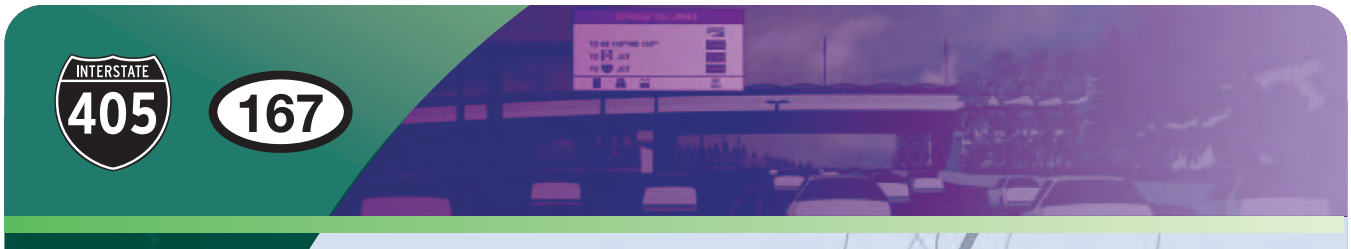

I-405/SR167 CORRIDOR **TOLLING STUDY**

Expert Review Panel **FINAL REPORT**

December 2010

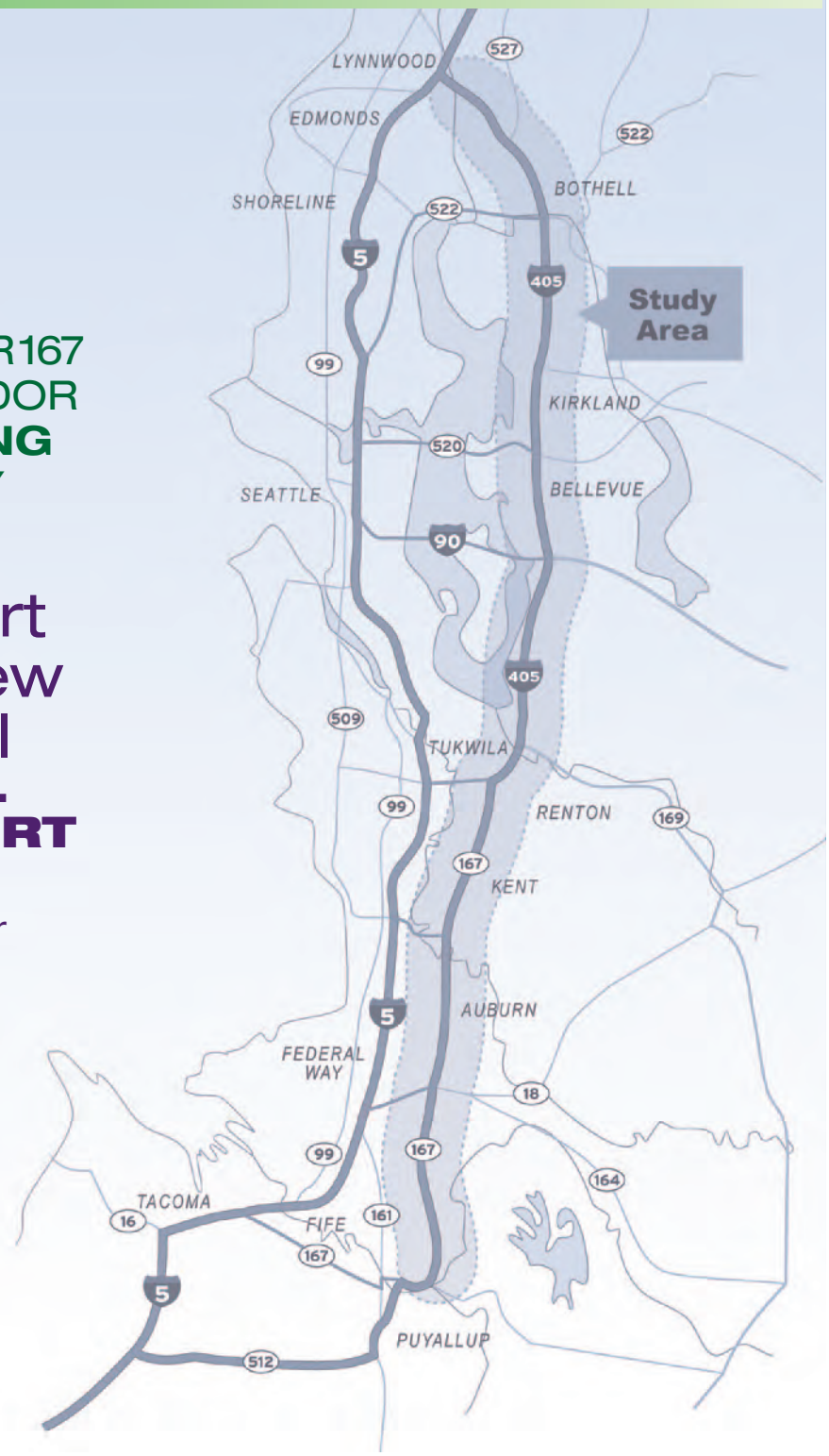

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Table of Contents

This is the Expert Review Panel's final report from their analysis of the I-405/SR 167 Corridor Tolling Study.

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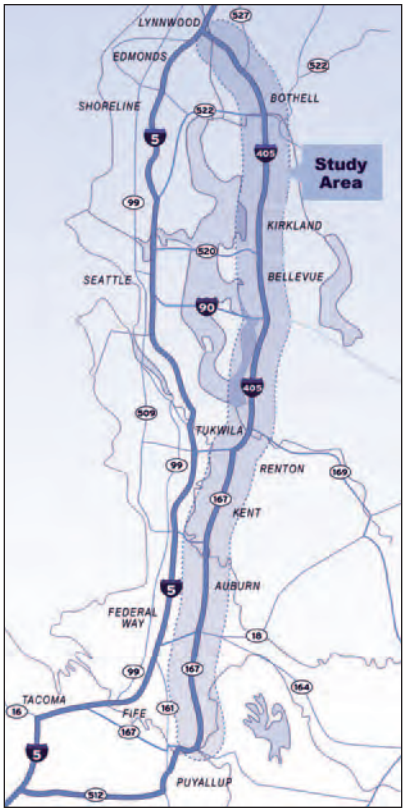
Chapter 1
INTRODUCTION

I-405/SR 167 Corridor



The 40+ mile I-405/SR 167 corridor connects I-405, SR 167, and SR 512, and is one of two north-south corridors in the Puget Sound region. It is expected to serve 1.5 million daily trips by 2030. But today, traffic is so heavy that even the HOV lanes are congested, offering carpools and transit little value during peak-hour travel times.

The I-405/SR 167 "Eastside Corridor" in Snohomish, King, and Pierce counties is of critical importance to the economic vitality and quality of life in the Puget Sound region of Washington State. It provides the only parallel alternative to I-5 and serves an estimated 1.1 million trips per day. Congestion on the corridor can last for up to 10 hours per day; the HOV lanes slow down during peak times as well because of an increased demand that leaves carpoolers and transit riders with little benefit. In fact according to The Washington State Department of Transportation, the HOV lanes on I-5, I-405, and westbound SR 520 are so well utilized that they are usually congested during the peak periods and no longer meet their established performance standard of 45 mph. Regional growth is expected to expand by one million people with 700,000 jobs over the next 20 years. This equates to an estimated 1.5 million trips on the I-405 corridor per day by 2030, resulting in more congested conditions over time.

In 2002, WSDOT collaborated with I-405 corridor partners, including local and federal agencies, 13 cities, and two counties to develop an inclusive and balanced corridor "master plan" vision for transportation solutions along the 30-mile corridor. The vision for I-405 was reflected in a corridor-wide programmatic environmental impact statement (EIS) and included adding two lanes in each direction, improving transit facilities and HOV lanes, adding a bus rapid transit (BRT) system, enhancing the environment, and potentially implementing a two-lane managed lane system. WSDOT is already implementing corridor projects, with the state investing $1.7 billion in gas tax funds to address key I-405/SR 167 congestion chokepoints in Bothell, Kirkland, Bellevue, and Renton.

In 2005, the Legislature authorized Washington's first managed lanes – the SR 167 High Occupancy Toll Lanes Pilot Project. These lanes opened to traffic in May, 2008. In 2009, WSDOT adopted the SR 167 Valley Corridor Plan, which was developed in partnership with local jurisdictions adjacent to and dependent on SR 167. This plan included improvement projects for SR 167 to address needs over the next 20 to 30 years. Both the I-405 and SR 167 plans acknowledge the importance of improving the connections between the I-405 and SR 167 corridors to form a seamless "Eastside Corridor."

In May 2009, the Legislature directed WSDOT to prepare a planning-level traffic and revenue study for I-405 in King and Snohomish Counties that assumes funding for improvements along the corridor and express lanes for traffic management. The Legislature directed WSDOT to prepare a report by 2010 that details a plan to operate up to two express lanes in each direction on I-405, confer with local elected officials, and coordinate information sessions to inform and solicit views from the public. The legislative directive resulted in the I-405/SR 167 Corridor Tolling Study, which summarized WSDOT's approach and findings and presented recommendations for a phased implementation plan on the corridor. The recommended strategy of building a 40+ mile system with two express toll lanes on I-405 from SR 522 to SR 167 was selected from five different options for the corridor. The 40+ mile alternative was noted as Study Option 4 in the technical documentation.

National Expert Review Panel Convened to Review I-405/SR 167 Corridor Tolling Study

The WSDOT Secretary of Transportation in August 2010 convened an Expert Review Panel (ERP) to assess the findings from the I-405/SR 167 Corridor Tolling Study. The ERP was charged with discussing how the findings fit into regional and national express lane experience and trends and to determine if assumptions from the financial analysis were consistent with national industry practices. WSDOT views the tolling study to be the end result of a robust policy discussion among local stakeholders regarding the potential for implementing express toll lanes on the affected routes. Forming an ERP provided an opportunity to provide an independent, expert evaluation of the analysis preformed by WSDOT. The charge of the ERP was to focus on the proposal to implement express toll lanes on the I-405/SR 167 Corridor.

Executive Advisory Group

City of Algona
Mayor David Hill

City of Auburn
Mayor Pete Lewis

City of Bellevue,
Councilman Grant Degginger

City of Bothell
Mayor Mark Lamb

Federal Highway Administration
Dan Mathis

Federal Transit Authority
Linda Gehrke

City of Kent
Mayor Suzette Cooke

King County
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Councilmember Reagan Dunn, Dist. 9

City of Kirkland
Mayor Joan McBride

City of Newcastle
Councilman Sonny Putter

City of Pacific
Mayor Richard Hildreth

Pierce County Council
Roger Bush, Chair, Dist. 3

Puget Sound Regional Council
Sue Singer, Deputy Mayor, City of Auburn

City of Puyallup
Mayor Kathy Turner

City of Renton
Councilman Randy Corman

Snohomish County Council
Mike Cooper, Chair

Sound Transit
Claudia Balducci

City of Sumner
Mayor Dave Enslow

City of Tukwila
Mayor Jim Haggerton

Washington State Legislature, District #31
Rep. Dan Roach

Washington State Legislature, District #45
Rep. Larry Springer

Washington State Legislature, District #48
Sen. Rodney Tom

Washington State Legislature, District #41
Rep. Marcie Maxwell

Washington State Transportation Commission
Dick Ford

ERP Panelists Include:

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  Texas Transportation Institute (TTI) of the Texas A&M University System in Austin, TX
- ***Transportation Policy: Robert Poole***
  Independent national transportation consultant (Los Angeles, CA and Fort Lauderdale, FL)
- ***Transportation Planning: Chuck Fuhs***
  Parsons Brinckerhoff in Houston, TX
- ***Express Toll Operations: Jennifer Tsien***
  PBS&J/Atkins, working with the Florida Turnpike Enterprise in Orlando and Miami on the I-95 Express Lanes
- ***Financing: Janet Lee***
  of Public Resources Advisory Group in New York

To evaluate the viability and appropriateness of the proposed express toll lane improvements for the I-405/SR 167 Corridor, the ERP addressed the following questions:

- *Is the concept viable from a general technical standpoint?*
- *Is the concept appropriate for addressing stated objectives?*
- *Does the proposed concept make sense for the situation and conditions?*

ERP Charge: The Secretary of Transportation charged the ERP to address key questions in four general topics, which were:

1. **POLICY:** Is the State's strategic approach to implement express lanes on I-405/SR 167 viable, appropriate, and consistent with emerging federal policy and current state and regional policies?
2. **METHODOLOGY:** Are the technical measures and results supporting the I-405/SR 167 Corridor Tolling Study valid? Were the right tools applied to the analysis? Are the report results reasonable? What outcomes are reasonable to expect based on industry experience?
3. **PHASING:** Is the proposed plan to implement an express toll lane system sensible, and provide for logical, usable segments towards a 40+ mile I-405/SR 167 corridor system?
4. **FINANCING:** Are the I-405/SR 167 Corridor Tolling Study financial assumptions, methods, and forecasts valid?

Overall Approach of the Expert Review Panel

Secretary Paula Hammond's overall approach to the ERP was to bring together a panel of five transportation experts from different areas of expertise and geographic locales, including academic, policy, planning, operations, and financing.

The ERP met three times on-site in September, October, and November 2010 to discuss the principal questions with WSDOT officials and the Project Team. The Executive Advisory Group (EAG), composed of local and state government officials, met with the ERP during each on-site visit. The purpose of the meetings between the ERP and EAG was to provide an update to the EAG regarding the status of the I-405/SR 167 Corridor Tolling Study review and for the ERP to receive continuous feedback from local officials. The public was invited to attend and give comments at the three meetings between the ERP and EAG – a summary of those comments and questions is in Appendix H.

The ERP examined each of the charge questions in depth, using the meetings and subsequent discussions with the EAG and other groups to clarify recommendations from the Tolling Study and seek supporting documentation from the I-405/SR 167 Project Team.

Implementation Principles: At the center of the panel's evaluation are the "implementation principles", as previously defined by WSDOT and the EAG in the Tolling Study. Based on the collective experience of the ERP, the guiding principles or goals of an express lane project form the basis of all facets of a project's planning, design, implementation and evaluation. Fundamentally, the ERP's charge was to evaluate whether the I-405/SR 167 Corridor Tolling Study recommendations achieve the overall vision for the corridor as described in the implementation principles (originally from the I-405/SR 167 Corridor Tolling Study). Beyond the fundamental evaluation, the ERP has provided additional suggestions and recommendations for consideration in moving the corridor improvements forward to successful completion.

In addition to panel deliberations, independent reviews of the technical elements of the study were conducted. The traffic forecast and simulation models were peer reviewed by modeling experts at TTI, under direction of Ginger Goodin. Independent financial modeling by Janet Lee with the Public Resources Advisory Group (PRAG) was performed to verify financing projections for the I-405/SR 167 Corridor. Both the modeling and financial reviews are summarized in later chapters in this report and both supported and supplemented the review by the panel.

Implementation Principles:

From the 2010 I-405/SR 167 Corridor Tolling Study (pg. 17)— WSDOT will use these principles to achieve the overall vision of managing congestion by optimizing new capacity and freeway lane performance.

Optimize Freeway Performance

1. *Move more people*
2. *Manage the corridor to improve speed and reliability to free-flow conditions (45 mph to 60 mph)*
3. *Prioritize and accommodate transit performance and HOV users*
4. *Maximize throughput to reduce diversion to arterials or neighborhood streets*
5. *Improve mobility for freight and drivers in all lanes*

Leverage Toll Revenue to Maximize Corridor Improvements

1. *Retain tolling revenue in the I-405/SR 167 corridor*
2. *Secure financing with fair terms, similar to other corridors*
3. *Exempt transit and carpools from tolls*
4. *Continue to monitor national and regional trends to better understand how to fund toll projects*
5. *Prioritize funding within the corridor to leverage toll revenue with other funding*

Develop a 10-year strategy for a 40+-mile system (Study Option 4)

1. *Express toll lanes should be built in incremental steps and begin with funded projects*
2. *Express toll lanes should fit within long-range regional planning and the regional tolling system*
3. *Sensitivity to construction phasing on a regional level*

Improve Understanding Before Implementation

1. *Grow awareness, experience and support by engaging the public, local agencies, and elected officials*
2. *Continue public education around tolling operation and improve access to Good to Go! accounts.*

First Generation and Second Generation Tolling Projects

The ERP compared the I-405/SR 167 Corridor proposal to national projects with similar performance and funding objectives. The I-405/SR 167 express toll lanes project represents both first-generation single-lane managed lanes. First generation lanes generally have a primary focus on traffic management, and second-generation managed lanes generally have a primary focus on financing to implement the project and improve operational performance. As a 40-mile corridor system under Study Option 4, the I-405/SR 167 corridor project is a combination of two different concepts:

First Generation: *22 miles of single lane HOV-to-HOT conversion*

- *I-405: SR 522 to I-5*
- *SR 167: King/Pierce County line to the I-405/SR 167 interchange*

Second Generation: *18 miles of HOV-to-HOT conversion combined withan additional express toll lane*

- *I-405: SR 167 to SR 522*
- *Mega project: The 40-mile corridor "Tolling Study Option 4" can be characterized as an express toll lane system and is functionally and financially a "mega project."*

Mega Project—the federal definition

Based on the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU), a Major or "Mega" Project is "a project with a total estimated cost of $500 million or more that is receiving financial assistance." Generally the project owner is the transportation agency, but major projects can also be developed by other state agencies (toll agencies), local public agencies, and/or private ventures (ie: public private partnerships). Mega projects must prepare and submit to FHWA a Project Management Plan and Finance Plan with annual updates. The Project Management Plan is the guide for implementing the mega project and documents assumptions and decisions regarding communication, management processes, execution and overall project control.

