



CITY OF KIRKLAND
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To: Dave Ramsay, City Manager

From: Daryl Grigsby, Public Works Director
David Godfrey, P.E., Transportation Engineering Manager

Date: October 9, 2008

Subject: COMMENT LETTER ON SR 520 EASTSIDE TRANSIT AND HOV PROJECT

RECOMMENDATION:

It is recommended that the Council authorize the Mayor to sign the attached comment letter regarding the scoping of the environmental process for the SR 520 eastside transit and HOV project. WSDOT staff plan to give a presentation on the project at the Council meeting.

BACKGROUND DISCUSSION:

The SR 520 program has been broken into several sub projects as shown below.

The SR 520 Corridor Program will replace the Portage Bay and Evergreen Point bridges and improve existing roadway between I-5 in Seattle and SR 202 on the Eastside.

The SR 520 Corridor Program includes four projects:

- Urban Partnership – congestion management tolling from I-5 to I-405.
- Eastside Transit and HOV – Evergreen Point Road to SR 202.
- Pontoon Construction Project – pontoons for catastrophic failure planning.
- Bridge Replacement and HOV Project – I-5 to the vicinity of Evergreen Point Road.



Source: WSDOT

Program area map.

Environmental scoping is now under way for the Eastside Transit and HOV Project. WSDOT is soliciting comments from agencies and Tribes primarily on the nature and scope of the environmental process but this also provides an opportunity to comment on the project in general. The Eastside Transit and HOV project is essentially the eastern piece of what was formerly known as the SR 520 Bridge Replacement and HOV project.

During the summer of 2007, a charette process was conducted with Eastside Mayors and staff. This process was designed to narrow the range of options in the environmental process for the major bridge replacement project. It was a productive process that resulted in consensus on a number of design issues. In September of 2007 WSDOT staff briefed the Council on these decisions and Council was supportive of what had been agreed upon. Most of the pieces of the project that were agreed to in 2007 make up the Eastside Transit and HOV project. The map below indicates major pieces of construction in the project.



Source: WSDOT

Not shown on the map is the reconstruction of the interchange at Lake Washington Boulevard and SR 520. Again, the rebuild that is planned is consistent with the one that was agreed to last summer.

The bicycle facilities being proposed in the Eastside HOV and Transit project are different than those considered during the summer of 2007. Earlier proposals extended the facilities all the way to the west end of the existing SR 520 trail. The current project brings facilities across Lake Washington Boulevard; a substantial improvement over earlier plans to drop them at Points Drive, but not the full treatment contemplated earlier.

Public Works' Stormwater group has been in contact with the WSDOT team and has some concerns that Kirkland might be asked to maintain additional facilities or that proposed discharges to the lake may not be appropriate.

Memorandum to Dave Ramsay

October 9, 2008

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The Eastside project is being split from the larger bridge project partly in response to legislation passed this spring which required the WSDOT to examine "near-term, low-cost enhancements which relocate the HOV lanes to the inside of the alignment". After evaluating several alternatives, WSDOT found that the combination of projects being proposed was the best way to get the HOV lanes on the inside of the freeway.

Three attachments to this memo have additional background information on the project. The first attachment is a presentation that was given at the Agency Scoping Meeting. It gives an overview of the project including information about scheduling, purpose, needs and benefits. The second attachment is a report that was transmitted to the Joint Transportation Commission of the State Legislature giving a more detailed explanation of the project. The third attachment is a much more detailed technical report that is a companion to the Joint Transportation Commission report.

SR 520 Eastside Transit and HOV Project

Agency and Tribal Scoping Meeting

Ron Paananen, P.E.
Deputy Administrator
Urban Corridors Office

Julie Meredith, P.E.
Program Director
SR 520 Project

Paula Hammond, P.E.
Secretary of Transportation

Dave Dye, P.E.
Deputy Secretary

Seattle, WA
October 2, 2008

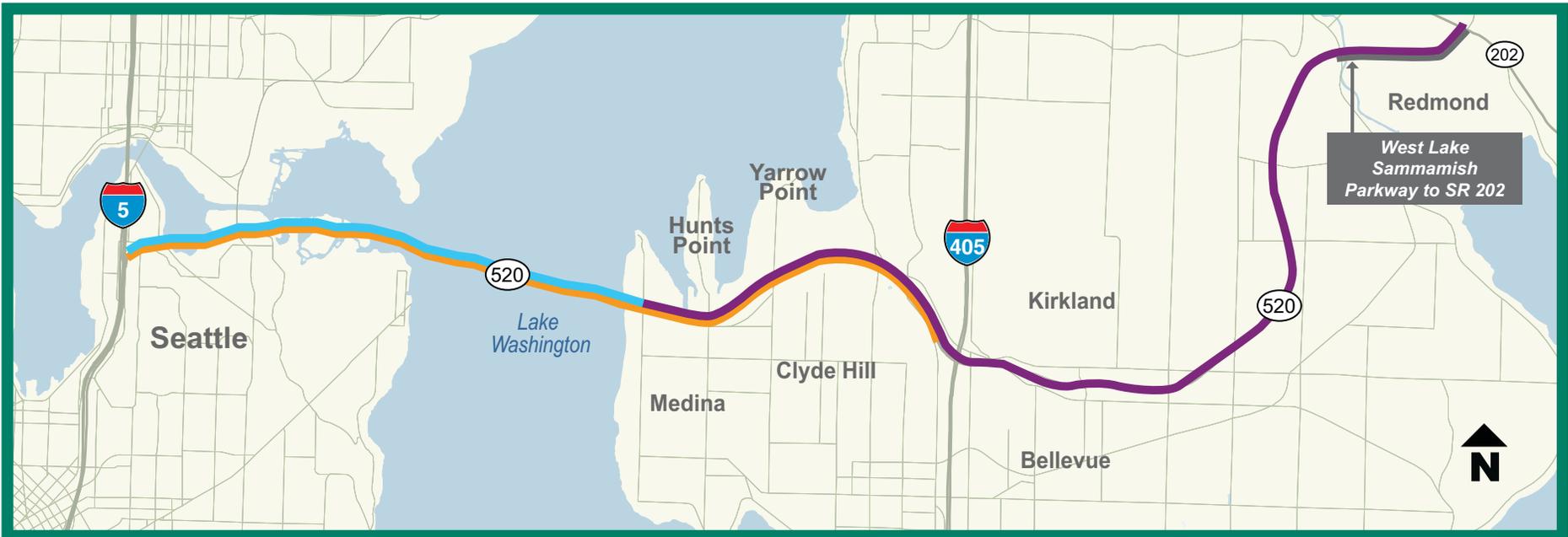


Program Description

The SR 520 Corridor Program will replace the Portage Bay and Evergreen Point bridges and improve existing roadway between I-5 in Seattle and SR 202 on the Eastside.

The SR 520 Corridor Program includes four projects:

- Urban Partnership** – congestion management tolling from I-5 to I-405.
- Eastside Transit and HOV** – Evergreen Point Road to SR 202.
- Pontoon Construction Project** – pontoons for catastrophic failure planning.
- Bridge Replacement and HOV Project** – I-5 to the vicinity of Evergreen Point Road.



Program area map.

Four Environmental Processes

Urban Partnership Environmental Assessment – study effects of tolling on SR 520 for congestion management.

Eastside Transit and HOV Project Environmental Assessment – evaluate improvements for transit and HOV from the vicinity of Evergreen Point Road to one mile beyond SR 202.

Pontoon Construction Project Draft EIS – evaluate options to expedite construction of pontoons to be used to restore the floating section of the SR 520 Evergreen Point Bridge in the event of a catastrophic failure, and to construct and store these pontoons until needed.

Bridge Replacement and HOV Project Supplemental DEIS – study new alternatives for the SR 520 west side interchange; construction techniques, staging and durations; and mitigation.



Project Purpose

The purpose of the Eastside Transit and HOV Project is to:

- Reduce transit and HOV travel times.
- Enhance travel time reliability, mobility and access for transit and HOVs.
- Support transit demand and planned service improvements.
- Improve traffic safety in the SR 520 corridor.
- Support current and planned growth east of Lake Washington.



Project Need: Support Eastside Growth

- Bellevue, Kirkland and Redmond are rapidly growing communities.
- Employment in Bellevue, Redmond and Kirkland is expected to increase by 90,000 jobs between 2000 and 2030.
- Major developments are planned along the SR 520 corridor. An additional 10,000 households and 12.5 million square feet of office/retail space are projected.

Rapid Growth in Eastside Communities

Population

| City | Population 2007 | Projected Population 2030 | Projected Change |
|----------|-----------------|---------------------------|------------------|
| Bellevue | 118,100 | 129,315 | +9.5% |
| Kirkland | 47,890 | 58,287 | +21.7% |
| Redmond | 50,680 | 58,000 | +14.4% |

Source: Local comprehensive plans

Employment

| City | Jobs 2000 | Job Targets 2022 | Projected Change |
|----------|-----------|------------------|------------------|
| Bellevue | 118,690 | 170,000 | +43.2% |
| Kirkland | 34,003 | 41,184 | +21.1% |
| Redmond | 72,919 | 106,000 | +45.4% |

Source: Puget Sound Regional Council



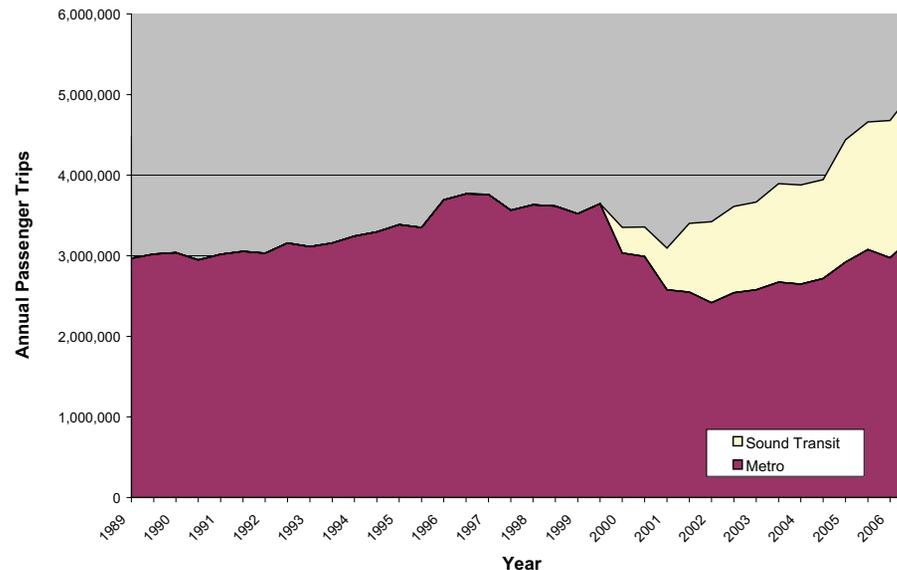
Eastside construction

Project Need: Support Increased Transit Demand

Transit use continues to increase on the Eastside:

- Since 2000, transit use has increased by 30 percent on the Eastside and by over 50 percent overall across SR 520.
- Transit routes on SR 520 carried 2.5 million more passengers per year in 2007 than 2001.
- Transit ridership is projected to increase by 35 percent due to potential tolling on the SR 520 bridge.
- Businesses are implementing private transit service to meet growing employee demand.

