to the north, the Joint Base Lewis McChord (JBLM) area saw an approximate 16% decrease in congestion compared to 2013.

This can partially be attributed to the implementation of 18 new ramp meters through the JBLM corridor in May 2015. The majority of the Fife area congestion is in the southbound direction, which is likely due to the relocation of a bottleneck, along with the end of HOV lane restrictions.

## King and Snohomish counties corridor conditions



In 2015, I-5 between Federal Way and Everett experienced vehicle delay northbound around the I-90 interchange and between Northgate and downtown Seattle. Southbound delays occurred at SeaTac and the SR 520 interchange. Vehicle delay along the I-5 corridor was consistently equal to or higher in 2015 than in 2013.

Delay significantly increased between 2013 and 2015 at specific locations on the I-5 corridor including: southbound at SeaTac (up 105%), northbound at the I-90 interchange (up 33%), and in both directions near Northgate (up 25%). Delay would have been worse without transit. Data shows that even with conservative assumptions, transit ridership along the I-5 corridor translates to a capacity savings equivalent to more than four additional lanes of traffic during peak commute periods. Improvements at key congestion areas, such as the transit access ramps from I-90 to downtown Seattle that bypass the I-5 interchange, provide significant benefits in capacity and reducing travel delay.

## What work is underway to pilot near-term I-5 improvements?

WSDOT is working with local organizations to develop an I-5 near-term action plan that will enhance near-term transportation system performance by improving street, transit and/or highway operations and increasing the use of transit, carpooling, vanpooling, bicycling, walking, compressed work week, telework, shifting work schedules, etc. The I-5 pilot project will produce a suite of projects to complement previously approved projects and services. These projects will be tailored for communities on two corridors: Seattle (Georgetown) to the King/Snohomish county line and Tumwater-DuPont in Thurston and Pierce counties.

Earlier this year, WSDOT convened an iterative series of workshops with experts from organizations including transit agencies, local jurisdictions, planning agencies, community non-profits and employers. These groups collaboratively identified, prioritized, vetted and refined promising near-term highway, street and transit operations and transportation demand management ideas. WSDOT is now working with partners to turn these ideas into proposals with more detailed performance, cost and timeline information. When complete, this information will be used to further refine the list and build consensus around a suite of projects that could be delivered during the next few years.

### **What near-term actions are most promising?**

While not yet finalized, the I-5 action agenda for King, Pierce and Snohomish counties is likely to include projects related to:

- Improving access to transit stations
- Expanding bus on shoulder operations on I-5
- Enhancing freeway HOV lane performance through access control and reducing violation rates
- Improving ramp metering
- Increasing the use of transit and other ridesharing options among shift workers and reverse commuters

## **Proposed Work Plan for a Long-Range Corridor Vision**

There is a clear need to develop consensus on the future of I-5, Washington's most heavily traveled and most congested corridor. There has not been a comprehensive look at I-5 since it was first constructed in the 1960s. Bridges and pavement along the corridor need to be preserved or reconstructed. As new development occurs around the region, more cars are drawn to I-5, the only statewide major north-south connector in Western Washington, and I-5 is becoming slower and less reliable. I-5 is our most important highway freight corridor, and I-5 approaching Seattle is our biggest freight bottleneck.

There may be places I-5 can be expanded, but in the core of the Puget Sound region I-5 is permanently constrained geometrically as it passes into and through Seattle. That constraint is the architectural limit for freeway expansion in the region. And to cope with I-5 congestion, many people have shifted their travel to other times, destinations, routes or travel modes to avoid congestion, and many of them would happily move back to I-5 during rush hours if more capacity was available – a phenomenon referred to as latent demand. The challenge in planning for I-5 is learning how to make the most of the capacity we have today by operating efficiently, managing demand, and maximizing walking, biking, carpools, vanpools, and bus and rail transit.

### ***System Strategy for HOV and Congestion Management is the First Step***

Section 2 of this report describes a collaborative process with PSRC to identify system strategies to improve effectiveness of HOV lanes and other systemic methods to manage congestion in the region's core. After three decades developing HOV lanes on I-5, clarifying the future of HOV or managed lanes in the corridor will be a critical first step towards building a long-term vision for the corridor.



### ***Scoping in Three Corridor Segments***

The most important part of any major effort is to plan the work carefully at the outset. This includes identifying the range of options to be considered, the measures of effectiveness and impacts to be evaluated, the metrics to be used, and the framework for making decisions and engaging stakeholders, elected officials, technical staff and the public. Concurrent with the system planning study of HOV and congestion management strategies, WSDOT will begin developing scope, framework, and local support for I-5 planning, including targeted interviews and outreach with stakeholders and opinion-leaders, and developing a framework for local and public involvement and environmental strategy.