Chapter 2 POLICY

Moving Washington – WSDOT's Strategic Plan to Fight Congestion

The ERP found the Tolling Study to be in line with the State's congestion relief goals, strategic planning, and policies for tolling and HOV.

***Aligned with the State's Policy Guidelines for Establishing Toll Facilities**, which encourage effective use of transportation systems, providing sources of funding. Encourages tolling to contribute a portion of the project cost when it cannot be funded solely with existing funds, or to optimize performance. If tolling is applied, it must be fair and equitable in terms of community and diversion impacts, and consider social equity, environmental, and economic issues, including greenhouse gas reduction goals. Toll rates should be set to meet funding obligations with revenues staying within the tolled corridor.*

***Aligned with the State HOV Policy and State Highway System Plan,** which states "There is not enough state or local money or land to build sufficient highway capacity to reach free-flow conditions statewide. Therefore, WSDOT has set a goal to manage the State Highway system to achieve maximum throughput."*

Is the State's strategic approach to implement express lanes on I-405/SR 167 viable, appropriate, and consistent with emerging federal policy and current state and regional policies?

ERP RESPONSE: The proposed express toll lane concept is a viable and appropriate strategy for improving mobility on the I-405/SR 167 corridor.

APPROACH

The ERP members performed a literature review (Appendix E) of federal, regional and state tolling, HOV, and livability policies, concluding that the I-405/SR 167 corridor express toll lanes are aligned with these policies.

Federal Policy

- **FHWA Tolling and Pricing Program** – The Value Pricing Pilot program encourages value pricing pilot projects to manage congestion on highways through tolling and other pricing mechanisms. SAFETEA-LU allows states to charge tolls on vehicles not meeting the established occupancy requirements to use an HOV lane if the state establishes a program to manage the facilities by varying the toll amount and enforcing violations.
- **USDOT/HUD/EPA Livability Initiative Principles** – Key principals of this initiative speak to the manage lanes issue. One of them is for providing more transportation choices and the other for increasing the collaboration among federal, state, and local governments to better target investments and improve accountability.

Regional Policy – Transportation 2040 Strategies

- **Congestion and Mobility** – improve mobility through a combination of effective land use planning, demand management, efficiency enhancements, and strategic capacity investments.
- **Environment** – protect and improve the region's environmental health, ensuring that the region has healthy air, that transportation projects improve storm water runoff procedures to protect the region's waters, and that we continue to address transportation's role in reducing greenhouse gas emissions and adapting to climate change.
- **Funding** – the region will transition to a new funding structure based on user fees, which could include high occupancy toll (HOT) lanes, facility and bridge tolls, highway system tolls, vehicle miles traveled (VMT) charges, and other approaches that replace the gas tax and further fund and manage the transportation system.

First-Generation Managed Lanes

Applications of pricing or electronic tolling as a means of managing traffic on dedicated lanes have been in use since the mid-1990s. The design and operational characteristics of the earliest lane-pricing demonstration projects nationwide are relatively simple, basically converting single HOV lanes to HOT lanes. The principal objective of these projects is to optimize the performance of an existing HOV lane by selling the excess capacity to lower occupant vehicles, and to minimize over-use by pricing lower occupancy vehicles. Since these were lane conversions, the associated capital costs were relatively low in comparison to adding a lane of roadway capacity. Whether categorized as HOT or express toll lanes, all of these projects allow for toll exemption for transit, and exemptions or discounted use by carpools.

Table 2-1 presents a comparison between the single-lane conversion portions on I-405/SR 167 and projects with similar design features and performance objectives.

	Operating Projects		New Operating Projects**			Projects Under Development	
I-405/SR 167 Project Objectives	Minneapolis I-394	Seattle SR 167	Minneapolis I-35W	Utah UT I-15	SF Bay Area I-680	Atlanta I-85	Los Angeles I-110
Freeway Performance							
Increase person throughput	•	•				•	•
Improve speed and travel reliability to free flow (45 to 60 mph)	•	•	•		•	•	•
HOV2+ to HOV3+ change as needed						•	
Transit priority	•	•	•	•	•	•	•
Reduce arterial diversion			•				•
Mobility improvement for general purpose lanes	•	•	•	•		•	•
Mobility improvement for freight						•	
Leverage Toll Revenue							
Retain tolling revenue in corridor	•	•	•	•		•	•
Secure financing							
Exempt transit and carpools from tolls	•	•	•	•	•	•*	•
Prioritize funding to leverage toll revenue with other funding							
Express Toll Lane System							
Incremental implementation beginning with funded projects						•	
Fit within LRP and regional tolling system					•	•	
Sensitivity to construction phasing on a regional level***							

** HOV3+ (all other projects HOV2+)*

*** Projects open less than one year from December 2010 when this report was prepared.*

**** No other project has focused on this project objective.*

The successes of the first HOT and tolled express lane demonstration projects, like SR 167, provided validation for implementing congestion pricing in the U.S. The experiences gained from these projects have provided important lessons for similar future projects.

As a first generation managed lanes pilot project, the primary purpose of the SR 167 HOT lanes is to use variable tolling to make better use of the HOV lanes and improve traffic flow in the corridor without affecting service for carpools and buses. Into year three of the pilot project, it is achieving the congestion management goal. The toll revenue from the SR 167 HOT Lanes Pilot Project is an added benefit as financing was not the primary goal. Revenue is steadily growing and currently covers about half of the operational costs. WSDOT projects that revenue will cover operating expenses during year three. WSDOT anticipated a ramp-up period of one to three years as drivers learn about HOT lanes, sign up toll accounts, and grow more accustomed to using HOT lanes. This ramp-up period to cover operation and maintenance costs is similar to first generation projects nationally.

Second-Generation Managed Lanes

The second wave of managed lane projects builds upon first-generation project successes. For the purposes of comparing the I-405/SR 167 corridor express toll lanes project, these next-generation projects have two distinguishing characteristics:

- They add substantial capacity, often providing multiple lanes in each direction. This is accomplished by the addition of express toll lanes coupled with pricing existing HOV lanes as HOT lanes.
- They are costly, frequently being called corridor-system mega projects because of the financial scale involved.

For these reasons most second generation managed lane projects require solid financial plans and delivery approaches targeting finance as the primary objective. The amount of toll exempt capacity available to HOVs is limited so that the majority of trips in the lanes generate needed revenue.

Second-generation managed lanes are trending toward corridor systems, as illustrated in **Table 2-3**. For these projects, financing emerges as a critical requirement for moving the project to implementation. Operational performance still remains an important goal, and major mobility benefits are achieved through major capital investment.

Table 2-2 highlights projects that convert HOV lanes to HOT, while adding tolled lanes by re-striping the existing freeway. Both projects maintain operational performance and prioritize transit. But in contrast to the first generation projects, HOV3+ is the prevalent policy for carpool exemptions in order to meet finance objectives.

I-405/SR 167 Project Objectives	Operating Project	Projects Under Development
	Miami I-95	Los Angeles I-10
Freeway Performance		
Increase person throughput		•
Improve speed and travel reliability to free flow (45 to 60 mph)	•	•
HOV2+ to HOV3+ change as needed	•	•*
Transit priority	•	•
Reduce arterial diversion		•
Mobility improvement for general purpose lanes	•	•
Mobility improvement for freight		
Leverage Toll Revenue		
Retain tolling revenue in corridor	•	•
Secure financing		
Exempt transit and carpools from tolls	•*	•**peak hours only*
Prioritize funding to leverage toll revenue with other funding	•	
Express Toll Lane System		
Incremental implementation beginning with funded projects	•	
Fit within LRP and regional tolling system	•	
Sensitivity to construction phasing on a regional level		

**HOV3+*

Mega Project

The proposed 40+ mile I-405/SR 167 corridor express toll lanes project, under federal definition, can be considered a "major" project (cost of the project greater than $500 million in total cost), or as a "mega project," which is a category of projects typically costing $1 billion or more. Study Option 4 is estimated to cost about $1.95 billion. By virtue of its scope, the I-405/SR 167 corridor is similar to other express toll lane mega projects. Tolling on these mega projects must contribute to financing the project and funding sustained operations into the future. As such, the development leads with a financing plan that usually influences design and operational decisions. These are large projects where connectivity among segments, connectivity with intersecting facilities, and transitions between segments play a role in phasing decisions as outlined later in Chapter Four.

Table 2-3 Comparison of I-405/SR 167 Concept to Corridor System Projects

	Operating Projects		New Operating Projects			
I-405/SR 167 Project Objectives	San Diego I-15	Houston I-10	Ft. Lauderdale I-595	Dallas I-635/I-35E (LBJ FWY)	Fort Worth SH 183/I820 (NTE)	D.C./Virginia I-495 (Capital Beltway)
Freeway Performance						
Increase person throughput	•					
Improve speed and travel reliability to free flow (45 to 60 mph)	•	•	•	•	•	•
HOV2+ to HOV3+ change as needed		•***				
Transit priority	•	•		•	•	•
Reduce arterial diversion						
Mobility improvement for general purpose Lanes	•	•	•	•	•	•
Mobility improvement for freight			•	•	•	
Leverage Toll Revenue						
Retain tolling revenue in corridor	•	•	•		•	
Secure financing			•	•	•	•
Exempt transit and carpools from tolls	•	•	•**	•*	•*	•**
Prioritize funding to leverage toll revenue with other funding		•	•	•	•	•
Express Toll Lane System						
Incremental implementation beginning with funded projects	•					
Fit within LRP and regional tolling system	•		•	•	•	
Sensitivity to construction phasing on a regional level						

**HOV2+ 50% discount peak periods only* ***HOV3+* ****HOV2+, to migrate to HOV3+ in future*

Financial Plans are comprehensive documents that reflect the project's cost estimate and revenue structure, providing a reasonable assurance that there will be sufficient financial resources available to implement and complete the project. Financial Plans are required for projects with costs ranging from $100 to $500 million as well as Transportation Infrastructure Finance and Innovation Act (TIFIA)-funded projects.

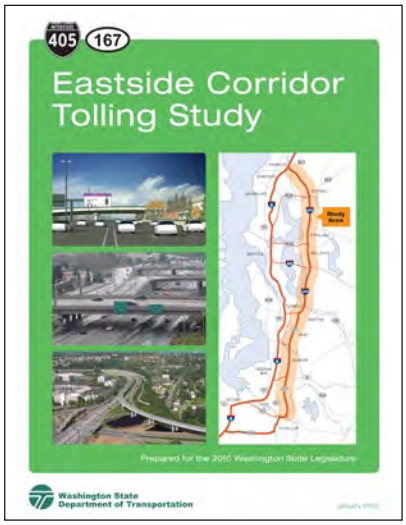
It is important to note that *none* of the comparable second generation projects are supported by toll revenue alone and require other sources of funding – traditional and non-traditional – to move the project to implementation. A consistent operating policy for these mega projects is limiting toll exempt usage that supports financing needs. An additional operating policy for those projects requiring substantial capital cost recovery is requiring all vehicles to have active transponder accounts for enforcement purposes.

Conceptually, the proposed improvements for the I-405/SR 167 corridor are comparable to similar projects implemented and under development in major metropolitan regions across the country. The I-405/SR 167 corridor express toll lanes project represents both first generation and second generation managed lanes. From a policy standpoint, the ERP suggests that the implementation of proposed improvements be driven by financing considerations consistent with other similar mega projects.

The details of the review are provided in Appendix E. Given specific legislative constraints and timing that influence delivery options, the program has regional consensus around project implementation principles that are also supported within the framework of federal, state and regional policies.

The Expert Review Panel held three public meetings with the Executive Advisory Group (EAG) in September, October and November, 2010. Each meeting included project information from WSDOT, an ERP report of preliminary findings, and comments from the EAG and public.

Chapter 3
METHODOLOGY



Terminology

Managed lanes *is a generic term for lanes proactively operated to achieve a pre-determined level of performance; HOV lanes, HOT lanes, and express toll lanes are examples of managed lanes. This term was used during development of the I-405 master plan to describe HOT and express toll lanes.*

High Occupancy Vehicle (HOV) *lanes are primarily reserved for carpools, buses, and motorcycles.*

High Occupancy Toll (HOT) *lanes are HOV lanes that also allow vehicles that do not meet the occupancy requirements to use the lanes by paying a toll.*

Express Toll Lanes *are open to travelers who pay a toll to use the lanes, and may offer exemptions to transit and carpools.*

Are the technical analytical measures and reports supporting the I-405/SR 167 Tolling Study valid? Were the right tools applied to the analysis? Are the report results reasonable? What outcomes are reasonable to expect based on industry experience?

ERP RESPONSE: The ERP reviewed the methodology for the I-405/SR 167 tolling analysis and found the technical and analytical measures to be valid and reasonable given recent industry experience. Overall, the ERP concluded that WSDOT used sound planning and engineering practices that are consistent with industry standards to analyze the operational performance of the I-405/SR 167 express toll lanes. A detailed response regarding the report methodology is found below.

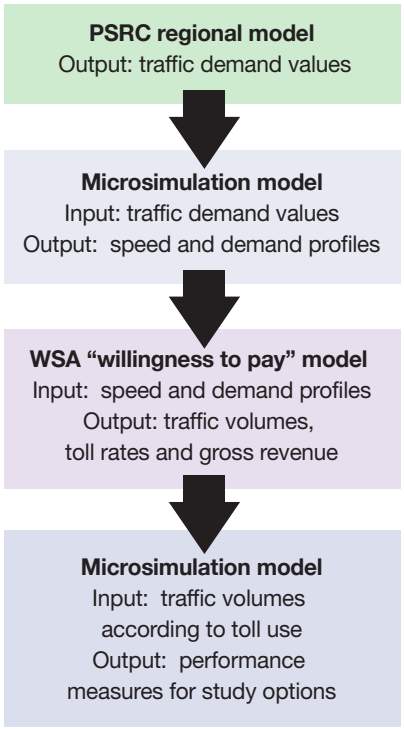
APPROACH

Independent Traffic Modeling Review

Transportation models are used to simulate the travel patterns of people and vehicles as an imitation of conditions compared to a real transportation network. WSDOT built the traffic models for the I-405/SR 167 corridor based on input from the regional forecasts. They used the models to approximate future travel patterns and to assess the changes that may occur over time, providing a good test to review differences in transportation policy. In preparing the I-405/SR 167 Corridor Tolling Study, WSDOT took predictions about future traffic growth and used them in a model that considered critical elements such as the physical dimensions of the corridor, trip-making behavior, and the proportion of drivers who would choose to pay a toll for the benefits received. The result of running the model was the generation of performance measures, such as speed and traffic volumes, that could be compared to other study options in the report.

The Texas Transportation Institute (TTI) conducted an independent review on behalf of the ERP to assess whether WSDOT used the right corridor tools and methodology for the modeling effort. TTI's charge was not to perform a detailed evaluation of the regional demand forecasting model which serves as input to the I-405/SR 167 corridor modeling tools. TTI examined the details of

Figure 3-1 *I-405/SR 167 Basic Modeling Approach*



the modeling documentation contained within the I-405/SR 167 Corridor Tolling Study and the corresponding appendices. In addition, TTI staff also reviewed the separate model calibration document entitled, "I-405/SR 167 Corridor Traffic Analysis Methodology for ERP Request," along with sample computer simulation files created by WSDOT to support the model. TTI examined the traffic modeling assumptions, and performed an assessment to determine whether the methodology was consistent with industry practice.

Specifically, each of the modeling elements – demand forecasts, microsimulation of operations, and predictions of use under tolling were reviewed independently. **Figure 3-1** provides a simplified overview of the steps in the modeling process.

The Puget Sound Regional Council (PSRC) provides a regional traffic model that incorporates approved and adopted trends involving growth, land use and other community goals. The ERP did not provide a detailed look at PSRC's regional travel demand model, from which global demand estimates were derived. TTI's limited assessment found the demand modeling approach for the corridor-level analysis to be consistent with current industry practice, and the traffic assignment portion that determines where and how the volumes are applied in the corridor appear to be consistent with the observed field data.

Within the last five years, the PSRC model has gone through two national expert panel reviews [see details in Appendix D]. In 2005, WSDOT worked with PSRC to enhance the regional model for modeling tolling and value pricing projects. As part of that effort, WSDOT assembled a national modeling expert review panel, which reviewed the model, recommending a series of improvements, which were all subsequently implemented.

In 2008, WSDOT worked with PSRC to assemble another national expert review panel to prepare the model for the SR 520 Toll Financing Study. The recommendations from this panel were implemented and the panel endorsed the improved model before it was used for the SR 520 financing analysis. That same model, with further on-going minor enhancements, was used in the I-405/SR 167 express toll lane analyses.

A traffic microsimulation model is a highly detailed set of movements that mimics how traffic operates throughout a transportation system under real-world conditions. These models are commonly used as a tool to evaluate different project options for a corridor or an intersection. TTI's review of WSDOT's microsimulation model revealed that the project team analysts who created the model had a thorough understanding of the process, and their methodology was detailed enough to reconcile simulated driver actions with real-world behavior observed on the I-405/SR 167 corridor. The microsimulation components of the study were conducted according to industry standards and with a high degree of attention to detail. One concern identified by the ERP was the use of a single performance measure focused on higher speed, higher throughput options. The independent modeling reviewers suggested that other more broadly-based corridor measures for evaluation be considered, including network-wide delay and speed for each of the studied options.