Ridership on SR 520



Source: King County Metro

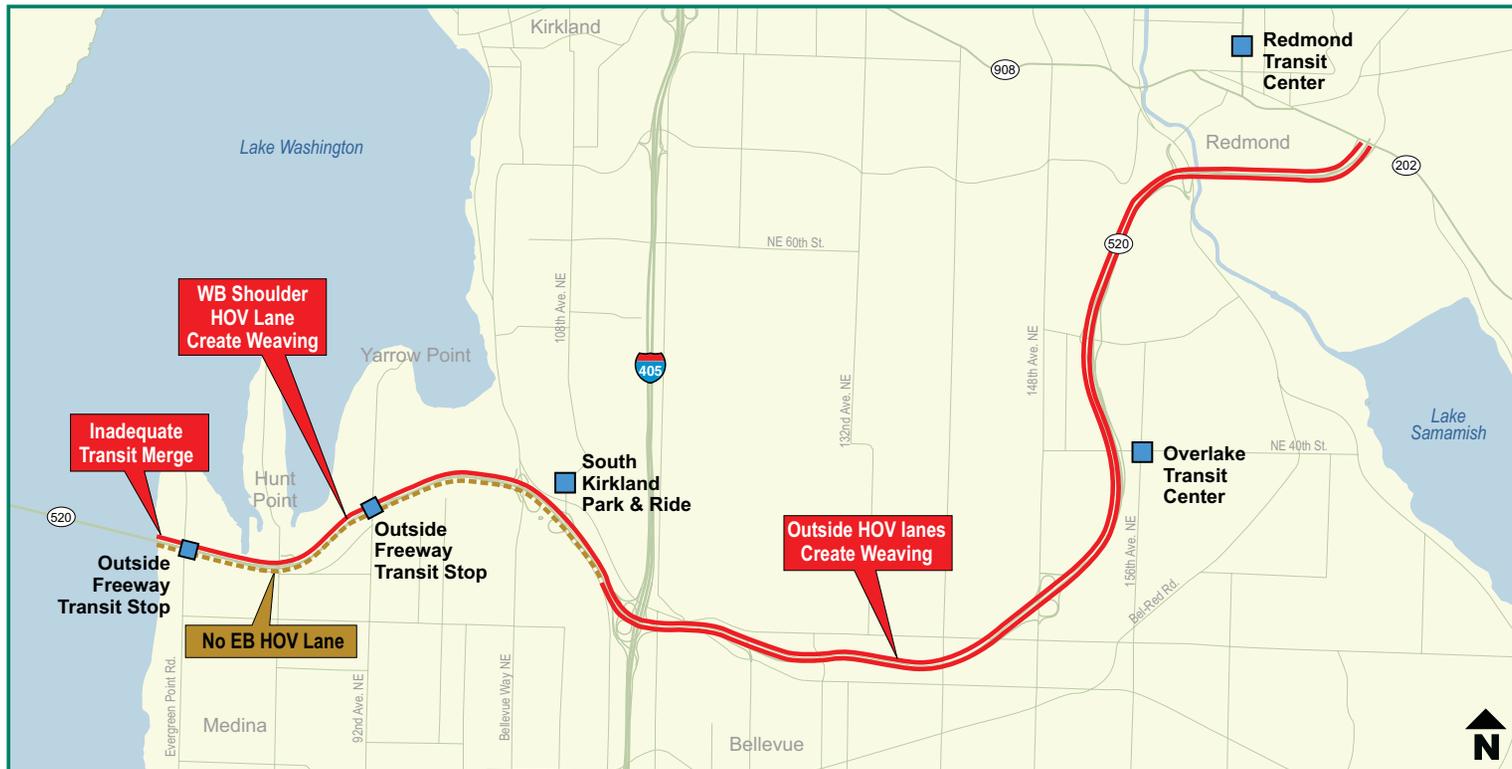
Project Need: Improve Traffic Safety

Traffic conflicts:

Outside HOV lanes create conflicts between slower-moving merging vehicles and faster-moving through vehicles.

Accidents:

Over 380 accidents occurred between the 124th Avenue NE interchange and Evergreen Point Road during the past two years. Eight of them involved buses.



Project Need: Improve Transit Reliability

Congestion on SR 520 currently reduces transit reliability:

- Existing eastbound HOV system is discontinuous.
- Outside HOV lane creates congestion, delaying buses up to 25 minutes.
- Outside HOV lane does not meet current design standards.
- Lack of direct transit access to South Kirkland Park and Ride lot at 108th Avenue NE results in increased travel times.



Project Need: Support Planned Transit Service Improvements

Transit agencies and local jurisdictions are planning transit improvement programs on the Eastside.

These programs include:

- Developing bus rapid transit (BRT) through the Eastside corridor under the SR 520 High Capacity Transit Plan, including increased ST Express service included in the Sound Transit 2 package on the November 2008 ballot.
- Additional buses and expansions of the South Kirkland and Redmond Park and Ride lots through the Urban Partnership Agreement grant programs.
- King County Metro's Transit Now initiative to expand services in the Eastside corridor by 15 to 20 percent to meet demand.
- RapidRide BRT lines in Bellevue and Redmond.



Transit Now map

Project Features



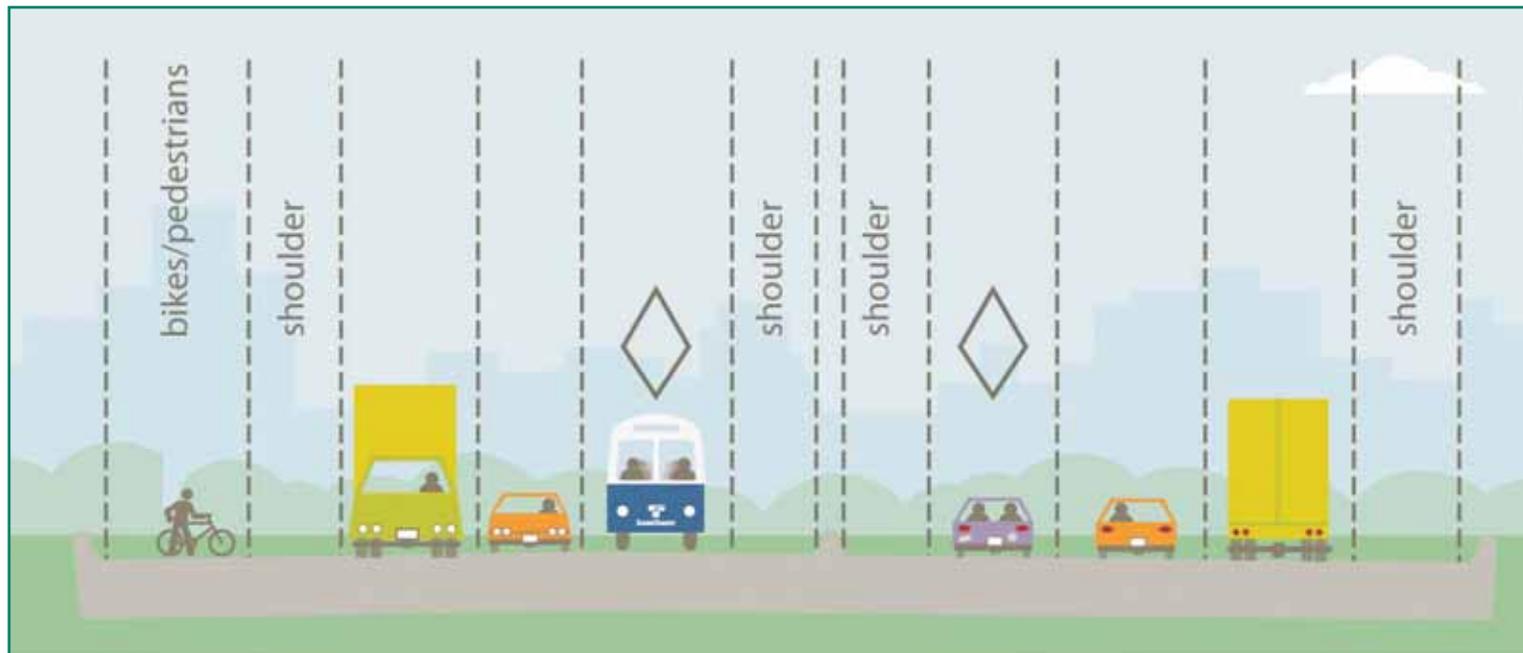
Project Elements

| | |
|---|---|
| <p>Transit Improvements</p> | <ul style="list-style-type: none"> • Completing the eastbound SR 520 HOV lane from Lake Washington to the existing eastbound HOV lane west of the I-405 interchange. • Restriping HOV lanes from the outside lanes to the inside lanes from Lake Washington to SR 202. • Building inside transit stops at 92nd Ave NE and the vicinity of Evergreen Point Road. • Constructing HOV direct access ramps at 108th Ave NE. |
| <p>Bike and Pedestrian Access</p> | <ul style="list-style-type: none"> • Adding a bike/pedestrian path between 108th Avenue NE and Evergreen Point Road. |
| <p>Stormwater Treatment and Fish Habitat</p> | <ul style="list-style-type: none"> • Constructing a stormwater system to improve water quality and reduce peak flows. • Improving and enhancing stream habitat by making culverts fish passable and realigning and daylighting Yarrow Creek, a salmon-bearing stream. |
| <p>Noise</p> | <ul style="list-style-type: none"> • Providing sound walls between Evergreen Point Road and Bellevue Way. |
| <p>Neighborhood Connectivity</p> | <ul style="list-style-type: none"> • Building lids at Evergreen Point Road, 84th and 92nd Avenue NE. |

Project Design

The project design includes:

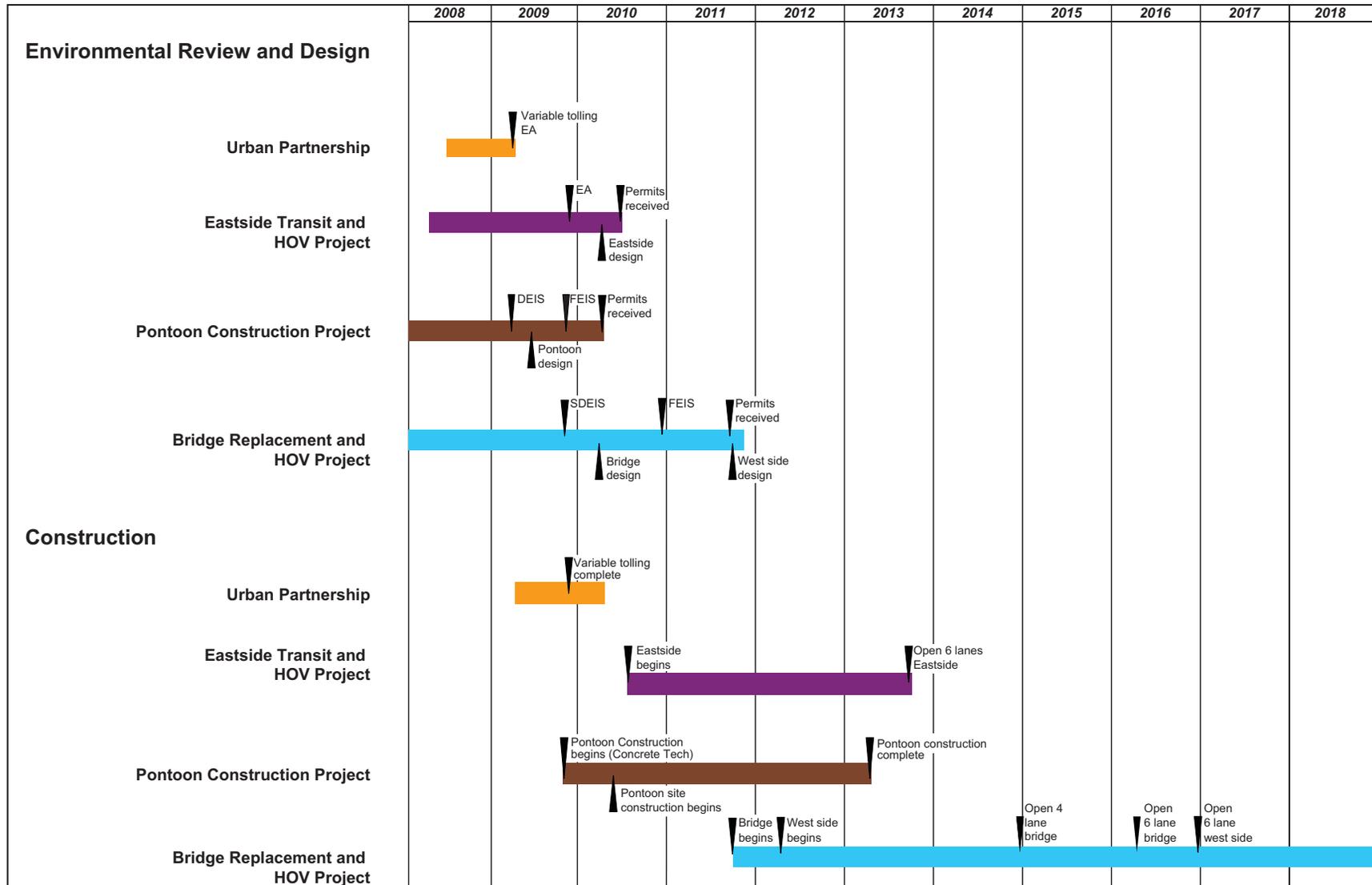
- Improvements to approximately 8.5 miles of SR 520 east of Lake Washington.
- Two general purpose lanes and one HOV lane in each direction (“4 + 2” configuration).
- A new bicycle/pedestrian path between Evergreen Point Road and 108th Avenue NE.



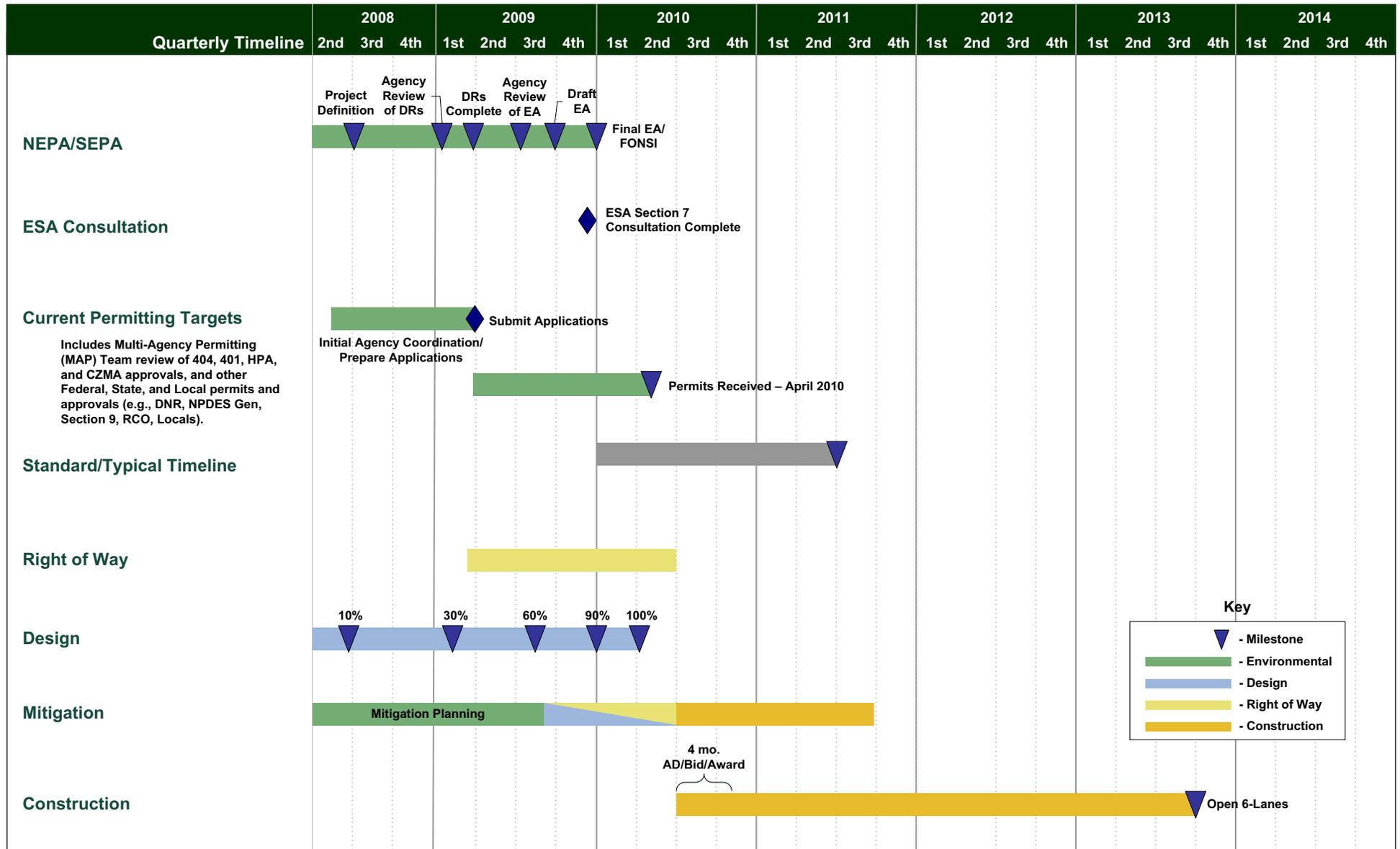
◇ = transit and carpool

4+2 configuration

SR 520 Program Schedule



SR 520 Eastside Transit and HOV Project Schedule – October 2, 2008





Washington State
Department of Transportation

SR 520 Corridor Program



Urban Corridors Office

Eastside Transit and HOV

Accelerated improvements
to address **ESHB 2878**

September 2008

Prepared for:

*The Washington State Legislature and
The Joint Transportation Committee*

Submitted by:

*Paula J. Hammond, P.E. - Secretary
Washington State Department of Transportation*

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Accelerated improvements to address ESHB 2878

The SR 520 bridge is a vital link connecting communities across Lake Washington. The bridge is vulnerable to earthquakes and windstorms, and is at risk of collapse if it is not replaced. Funding the SR 520 bridge replacement is a high priority for Washington state. As Governor Chris Gregoire stated on November 7, 2007, “Safety must be our number one priority and the 520 bridge, a critical link in our transportation system, is one of the top regional safety issues. It is vulnerable to earthquakes and winds, and it must be replaced.”

To address the urgency of replacing the SR 520 floating bridge, the Washington State Legislature has passed several key pieces of legislation to resolve issues related to the design of the west side interchange, develop a financing plan, and evaluate tolling as a way to pay for a new bridge. In addition, ESHB 2878 was approved in March 2008 and requested the Washington State Department of Transportation (WSDOT) evaluate opportunities for accelerating improvements on the east side of Lake Washington. Specifically, the legislation requested:

For the period of preconstruction tolling on the SR 520 bridge, the Department shall develop improvements of traffic flow from the eastern Lake Washington shoreline to 108th Avenue NE in Bellevue including:

- (a) Near-term, low-cost enhancements which relocate the high-occupancy vehicle lanes to the inside of the alignment; and*
- (b) A plan for an accelerated improvement project for the construction of median flyer stops, reconfiguration of interchanges, addition of direct access ramps, community enhancement lids, and pedestrian/bike path connections.*

The department shall report to the joint transportation committee by September 1, 2008, on the short-term low-cost improvement plans and include in their budget submittal to the office of financial management a proposal for the accelerated improvement project.

This legislation directs the development of an accelerated plan for several improvements on the Eastside during the period of proposed pre-construction tolling on SR 520 – the time between when tolls may be implemented in 2009 and the planned opening of the new floating bridge in 2014.

Pre-construction tolling is being considered as part of the Urban Partnership Agreement, which is a cooperative agreement to employ innovative tools for improving traffic flow along SR 520 and I-90 between Seattle and the Eastside. The agreement calls for variable tolling that could improve traffic flow through the SR 520 corridor and is estimated to provide up to \$500 million in funding to replace the aging floating bridge. The Urban Partnership, made up of the Washington State Department of Transportation, King County, the Puget Sound Regional Council and the federal government, is also advancing three other key strategies: technology, transit, and telecommuting.



“Safety must be our number one priority and the 520 bridge, a critical link in our transportation system, is one of the top regional safety issues. It is vulnerable to earthquakes and winds, and it must be replaced.”

Governor Chris Gregoire

Can we provide benefits to the traveling public on the Eastside earlier than 2016?