I-5 in the Puget Sound has at least three separate contexts, each with its own set of challenges, opportunities and stakeholders. Tumwater to Tacoma, Tacoma to Seattle, and Seattle to Marysville will be considered separately, but planning for all I-5 segments would be coordinated.

Putting the Practical Solutions approach into practice on I-5 would include at minimum:

- Clarifying and developing a plan to manage assets and reduce seismic risks,
- Identifying performance gaps for all modes and strategic opportunities,
- Managing demand and maximizing efficiency,
- Identifying preferred congestion management strategies,
- Reducing impacts of I-5 on communities and transportation systems, and
- Identifying partnership opportunities and balance local/regional/state objectives

## 4. Planning Beyond Connected Washington

Over the past 15 years, legislative packages have funded specific major corridor improvements throughout the state, culminating in the Connecting Washington program enacted in 2015. However, many identified improvements to state highways remain unfunded. In addition, preservation funding is needed for many local roadways, and continuing rapid growth is increasing demands on local-interest state highways. WSDOT proposes a renewed collaborative effort to find efficient multi-modal solutions for emerging issues, ensure previously-identified solutions are still sensible, and align state and regional priorities for funding.

Many communities in the Puget Sound region rely on state highways for regional travel and local circulation. The state routes serving these communities are usually principal or minor arterials rather than limited access freeways and often function as “main streets” through suburban areas and smaller cities. They serve a wide range of needs, including daily commuting, commerce, non-motorized travel, transit and school bus routes, and access for emergency services. While the state and Sound Transit have made significant investments in the major regional corridors, growth is also increasing congestion on many of the other state highways.

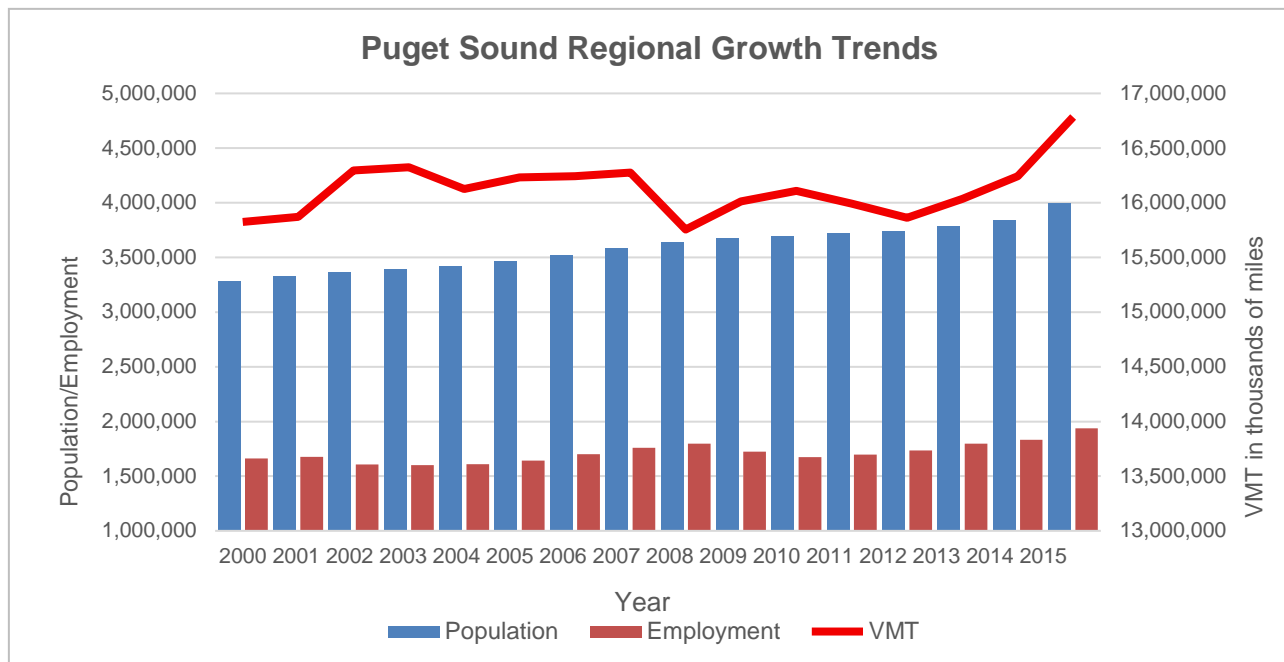
This has raised two questions:

- (1) Will the State help fund congestion relief projects that have been identified to date, and
- (2) How will WSDOT and the region address emerging mobility needs in these corridors?