Wilbur Smith Associates (WSA) used an econometric model to predict toll lane use. TTI's independent assessment of this portion of the modeling confirmed that WSA's approach to proportioning traffic based on "willingness to pay" is consistent with industry practice, and in fact, the analysis is more detailed than reports prepared for other projects at this stage in the planning process.

Figure 3-2 *Speed and Vehicle Throughput Measures for I-405 SB from SR 522 to SR 520 during AM Peak Period*

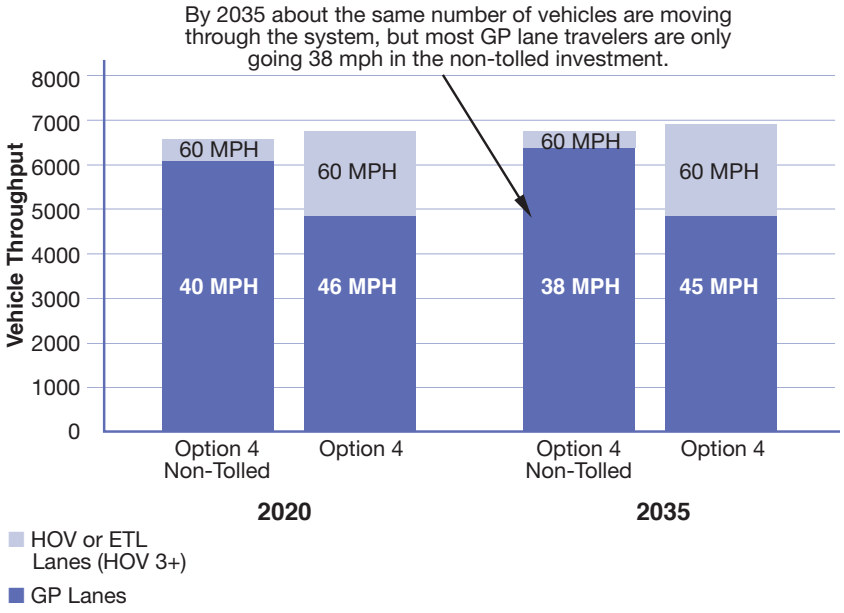
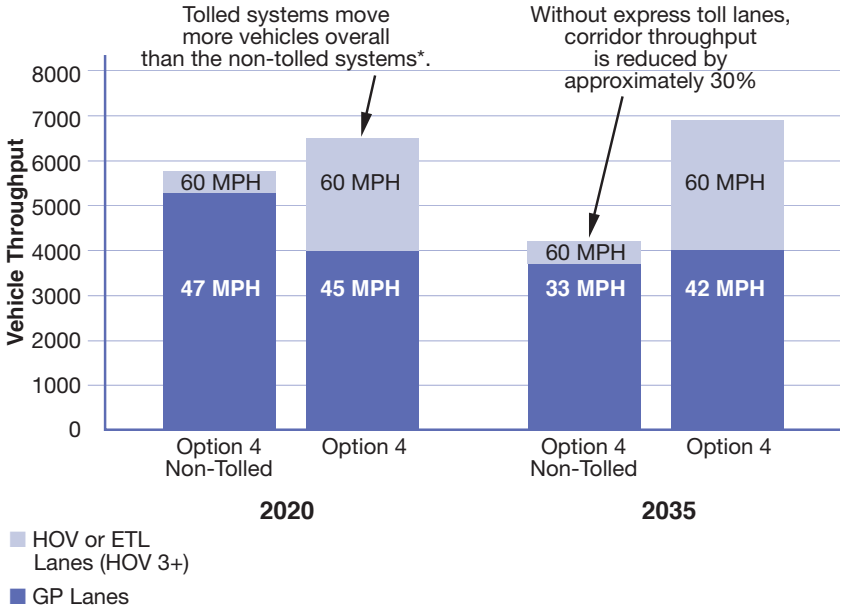


Figure 3-3 *Speed and Vehicle Throughput Measures for I-405 NB from SR 167 to NE 8th Street during AM Peak Period*



* *Not only does the tolled investment move more vehicles overall than the non-tolled investment, it moves more vehicles at 60 mph. Comparing options, GP lane speeds do not change very much until you get to 2035, when GP lane speeds slow down to 33 mph with the non-tolled investment. Over time, GP lanes fill up and consequently slow down. Because express toll lanes manage traffic with dynamic tolls, they keep vehicles moving at 60 MPH into the future.*

Commentary on Measures of Effectiveness

The ERP found the Tolling Study's single performance measure of "moving more people and vehicles at free-flow speeds" to be limiting both in the evaluation of overall corridor performance as well as the assessment of the performance for each project option with respect to the project's implementation principles. Such a measure favors higher speed, higher throughput options since pricing, by definition, is specifically designed to ensure performance within the tolled lanes are maintained at free-flow speeds. It was suggested to WSDOT that more broadly-based corridor measures – such as network-wide delay or speed be used to compare the various tolled and non-tolled scenarios analyzed for I-405 and SR 167.

The basic concept of "people and vehicles" also cannot assess whether the project will improve specific transit, freight, and arterial road performance. Subsequent to the ERP's finding regarding the limitations of the study's primary performance measure, WSDOT provided the ERP overall corridor performance metrics and conventional operational measures more commonly applied in other studies and projects. The supplemental measures that were provided are described in the following section, and support the development of express toll lanes in the I-405/SR 167 corridor.

Modeled Performance Results

The WSDOT models for the various I-405/SR 167 corridor project options are able to produce a variety of output measures predicting performance characteristics. Modeled results can vary due to the influence of local factors and the limitations of modeling during this phase of the planning process (Appendix F). For example, a specific interchange may have a greater influence on the assessment of performance for a nearby segment versus the entire corridor. Simulation results can be provided as corridor-wide measures or "snapshots" of specific points or segments within the overall corridor. The ERP was provided with both measures for our reference and usage, but for the purposes of a corridor-wide assessment the focus was on the overall system measures.

In reviewing modeling output provided by the Project Team, the ERP notes that some screenline locations offering "snapshots" of performance do not show a noticeable improvement between the tolled and non-tolled options. High future demand in the corridor that cannot be accommodated under either option may influence performance measures under both the toll and non-toll options.

Corridor-wide measures that detail vehicle throughput, average speed, total travel time, and average delay per vehicle indicate improved operating conditions under the tolled option. **Table 3-1** shows the performance values for the tolled and non-tolled scenarios of Option 4 during the AM peak period.

Table 3-1 Modeled Network Performance Measures for AM Peak Period in 2035

	Option 4 Non-Tolled	Option 4 Tolled	% Difference
Vehicle Throughput (no. vehicles)	212,904	242,932	+14%
Average Speed (mph)	27.1	37.0	+36%
Total Travel Time (hours)	56,217	48,142	-14%
Average Delay per Vehicle (sec.)	430	241	-44%

For the purposes of the ERP's review of the modeling output and supplemental measures of effectiveness (MOEs), the focus was placed on reviewing a variety of MOEs to assess overall corridor performance, which is consistent with the ERP's emphasis to encourage a broader system approach for project implementation. The system-wide metrics presented in **Table 3-1** support the overall improvement provided by the tolled option. Additionally, WSDOT provided reports of vehicle throughput and speeds by major segments of the corridor, which demonstrate performance benefits with the tolled option, as seen in **Figures 3-2** and **3-3**. **Figure 3-2** illustrates that between SR 522 and SR 520, vehicle throughput is similar between tolled and non-tolled options, but a greater number of vehicles benefit from higher speeds, and resulting time savings and travel reliability, under the tolled option. For the section of I-405 between SR 167 and SE 8th that is shown in **Figure 3-3,** both vehicle throughput and speed measures are noticeably improved under the tolled option, particularly in 2035.

Table 3-2 Operational Performance of Selected Express Toll Lane Corridors after Implementation

Project	Volume (vph)	Travel Speed
I-394 Minneapolis (2007)	600 – 1000 additional vehicles in underutilized HOV lanes	Speeds in General Purpose lanes increased up to 15% during peak hours
SR 167 Seattle (2010)	600 vph to 1200 vph in express lanes	General purpose lane speeds increased by 11%, express lane speed at 60 mph
I-15 San Diego original HOV Lane conversion (1996)	600 vph to 1200 vph in express lanes	Speeds were maintained in both the express and general purpose lanes

Why Express Lane Tolling Provides Improved Operational Performance

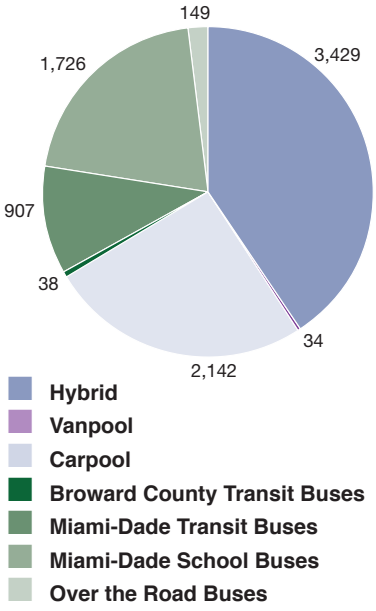
A major theme of the ERP findings is that express toll lanes, as proposed in Option 4, will provide a greater operational benefit than a general-purpose lane alternative with existing HOV lanes. Similar HOV-to-HOT conversion projects completed throughout the nation have shown an improvement in performance, and WSDOT's traffic operations forecast had a similar result.

For example, the I-95 Express Lanes in Miami experienced an average lane speed increase from 18 mph to 57 mph in the HOV lane that was converted to an express toll lane. Speeds in the general purpose lanes improved from 19 mph to 40 mph with the conversion of the existing HOV lanes to express toll and the addition of a new express toll lane in each direction. (See highlight this page and Appendix G) Other experiences nationwide show a similar trend. **Table 3-2,** on page 14, details the differences in operational performance by vehicular throughput and travel speeds in the express lane and general purpose facilities.

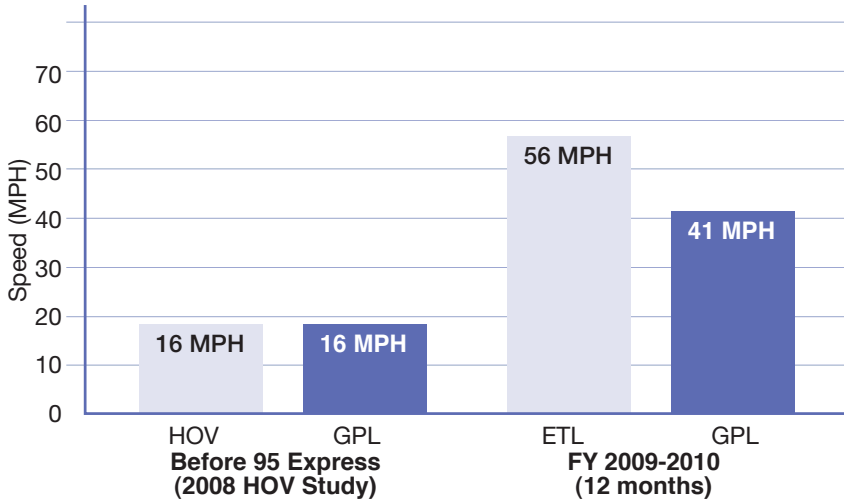
Case Study: Miami I-95 Express

Prior to 95 Express implementation the existing HOV lane and four general purpose lanes on I-95 were operating at congested levels during peak periods. The violation rates on the existing HOV lane were very high, exceeding 30% in many segments. The existing HOV lane was converted to a HOT lane for a 7-mile segment, and a second express toll lane was added by restriping the entire facility. The northbound section opened first, the southbound section followed. The decision was made by Florida Department of Transportation to raise the occupancy limit from HOV2+ to HOV3+ during the conversion. Traffic forecasts for later years predicted an oversaturation of traffic under the HOV2+ scenario. The new express lanes, called "95 Express," are managed through pricing to maintain a minimum speed of 45 mph.

Figure 3-4 Number of Toll-Exempt Registrations to Date for the I-95 Express Lanes



I-95 Express NB Average PM Peak Period Speeds (MPH)



I-95 Express SB Average PM Peak Period Speeds (MPH)

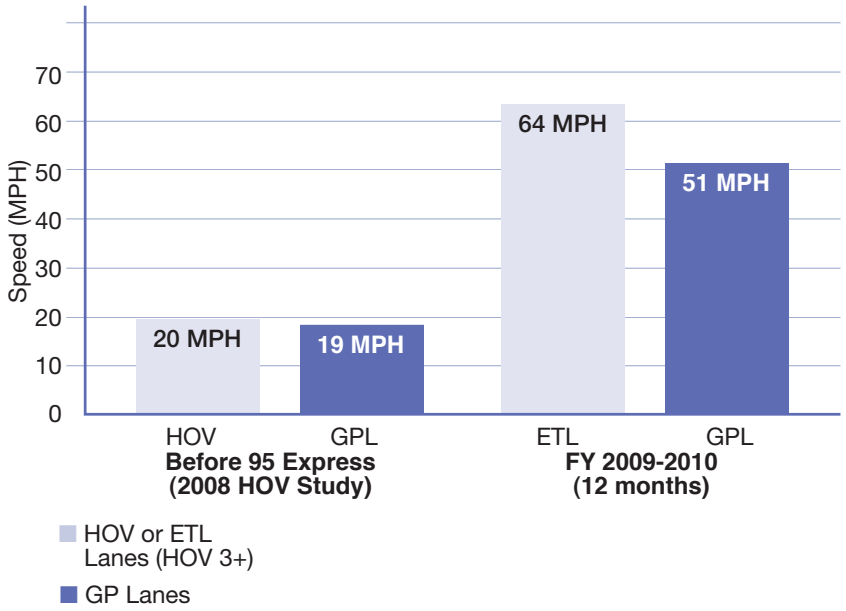
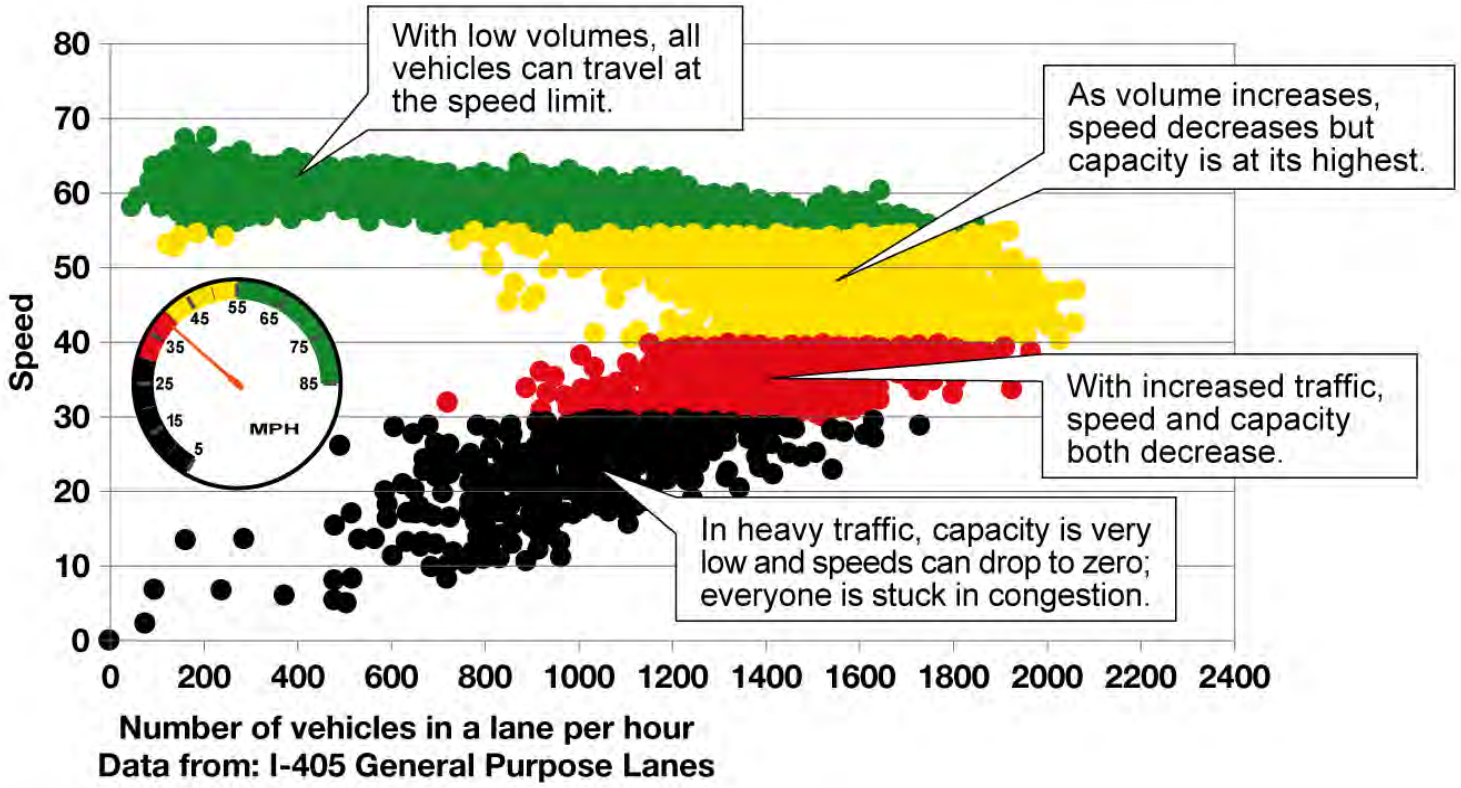


Figure 3-5 Speed-Flow Diagram. Traffic in managed lanes are designed to keep moving freely—above 45 MPH



The relationship in flow due to reduced speed during congestion can best be explained graphically in a diagram shown in Figure 3-5. The plot of associated speeds and volumes symbolizes a "boomerang" shape, where an apex is formed signifying the maximum throughput for a particular travel speed. That apex is located within the diagram at the datapoint furthest to the right on the graph. The lower half of the diagram shows that when speed is reduced the vehicle throughput is also reduced due to excessive volume all at one time. Speed has a strong influence on the effective capacity of a highway. Knowing the direct relationship, traffic operators try to maintain travel at the optimum speed (the apex in the curve, about 45 mph) to seek the maximum traffic volume on a lane or roadway facility.