The Urban Partnership Agreement will provide benefits to the traveling public during the period of pre-construction tolling. It creates a partnership among WSDOT, King County, the federal government and the Puget Sound Regional Council to focus on three key strategies, in addition to pre-construction tolling, which will improve travel in the SR 520 corridor:

- **Technology:** Innovations such as active traffic management will allow the SR 520 corridor and eventually a new bridge to provide a more reliable commute, even as the Eastside population increases. This benefit will be realized both during and after construction. These technologies include real-time driver information displayed electronically over each lane, and state-of-the-art information systems linking commuters to multiple transportation modes. The Agreement provides \$86 million to develop these technologies and they would be in place beginning in 2009. If funding is not provided through the agreement, we will request additional funding to ensure these critical investments occur.
- **Transit:** Transit service will be expanded in the SR 520 corridor to reduce auto trips and provide toll-free travel options. The partnership's goal for transit is to increase ridership on SR 520 by 15 to 35 percent and provide sufficient transit service capacity to accommodate commuters who choose to switch to transit when tolls are implemented. The Urban Partnership Agreement provides up to \$41 million to purchase 45 new buses and other transit improvements.
- **Telecommuting:** More than 1,100 work sites participate in the state's Commute Trip Reduction Program. The agreement will invest in telecommuting by working with employers in the SR 520 corridor to encourage flexible employment arrangements that improve worker productivity and reduce rush-hour traffic demands. Commute trip reduction programs reduce traffic by 19,200 vehicle trips each weekday morning in the central Puget Sound region.



Exhibit 1 - General Vicinity Map

Can we accelerate improvements on the Eastside?

In June 2008, we received concurrence from the Federal Highway Administration (FHWA) that the Eastside Transit and HOV Project meets the criteria for development of a new project as specified by federal regulations (23 CFR 771.111(f)). This allows us to proceed with environmental review, design, and construction of the Eastside project independent of the Seattle and floating bridge portions of the SR 520 corridor. Critical components include:

1. Completing the eastbound SR 520 HOV lane from Lake Washington to the existing eastbound HOV lane west of the I-405 interchange.
2. Building inside transit stops at 92nd Avenue NE and Evergreen Point Road.
3. Constructing HOV direct access ramps at 108th Avenue NE.
4. Restriping HOV lanes from the outside lanes to the inside lanes on SR 520 from the Lake Washington area to SR 202.

We are conducting environmental scoping beginning in September 2008 and will issue an environmental assessment for the project in fall 2009, with a National Environmental Policy Act (NEPA) decision expected in December 2009.

Preliminary design for the Eastside project is planned for completion in early 2009. The design may then either be completed for bidding by contractors – known as “design-bid-build” – or may be advanced by a contractor as a “design-build” project. Regardless of construction method, the improvements are planned to begin in 2010, and to be open to drivers by late 2013.

What are benefits of the Eastside Transit and HOV Project?

The Eastside Transit and HOV Project will provide the necessary infrastructure and operational improvements to support planned population growth, economic expansion, and increases in transit service in rapidly growing communities on the Eastside. There are four primary benefits of the project:

1. It completes the Eastside transit and high occupancy vehicle (HOV) system. The project will create a complete and continuous Eastside transit and HOV system on SR 520.
2. It provides substantial travel time benefits to transit and carpools. Upon completion of the project, transit vehicles will see a reduction in travel time going between the Evergreen Point transit stop and SR 202.

3. It enhances public safety. The project separates merge movements between buses and other vehicles at busy interchanges, eliminates weaving caused by general purpose traffic needing to enter or exit using the outside HOV lanes, and widens shoulders to current design standards.
4. It supports regional and local transit and land use plans and policies. The transit and HOV improvements identified in the project are consistent with regional and local transit and multimodal plans and policies.

Additionally, the Eastside Transit and HOV Project will be completed before the Bridge Replacement and HOV Project.

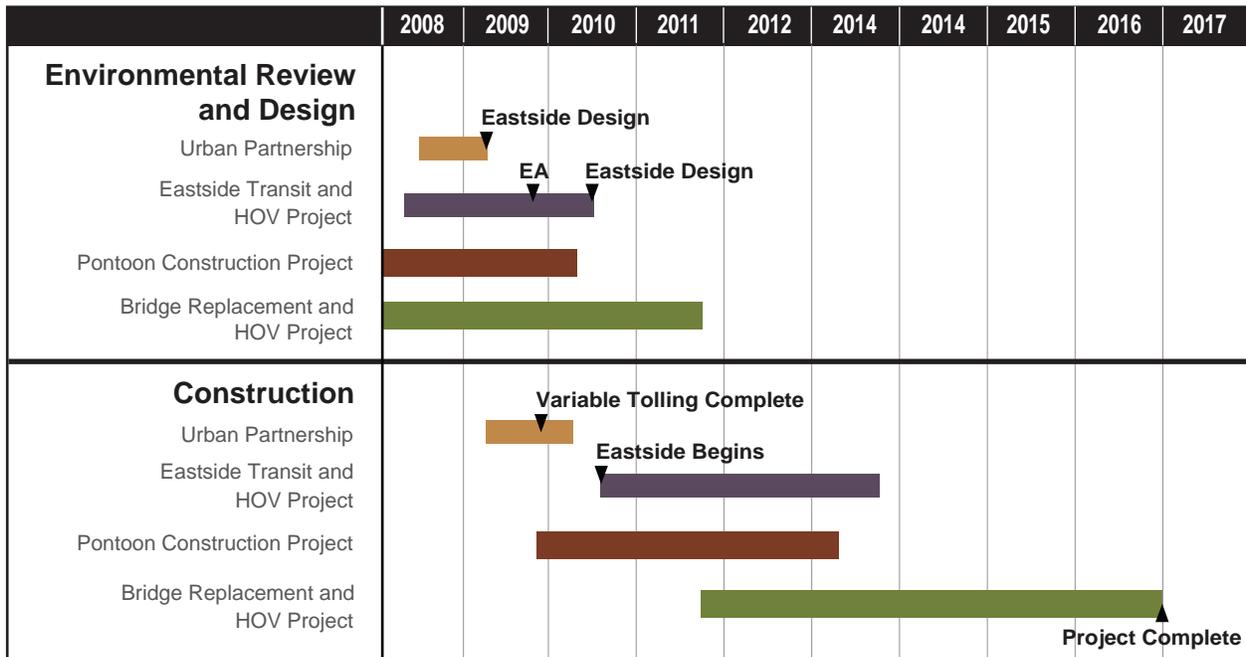


Exhibit 2

Can the HOV lanes on the east side of SR 520 be relocated early to the inside of the road?

The existing outside HOV lanes on the Eastside of the corridor are part of an integrated system that includes outside shoulder freeway transit stations. Relocating the HOV lanes would affect transit, carpool and general purpose traffic.

Potential benefits of early relocation of the HOV lanes include:

- Buses traveling the entire length of the corridor would see a travel time benefit if they did not have to access the transit stations currently on the outside of the corridor.

- Carpools traveling the entire length of the corridor would see a travel time benefit due to general purpose traffic no longer merging across the lane. This would benefit drivers commuting from Redmond to Seattle.
- General purpose vehicles would have direct access to the general purpose lanes from the on- and off-ramps.
- There are interchanges and on-ramps in the corridor that are spaced less than one mile apart. This spacing does not meet current highway design guidelines. These interchanges are problematic because of the speed differences between cars in the current outside HOV lanes and those entering from closely spaced ramps. Relocating the HOV lanes to the inside would alleviate this safety concern.

Potential concerns about early relocation of the HOV lanes to the inside include:

- The geometry of the HOV lanes on the outside of the corridor do not meet WSDOT guidelines for general purpose deceleration and acceleration lengths for the ramps, and would not be acceptable for use as a general purpose lane without major physical reconstruction.
- Relocating the HOV lane to the inside between 108th Avenue NE and Evergreen Point Road would cancel the benefit of eliminating general purpose vehicles weaving across the HOV lane, with the need for buses to weave across general purpose lanes to access outside shoulder freeway transit stations. This would most negatively affect bus riders traveling west of I-405.
- The freeway transit stops on SR 520 are currently located on the outside of the road. Relocating the HOV lanes would require either that the transit stops also be relocated, which does not meet the criteria of “near-term, low-cost,” or that buses continue to use the outside stops even though they would not be adjacent to the HOV lanes. Under either of these options, transit service would be negatively affected.
- If the transit stops were still used, buses would be delayed by weaving across general purpose lanes to access ramps and transit stations. If the transit stops west of I-405 were closed, more than 1,400 daily bus riders would have to find other routes or transfer points.
- Bus travel time would likely increase by approximately eight minutes during the peak morning and afternoon periods because of buses having to cross the congested general purpose lanes to access the freeway transit stations. This increase in travel times would affect approximately 1,400 daily riders traveling westbound from the 92nd Avenue NE and Evergreen Point Freeway stations. Any changes to bus service at these stations would likely reduce transit service options for some or all of these riders.

- Carpools would have to cross multiple lanes between ramps and inside HOV lanes. Additionally, buses and carpools weaving across lanes to access ramps and freeway stations would affect general purpose traffic.
- Westbound buses traveling from I-405 to SR 520 would have to cross three lanes to access inside HOV lanes or choose not use HOV lanes.



Passengers boarding and exiting buses along the corridor.

While early relocation of the HOV lanes may bring some near-term benefits to carpool traffic, the effects on transit service are substantial. With this information, we have concluded that it is most appropriate to move the HOV lanes to the inside of the alignment when the rest of the planned investments are made on the east side of the corridor, such as inside median HOV lanes and direct access ramps.

Additionally, staff at King County Metro have conducted their own assessment of relocating HOV lanes early. They have also raised concerns over the increased difficulty for passengers to board and exit buses along the corridor.

What are the next steps for the Eastside corridor?

For the reasons described previously, we recommend that the SR 520 HOV system continue to operate in the outside lanes through construction of the Eastside Transit and HOV Project. The project will provide the necessary transit infrastructure to maximize the efficiency of inside HOV lanes for the Eastside section of the SR 520 corridor. With the acceleration of the Eastside project, the inside HOV lanes, inside median freeway transit stations, and 108th Avenue NE direct access ramp are planned to be open to traffic in late 2013.

Since FHWA has approved proceeding with this project as a separate project, we have begun planning and scoping for the environmental review and design processes. Our approach for advancing the Eastside project includes:

- Expediting the environmental process by: (1) using as much as possible of the already-completed draft EIS analysis; (2) exploring opportunities for permit streamlining; and (3) continuing to work collaboratively with resource agencies to identify opportunities and sites for mitigation.
- Exploring the potential for using design-build contracting to expedite all or part of Eastside construction.
- Continuing to work proactively with Eastside jurisdictions to involve citizens and elected officials in the project design process.
- We will include in our budget submittal to the Office of Financial Management a proposal for this accelerated improvement project.

Organization of Technical Report

Chapter 1 explains the current HOV, transit, and general purpose traffic operations of the Eastside corridor between Evergreen Point Road and SR 202 in Redmond, and provides accident and safety data for the corridor. This information provides context for the evaluation summarized in Chapter 2.