This section will briefly describe the trends that are increasing demand and constraining capacity; outline the policies that guide improvements to local priority state routes; and identify the strategies that respond to mobility needs. It describes a proposed work plan to apply a practical solutions approach to reconfirm or update previously identified projects; and identify and prioritize strategies to address emerging needs.

### **What is causing increased demand on local priority state highways?**

Over the last decade the Puget Sound region has experienced strong growth in population and employment, and this has resulted in increased vehicle miles travelled (VMT). The graph below shows trends from 2000 - 2015. Employment and VMT decreased briefly during recessions but have since rebounded to significantly higher levels. OFM forecasts indicate that strong population and employment growth is expected to continue.



Sources: WSDOT (VMT), PSRC (Population and employment)

Other factors that have contributed to increasing demand on local priority state highways:

- **Sparse arterial network:** In many parts of the region, the local street network is not built-out. As a result, traffic tends to funnel onto state highways because they provide the primary connection for traveling within the town or small city.
- **Exemption from concurrency:** Because highways of statewide significance are exempt from concurrency requirements development is allowed to go forward even without improving congested highways in the immediate area.
- **Limited capacity:** Many of the local priority state routes have limited ability to absorb large increases in traffic.
- **Limited access control and coordinated signal timing:** Unlike limited-access freeways, the local priority state highways provide local access, and as a result, traffic is slowed by vehicles entering the highway from driveways or businesses, as well as by traffic signals that are not coordinated to maximize traffic flow.
- **Pass-through traffic:** Many local priority state highways are important routes for regional and inter-regional travel. As the region has grown so has travel on these highways, including freight and goods traffic that passes-through local communities.

Implementing highway improvements that would reduce congestion must be balanced with other local conditions, including:

- **Safety objectives:** As the highway is developed, increasing pedestrian and bicycle activity may warrant lower speed limits and more frequent crossing opportunities.
- **Right of way limitations:** Expansion of local priority state highways is often constrained by built-up areas in cities, and natural features such as wetlands, streams and steep slopes in rural areas.

The variety of factors that influence demand and the varying geographic constraints mean the appropriate set of strategies may differ from one corridor to another.

## What policies guide planning for local priority state highways?

WSDOT plans for highways in the Puget Sound region are guided by the state transportation policy goals adopted by the legislature, as well as regional policies and local plans. These include:

- **State transportation system policy goals in RCW 47.04.280;** which emphasize economic vitality, system preservation, safety, mobility, environment, and stewardship.
- **Regional policy goals in the PSRC VISION 2040 plan;** including the regional growth strategy and the regional economic strategy.
- **Local jurisdiction plans;** which provide guidance on land use plans, local street improvements, and non-motorized transportation needs.

Starting with guidance provided by these adopted policies, WSDOT uses a practical solutions approach to evaluate potential improvements. Practical Solutions begin with an understanding of what local stakeholders need, and then apply lower cost enhancements that address essential corridor functions, improve performance, and address those local needs. In collaboration with local partners WSDOT uses this process to identify performance gaps and evaluate trade-offs among competing objectives. Improvements that increase capacity by adding lanes will be considered if policy change, local network improvements, operational improvements, or demand management strategies don't address identified mobility needs.

## What strategies have potential to address mobility needs?

Strategies that respond to mobility needs include:

- **Increased transit service** – The effectiveness of transit strategies depends on the characteristics of each corridor as well as the plans and service policies of the transit agencies.
- **Highway operational improvements** – Strategies such as signal timing, adaptive signal systems, modifications to channelization and signage have the potential to improve traffic flow.
- **Local street network additions** – In some corridors improvements to the local street network can reduce demand on state highways and improve overall mobility.
- **Local comprehensive plans** – Much of the travel demand on local priority state highways is the result of local development. Incorporating smart growth techniques in local land use plans can help shape development to minimize vehicle trips.
- **Transportation Demand Management programs** – TDM incentives have the potential to increase the HOV/transit mode share when the corridor offers an HOV travel time advantage and transit and ridesharing options are attractive.
- **Non-motorized transportation improvements** – Improved facilities for bicyclists and pedestrians can provide an alternative for short trips.
- **HOV priority treatments** – HOV lanes, BAT lanes, and transit signal priority systems can create travel time incentives that help shift demand to transit and HOV modes.
- **Highway capacity improvements** – Capacity improvements such as addressing bottlenecks at spot locations or adding lanes may be considered when lower cost strategies are insufficient to meet mobility needs.