From the FHWA Value Pricing Program:

"New variably priced express lanes render much higher throughput at significantly higher speeds than adjoining general purpose lanes, and reduce congestion on the overall facility.".

http://ops.fhwa.dot.gov publications/fhwahop08023/vppp_lessonslearned.pdf

Based on national experience, as well as I-405 data, a lane that could have handled a volume of 1800 vehicles per hour at 55 mph is reduced to a volume of 700 vehicles per hour at 25 mph because the slower speed restricts vehicle flow. For example, consider a single point of time during rush hour when drivers elect to use the HOV lane. The increased demand during that peak time causes a significant grouping of vehicles traveling together in the HOV lane in closely-packed spaces. This in turn prompts drivers in that group to hesitate because the distance between vehicles is reduced. Drivers react by decreasing their speed to gain a buffer of distance, and vehicles following also decrease their speed, escalating the breakdown in the flow of traffic.

Pricing in response to changing demand (variable pricing) helps to improve performance by maintaining a constant flow rate, to manage higher demand and prevent the breakdown in flow. A variable tolling structure provides the ability to adjust the toll rate to essentially "meter" drivers who elect to use the system at the same time. Express lanes that use pricing can have a higher volume because breakdowns in traffic flow due to slower travel speeds are less common, and thus, the effective capacity for the lanes can be increased because more demand is met. If the demand is the same in both the express and general purpose lanes before and after pricing, then the general purpose lanes might actually see an increase in effective capacity because the express lane services more vehicles at higher operating speeds.

Environmental Assessment in Progress

WSDOT is currently conducting an environmental assessment (EA) for an improvement project on I-405 between 6th Street in Bellevue and I-5 in Lynnwood. The improvement project proposes additional lanes and bridges to support small amounts of widening, provide new shoulders for transit vehicles, and construct wider shoulders for enforcement areas and maintenance pull-outs. Once completed, an additional lane will become operational in each direction, between 6th Street in Bellevue and SR 522 in Lynnwood. An express toll lane and an HOV lane are the two lane management options being considered for the EA. Both options are assuming an HOV-3+ occupancy requirement at least during periods of greatest demand for the new lane.

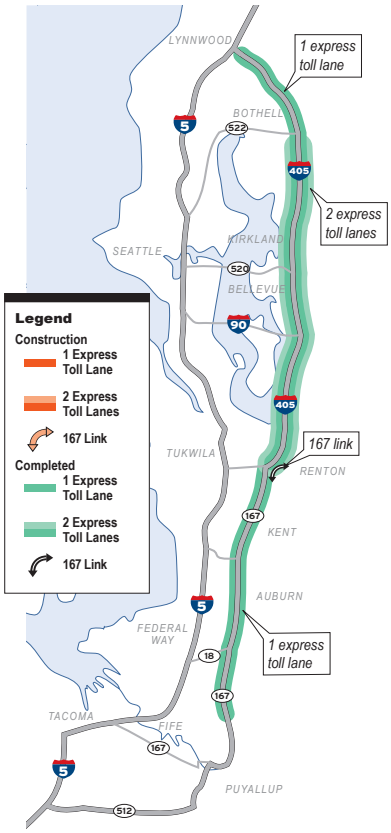
WSDOT has stated additional MOEs will be considered in the EA that were not originally in the I-405/SR 167 Corridor Tolling Study. The ERP suggests that this subsequent analysis include measures assessing transit, freight, and arterial components of the transportation system that will assist in evaluating project options. The ERP recommends that the EA include a more detailed analysis for the specific impacts influencing the project implementation principles.

Case Study: I-10 Houston

The Katy Freeway in Houston is the first in Texas to provide both added general purpose capacity and managed lanes along a 22-mile portion of the corridor from I-610 to Katy, Texas. About 60 percent of this project design reflects four toll express lanes with toll exemption to HOVs during peak periods. Further out, the single concurrent HOV lanes operate with buffer separation and are not tolled. Express lanes are separated by permanently placed pylons located at ten foot spacing. Outside the peak periods, tolls are charged to all users. Transit and HOT direct access ramps are provided at various locations near I-610 and SH 6 to transit centers and park and ride lots. Tolls typically range from $0.30 to $1.00 per trip in the off-peak direction and up to $3.00 in the peak direction. The Harris County Tollroad Authority has leased and operates the managed lanes, while the local transit agency operates transit facilities and express bus services in the corridor. The entire widening and reconstruction project was implemented at the same time and not phased so that toll operations could commence at the earliest opportunity.

Chapter 4
PHASING

Option 4 – 40 Mile System



Is the proposed phasing plan to implement an express toll lane system sensible? Does the proposed phasing plan provide for logical, usable segments towards a 40+ mile corridor system?

ERP RESPONSE: Moving forward with Phase 1 (funded improvements comprising Study Option 1) as a first step to implementing Study Option 4 makes sense and provides logical first segments to complement the existing SR 167 HOT Lanes Pilot Project. The ERP recommends that a more detailed plan is needed for future phasing, examining current HOV lane shortcomings, financing, project delivery, operational performance and risk management associated with implementing and opening remaining portions of the corridor over the next decade. The ERP does not recommend going back or redirecting the current momentum for funded projects in fulfilling these additional needs.

APPROACH

To evaluate phasing, three types of input for the I-405/SR 167 corridor were considered, including:

- **Typical phasing criteria:** How does the current envisioned phasing respond to typical criteria applied to determine project phasing? Such criteria include responsiveness to current problems like congestion, HOV performance and accidents, as well as demand, support and project readiness.
- **Experience elsewhere:** What is the phasing experience from similar managed lane projects nationally? Comparing the I-405 portion of the project to other mega projects reveals how important financing is to phasing, and national case studies provide insight to phasing issues.
- **Baselining current progress:** What work is already completed or underway and what remains to be performed? Since some improvements have already been completed and others are nearing completion, what foundation has already been laid from which to rationalize future phasing?

Typical Phasing Criteria

- ***Congestion***
- ***HOV Lane Performance***
- ***Collisions***
- ***Demand***
- ***Support & Project Readiness***

The following presents relevant data and information from the ERP analysis, supporting the overall phasing recommendations which appear at the end of this chapter.

Phasing to get to Option 4: WSDOT investigations to date have comparatively examined costs, revenues and performance for a series of study options that are generally represented as incremental steps toward the ultimate corridor implementation of Study Option 4 **(Figure 4-1**), which provides for:

- Single concurrent express lanes in each direction on SR 167 extending the existing HOT lane pilot project
- Dual concurrent express lanes in each direction along I-405 from the SR 167 interchange to SR 522
- Single concurrent express lanes in each direction along the balance of I-405 from SR 522 to I-5

Typical Phasing Criteria

For corridor improvement projects of this magnitude, there are various ways of examining and prioritizing phasing. Some of these criteria include addressing immediate and easily solvable problems first; addressing congestion sources and safety; examining the readiness and public support for projects that could be constructed; and looking at where demand and benefits can be best achieved at the lowest cost. Additionally, for cases like the I-405/SR 167 corridor where funding and implementation actions have already taken place, the ERP examined the rationale beyond those actions to move forward and optimize the completion of the remainder of the corridor (Renton to Bellevue).

WSDOT provided various data and background information to the ERP so the panel could analyze phasing from a set of standard criteria. In particular, the ERP reviewed and discussed the following criteria based on available data.

Congestion: The presence of recurring, existing and forecasted congestion is one of the most readily available ways of determining where phasing should be prioritized, assuming congestion is worse in some areas than in others. The presence of congestion is an indicator of where the greatest benefits to reducing congestion are likely to be found. The Puget Sound region has a long and rich legacy of measuring freeway performance both in terms of understanding the intensity of congestion (shown in shades of color on **Figure 4-2** ranging from green to yellow to red to black) and duration (expressed over a 24-hour typical weekday).

The congestion profile along I-405 shows various locations where speed degradation is happening in both directions. The ERP examined the comparative congestion snapshots to validate that the early action investments were both meaningful and cost effective as early phasing strategies for this criterion. The Phase 1 limits bracketed on the graphic in **Figure 4-2** of each graph above clearly highlight some of the more congested segments along I-405. Some pockets of more intense congestion are prevalent further south, and these seem to be largely caused by interchange capacity shortcomings associated with SR 167 and I-90.

Figure 4-1 *Phasing for Option 4*

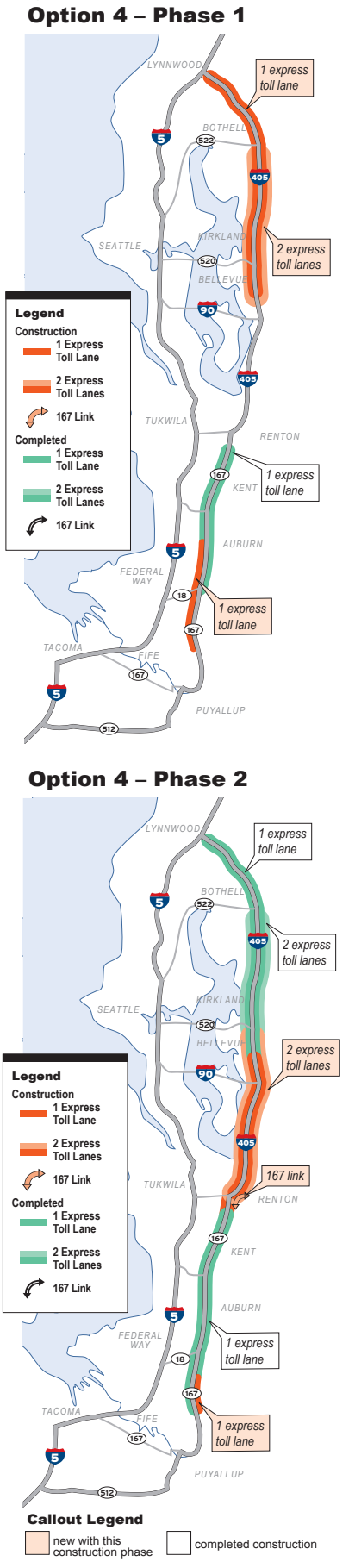
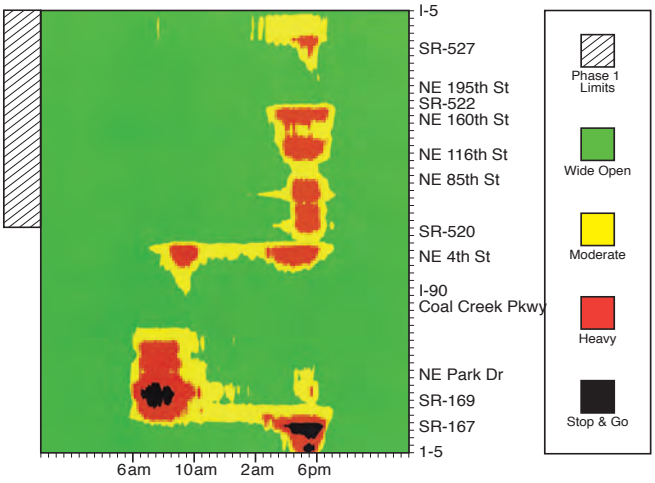


Figure 4-2 *provides a recent snapshot of typical congestion for the I-405 portion of the project, including recent improvements to congestion chokepoints in Kirkland, Bellevue and Renton. Mainline congestion directionally affects most of the I-405 corridor at some time during the day*

I-405 Northbound Congestion
Typical Weekdays, 2010



I-405 Southbound Congestion
Typical Weekdays, 2010

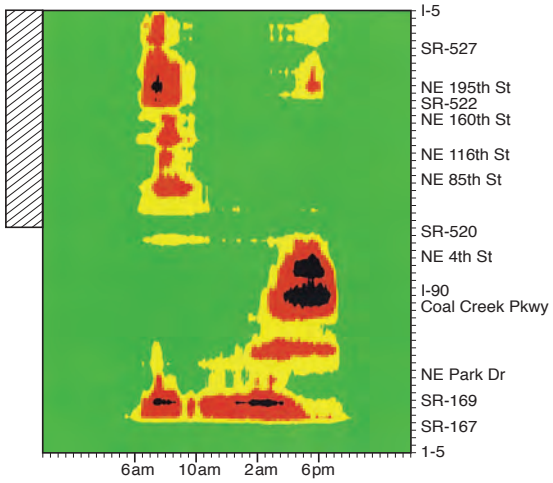
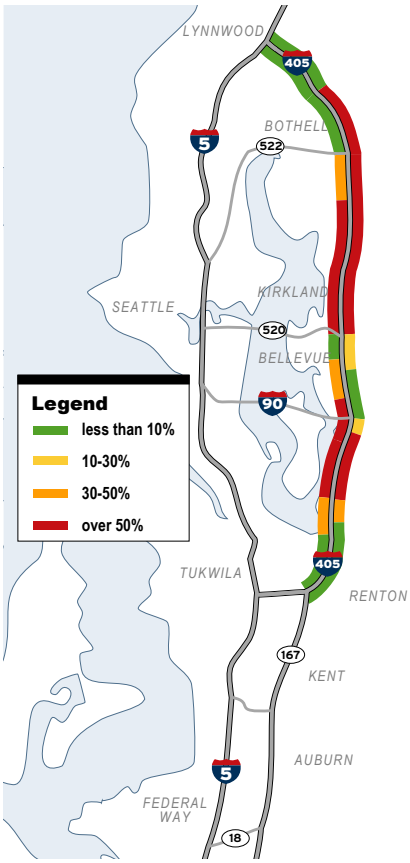


Figure 4-3 *I-405 HOV Lanes are Over Capacity*



I-405 HOV Lanes in 2009—Percent of weekdays over capacity (>1400 vehicles)

HOV Lane Performance: Phasing should not just look ahead at forecasted conditions in the design year, but also address more immediate problems that currently exist. While general purpose traffic bottlenecks have been largely identified and addressed through a series of recent projects in Kirkland, Bellevue and Renton, HOV operational problems have not been targeted. The I-405/SR 167 Coridor Tolling Study, January 2010, (p. 9) noted deterioration in the existing HOV lane performance. Based on discussions with the EAG and WSDOT, the ERP requested additional data to better understand how the existing HOV lanes are performing. WSDOT monitors all HOV lane operations and annually reports on their performance. This question is relevant because HOV lanes that have operated for decades throughout the country are incurring service degradation caused by successfully attracting too many HOVs, particularly 2+ carpools. Much of the Puget Sound HOV network dates from the early 1990s, including HOV lanes along I-405. Recent data for the I-405 HOV lanes is provided in **Figure 4-3**.

These representative data indicates that most of the I-405 HOV lane operation is regularly experiencing congestion at some time of the day for a majority of the days each year. This degradation, reflected in lane volumes exceeding 1400 vehicles per hour, is indicative of peformance degradation in the lanes. The 1400 vehicles per hour value does not represent the absolute lane capacity; rather, it reflects the threshold at which congestion forms on the speed/flow curve for a single-lane highway facility. Beyond this value, there is no method for free-flow speeds to be assured due to a wide variety of geometric and operational factors. If transit reliability is to be assured, flow rates should be managed at or below this threshold. These data indicate that transit agency concerns regarding reliability of service are well founded. The most recent I-405 project investments, including HOV ramps to provide benefit to carpools and transit are being compromised because overall HOV performance is deteriorated. This observation is important to the phasing question, because if the current operation is not meeting its stated goals, then future planned investments should be considered earlier to address these shortcomings.

Collisions: Safety at a programmatic level is always given high priority to focus funding and projects within a corridor at locations where collisions are highest. WSDOT provided the ERP the most recent collision data for all of I-405 and a portion of SR 167 (**Figure 4-4**).

WSDOT's collision data are reflective of all traffic over a multi-year period; data were not separately provided for the HOV lane operation. The data have not been normalized to account for differences in traffic volumes at various points along the corridor nor have the data been compared to vehicle miles of travel or with other corridors in the region to arrive at a more accurate and comparative collision rate for given corridor portions of this project. However, the data are indicative for the purpose of ascertaining if there are particular portions of the corridor which might warrant attention. The data show that collisions are experienced throughout the corridor at a moderate to high level. Collisions are clustered in greater proportion around major interchanges where queuing is most evidenced, including portions of the corridor near the SR 167, I-90 and SR 520 interchanges. This fits with national trends showing most collisions as congestion-related, so when congestion is relieved, it helps reduce collisions. WSDOT's collision data suggest that early action bottleneck projects such as the northbound auxiliary lane in Bothell have been and will continue to be positive influences in reducing collisions. While the entire corridor needs capacity, the next highest priorities from a safety perspective alone would be the SR 167/I-405 interchange followed by capacity improvements through the central portion of the corridor.