Chapter 2 addresses the first section of the ESHB 2878 legislation related to SR 520 through the evaluation of several options for relocating the HOV lanes to the inside in advance of constructing inside median freeway transit stations at 92nd Avenue NE and Evergreen Point Road and direct access at 108th Avenue NE.

Chapter 3 describes the Eastside Transit and HOV Project. It explains the history of the project, describes the transportation needs on the Eastside, and lists the project elements.

Chapter 4 presents a full evaluation of the options presented in Chapter 2.



**Washington State
Department of Transportation**

Urban Corridors Office





Washington State
Department of Transportation

SR 520 Corridor Program



Urban Corridors Office

Eastside Transit and HOV

Accelerated improvements
to address **ESHB 2878**

Technical Report

September 2008

Prepared for:

*The Washington State Legislature and
The Joint Transportation Committee*

Submitted by:

*Paula J. Hammond, P.E. - Secretary
Washington State Department of Transportation*



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Chapter 1:

Understanding SR 520 traffic operations

Introduction

Traffic flow on the Eastside of the SR 520 corridor is affected by many factors. Currently, the HOV lanes are on the outside throughout the corridor and the HOV and transit infrastructure has been designed to maximize their efficiency. Relocating the HOV lanes to the inside – even temporarily – would have substantial implications for bus service and minimal to no improvements to traffic flow for carpools and general purpose traffic. Like the current outside HOV lanes, inside HOV lanes are most effective when they are part of an integrated system with the appropriate support infrastructure, such as inside median freeway transit stations and direct access ramps.

This chapter presents the current operation of HOV lanes, transit, and general purpose traffic and how each mode works together. This information serves as context for how the system operations were evaluated to arrive at recommendations for relocating the HOV lanes as proposed in ESHB 2878.

The study area for the traffic flow improvements is shown in Exhibit 1 and includes SR 520 east of 108th Avenue NE to SR 202. This study area was expanded from what was outlined in ESHB 2878 in order to provide a comprehensive corridor evaluation of the effects of relocating the HOV lanes to the inside.

Exhibit 1 provides a general look at the current HOV lane configuration and bus facilities.



Exhibit 1

Exhibit 2 – SR 520 Westbound AM & PM peak periods – Year 2005-2007 provides a general look at accident data from Evergreen Point Floating Bridge to W Lake Sammamish Parkway.

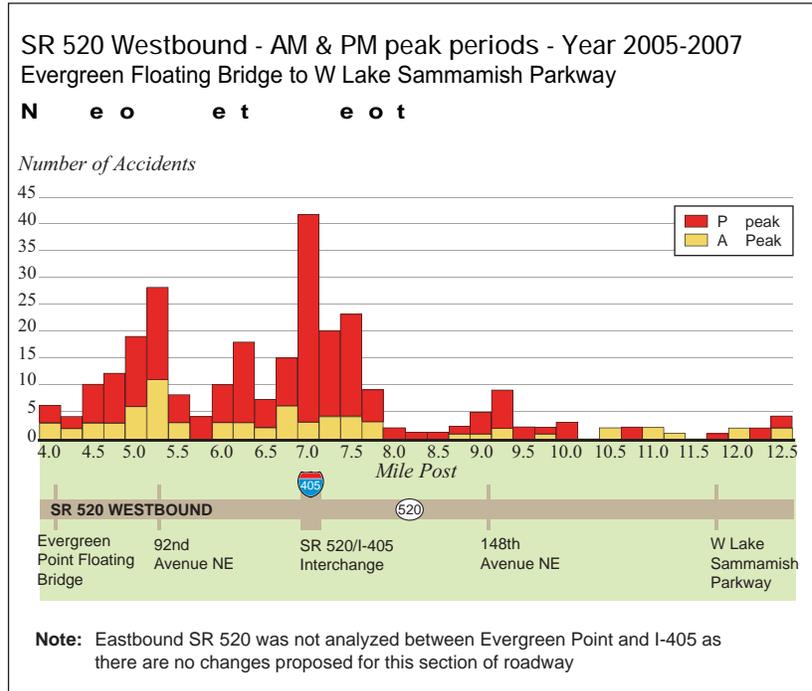


Exhibit 2

How does traffic operate today in the Eastside SR 520 corridor?

West of I-405

Buses and carpools

The SR 520 HOV lane system is currently incomplete. Between 108th Avenue NE and the east shore of Lake Washington, the only HOV lane is located on the outside westbound shoulder. In order to limit the number of vehicles in the lane, this HOV lane has been given a three or more occupancy requirement. The three or more HOV lane on westbound SR 520 is one of the oldest HOV lanes in the region. It opened in 1973 as a transit-only lane to allow buses to bypass the toll booths which operated on the bridge at the time. The right side shoulder was restriped to serve as the transit lane and cannot safely carry the high volumes that other HOV lanes carry.

Today, the westbound HOV lane terminates before the SR 520 bridge, requiring carpools and buses to merge with general purpose traffic. This, in turn, causes congestion. Approximately 300 HOV vehicles use this lane during the morning peak hour and approximately 500 vehicles use it during the afternoon peak hour. On an average weekday, approximately 3,200 vehicles use this HOV lane. See Exhibit 3: Existing issues – West of I-405.

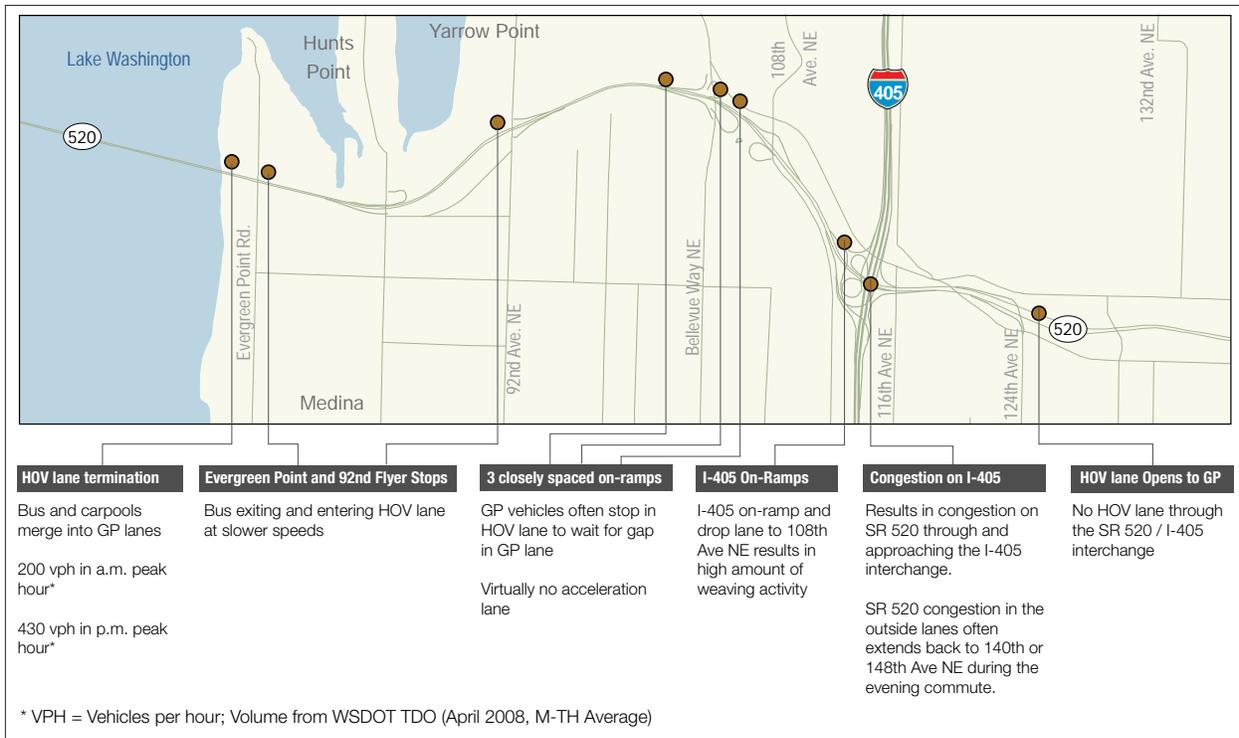


Exhibit 3

With the HOV lane on the outside, buses and carpools are able to enter onto the highway directly into the HOV lane and bypass congestion in the general purpose lanes. Buses are also able to directly serve the freeway stations at Evergreen Point Road and 92nd Avenue NE. At the same time, buses and carpools are regularly delayed by general purpose vehicles being stopped in the HOV lane as they try to merge in and out of the general purpose lanes. In addition to causing delays, general purpose vehicles merging across the HOV lanes presents safety issues due to the differences in speeds between the general purpose and HOV lanes.

Another operational challenge for this section of HOV lane is the number of closely spaced on-ramps. The I-405, 108th Avenue NE, and Bellevue Way north- and southbound on-ramps all occur within less than a mile. To put this in perspective, the current highway design guidelines state that interchanges should be spaced no closer than one mile intervals within urban areas. Closely spaced interchanges and ramps introduce more weaving activity as vehicles enter and exit the highway, which interrupts and degrades HOV lane traffic. This weaving activity affects about 310 daily westbound buses using the HOV lane between 108th Avenue NE and the Evergreen Point Freeway Transit Station.

General purpose traffic operations

General purpose traffic must cross the HOV lanes to enter and exit the freeway in the current configuration. When congestion is present, the general purpose lanes move at slower speeds than the HOV lanes; this speed difference can affect safety and operations for both lanes.

The outside HOV lanes offer a benefit to general purpose traffic by keeping transit vehicles in the outside lane. Buses accelerate slowly, take longer to make lane changes, and require longer stopping distances. When buses travel in and out of general purpose traffic, they increase the travel times for general purpose vehicles.

West of I-405, the general purpose lanes are congested during peak periods and traffic merging into the general purpose lanes adds to the delay experienced by general purpose traffic. The HOV lane allows vehicles to bypass the queues in the general purpose lanes, but it increases delays for general purpose traffic in the westbound lanes where it terminates and merges into the general purpose lanes.

Safety and design considerations

We evaluated historical accident data for SR 520 between the eastern shore of Lake Washington and SR 202 in Redmond. We used this data to identify locations where accidents have occurred at a higher than average rate in order to identify where safety concerns along the corridor might be affected by moving the HOV lane to the inside.

Between 2005 and 2007, there were approximately 230 westbound accidents, with nearly 60 of these accidents occurring in the HOV lane. Forty-two percent of HOV lane accidents occurred during either morning (6 to 9 a.m.) or afternoon (3:15 to 6:15 p.m.) peak travel hours.