## **What system implications need to be taken into consideration?**

Puget Sound freeways have very little spare capacity to accept more traffic. The interstate system is essentially complete, and there are often significant and sometimes insurmountable constraints to widening freeways due to limited rights of way and environmental concerns. Funding is also limited, and maintaining aging infrastructure is a higher priority than expansion.

In some locations increasing capacity of local priority state highways would exacerbate congestion on the freeways they feed into. This presents a dilemma; on one hand local mobility improvements should not be held up just because freeways are congested, on the other hand, downstream impacts on congestion need to be taken into consideration when evaluating net benefits. Regional policies that seek to balance land use and transportation may affect choices between managing demand vs. increasing capacity.

In the Puget Sound region a network of HOV, HOT and express toll lanes has been implemented. Much of the planned network, which has been WSDOT's highest priority for new capacity for more than twenty years, is nearing completion. Enhancements to local priority state highways need to take into consideration opportunities to connect with that system as well as potential operational impacts.

Pricing strategies have the potential to improve system performance significantly but they need to be considered in the context of a larger regional system management strategy and equity considerations.

## **How is WSDOT assessing needs on local priority state routes?**

WSDOT has been working on developing "corridor sketches," which will document mobility needs, performance gaps, planned improvements, and potential strategies for each state route. In the Puget Sound region this work is underway but not complete for all corridors. The PSRC Regional Transportation Plan Update will provide much of the information needed to complete this work. In some regions WSDOT planners have met with local and regional agency staff to identify performance requirements for each route.

Corridor sketches will incorporate information from:

- Prior studies and WSDOT Route Development and Corridor Plans
- Local jurisdiction comprehensive plans and transportation plans
- The regional 2040 plan
- Meetings with local partner agencies

Strategies that do not require extensive analysis will be identified in collaboration with local partners using a practical solutions approach. In preparing corridor sketches, WSDOT will identify the corridors where additional study and detailed planning is needed.

Many local jurisdictions and subarea groups have identified project priorities on these routes that emerged from planning conducted in partnership with WSDOT. Where appropriate the corridor sketch process will ask whether conditions have changed or less expensive solutions could meet the identified purpose and need for these investments. Where the answer is yes, an analysis and local engagement process will be proposed to reconfirm or update previously identified strategies or projects.



## Proposed Planning Work Program for Local-Interest State Routes

The proposed process is envisioned to engage local and regional technical staff in a structured collaborative process during 2018 to develop a prioritized list of desired outcomes for corridor projects in Central Puget Sound.

Because there are over 50 state facility corridors in King and Snohomish counties alone, a streamlined approach for reviewing previous analysis and desired corridor outcomes is desired.

Baseline data will be gathered from corridor sketches, existing models, plans, and a variety of other sources, and displayed as overlays on a network base map. Local area teams will identify and prioritize performance issues and opportunities worth further consideration, including:

- Common sense early actions that don't require extensive analysis (e.g., operational improvements such as hard shoulder running and ramp metering),
- Site-specific issues or opportunities that may be addressed through workshop(s),
- Issues that require structured alternatives evaluation for corridor-wide treatments,
- System planning issues that require coordinated action on multiple corridors, and
- Reconsideration of previously-identified projects due to changed conditions.

Based on this assessment, WSDOT will work with local stakeholders to identify and prioritize:

- Near-term actions that are common sense and require little additional analysis that can be implemented without substantial new funding.
- A program of longer-term planning activities needed to assess the most effective solutions to identified issues, with each activity scaled to match the complexity and magnitude of the problem for both analysis as well as public and agency engagement.

In all cases, potential funding and partnership options would be assessed, with the potential for high priority planning needs submitted to compete in appropriate funding arenas.

Legislative support to fund improvements on local priority state routes will be enhanced if local, regional, and state priorities are aligned, so it is a WSDOT goal to work together with the region, counties, cities, and tribes to align priorities prior to adoption of the Transportation 2050 plan update. WSDOT proposes to work with PSRC staff to convene a work group during 2018 to consider the different approaches used to prioritize solutions. The goal for this process would be to understand the different approaches used, the policy and planning objectives each is intended to advance, and the role of cost-effectiveness or benefit-cost assessment in prioritization of investments.

As WSDOT continues to evolve its Practical Solutions approach, this process will be adapted or described differently to remain consistent with Practical Solutions objectives and guidance.