Figure 4-4
Total Collisions, 2006-2009

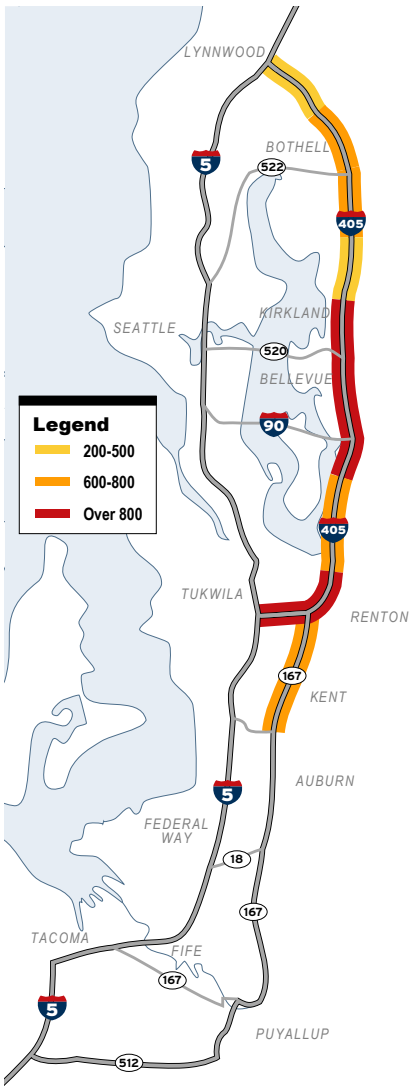


Figure 4-5
Cumulative Corridor Demand 2030

Demand: Forecasted corridor demand is another good indicator for phasing – 1) to determine if there are separate portions of the corridor where demand is clustered (which is indicative of phasing opportunities) and 2) to determine if there are any areas where demand is greatest (helps establish phasing priorities). Demand concentrations are illustrated for all movements in 2030 in **Figure 4-5**.

This illustration suggests that all of I-405 should ideally be constructed at one time. At a minimum, it suggests that phasing segments should be sufficiently long enough to adequately load and unload major improved segments. Note that overall demand is rather uniform for the majority of I-405, despite high entering and exiting movements at major system interchanges, and separate commute patterns focused on east side and south end activity centers. Similarly, SR 167 reflects consistent demand. Also of note is the traffic demand at the SR 167/I-405 interchange, which suggests almost as much demand extending further south as interconnecting with I-5 to the west. This understanding lays the basis for a subsequent recommendation to convene a value engineering team for this interchange to examine the best future mainline orientation (for general purpose and express toll lanes) and means for reducing overall project costs.

Support and Project Readiness: Support for the project is strong throughout the corridor, as exemplified by findings in the I-405/SR 167 Corridor Tolling Study, January 2010, and comments provided by the EAG in the 2010 ERP workshops. Notwithstanding the state of project funding, the entire I-405/SR 167 corridor is not yet ready for implementation. Right-of-way and utility relocation on I-405 from Renton to Bellevue needs to be cleared, and getting environmental approval to operate the lanes as express toll lanes. These prerequisite steps are necessary before proceeding to construct the rest of the corridor. As a first step toward corridor implementation, it makes sense to move Phase 1 forward because of regional support, specific project readiness, and economic conditions for construction.

Implementing a Mega Project

As noted in the policy section of this report, most mega projects that have primary objectives driven by finance have one phasing aspect in common—they typically are opened in their entirety without the need for phasing. This is because the demand and financial profile of such capacity projects is most commonly optimized when they can be opened to generate the greatest level of use to immediately repay bonds. Under this delivery framework the project opens from one end of the corridor to the other. Temporary termini created by incremental (phased) openings have been known to create traffic bottlenecks if not carefully designed. This does not mean that phasing cannot be accomplished with incremental openings, but it does mean that greater challenges are imposed on the I-405 portion of this mega project. The currently envisioned I-405/SR 167 phasing plan could require up to a decade or more to be fully funded. Most managed lane mega projects have been implemented or planned to open in an average of five years or less (**Table 4-1**). While projects listed as comparable to I-405/SR 167 corridor have different designs and operating characteristics, they all are representative of the same relative funding requirements and are intended as capacity expansions to be operated as tolled express lanes.

Five of six example projects were implemented in a single phase of construction due to the need to achieve financial goals for early revenue generation which could not be accomplished incrementally through traditional phasing. Four of six were public-private partnerships (PPP), which require a *mosaic* of funding sources and leveraged both private equity and public funding in covering the balance. A detailed description about long-term concessions for mega projects with public-private partnerships can be found in the next chapter (Appendix I).

The I-405/SR 167 corridor functionally and financially fits the definition of a mega project and the framework that other projects have addressed to get to implementation. This comparative examination shows that the manner in which mega projects are phased can be important to a successful financial and operational outcome. The financial plan for this project could control its opportunities for future phasing, and vice versa.

Table 4-1 Comparable National Express Toll Lane Mega projects

Project	Delivery Approach	Phasing	Financing*
I-15, San Diego 20 miles	Conventional design-bid-build	Multiple phases as corridor is extended and widened, opening 2008-2015	Conventional, augmented with local sales tax bonding
I-10, Houston 22 miles	Public-public partnership w/ toll authority	Single phase, opened in 2009	Toll authority contribution of $250M on $2.6B
I-495, N Virginia 14 miles	Public-private partnership	Single phase, under construction	30% public match on $1.3B
I-595, Ft Lauderdale 10.5 miles	Public-private partnership	Single phase, under construction	future public availability payments on $1.7B
SH 183/I-820, Ft Worth 13.3 miles	Public-private partnership	Single phase, under construction	32% public match on $1.8B
I-635/I-35E, Dallas, 15 miles	Public-private partnership	Single phase, under construction	22% public match on $2.2B

* Excluding financing-related costs

As shown in the six example projects, few other similar projects have attempted the extent of long-term phasing contemplated for the I-405/SR 167 corridor. There are likely to be increased challenges with a partial build-out that is not immediately followed by full corridor completion. One challenge is that without the full corridor implementation, the phased portion may see less-than-anticipated demand and revenue in early years. Steps to address these challenges need to be part of the phasing plan beyond the implementation of Phase 1. These steps include exploring different ways to finance and deliver the corridor project. Options include:

- Building the balance (Phase 2) as one project, requiring about $1.5 billion.
- Implementing pricing earlier than planned for the rest of the corridor's HOV lanes to address transitional operation issues associated with pricing only express toll lanes in Phase 1.
- Exploring leveraging the funded Phase 1 project into a public-private (or public-public) initiative to address the unfunded gap for the balance of the project.

Methods for Addressing HOV Lane Degradation Challenges

The first challenge needing attention in parallel with implementing Phase 1 is regaining HOV lane performance in the I-405 corridor. This need dovetails into other related recommendations, such as raising the minimum free occupancy use to HOV 3+ for Phase 1 to meet the financial viability objective.

Current HOV Performance: WSDOT should consider various steps to adopt a HOT3+ minimum occupancy policy for the I-405/SR 167 corridor in the near term to support the following goals:

1. Address existing problems with HOV performance and improve transit service and reliability.
2. Provide needed toll operating experience and toll revenue history to support future bond financing.
3. Support seamless integration of operating policy for Phase 1 with remaining segments in the corridor.

The specific business rules to achieve corridor consensus may be different from the region, but may help to inform an updated regional HOV policy. Moving to HOV 3+ for toll exempt and tolling all others has many variants including:

- Minimum occupancy requirements by time of day (peak may be more restrictive than off-peak periods).
- Pricing SOV and HOV2+.
- Pricing HOV2+ with a discount over fully tolled SOVs .

Stakeholders need a clear and concise message regarding why this change is needed and what benefits are associated with such changes. Other HOT lane projects that have and are undertaking this change in its many forms noted above include I-95 Miami (pg. 15), I-10 Houston (pg. 17), I-85 Atlanta (pg. 23), and I-10 Los Angeles (pg. 26).

HOV 3+ Transition: The transition to HOV 3+ can be accomplished gradually through successive steps or at once. The ERP suggests that WSDOT engage members of the EAG in a dialog with a stated goal of transitioning from the current HOV rules to the ultimate HOV 3+ express toll lane policy to consider all constituent needs and perspectives. Some strategies that other areas have employed include the following, either singularly or in various combinations (also see **Table 4-2**):

1. Applying variable occupancy requirements (e.g., peak HOV3+ and off-peak HOV2+).
2. Allowing HOV3+ as toll exempt vehicles, HOV2+ toll discounts, and fully tolling SOV.
3. Other strategies that support an evolution of carpool demand management within the express toll lanes.

Case Study: I-85 Atlanta

The Atlanta metropolitan region is currently undergoing a Federal Congestion Reduction Demonstration (CRD) project to convert 16 miles of existing HOV lanes on I-85 in DeKalb and Gwinnett Counties to HOT lanes. As part of the transition, the minimum occupancy requirement for HOVs will be raised from 2+ to 3+ persons per vehicle, with lower occupant vehicles being able to use the lane for a toll along with all other traffic. The Clean Air Campaign is providing outreach to employers and commuters to encourage the use of alternative travel modes like carpooling and telecommuting. Travelers who currently drive alone and switch to carpooling may be eligible for a cash incentive for up to three months under a carpool reward program supported by the Clean Air Campaign. An example of an incentive is a $40 gas card per month for a 3-person carpool and $60 gas card for a 4-person carpool.

While there are many variables involved in setting business policies aimed at addressing HOV lane degradation and many "shades of gray" in adopting regional HOV policies, the specified goal from these strategies is to have an HOV policy in place within the next six months and to have implemented the phased changes by the time Phase 1 opens. Ideally the same policy would eventually apply to all express toll lanes in the corridor. To note, these transitional steps may not meet the stated financial goals for the corridor. Any interim steps considered should be evaluated for traffic and revenue impacts to the project. The transitional steps may be defined as orienting users gradually to the changes rather than restricting them to higher occupancies, transponder account requirements, access restrictions, and related changes all at once.

A framework of performance measures with pre-determined threshold values should be used to trigger a change to the next logical occupancy and tolling policy, with the objective of free-flow performance as the guiding principle. The ERP recommends that this policy be addressed by WSDOT's ongoing Express Lane Pre-Design Study for regional HOV policy issues, which should be concluded in 2011.

Table 4-2 Trade-offs to Transitional Occupancy and Tolling Strategies for I-405 HOV Lanes

Strategy	Pros	Cons
Raise to 3+, toll all others same rate	• Matches long term policy needed to meet finance goal • No incentive to HOV2 at any time • Transit benefits regained • Maximizes financial viability • Eventual higher person throughput	• Hard to implement because HOV2s lose current incentives (but others get to use the HOV lanes) • Initial person throughput impacts • Public support
Raise to 3+ in peaks, 2+ in off peaks and toll excess capacity (there are many tolling approaches that might be applied within tiered occupancy requirements)	• 3+ only applies to hours when degradation is evidenced, otherwise no change from present • Tolling used to manage excess capacity in maximizing throughput • Generates revenue • Transit benefits are regained	• No incentive to HOV2 in peaks • Perception of favoring SOVs over lower HOVs in peaks • Initial person throughput impacts • Public support • May not support financial goal
Raise to 3+, discount tolls to 2+, and all others not meeting occupancy pay a toll	• Comes closest to matching long term policy • Tolling used to manage excess capacity • Still provides benefits to all HOVs • Transit benefits regained	• Requires different kind of self declaration transponder, higher cost • More complicated enforcement • More complex business rules • May not support financial goal
Raise to 3+ in peaks, 2+ in off peaks (no tolling)	• Only applies to hours when degradation is evidenced • Does not introduce tolling requirement nor reduce HOVs for SOV buy-in • Transit benefits regained	• Potential empty lanes in peak period • Major LOS degradation to general purpose lanes • Increases violations • Likely public and political backlash • Does not effectively manage lanes to maximize mobility • Reduce financial viability-no revenue generation
Require all HOV2+ (or all HOVs) to be registered (stickers) or have an active transponder account to meter demand as an interim step (no tolling)	• Lowers current demand (hopefully enough) • Effective interim step applied for some projects prior to electronic tolling (I-15 San Diego and I-15 Salt Lake City) • Regiments carpool formation (similar to "first on" ferry loading program) • Transit benefits regained	• Impedes spontaneous carpooling • Major administration and capital cost (transponder option) • Does not allow for active lane management in peaks • No revenue generation -defers introduction of tolling

Maintaining transit access: Preserving and/or enhancing transit access is important. A number of access-related issues were raised during the peer review, including potential mixed traffic use of HOV- and transit-only ramps and stations along the I-405/SR 167 corridor. Part of the concern was related to the transit investment in these dedicated ramp facilities and potential pay-back funding to recoup these investments. Nationally some HOV and transit-only ramps have been or will be opened to general traffic as part of toll conversion on HOV lanes, including I-10 in Houston, I-15 in San Diego, I-85 in Atlanta, I-95 in Miami, SR 237/880 connector in Santa Clara County (San Francisco Bay Area), and I-10 and I-110 in Los Angeles (**Table 4-3**). For most case examples, expanded use has not impaired transit operations. In select cases such as in-line stations, tolled users should be restricted since these facilities serve no general purpose function and mixing use can impair safety. Each issue should be considered on a case-by-case basis, and if degradation is forecasted, then the ramp should be restricted to buses or HOVs only. No pay-back provisions have been affected by any of the following national case study example projects, including some ramps that were implemented entirely with transit funding such as those in I-10 Katy Freeway in Houston.

Learning from the SR 167 HOT Lanes Pilot Project: This pilot project is an important test for what pricing can do to promote more efficient lane use, and for demonstrating the potential for pricing to accomplish a mobility goal. In keeping with other similar first generation national projects, tolling should not be anticipated to contribute meaningful revenue to achieve this mobility goal, but it can help offset the cost for lane management and administration. Continuing authorization on the SR 167 HOT Lanes Pilot Project can help dovetail to subsequent extensions further south along the SR 167 corridor and throughout the I-405/SR 167 corridor.

Table 4-3. Transit/HOV Direct Access Changes on Other National Projects

Location	Route	Type of Access	Operational Change
Houston	I-10 Katy	Flyover and tee ramp to city streets (to P&R and transit stations)	HOT2+ to HOT2+ peak. SOV buy-in was previously allowed before conversion from 1 reverse HOT to 4 express toll lanes
San Diego	I-15	Flyovers and drop ramps to city streets and P&R	HOV2+ to HOT2+, all ramps open to SOVs with transponder
Atlanta	I-85	Drop ramps to city streets	HOV2+ to HOT3+, all ramps open to SOVs with transponder
Miami	I-95	Flyovers with other freeways	HOV2+ to registered HOT3+, all ramps open to vehicles with a transponder
Santa Clara Co	SR 237/I-880	Connector between two HOV lanes	HOV2+ to HOT3+ in peaks (all traffic can use off-peak)
Los Angeles	I-10 El Monte	Flyover to city street and P&R	Change from HOV3+ peak to HOT3+, all ramps opened to SOVs with transponder
Los Angeles	I-110 Harbor	Connector to other freeways and flyover to city streets	Change from HOV 2+ to HOT2+, all ramps opened to SOVs with transponder

Case studies from various cities involved in phasing need to be explored for potential relevance and transferability as phasing is evaluated for subsequent improvements. These examples could include I-15 and I-5 in San Diego, various projects in Dallas-Ft. Worth, I-495 in Virginia, I-10 in Houston, and I-95 and I-595 in Ft. Lauderdale. Some of these projects will have formal case studies available as part of their obligations as federal Urban Partnership grantees.

Financing needs drive policy: A fundamental principle coming out of this peer review is that financing needs can drive operational policies regardless of the phasing strategy. To better position the "second generation" I-405 portion of the corridor to be financeable and bondable, the state should consider leveraging their funding contribution to address pressing operational policies now. Current HOV lane degradation offers an opportunity to address this principle earlier, thereby reducing challenges associated with implementing all the necessary restrictions later on. The limits associated with any potential early actions to toll the I-405 HOV lanes should consider the full project limits currently in effect.

Addressing Funding and Legislation Challenges

Available funding and state funding legislation have been the primary factors dictating the first phase of the project, underscoring the fact that phasing is essential to a funding approach and financial plan. To continue the momentum already established, WSDOT should seek legislative approval to implement Option 1 as the first phase of the corridor improvements while developing a plan for implementing the balance of the proposed project (Option 4) that fits into the larger framework ("master plan") footprint. Several issues should be addressed in seeking legislative approval:

Line Item Legislation: The current line item budgeting process has both positive and potential adverse affects on phasing mega projects. Unlike smaller geographically dispersed projects that have independent value and utility, and are not dependent on a viable toll revenue stream, mega projects like the I-405/SR 167 express toll lanes are similar to toll bridges or tunnels that need to be substantially completed in their entirety before revenues are fully gained. Understandably, the legislative process has to distribute funding resources among a wide range of needs, and a singular line item for a project of this magnitude may be politically infeasible. Incremental funding that attempts to gain incremental revenue for future financing leaves the state and constituent supporting agencies with many challenges. The program would benefit from flexibility where available within current legislation to leverage state contributions to other delivery and equity sharing approaches, such as PPPs, that may be able to bring a project to completion with the available and known funding stream.

Finance: Future phasing is influenced by financing, so a financial plan will account for likely financial performance for each subsection of the total corridor. This planning requires a focused investment level traffic and revenue study for these subsets (i.e., Phase 2 and future phases), in order to assess the likely impacts of current and future phasing on financial planning. These studies can then help inform the line-item process and opportunities to leverage both available funding and bonding to implement successive phases of work.

Case Study: I-10 Los Angeles

As a part of the federal Congestion Reduction Demonstration (CRD) for Los Angeles, Caltrans will convert the existing HOV lanes on the I-10 El Monte Busway and I-110 Harbor Transitway to HOT lanes. The current occupancy requirement for carpools traveling on the I-10 HOV lane is 3+ persons in peak hours and 2+ in the off peak. When pricing is implemented on two directional lanes (one more than current), the same users will be allowed toll exempt travel. Metro will encourage vanpools on the corridor by promoting them to employers through meetings and business coalitions. Metro will provide special training in vanpool etiquette to groups of commuters once they agree to participate, and offer a guaranteed ride home program to support instances where travelers may have to miss a trip.