The predominant accident types were rear-ends and sideswipes, which are typical for congested traffic conditions with frequent merging activity. Reasons for accidents occurring in the HOV lane include failing to grant right of way to other vehicles, following too closely, exceeding reasonable safe speed, and driving under the influence of alcohol. The majority of the accidents involved passenger cars and a larger vehicle, such as a truck or bus.

Through the SR 520/I-405 interchange

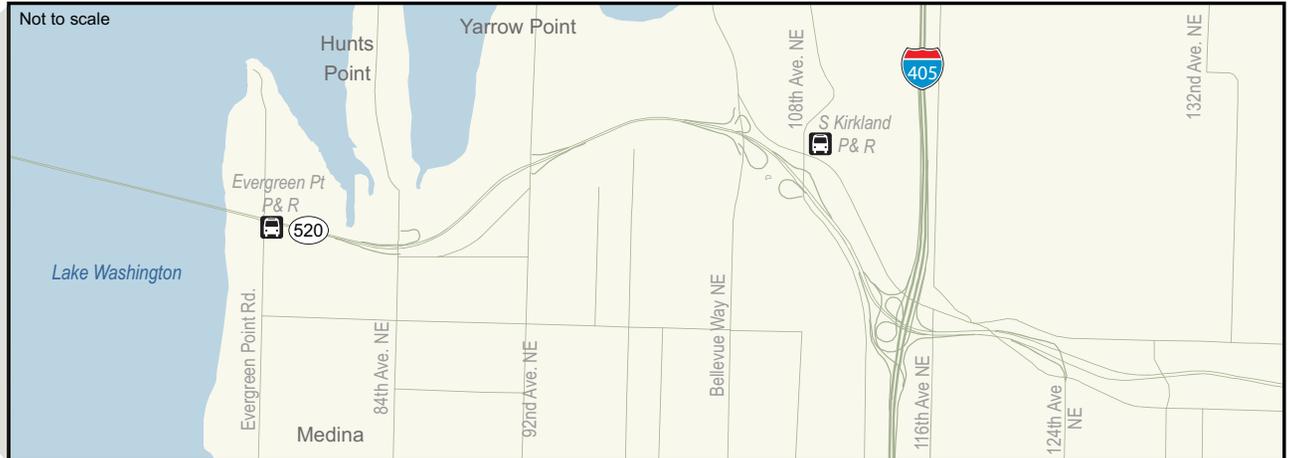
There are no HOV lanes through the I-405/SR 520 interchange in either direction. The eastbound HOV lane starts just west of 108th Avenue NE. It opens to general purpose traffic just east of 108th Avenue NE through the I-405 interchange to 124th Avenue NE. See Exhibit 4 on page 9: SR 520 lane diagram for existing and Option A and B - between Evergreen Point Road and 124th Avenue E.

The westbound SR 520 HOV lane designation stops just east of 124th Avenue NE and the lane opens to general purpose traffic and primarily serves the I-405 off-ramps. During the evening commute, westbound congestion approaching the SR 520/I-405 interchange can extend as far east as 148th Avenue NE, interfering with HOV lane operations. Traffic congestion is caused by closely spaced ramps, interchange capacity constraints, high traffic volumes and weaving between SR 520, I-405 and 108th Avenue NE. As a result, buses and carpools are delayed through the SR 520/I-405 interchange.

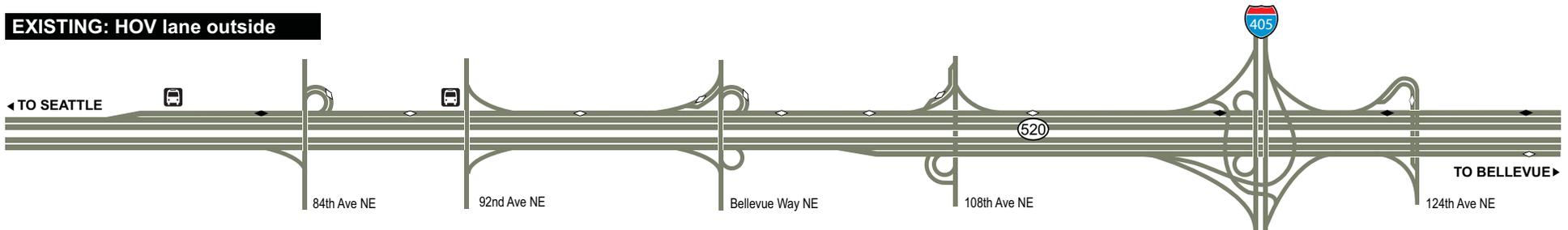
Exhibit 4: SR 520 lane diagram for existing and option A and B - Between Evergreen Point Road and 124th Avenue NE



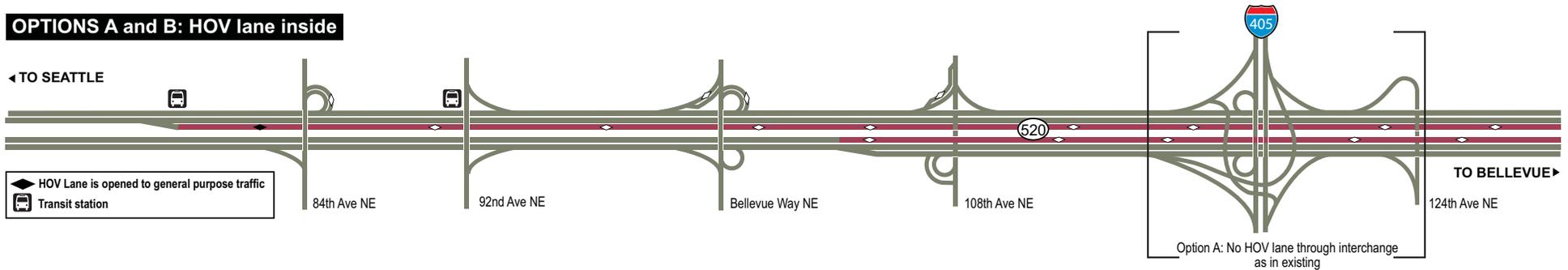
VICINITY MAP



EXISTING: HOV lane outside



OPTIONS A and B: HOV lane inside



Because the outside lanes are most congested, many buses change lanes to travel in the inside general purpose lane through this interchange. Buses then weave back into the outside HOV lane after passing the I-405 on-ramp.

Safety and design considerations

Between 2005 and 2007, there were approximately 120 westbound accidents in this segment, with more than 40 of those accidents occurring in the outside lane. In the eastbound direction there were approximately 85 accidents, with more than 10 accidents occurring in the outside lane. The predominant accident types were rear-ends and sideswipes, which are typical for congested traffic conditions with frequent merging activity.

East of 124th Avenue NE

East of 124th Avenue NE the HOV lane has a two passengers or more designation. Like the westbound lane between 108th Avenue NE and Evergreen Point Road, the lanes are located on the outside of the corridor. Freeway transit stations are located on the NE 40th Street and NE 51st Street ramps. Both of these ramps are connected via a collector/distributor system in each direction.

During the evening commute period, eastbound congestion begins at the SR 520/SR 202/Avondale Road intersection and extends as far back as the NE 51st or NE 40th Street interchanges. The eastbound HOV lane begins just east of the 124th Avenue NE interchange and ends at the NE 40th Street/NE 51st Street collector-distributor, which means that buses and carpools must wait in stop-and-go congestion to reach the West Lake Sammamish Parkway exit and the end of the corridor. See Exhibit 5 on page 10: SR 520 lane diagram for existing and Option B – between 124th Avenue NE and SR 202.

General purpose traffic operations

Traffic demand east of I-405 is lower than in other sections of the corridor. Some congestion and slowing exists during the morning peak period between West Lake Sammamish Parkway and NE 51st Street due to the high volume of traffic entering and exiting the freeway. The auxiliary lane between the interchanges operates at capacity and traffic is slowed by weaving maneuvers related to the auxiliary lane and the westbound truck-climbing lane. The westbound general purpose lanes in this area experience slowing due to exiting vehicles attempting to cross the HOV lane and accelerating up the grade in this area, which is especially difficult for buses.

Safety and design considerations

Between 2005 and 2007, there were approximately 200 westbound accidents in this segment, with more than 30 of those accidents occurring in the HOV lane. In the eastbound direction there were approximately 370 accidents, with more than 50 accidents

occurring in the HOV lane. The predominant accident types were rear-ends and sideswipes, which are typical for congested traffic conditions with frequent merging activity.

How does transit service operate today in the Eastside SR 520 corridor?

There are 23 bus routes that currently use the Evergreen Point Bridge: 18 Metro routes, four Sound Transit Regional Express routes, and one route operated by Community Transit.

Today, Metro and Sound Transit provide approximately 570 daily bus trips across the Evergreen Point Bridge on an average weekday and carry almost 15,000 riders. During the morning peak period there are approximately 4,900 riders crossing the bridge in both directions in 175 buses (not including custom bus school routes and Community Transit service). See Exhibits 6 and 7 on page 13 and 14: Existing bus service during the morning and afternoon peak periods – West and East of I-405 for a summary of existing peak period bus service and freeway transit station activity in the SR 520 corridor.

The routes serving SR 520 reach frequencies as high as one bus every ten minutes during peak periods, with midday service provided at 30-minute frequencies. The combined frequency of all the routes using SR 520 to cross the lake provides a scheduled bus trip that serves the freeway stations west of I-405 every one to four minutes during the morning and afternoon peak periods. In addition to Metro and Sound Transit routes, Microsoft operates its Microsoft Connector service, which provides service for Microsoft employees between Microsoft and Seattle, Bothell, Mill Creek, Issaquah and Sammamish. Microsoft estimates that the service can currently accommodate up to 4,600 daily riders.

Recent travel time data collected by Metro indicates that actual bus travel times between NE 51st Street in Redmond and the Montlake freeway station can range from 10 to 40 minutes westbound in the morning and 10 to 35 minutes eastbound in the afternoon on a regular basis.

SR 520 freeway stations and current use

Having the SR 520 HOV lanes on the outside allows buses to serve the existing freeway transit stations located on the shoulders or alongside ramps throughout the corridor. These freeway transit stations serve approximately 3,100 riders per day and 1,800 people during the peak commute periods alone.

There are four freeway transit stations on the east side of the SR 520 corridor:

- Evergreen Point Road (shoulder station): Nearly 500 people use this station during the peak periods (westbound).