In 1999, the California Legislature passed a bill that lowered the occupancy requirement on the I-10 El Monte Busway HOV lanes from 3+ to 2+, leading to a detrimental impact on corridor operations. With this reduction, morning peak period speed went from 65 down to 20 mph, HOV lane vehicle throughput decreased from 1,600 to 1,100 vph, and the total number of persons carried dropped from 5,900 to 5,200 per hour. The lead sponsor of the bill in the State Legislature, Hilda Solis, admitted that HOV-2+ was a failure six months after the change and co-sponsored another bill to revert the El Monte Busway back to the HOV-3+ rule during peak hours.

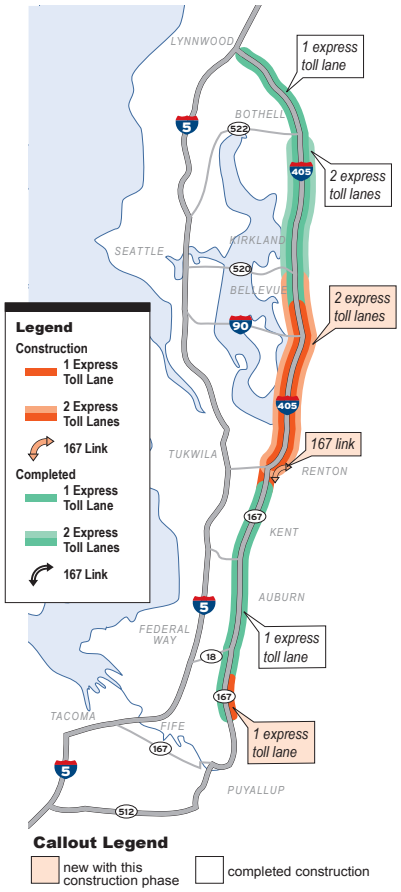
Phasing Recommendations—
Move forward with Phase I as a first step to a corridor-wide solution

Option 4 represents a corridor-wide approach to implementing the master plan vision. To optimize overall corridor performance through successive phases, WSDOT, along with the corridor and agency stakeholders comprising the EAG, should take a broader, more strategic approach to implementing the balance of improvements in Option 4. To that end, and in parallel with Phase 1 implementation, WSDOT should lead development of the following:

- **Constituent outreach.** The ERP found WSDOT highly engaged at all levels with public outreach efforts applied to date on the I-405/SR 167 corridor project. Indeed, there appear to be no other similar scale mega projects that have invested as heavily and effectively in broad and focused outreach efforts, including such forums as the EAG and thorough evaluation of options. Future phasing support for such a mega project will critically depend on maintaining strong constituent outreach and transparency through communication and corridor partnerships, and with the legislature.
- **Address regional policy for HOV degradation and migration to HOT3+.** The first challenge needing to be addressed in parallel with implementing Phase 1 is regaining HOV lane performance in the I-405 corridor. This need dovetails into other related requirements to raise, or step toward raising, minimum toll exempt usage to 3+ for Phase 1 to meet the financial viability objective.
- **A reassessment of delivery options enabled by current state legislation.** As evidenced from various other peer projects nationally, there may be other options with political support (such as public-private partnerships) for alternate ways of moving the rest of the project forward without as many phases.
- **A corridor-wide project management plan.** WSDOT has effectively delivered a range of improvements along the corridor to date on time and within budget, and the vision for moving forward makes sense and is sound. Looking ahead, if this complex project is to be accelerated, WSDOT needs to continue a strong project management focus, preferably involving the same legacy Project Team with the knowledge to most effectively deliver these improvements. A solid corridor management plan also helps assure bond holders of the project's integrity and soundness.
- **SR 167/I-405 Interchange.** Particular emphasis should be placed on the I-405/SR 167 interchange improvements as the next priority for moving forward beyond Phase 1. Efforts should be undertaken with the legislature to get this particular segment accelerated over the current timeline. A high priority needs to be assigned to right-of-way given the long timeline required. WSDOT should consider conducting a value engineering effort on the current interchange concept with the objective of identifying cost savings and improved benefits that support the phasing plan.
- **Risk management plan.** Beyond the technical aspects of this project, ahead lie an unknown number of constituency, operational and political challenges associated with both near term actions to the existing HOV lanes and longer term fortitude associated with the corridor vision. A risk management plan will help identify the known and unknown along with mitigating actions to help maintain both current momentum and critical support.
- **Master schedule.** The project needs a detailed schedule supported by an adopted and approved financial plan. Currently the project schedule primarily responds to funded projects and a desire to gain a track record on revenue before future bonding occurs. As a financial plan is further refined, a critical-path-based schedule should be developed to more closely track and monitor delivery performance against. This is an important tool required by FHWA for other mega projects, providing greater local constituent assurance that the project can be implemented.
- **A role for active traffic management.** Similar to recent and current bottleneck projects, some consideration should be given to modest reexamination of the project scope in continuing to address overall traffic management needs looking forward. Some of these strategies could help manage traffic during construction and preserve mobility over each successive stage of work. Such tools, already being tested elsewhere in the region on other routes, may include active traffic management ("smarter highways") improvements including variable speed and lane controls, incident management and related traffic and queue warning controls.

Chapter 5 FINANCING

Option 4, Phase 1—
Project Costs and Funding



COSTS:

I-405 Project Elements

• *SR 520 to I-5 Widening*	*$388 million*

SR 167 Project Elements

• *Stage 4 SB HOT Lane Extension*	*$82 million*
Total Cost	***$470 million***

FUNDING:

I-405 Funding	*$321 million*
SR 167 Funding	*$82 million*
Total Funding	*$403 million*
Funding Gap	*$ 67 Million*

Are the Eastside Corridor Express Tolling Study financial assumptions, methods, and forecasts valid?

ERP RESPONSE: The financial assumptions, methods, and forecasts are valid for this initial phase in developing a plan of finance for funding Study Option 4. Phase 1, which includes the improvements from Study Option 1, provides the necessary momentum and helps to fill the funding gap for future phases. An investment grade traffic and revenue study will be needed to produce a viable financial plan for a corridor-wide solution.

APPROACH

Independent Financial Review

Public Resources Advisory Group (PRAG) performed independent financial modeling using the assumptions in the feasibility analysis, and the modeling resulted in funding gaps consistent with the gaps identified in the I-405/SR 167 Corridor Express Toll Lanes Financial Feasibility Analysis. WSDOT provided the capital program expenditure schedules, gross revenues and operating and maintenance expenses to derive net revenues for Study Option 1 through Study Option 4, assuming 2015 opening for all segments in the corridor. The cash flows were modeled to determine bonding capacity with non-recourse bonds and State-backed triple pledge bonds, using current interest bonds and capital appreciation bonds over 30 years and targeting a minimum debt service coverage of 2.0 times. A range of net revenues – 40 percent and 100 percent – was assumed and the range of bonding capacity was similar to those in the financial feasibility analysis, resulting in funding gaps ranging up to $1 billion for Study Option 4 (at HOV 3+). The development of the model enabled PRAG to test the assumptions and determine the impact on bonding capacity if assumptions changed.

Initial Funding and Use of Toll Revenues

The State has available funding for Phase 1, which is estimated to cost $470 million. The funding includes $403 million from the 2003 and 2005 gas taxes and $67 million of savings within the corridor. In order to fund additional phases and ultimately fund Study Option 4, which is estimated to cost $1.95 billion, other funding sources will need to be identified. Revenues derived from express toll lanes in the I-405/SR-167 corridor can be leveraged to meet a significant portion of the funding gap. The bonding capacity will depend on the risk constraints of the State and on structuring security features acceptable

to the credit market to obtain financing for the project. To help develop a viable, feasible financing plan, the State's risk constraints with respect to toll revenue bonds (and specifically related to express toll lanes) need to be determined.

There is limited revenue history for express toll lanes nationally and locally. In 2009, when the feasibility analysis was conducted, only two other express toll lane projects had obtained financing with bonds secured by express toll lane revenues – SR 91 (Orange County, CA) and the Capital Beltway I-495 (Northern Virginia). Subsequently, two other projects have reached financial close – the North Tarrant Express (I-35W/I-820/SH 121/SH 183 corridor in Fort Worth, TX) in December 2009 and the LBJ Project (I-635 in Dallas, TX) in June 2010. However, of these facilities, only SR 91 has a lengthy history of operation and can provide significant revenue history and comparison of actual traffic and revenue to forecast.

With express toll lanes, there is potential for a higher degree of volatility in revenues when compared to revenue streams of other types of toll roads, which are themselves difficult to forecast. The uncertainty of the price a driver is willing to pay for travel time reliability results in more volatility in predicting revenue streams. Additionally, the small changes in speed within a system can impact driver behavior; influencing willingness to pay that can lead to greater unpredictability in forecasting. Given the inherent volatility of the revenues and limited history, it is prudent to use more conservative revenue and financing assumptions for this initial phase in developing a financial plan. Further, when it comes time to actually finance the project, credit analysts will apply more stringent stress tests to the revenue stream to determine what will result in sufficient toll revenues to meet debt service requirements.

Toll revenues can contribute significant funding, but based on comparable projects tolls alone are unlikely to fully fund the program. Using the available funding for Phase 1 will enable the State to start the initial work in building the corridor and allow for developing traffic and revenue history. An investment grade traffic and revenue study that will take into account Phase 1 and analyze phasing alternatives will be needed to determine how best to phase subsequent segments of the project to optimize revenue generation and thus, lead to a viable, feasible financial plan. In deciding how to implement the phasing beyond Phase 1, WSDOT can take into consideration the forecast from the traffic and revenue study and develop the phasing to optimize both financial performance and operational performance.

Operating express toll lanes optimally for both congestion relief and financing needs will require openness to new operational tools, design features, and policies. Financing needs may drive different application of operating policies than would be otherwise considered. To be able to develop a viable financial plan, HOT3+ will be needed to maximize toll revenues. Additionally, WSDOT should consider strategies like photo enforcement of tolling or a registration component, and 24/7 operations to maximize toll revenue and design considerations to minimize revenue leakage.

WSDOT's SR 167 HOT Lane Pilot Project was designed to help reduce traffic congestion and maintain free-flow traffic conditions in the HOT lane. Revenue generation is an added benefit. Nonetheless, revenue has gradually increased as drivers have grown more comfortable with tolling operations, the economy recovers, and transponder ownership within the region becomes more common.

Capital Costs

Project capital costs for each study option are those "most likely" costs (70 percent likelihood) determined during the cost-estimating validation process in June 2009. For this initial phase in planning, using this most likely scenario is reasonable. As the financing plan is developed, the estimated capital costs should be re-visited to account for any value engineering to reduce costs or any contingencies that may need to be added.

The capital costs were derived assuming independent construction start dates for each project within a study option, resulting in different completion dates from 2015 to 2020. However, for purposes of comparison of the study options and the potential funding gap, the financial feasibility analysis assumed construction schedules were shifted so that the completion date for all options is July 2015. The construction costs are based on year of expenditure dollars assuming the different completion dates and were not deflated for the assumed 2015 earlier opening. If the capital costs had been deflated for the assumed 2015 opening, then the funding gaps identified in the feasibility analysis would have been likely less. For this first phase of analysis, the assumed 2015 opening provides the general magnitude of the funding gap. If a phased approach is undertaken, a realistic phasing of the projects and associated capital costs will be needed to develop a viable financial plan.

Net Revenues

WSDOT's financial feasibility analysis assumed the toll revenue bonds would be secured by a net revenue pledge rather than a gross revenue pledge. Net revenues are derived by deducting operating and maintenance expenses and an allowance for uncollectible accounts from gross revenues. The net revenue pledge is generally considered stronger than a gross revenue pledge since credit analysts want to ensure the asset is being operated and maintained so it can generate revenues. For toll revenue bonds, a net revenue pledge is more standard.

Getting to Net Revenue: Gross revenue comes from traffic and dynamic toll rate assumptions by Wilbur Smith Associates. The traffic study was based on certain assumptions, including HOV 3+ vehicles using the express toll lanes toll free with the minimum toll of $1 when the facility opens and increasing with inflation and with no maximum toll. The estimated average toll per mile for the study options ranges from $0.40 to $0.74, based on a typical commute day with year 2020 conditions in 2008 dollars with average tolls ranging from $3.90 to $7.90 per trip. Study Option 4 has the highest average toll per mile of $0.74 and the highest average toll of $7.90 because based on the forecast, there is a greater demand for a longer system and there are longer average trip lengths as drivers choose to pay a toll for the benefit of a longer, quicker trip in the express toll lanes. In comparison:

- SR91 (CA) has a maximum toll per mile of $0.99 as of December 2009.
- Capital Beltway I-495 (VA) is projected to have an average toll per mile of $0.75 to $1.00 (2004 dollars during the peak periods).
- IH-635 LBJ (TX) and North Tarrant Express (TX) are projected to have an average toll rate per mile during the peak periods of $0.45.

In determining bonding capacity, a range of net revenue was used in WSDOT's financial feasibility analysis. The minimum amount of net revenue available for financing was assumed to be 40% of net revenue and the maximum amount was assumed to be 100% of net revenue. Given the inherent volatility of the revenue stream, it is reasonable to use a range of net revenue to determine a range of bonding capacity. Applying such sensitivity analysis is key at the planning level to understand the potential magnitude of the funding gap. Additionally, credit analysts will apply stress tests to the revenue stream, including assuming lower traffic moving onto the express toll lanes, lower toll rates and lower overall corridor growth.

Table 5-1 Bond Financing Assumptions

	Assumption	Comment
Maximum Final Maturity	• Non-Recourse: 30 years • Triple-Pledge GO: 30 years	• Constitutional limit for state G.O. debt. • Credit analysts indicate debt beyond 30 years for this asset class is much riskier. • 30-years is the maximum final maturity that should be assumed.
Interest Rate Assumption	• Non-Recourse: 9.0% CIBs/10.0% CABs • Triple-Pledge GO: 6.0% CIBs/6.5% CABs CIBs: Current Interest Bonds CABs: Capital Appreciation Bonds	• Recent private activity bonds issued for managed lanes priced with yields of about 7% to 7.25%. • Current interest rate for Washington G.O. 30-year debt is approximately 4.85% • Interest rates are near 40-year lows. • For planning purposes the interest rate assumptions in the feasibility analysis are reasonable.
All-in Cost of Issuance	• Non-Recourse: 2.5% of Par • Triple-Pledge GO: 1.2% of Par for CIBs 1.7% of Par for CABs	• Financing expenses generally higher for low investment grade toll revenue bonds than state GO bonds. • These assumptions provide ample cushion.
Capitalized Interest Period	• 1-year past project completion date	• This is a reasonable assumption.
Bond Insurance	• N/A	• Generally not cost-effective in the current market. • There are no triple-A insurers currently. • At the time bonds are issued use of insurance should be evaluated.
Debt Service Reserve Fund	• 10% of bond proceeds	• This level is standard for revenue bonds.
Revenue Pledged to Repayment	• Net toll revenues after O&M costs and credit card fees, plus interest earnings on revenue and reserve funds	• Net revenue pledge generally considered stronger than gross revenue pledge; asset must be operated and maintained to continue generating revenues
Debt Service Coverage	• 2.0x annual debt service	• Higher coverage required than standard toll roads given inherent volatility of revenues. • Recent managed lanes financed show debt service coverage of senior bonds in excess of 2.0x.
Earnings Rate on Invested Funds	• 2.5%	• Current 10-year US Treasury yield approximately 3.35%. • 10-Year U.S. Treasury yield has ranged from 2.39% to 3.99% during 2010. • This is a reasonable assumption.

Structure of Toll Revenue Bonds

WSDOT's financial feasibility analysis looked at two "bookend" sets of financing structures:

- State-Backed Triple-Pledge Bonds. Toll revenue bonds are secured by toll revenues, motor fuel taxes and general obligation pledge of the State. This structure results in the highest bond rating, Aa1/AA+/AA+, which is the general obligation bond rating of the State, and therefore, will provide the lowest cost of borrowing. However, the State has limited debt capacity.
- Non-recourse (Stand-Alone) Toll Revenue Bonds. Toll revenue bonds are secured solely by net toll revenues and would be structured to achieve minimum investment grade ratings. In this structure, if toll revenues were not sufficient to cover debt service, there would be no legal requirement for the State to step in and make any debt service payments. These bonds would not impact State debt capacity and would not be included in net tax-supported debt of the State. Without the backing of the State, the bonds will likely carry lower bond ratings and therefore, will have a higher cost of borrowing.

WSDOT's feasibility analysis assumed the two bond structures on an individual basis and assumed the bonds are issued as senior lien bonds. The financial plan can incorporate a multi-lien structure where bonds could be issued as subordinate bonds and therefore, increase bonding capacity. The subordinate bonds can be issued as non-recourse toll revenue bonds, which would likely be non-investment grade if the senior lien non-recourse toll revenue bonds were structured with minimum investment grade ratings. Alternatively, the financial plan can incorporate a combination of non-recourse toll revenue bonds and State-backed triple pledge bonds. The non-recourse toll revenue bonds can be structured as senior lien bonds, and the State-backed triple-pledge bonds can be structured as subordinate bonds (while still targeting debt service coverage ratios that the State would feel comfortable with).

Toll Bond Financing Assumptions

Based on the ERP review, overall, the financing assumptions used in structuring the toll revenue bonds are reasonable and appropriate in developing bonding capacity for planning purposes. **Table 5-1** lists the assumptions used to assess the bond financing options. Specific comments for each assumption are provided in the table with more discussion on key assumptions below.

Interest rate assumptions have a significant impact on bonding capacity: For example, if the non-recourse toll revenue bonds were priced in this current market with similar interest rate spreads as the two most recent bond financings for managed lanes (I-635 LBJ and North Tarrant Express), which priced in the 7.00 percent to 7.25 percent range, bonding capacity would increase by approximately $200 million for non-recourse toll revenue bonds. It is hard to predict where interest rates will be when these bonds will be issued. Given that tax-exempt rates are near 40 year lows, for planning purposes, the interest rate assumptions used in the financial feasibility analysis are reasonable.

Debt service coverage also impacts bonding capacity: When the bonds are ready to be issued, the State can discuss the debt service coverage level with the credit rating agencies and what they would seek for investment grade ratings. The coverage level required will likely be higher than the level required for other types of toll revenue bonds given the higher volatility with express toll lane revenues. The 2.00x coverage for senior lien bonds that is assumed in the financial feasibility analysis is reasonable, but a sensitivity analysis using 2.50x coverage would be worthwhile since the minimum coverage on I-635 LBJ and North Tarrant Express was approximately 2.50x. Based on PRAG's modeling, the bonding capacity would be about $160 million less with 2.50x debt service coverage on non-recourse toll revenue bonds.

Prior to beginning Phase 2, the Expert Review Panel recommends completing an investment grade traffic and revenue study

Leading up to implementation of a toll project, several levels of analysis are performed. Generally, the I-405/SR 167 Corridor Tolling Study is a Level 2 Preliminary Study; however, it includes several components from the Level 3 Investment Grade Study.

*The process usually begins with an **Initial Screening Process**, followed by:*

Level 1 – Sketch Level Study

- *Project screening with available data*

Level 2 – Preliminary Study

- *General toll traffic, revenue, and feasibility using existing models, new traffic data and census statistics*

Level 3 – Investment Grade Study

- *"Certified" revenue, used by bond rating agencies and investors to evaluate financial return on the project*
- *Existing travel demand models with adjustments*
- *New counts and speed/delay studies*
- *Origin-destination surveys*
- *Traveler surveys*
- *Independent economic review and adjustments*
- *Operational analysis and toll technology*
- *New travel demand forecasts including transit*
- *Sensitivity tests*

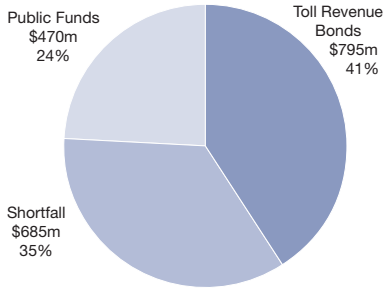
Final Steps – Project Finance and Implementation

With less conservative financing assumptions, WSDOT could achieve additional bonding capacity: As noted previously, WSDOT's financial feasibility analysis assumed only senior lien non-recourse bonds or senior lien State-backed triple pledge bonds. If a subordinate lien is added, additional bonding capacity can be generated. Based on PRAG's modeling and assumed interest rates 100 basis points over senior lien bonds, subordinate lien non-recourse toll revenue bonds with 1.50x debt service coverage could generate up to $240 million of additional bonding capacity for Study Option 4. With 1.75x debt service coverage on the State-backed triple pledge subordinate lien bonds, there is approximately $160 million of additional bonding capacity for Study Option 4 and with 1.50x coverage there is approximately $375 million of additional bonding capacity.

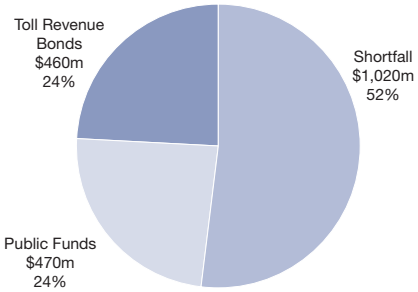
A reduction of the funding gap will involve further development of the financing structure and refinement of assumptions: Additionally, if Study Option 4 is developed with a phased approach, a realistic phasing of the project and associated capital costs would be needed to develop a financial plan. An investment grade traffic and revenue study that analyzes phasing options would be needed to determine how best to phase the segments of the project to optimize revenue generation and thus, lead to a viable, feasible financial plan. With the funding in place for Phase 1, it makes sense to use Phase 1 as a stepping-stone and provide the necessary momentum to help fill the funding gap for future phases.

An investment grade traffic and revenue study can more accurately forecast revenue for future phases beyond Phase 1: In deciding how to implement the phasing beyond Phase 1, WSDOT can take into consideration the forecast from the traffic and revenue study and develop the phasing to optimize both financial performance and operational performance. The traffic and revenue experience from Phase 1 can potentially be beneficial for future phasing. However, although credit analysts judge projects with operational history to generally have reduced risk, given the inherent volatility of express toll lanes, the behavior of drivers on the Phase 1 segment may not correlate perfectly with the behavior on other segments. The degree to which operational history could help validate the traffic and revenue forecast for the remaining segments (i.e. how similar is driver behavior in the Phase 1 segment to driver behavior in the corridor) can be addressed in the investment grade traffic and revenue study.

Figure 5-1 Example of Potential I-405/SR 167 Corridor Funding



Study Option 4 ($1.95 billion), Non-recourse toll revenue bonds, HOT3+, 100% of net revenues



Study Option 4 ($1.95 billion), Non-recourse toll revenue bonds, HOT3+, 40% of net revenues

Considerations for Feasible Financial Planning

Financing Recommendations: Toll revenue can contribute a significant portion of the funding for Study Option 4, but toll revenues alone are unlikely to fully fund the program. In addition, the impact on overall State debt capacity and evolving debt policy regarding toll revenue bonds will be a factor in how much toll revenues can be leveraged. Other potential funding sources, including state, local and federal sources need to be identified, and other financing tools need to be explored to fill the funding gap and develop a feasible financial plan.

The charts in **Figure 5-1** show the possible range of the funding gap for Study Option 4 based on non-recourse toll revenue bonds, HOT3+ and a range of net revenues. Under these scenarios, the funding gap ranges from $685 million to about $1 billion. **Figure 5-1** shows graphs of the two funding scenarios.

To fill the funding gap, consideration should be given to all available financing options, including:

- Federal credit assistance programs, such as a Transportation Infrastructure Finance and Innovation Act (TIFIA) loan that provides very favorable and flexible repayment terms,
- GARVEE (Grant Anticipation Revenue Vehicles) Bonds, which are bonds secured by federal highway reimbursements received by the State,
- Build America Bonds (if reauthorized after 2010), which are taxable bonds, and the Federal government currently provides a 35 percent subsidy on the interest on the bonds,
- Public-Public Partnerships, involving another public entity that is able to provide funding from a dedicated revenue stream, such as revenues from an incremental sales tax, a special assessment tax or any motor vehicle-related tax,
- Public-Private Partnerships, see Public-Private Partnership Primer (page 36) and Examples (Appendix I).

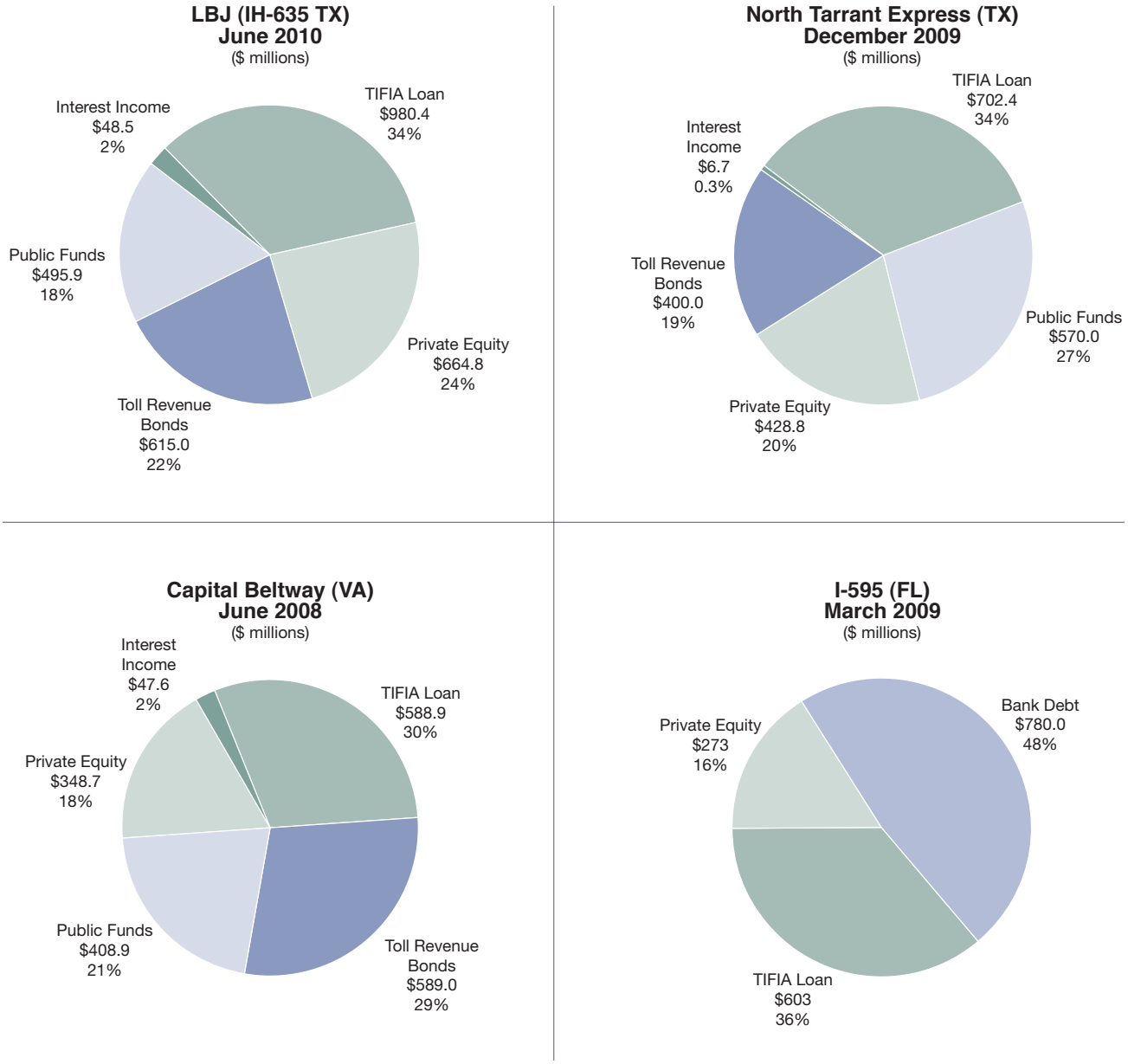
Consideration of the funding mosaic: Consideration should be given to funding models used successfully to finance other national mega projects, especially in today's stressed credit markets. Funding mosaics including toll concession, combinations of toll revenue and availability payments, and partnerships with other funding entities, both public and private, have been shown to be viable.

Consideration of public-private partnerships: Four managed lanes projects have reached financial close in the last three years through public-private partnerships. In three of these cases (I-635 LBJ, North Tarrant Express and Capital Beltway), the projects were financed with toll revenues bonds, but toll revenues were not sufficient to completely fund the project. These projects also required a contribution of public funds along with private equity and a TIFIA loan. The financial plan for the fourth project, I-595, which also included

private equity and a TIFIA loan, was structured with availability payments requiring annual public contributions based on performance standards of the facility. **Figure 5-2** shows the sources of financing for four U.S.-based managed lane projects supported by Public-Private Partnerships.

Public-private partnerships can offer benefits to the public sector, including upfront private equity to help fill the funding gap and the transfer of certain risks, including construction and completion risk and revenue risk, from the public sector to the private partner. Further, the upfront private equity can potentially relieve the pressure for the need for State-backed triple-pledge bonds. Public-private partnership is a financing option to consider. However, a full evaluation of the benefits and risks and a comparison to a traditional public sector financing should be undertaken before any decisions are made to proceed with such an option.

*Figure 5-2 Distribution of Financing for Projects Supported by Public-Private Partnerships**



** Includes all financing related costs*

- *Considerations for Operations to Maximize Revenues.* Operating express toll lanes optimally for both congestion relief and financing needs will require openness to new operational tools, design features, and policies. Financing needs may drive different application of operating policies than would be otherwise considered. WSDOT should consider strategies like photo enforcement of tolling, carpool registration, and 24/7 operations to maximize toll revenue, along with design considerations to minimize revenue leakage. Additionally, to help develop a viable financial plan, HOT 3+ would be needed to maximize toll revenues.
- *HOT3+ results in smaller funding gap.* With HOT 3+, for Study Option 4, non-recourse toll revenue bonding capacity is estimated to range from $460 million to $795 million, resulting in a funding gap of approximately $685 million to $1.02 billion. In comparison, with HOT 2+, for Study Option 4, non-recourse toll revenue bonding capacity is estimated to range from $310 million to $545 million, resulting in a larger funding gap to fill, ranging from approximately $940 million to $1.2 billion.

Long-Term Concessions for Mega Projects with Public-Private Partnerships

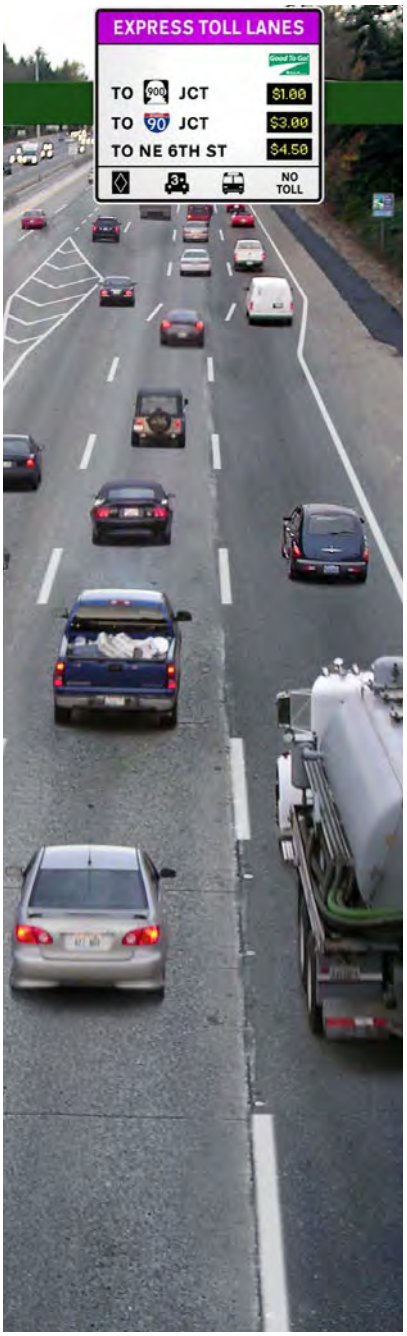
Large-scale second-generation managed lanes projects are inherently mega projects. By the nature of their size and scope, transportation mega projects involve significant risks. To reduce these risks to taxpayers and the public sector, a public-private partnership (PPP) model can shift commercial-type risks – such as cost overruns, late completion, and traffic and revenue risk – to investors willing to take on such risks in exchange for a long-term contractual agreement to be responsible for design, finance, construction, operations, and maintenance.

Under the long-term concession approach, the private sector team is responsible for the project's long-term viability, so its design approach will seek to minimize life-cycle costs, not just initial cost. If the project is toll-financed, the PPP team will also have strong incentives to make design and construction decisions that facilitate on-time completion (so toll revenues begin flowing), minimize non-essential costs, and maximize revenues (within the constraints set by the public sector).

Concerns are often expressed that PPP concessions cannot be good for the public sector, since the financing costs of a PPP mega project are significantly higher than that of the same project if financed and developed by the public sector. PPP concessions are financed based on a mix of equity and debt with equity typically providing between 15 and 30 percent of financing. To help reduce the cost of debt, Congress authorized the issuance of up to $15 billion of tax-exempt bonds for PPP-type projects, reducing the interest rate differential, and created a credit program that provides low-interest, taxable subordinated debt for revenue-based transportation projects (TIFIA).

What public interest justifies allowing equity providers a double-digit return on that portion of the mega project's financing? One key consideration is risk transfer, which is widely accepted in Australia, Canada, and the United Kingdom. The equity return is the hoped-for reward that equity providers seek in exchange for providing an upfront contribution and taking on construction risk, completion risk, and traffic and revenue risk. There is also evidence that PPP concessions can generate greater up-front capital than the traditional all-debt municipal revenue bond model due to less-conservative debt coverage ratios, different investor classes, acceptance of greater risk on toll performance, and the value placed on accelerated depreciation. Another key consideration is the potential ability to accelerate the project with the private equity contribution providing additional funding, rather than waiting until sufficient funding is in place to proceed with the project.

Chapter 6
RECOMMENDATIONS



Given the critical importance of the I-405/SR 167 corridor to the economic vitality and quality of life in the Puget Sound region of Washington State, the ERP has identified a series of steps for advancing the corridor improvements. Suggested timelines are based on the published date of the ERP report:

1. **Move forward with the funded Phase 1 project (6 months)** WSDOT should seek legislative approval for tolling the Phase 1 project and continue the delivery momentum to address congestion in the corridor. Continued development work in the corridor will leverage Phase 1 for delivery of future phases.

2. **Address regional policy for HOV degradation and migration to HOT 3+ (6 months)** The first challenge needing to be addressed in parallel with implementing Phase 1 is regaining HOV lane performance in the I-405 corridor. This need dovetails into other related requirements to move toward raising minimum toll exempt occupancy use to 3+ for Phase 1 to meet the goal of financial viability.