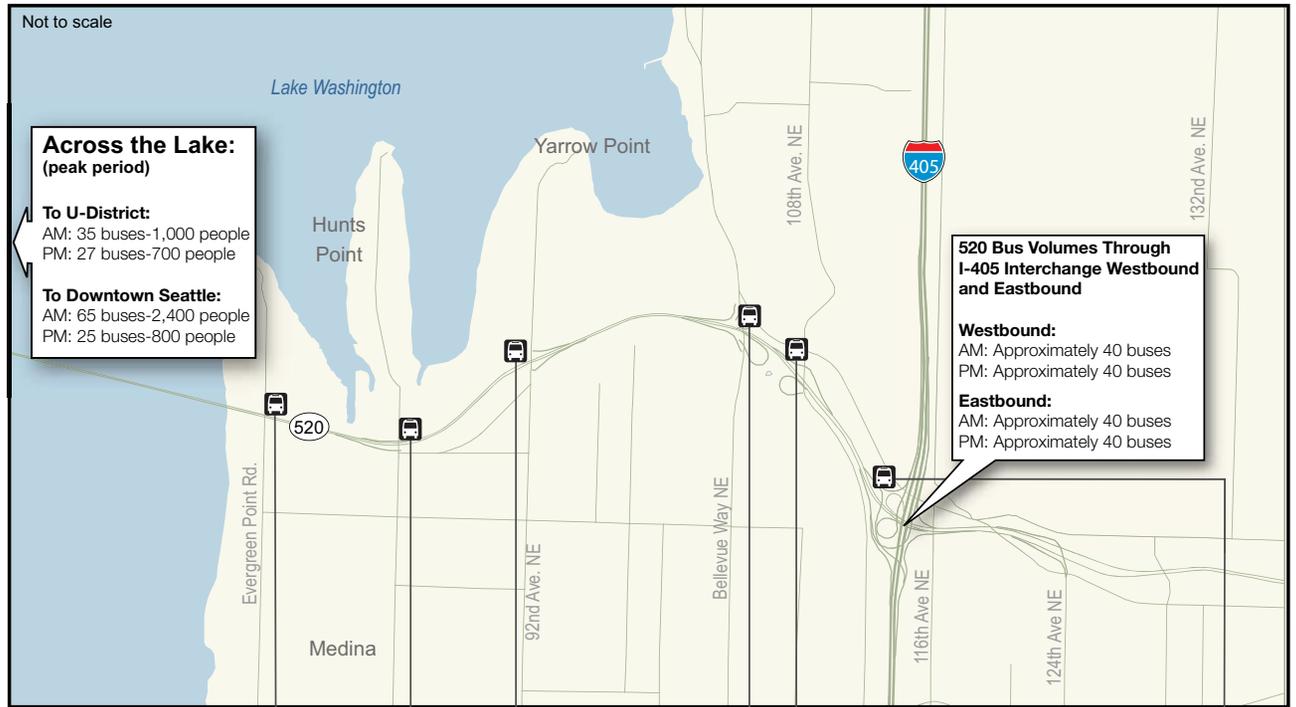
Exhibit 6: SR 520 Existing bus service during the AM and PM peak period - West of I-405



VICINITY MAP

In the west end of the corridor, the Evergreen Point freeway transit station is the busiest, with most of the on/off activity related to transfers between buses. The information in the exhibit illustrates two important factors to consider if the HOV lanes are moved to the inside of the corridor without providing inside median freeway transit stations:

- 1) the number of buses during the peak periods that would need to weave across the GP lanes in order to access the transit stations, which would affect travel times, reliability and GP traffic flow.
- 2) the number of people during peak periods that would need to find alternate routes or transfer points if the freeway transit stations were closed or had reduced transit service.



Across the Lake: (peak period)
To U-District:
 AM: 35 buses-1,000 people
 PM: 27 buses-700 people
To Downtown Seattle:
 AM: 65 buses-2,400 people
 PM: 25 buses-800 people

520 Bus Volumes Through I-405 Interchange Westbound and Eastbound
Westbound:
 AM: Approximately 40 buses
 PM: Approximately 40 buses
Eastbound:
 AM: Approximately 40 buses
 PM: Approximately 40 buses

| Evergreen Pt Transit Station | 84th On-Ramp | 92nd Transit Station | Bellevue Way On-Ramps | 108th On-Ramps | I-405 Ramps |
|---|--|--|--|--|--|
| AM: 100 buses, 440 on/off PM: 50 buses, 60 on/off | AM: 14 buses PM: 10 buses | AM: 86 buses, 80 on/off PM: 40 buses, 15 on/off | AM: 0 buses PM: 3 buses | AM: 23 buses PM: 14 buses | AM: 48 buses PM: 4 buses |
| 7 U-District Routes: 167, 243, 271 , 272, 277, 540 , 556 | Routes: 261, 271 | 19 Routes: 167, 242, 243, 250, 252, 255 , 256, 257, 260, 261, 265, 266, 268, 271 , 272, 277, 311, 540, 545 , 555, 556 | 1 Route: 243 | 2 Routes: 255 , 540 | 10 Routes: 167, 252, 257, 260, 265, 272, 277, 311, 555, 556, |
| 13 DT Seattle Routes: 250, 252, 255 , 256, 257, 260, 261, 265, 266, 268, 311, 545 | | | | | |

Bus data collected from King County Metro website (July 2008) and Ridership data from KC Metro, Fall 2007 APC counts

AM and **PM** peak period data (from 6:00 to 9:00 AM or from 3:15 to 6:15 PM)
XXX = Indicates all day service, otherwise routes only provide peak period service
 Transit station

Exhibit 7: SR 520 Existing bus service during the AM and PM peak period - East of I-405

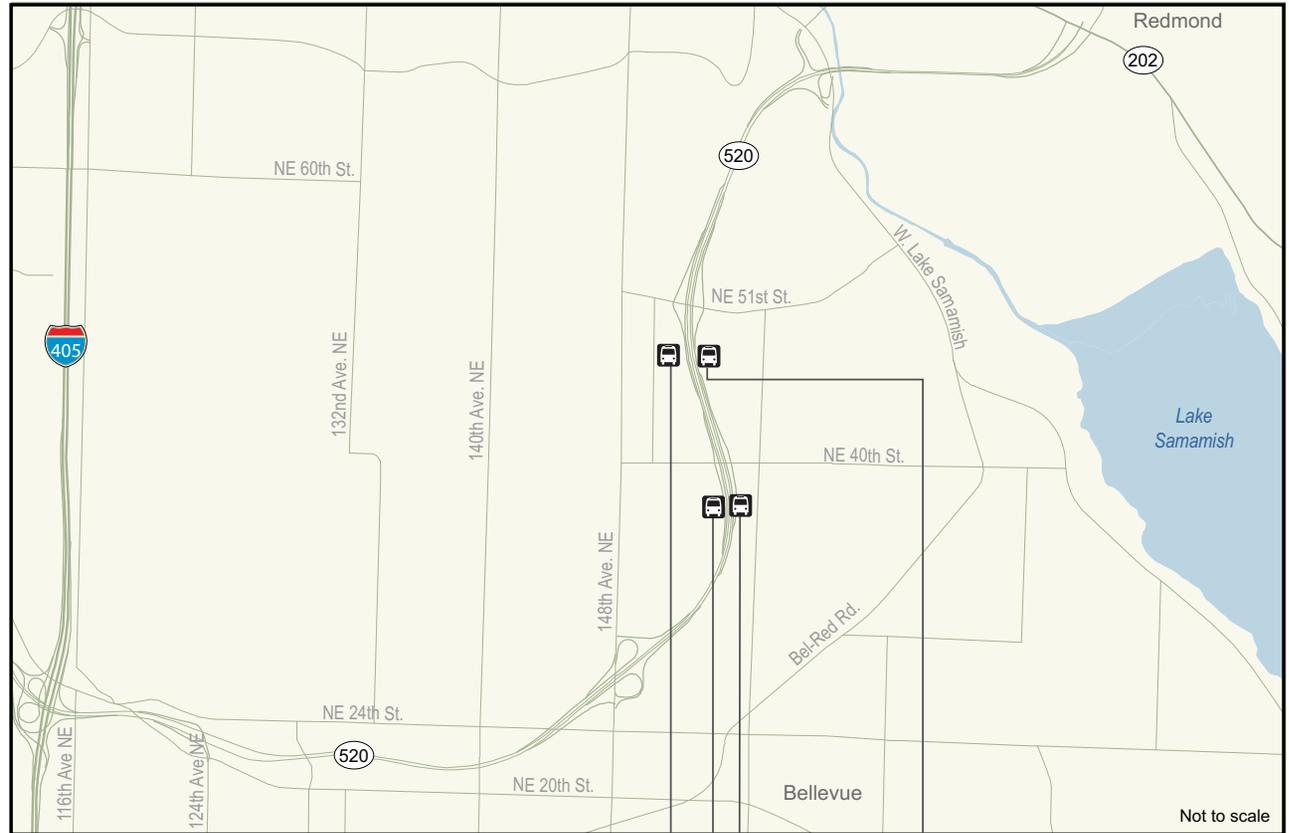


VICINITY MAP

In the east end of the corridor, the NE 40th (Overlake) transit station is the busiest as it serves the main Microsoft campus. Sound Transit route 545 is the only route that provides all day service between Seattle and Redmond. The information in the exhibit illustrates two important factors to consider if the HOV lanes are moved to the inside of the corridor without providing inside median freeway transit station:

- 1) the number of buses during the peak periods that would need to weave across the GP lanes in order to access the transit stations which would affect travel times, reliability and GP traffic flow.
- 2) the number of people during peak periods that would need to find alternate routes or transfer points if the freeway transit stations were closed or had reduced transit service.

However, because there is generally less congestion between 148th Avenue NE and the NE 40th/51st Street Interchange area, the effect on transit service would not be as great as it would be for the freeway transit stations west of I-405. It is likely that transit travel times and reliability would be similar to what they are today.



| 51st Transit Station - Westbound | 40th/Overlake Transit Station - Westbound | 40th/Overlake Transit Station - Eastbound | 51st Transit Station - Eastbound |
|--|--|--|---|
| AM: 40 buses, 70 on/off PM: 40 buses, 160 on/off | AM: 32 buses, 210 on/off PM: 36 buses, 130 on/off | AM: 38 buses, 320 on/off PM: 33 buses, 230 on/off | AM: 23 buses, 120 on/off PM: 27 buses, 70 on/off |
| 4 Routes: 230, 232, 233, 268, 269, 545, 997 | 4 Routes: 232, 268, 545 , 564, 565, 644 | 6 Routes: 232, 268, 644, 545 | 6 Routes: 232, 233, 268, 545, 644, 977 |
| <p>AM and PM peak period data (from 6:00 to 9:00 AM or from 3:15 to 6:15 PM) XXX = Indicates all day service, otherwise routes only provide peak period service Transit station</p> | | | |

Bus data collected from King County Metro website (July 2008) and Ridership data from KC Metro, Fall 2007 APC counts

- 92nd Avenue NE (shoulder station): Nearly 100 people use this station during the peak periods (westbound).
- NE 40th Street (Overlake) (ramp station): More than 1,000 people use this station during the peak periods (both directions).
- NE 51st Street (ramp station): More than 400 people use this station during the peak periods (both directions).