3. **Seek FHWA tolling approval for corridor (6 months)** WSDOT should pursue approval from FHWA for tolling the I-405/SR 167 corridor. This approval is standard for pricing projects on federal aid highways.

4. **Continue authorization of tolls on the SR 167 HOT Lanes Pilot Project (1 year)** The SR 167 HOT Lanes Pilot Project continues to achieve its purpose. The goal of the pilot project is to demonstrate that variable tolling can make better use of the HOV lanes and improve traffic flow in the corridor without affecting service for carpools and buses. With a primary goal of optimizing performance, the project has produced measurable performance improvements, and ridership and revenue to offset operation costs continues to grow. Authorization to continue tolling for this project should be sought from the legislature.

5. **Continue developing the components comprising a mega project (project management plan, risk management plan, master schedule, phasing plan, and financial plan). Maintain momentum with the legacy Project Team. (1 year)**
WSDOT needs to maintain a strong project management focus through development of a project management plan, preferably involving the same legacy Project Team with the knowledge to most effectively deliver these improvements. Beyond the technical aspects of this project, ahead lie an unknown number of constituency, operational and political risks associated with both near term actions regarding the existing HOV lanes and longer term fortitude associated with the corridor vision. A risk management plan helps identify the known and unknown factors along with mitigating actions to help maintain both current momentum and critical support. Finally, a detailed schedule is needed that is supported by an adopted and approved financial plan for the project.

6. **Leverage completed environmental documents by augmenting existing EAs to reflect managed lane/toll scenarios.**
Longer timelines are often associated with complex mega projects where funding lags the planning and consensus building process. Specific updates to the existing approved environmental documents may be necessary to reflect the managed lane/toll scenarios. Operational changes such as tolling may require supplementing the original environmental documentation to address issues specific to the adopted operating principals. Based on the tentative schedule outlined, this updated documentation would augment the current EAs providing additional information prior to implementing each project. For the NE 6th Street to I-5/Lynnwood Project, the state should include an analysis to better define effects to transit, freight, and local streets.

7. **Address operating policies and design elements that support financing requirements (1 year)**
Operating express toll lanes optimally for both congestion relief and financing needs will require openness to new operational tools, design features, and policies. Financing needs may drive different application of operating policies than would be otherwise considered. WSDOT should consider strategies like photo enforcement of tolling, carpool registration, and 24/7 operations to maximize toll revenue, along with design considerations to minimize revenue leakage. Additionally, to help develop a viable financial plan, HOT 3+ will be needed if the goal is to maximize toll revenues for continued corridor improvements. If any interim steps are considered to migrate from the existing HOV2+ to HOT3+ then the Project Team will need to evaluate associated traffic and revenue impacts, capital costs, and operations/maintenance costs.

8. **Make the I-405/SR 167 interchange a higher priority by mobilizing critical path items like ROW and value engineering (2 years)**
Particular emphasis should be placed on the SR 167/I-405 interchange improvements as the next priority for moving forward beyond Phase 1. Efforts should be undertaken with the legislature to accelerate this particular segment over the current timeline. A high priority needs to be assigned to right-of-way given the long timeline required. WSDOT should conduct a value engineering effort on the current interchange concept with the objective of identifying cost savings and improved benefits that support overall forecast demand and phasing.

9. **Address the funding gap through financing, user fees and delivery options as part of the financing and phasing plan (2 years)**
As evidenced from various other peer projects nationally, options may exist with political support to consider alternate ways of moving forward that may allow for the balance of the project to be implemented without as many phases.

10. **Complete an investment grade traffic and revenue study (2 years)**
An investment grade traffic and revenue study based on the appropriate phasing will be needed to refine the toll revenue bonding capacity. The mix of non-recourse toll revenue bonds and State-backed triple pledge bonds will need to be reviewed. The optimal mix of senior lien and subordinate lien toll revenue bonds will need to be analyzed and will depend on the mix of non-recourse toll revenue bonds and State-backed triple pledge bonds. Further, since it is likely that a funding gap will exist for Study Option 4, WSDOT will need to start exploring other potential funding sources and consider the use of other financing tools, including those funding models that have been successful for express toll lane mega projects in other states.

The proposed express toll lane concept is a viable and appropriate strategy for improving mobility on the I-405/SR 167 corridor.

The ERP found that WSDOT and partnering agencies have a comprehensive understanding of the purpose and need and associated policies, and they have generated a solution that meets these objectives, fitting within the context of the I-405/SR 167 corridor master plan and record of decision. Implementing this ambitious plan given the corridor complexities and scale of investment represents the next steps for WSDOT's Project Team. The ERP workshops and deliberations have helped inform the EAG and Project Team to the challenges that lie ahead. The ERP outlined a series of recommendations that can help assure successful completion of this project and generate the anticipated benefits in a timely manner. Members of the ERP gained much insight into the conduct and collaborative spirit found among Project Team and EAG members, and sincerely appreciate the opportunity to have shared participation in this landmark endeavor.

Vision for Future Express Toll Lane System

Active Traffic Management: Smarter highways, or active traffic management technology, or ATM, as it is called in the industry, dynamically controls traffic based on real-time roadway conditions. Using integrated systems and a coordinated response, both everyday and incident-related congestion can be managed to improve roadway safety and traffic flows.

Design-Build (D-B) Method: A method of project delivery in which the agency executes a single contract with one entity (the design-builder) for design and construction services to provide a finished product.

Differential Pricing (Variable Pricing): Time-of-day pricing and tolls that vary by factors like facility location, season, day-of-week, or air quality impact.

Dynamic Pricing: Tolls that vary in real time in response to changing congestion levels, as opposed to variable pricing that typically follows a fixed schedule.

Eastside Corridor: The combined corridor formed by I-405 and SR 167 that forms the basis of the 40+ mile express toll lane system. When SR 512 is included to the south, the Eastside Corridor forms a 50+ mile north/south bypass to I-5.

Eastside Corridor Tolling Study (also referred to as the I-405/SR 167 Tolling Study): As directed by the Legislature, the Tolling Study summarizes WSDOT's approach and findings for a phased implementation plan on the I-405/SR 167 Corridor. Recommends an implementation strategy (Option 4) building a 40+ mile system, which was selected from five different options for the corridor.

Environmental review: Consists of the range of proposed activities, alternatives, and impacts to be analyzed in an environmental document, in accordance with National and State Environmental Policy Act (NEPA/SEPA) goals and policies. The I-405 Corridor planning includes a programmatic environmental impact statement (EIS) followed by project-specific environmental assessments (EA) for each funded project.

Executive Advisory Group (EAG): Comprised of elected officials (legislators, mayors, city and county council members), and representatives from the Washington State Transportation Commission, the Puget Sound Regional Council (PSRC), and local transit agencies. When the Washington State Legislature directed WSDOT to perform a traffic and revenue study for tolling the I-405/SR 167 Corridor, the directive included engaging these corridor-wide elected officials. Members included as many original members of the I-405 Corridor Executive Committee as still held their relative positions.

Expert Review Panel (ERP): WSDOT's Secretary of Transportation convened a five-person panel to assess the findings from the I-405/SR 167 Eastside Corridor Tolling Study, discuss how the findings fit into regional and national express toll lane experience and trends, and determine if the assumptions from the financial analysis were consistent with national industry practices.

Express Toll Lanes: Open to travelers who pay a toll to use the lanes, and may offer exemptions to transit and carpools.

Express Lanes: A lane or set of lanes physically separated from the general-purpose lanes within major roadway corridors. Express lane access is managed by limiting the number of entrance and exit points to the facility. Express lanes may be operated as reversible flow facilities or bi-directional facilities.

First-Generation Managed Lanes: The design and operational characteristics of these earliest lane-pricing demonstration projects nationwide are relatively simple, basically converting single HOV lanes to HOT lanes. The principal objective of these projects is to optimize the performance of an existing HOV lane by selling the excess capacity to lower occupant vehicles, and to minimize over-use by pricing lower occupancy vehicles. Since these were lane conversions, the associated capital costs were relatively low, in comparison to adding a lane of roadway capacity. Whether

Glossary cont.

categorized as HOT or express toll lanes, all of these projects allow for toll exemption for transit, and exemptions or discounted use by carpools.

High-Occupancy Toll Lanes (HOT lanes): Managed, limited-access, and sometimes barrier-separated highway lanes that provide free or reduced cost access to transit and HOVs, and also make excess capacity available to other vehicles not meeting occupancy requirements at a market price.

High-Occupancy Vehicle (HOV): A passenger vehicle carrying more than a specified minimum number of passengers, such as an automobile carrying more than one or two people (2+, 3+). HOVs include carpools and vanpools, as well as buses.

HOV Lane: An exclusive traffic lane or facility limited to carrying HOVs and certain other qualified vehicles.

Interagency Working Group: Comprised of technical and policy staff from corridor cities, and staff from federal, state, and local agencies. The IWG provided technical input on the I-405/SR 167 Eastside Corridor Tolling Study.

Lane Management Tools:

- Access—Limiting or metering vehicle ingress to the lane or spacing access so that demand cannot overwhelm managed lane capacity. See also Limited Access.
- Eligibility—Limiting lane use to specific types of users, such as HOVs, motorcycles, low emission vehicles, or trucks. For most typical managed lane settings, eligibility requirements would be used during selected hours or at specific access ramps.
- Pricing—Imposing a user fee on a lane that helps regulate demand by time of day or day of week. The fee increases during periods of highest demand.

Level-of-Service (LOS)]: Also known as "Traffic Service," LOS is a qualitative measure describing operational conditions within a traffic stream. LOS assesses conditions in terms of speed and travel time, freedom to maneuver, traffic interruptions, comfort and convenience, and safety. Six levels of service are defined by letter designations from A to F, with LOS A representing the best operating conditions and LOS F the worst.

Limited Access: Access management used to restrict entry to a facility based upon facility congestion levels or operational condition, such as the presence of an accident or maintenance activities. Access may be restricted by 1) metering signals, or 2) limiting the number of entrances and exits. Some restricted access lanes include HOV priority.

Managed Lane: A lane or lanes designed and operated to achieve stated goals by managing access via user group, pricing, or other criteria. A managed lane facility typically provides improved travel conditions to eligible users.

Mega project: Projects typically costing $500 million or more.

Mileage-Based Fee: A vehicular toll based on the vehicle miles traveled (VMT) in the jurisdiction.

Non-Recourse Bonds: In the event of default, the bond holder has no recourse to other governmental assets or revenues. In this structure, if toll revenues were not sufficient to cover debt service, there would be no legal requirement for the state to step in and make any debt service payments. These bonds would not impact state debt capacity and would not be included in net tax-supported debt of the state. Without the backing of the state, the bonds will likely carry lower bond ratings and therefore, will have a higher cost of borrowing.

Phase 1: Phase 1 is the first step to implement Option 4 from the I-405/SR 167 Eastside Corridor Tolling Study. It is fully funded, including $403 million from the 2003 and 2005 gas taxes, and $67 million of savings from within the corridor.

Phase 2: Phase 2 is the second step to implement Option 4 from the I-405/SR 167 Eastside Corridor Tolling

Study. Study Option 4 creates a continuous express toll lanes system from the Pierce/King County line on SR 167 to the I-405/I-5 interchange in Lynnwood. Phase 2 completes the 40+ mile system from Bellevue to the south. Funding for Phase 2 will come from leveraging toll revenue from Phase 1 to meet a portion of the funding gap for the Phase 2 corridor system.

Second-Generation Managed Lanes: These next-generation projects have two distinguishing characteristics:

a) They add substantial capacity, often providing multiple lanes in each direction. This is usually accomplished by the addition of express toll lanes coupled with pricing existing HOV lanes as HOT lanes.

b) They are large projects, frequently being called corridor-system mega projects because of the financial scale involved.

For these reasons most second generation managed lane projects require solid financial plans and delivery approaches targeting finance as the primary objective. The amount of toll exempt capacity available to HOVs is limited so that the majority of trips in the lanes generate needed revenue for construction.

Single Occupant Vehicle (SOV): A vehicle occupied by only one person.

State-Backed Triple Pledge Bonds: Also referred to as triple-pledge bonds, place the risk of paying the bonds back with the state. By backing the bonds not only with toll revenues, but also with fuel taxes, and the full faith and credit of the State of Washington, the I-405/SR 167 Eastside Corridor Program would receive more favorable borrowing terms, including lower interest rates, than if issuing non-recourse bonds. This structure would result in the highest bond rating, Aa1/AA+/AA+, which is the general obligation bond rating of the state, and therefore, would provide the lowest cost of borrowing. However, the state has limited debt capacity.

SR 167 HOT Lanes Pilot Project: WSDOT opened the SR 167 High Occupancy Toll Lanes Pilot Project in May 2008, allowing free use of the HOT lanes to 2+ HOVs and transit. Since then, more people and cars are moving efficiently during the peak period commutes. Volumes are up in the general purpose lanes and HOT lanes, while speeds have increased or stayed the same. The average number of daily tolled trips continues to increase – for example, in April 2010 there was an average of 2,150 tolled trips, up from 1,710 in April 2009.

Study Option 4: Based on their review of study findings and public input, the EAG expressed support for a robust express toll lane system as demonstrated in Study Option 4. Study Option 4 creates a continuous express toll lanes system from the Pierce/King County line on SR 167 to the I-405/I-5 interchange in Lynnwood. Study Option 4 includes two I-405 express toll lanes between the SR 167/I-405 interchange and SR 522 with a single express toll lane between SR 522 and I-5.

Transponder: An electronic tag mounted on a license plate, built into a vehicle, or placed on the dashboard. The tag is read electronically by an electronic tolling device that automatically assesses the amount of the user fee.

Transportation Demand Management (TDM): Actions that improve transportation system efficiency by altering system demand using such strategies and facilities as: pricing, ridesharing; park-and-ride facilities; transit friendly development/zoning; and employer-based programs, such as staggered work hours and telecommuting. TDM programs improve the efficiency of existing facilities by changing demand patterns rather than embarking on capital improvements.

Value Pricing: A concept that uses monetary incentives to manage congestion during peak travel periods on tolled highways and crossing facilities.

Vehicle Miles Traveled (VMT): The measurement of the total miles traveled by all vehicles in a specified area during a specified time.

EA – Environmental Assessment. An assessment of the possible positive or negative impact that a proposed project may have on the environment, together consisting of the natural, social and economic aspects.

EAG – Executive Advisory Group.

ERP – Expert Review Panel.

FHWA – Federal Highways Administration. Part of the U.S. Department of Transportation and headquartered in Washington, D.C., with field offices across the United States. FHWA is charged with the broad responsibility of ensuring that America's roads and highways continue to be the safest and most technologically up-to-date.

GARVEE – Grant Anticipation Revenue Vehicles Bonds. Debt financing instrument. GARVEEs can be issued by a state, a political subdivision of a state, or a public authority. States can receive Federal-aid reimbursements for a wide array of debt-related costs incurred in connection with an eligible debt financing instrument, such as a bond, note, certificate, mortgage, or lease. Reimbursable debt-related costs include interest payments, retirement of principal, and any other cost incidental to the sale of an eligible debt instrument.

HOV – High occupancy vehicle.

HOV2+ – HOV policy requiring 2 or more people in the vehicle

HOV3+ – HOV policy requiring 3 or more people in the vehicle

HOT – High occupancy toll.

HOT3+ – express toll lane with toll discounts or exemptions for HOV3+ vehicles

IWG – Interagency Working Group.

LRP – Long range plan.

MOE – Measures of Effectiveness. Quantitative measures that give insight into how effectively a system is performing.

PPP (P3) – Public / Private Partnership. Describes a government service or private business venture, which is funded and operated through a partnership of government and one or more private sector companies; involving another public entity that is able to provide funding from a dedicated revenue stream, such as revenues from an incremental sales tax, a special assessment tax or any motor vehicle-related tax.

PRAG – Public Resources Advisory Group. An independent financial and investment advisory firm headquartered in New York City. Since the firm's founding in 1985, it has advised on over $618 billion of financings for a variety of state and local governments, authorities, agencies, and not-for-profit entities.

PSRC – Puget Sound Regional Council. Assists in planning for regional transportation, land use and economic development, under authority embodied in state and federal laws.

ROW – Right of way. A strip of land granted for a transportation facility.

SAFETEA-LU – Safe, Accountable, Flexible, Efficient Transportation Equity Act. A funding and authorization bill that governs United States federal surface transportation spending. The $286.4 billion measure contains a host of provisions and earmarks intended to improve and maintain the surface transportation infrastructure in the United States, including the interstate highway system, transit systems around the country, bicycling and pedestrian facilities, and freight rail operations.

TIFIA – Transportation Infrastructure Finance and Innovation Act. Federal credit program for eligible transportation projects of national or regional significance under which the U.S. Department of Transportation may provide three forms of credit assistance – secured (direct) loans, loan guarantees, and standby lines of credit.

TTI – Texas Transportation Institute of the Texas A&M University System in Austin. Its mission is to solve transportation problems through research, to transfer technology, and to develop diverse human resources to meet the transportation challenges of tomorrow.

How Do I Get More Information?

The complete Expert Review Panel report and all report appendices are on the WSDOT website at: ***http://www.wsdot.wa.gov/Tolling/EastsideCorridor/Library.htm.***

You may also contact:
Ginger Goodin
Texas Transportation Institute
Expert Review Panel Chair
G-goodin@tamu.edu

Alternative Formats: Persons with disabilities may request alternative formats – large print, Braille, cassette tape, or computer disk. Please call the WSDOT ADA Accommodation Hotline at 206-389-2839. Persons with hearing impairments may access the Washington State Telecommunications Relay Service at 711.

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