Exhibit 8 (SR 520 Transit Boardings/Exits by Freeway Station) illustrates the relative morning peak period, afternoon peak period, and daily passenger volumes at each of the freeway stations along the SR 520 corridor.

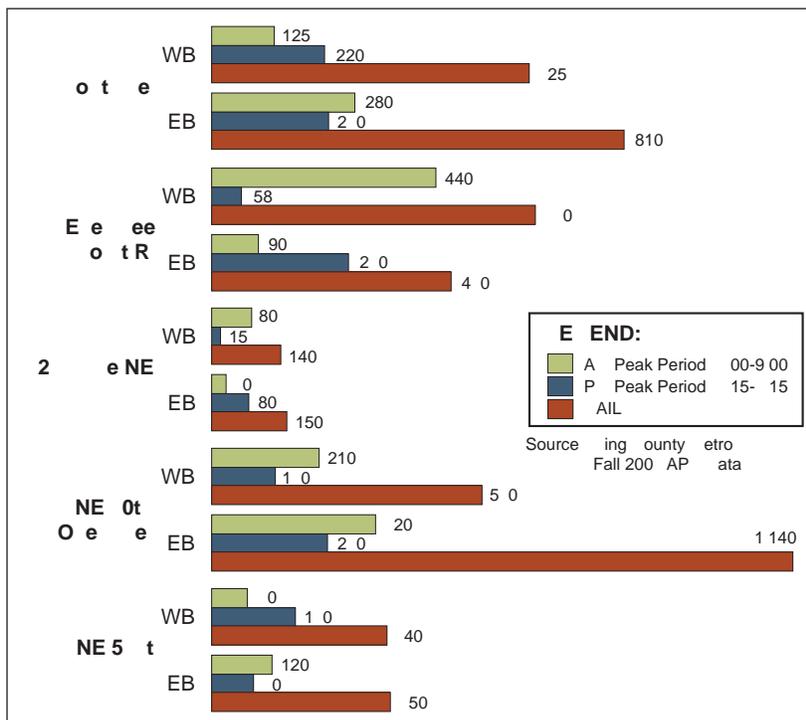


Exhibit 8

Evergreen Point Freeway Station

The Evergreen Point freeway station is located west of I-405 and near the east end of the Evergreen Point Bridge. Both eastbound and westbound bus platforms and shelters are located on the shoulders of SR 520. On the south side of SR 520, the Evergreen Point Park and Ride lot provides 51 parking stalls just south of the eastbound bus platform.

The majority of bus riders using the Evergreen Point freeway station transfer to and from bus routes serving the University of Washington (over 50 percent) or downtown Seattle (over 30 percent). Many of the connecting Eastside routes originate in Redmond, Kirkland, and Bellevue. Over 600 riders per day used this station in 2007. Many bicyclists use this stop because it is the last stop to put bikes on buses before crossing the floating bridge.

The westbound stop is served by 20 routes during the morning peak period. There are approximately 100 buses that serve the Evergreen Point freeway station. Among these 100 buses, approximately 440 people either board or exit. During the afternoon peak period, bus service is about half of the morning peak period with approximately 60 total people either boarding or exiting the approximately 50 buses that serve this stop.

92nd Avenue NE freeway station

The 92nd Avenue NE freeway station provides bus access for Hunts Point, Yarrow Point, and Clyde Hill to routes crossing the Evergreen Point Bridge. The westbound freeway stop is served by nine routes and, with 140 riders per day using the station in 2007, is the least used station in the corridor. During the morning peak period, approximately 85 buses serve this stop and approximately 80 people either board or exit. During the afternoon peak period, approximately 40 buses serve this stop and approximately 15 people either board or exit.

Most bus riders using this station transfer to and from bus routes serving the University of Washington or work locations in downtown Seattle. This freeway transit station is also used by students busing to private schools in Seattle on special Metro routes. Bicyclists also often use this stop to load bikes on buses to be able to cross the lake.

NE 40th Street freeway station at Overlake Transit Center

East of I-405, the NE 40th Street freeway station is the most used station in terms of passengers served, as it is adjacent to the Overlake Transit Center – a main transfer point for other Eastside routes and a hub for Microsoft campus shuttles. While only served by four routes, the eastbound stop has approximately 320 boardings/exits among 40 buses during the morning peak period and 230 boardings/exits among 33 buses during the afternoon peak period. The westbound stop is served by six routes and has 210 boardings/exits among 32 buses during the morning peak period and 130 boardings/exits among 36 buses during the afternoon peak period.

NE 51st Street freeway station

The NE 51st Street freeway station primarily serves the surrounding residential area and as a result has lower passenger volumes. The eastbound stop is served by six routes, with approximately 120 boardings/exits among 23 buses during the morning peak period and 75 boardings/exits among 27 buses during the afternoon peak period. The westbound stop is served by seven routes and has approximately 70 boardings/exits among 40 buses during the morning peak period and 160 boardings/exits among 40 buses during the afternoon peak period.

Other bus service on SR 520

I-405 Buses using SR 520

The bus routes that travel between I-405 and SR 520 are mentioned here because they would be affected by relocating the HOV lanes to the inside of the corridor. Currently, I-405 buses can merge directly into the outside HOV lanes from the I-405 on- and off-ramps.

There are 10 bus routes on I-405 (see Exhibit 6 on page 13: Existing bus service during the morning and afternoon peak period – West of I-405) that use SR 520 and provide only peak period service. There are no routes that provide all day service via I-405 between areas north and south of SR 520 and Seattle. However, the westbound bus volumes are substantial during the morning peak period, with approximately 50 buses traveling between I-405 and SR 520 westbound. During the afternoon peak period, most of the routes serve the return eastbound commute, resulting in only five buses originating from I-405 traveling westbound on SR 520 during the afternoon peak period.

South Kirkland Park and Ride buses using SR 520

The bus routes that travel between the South Kirkland Park and Ride and SR 520 are mentioned here because they would be affected by relocating the HOV lanes to the inside of the corridor. These buses currently use the 108th Avenue NE on-ramp to access SR 520 and they can merge directly into the outside HOV lanes.

There are two bus routes (see Exhibit 7 on page 14: Existing bus service during the morning and afternoon peak period – East of I-405) that serve the South Kirkland Park and Ride and then travel westbound on SR 520 using the 108th Avenue NE westbound on-ramp. Metro route 255 and Sound Transit route 540 provide all-day service between Kirkland and downtown Seattle (255) and the University District (540). During the morning peak period, approximately 23 buses use the 108th Avenue NE westbound on-ramp, and during the afternoon peak period, approximately 15 buses use this ramp.

Chapter 2: Overview of near-term, low-cost options for HOV relocation

Introduction

In ESHB 2878, the Washington State Legislature directed us to examine possibilities for “near-term, low-cost enhancements which relocate the HOV lanes to the inside of the alignment.” When doing this evaluation, we assumed that the lanes would be relocated immediately (in 2009) without making any other changes to the transit facilities throughout the corridor, such as inside median freeway transit stations and direct access ramps.

Additionally, we assumed that the inside median freeway transit stations and direct access ramps would be constructed as a part of the full Eastside project rather than as part of near-term, low-cost HOV lane relocation.

Moving the HOV lane from the outside of the road to the inside has several potential benefits. Among them are:

- Buses and carpools could have more reliable travel time as they would no longer be delayed by general purpose traffic merging across the HOV lane. This would also improve safety for the outside lane.
- General purpose vehicles would have direct access to the general purpose lanes from on-ramps.

However, relocating the HOV lanes simply by restriping them without other infrastructure improvements in the corridor creates the following concerns:

- Carpools and buses will have to cross two lanes between ramps and the inside HOV lane. Delays will be considerable during peak periods when general purpose lanes are congested.
- It will be challenging to continue serving the 92nd Avenue NE and Evergreen Point Road freeway transit stations because buses would have to change two lanes from the inside HOV lane to the outside general purpose lane to pick up and drop off passengers.
- General purpose lane operations would likely degrade due to weaving across lanes to access the freeway stations.
- The shoulder, currently used as the outside HOV lane, is not designed to carry general purpose volumes.
- There would still be safety issues related to the speed differences between HOV and general purpose lanes.
- Westbound buses traveling from I-405 to SR 520 will have to cross three lanes to access inside HOV lanes or choose to not use HOV lanes.

What options were considered?

We identified four options for evaluating moving the HOV lane to the inside to meet the requirements of ESHB 2878. Since the current HOV lanes east of I-405 are on the outside of the corridor, we chose to evaluate improvements that extended beyond the 108th Avenue NE limit stated in the legislation. We developed a spreadsheet application to determine and evaluate the relative travel time differences between the existing outside HOV lane configuration and the various HOV lane configurations described below. The full evaluation can be found in Appendix D.

The options evaluated were:

Option A: Inside HOV lane between Evergreen Point Road and 108th Avenue NE

Purpose: This option was evaluated because it was specifically identified in ESHB 2878.

Option A is shown in Exhibit 4 on page 9: SR 520 lane diagram between Evergreen Point Road and 124th Avenue E. It moves the westbound outside HOV lane to the inside between 108th Avenue NE and Evergreen Point Road. East of I-405, the westbound and eastbound HOV lanes would remain outside lanes as they are today.

Option B: Inside HOV lane between Evergreen Point Road and SR 202

Purpose: This option was included to address westbound congestion through the SR 520/I-405 interchange.

Option B is shown in Exhibit 5 on page 10: SR 520 lane diagram for Existing and Option B – Between 124th Avenue NE and SR 202. West of 108th Avenue NE, it is the same as Option A. East of 108th Avenue NE, Option B would move the westbound and eastbound HOV lanes to the inside, with the westbound HOV lane extending through the I-405 interchange.

Option C: Outside HOV lane between 108th Avenue NE and Evergreen Point Road/Inside HOV lane between SR 202 and 108th Avenue NE

Purpose: This option was included to allow buses and carpools to bypass the congestion in the SR 520/I-405 interchange area while maintaining service at the 92nd Avenue NE and Evergreen Point Bridge Freeway stations.

The west end of Option C is not shown in an exhibit; the east end of Option C would be the same as Option B, which is shown in Exhibit 5 on page 10: SR lane diagram for Existing and Option B – Between 124th Avenue NE and SR 202. West of 108th Avenue NE, the westbound SR 520 lane would remain

the same as it is today: on the outside shoulder. East of 108th Avenue NE, the westbound and eastbound HOV lanes would be moved to the inside of the corridor.

Option D: Ramp management to improve traffic flow

Purpose: This option was added as an alternative to moving the HOV lane to the inside while still providing some traffic flow improvements.

Option D is not shown in an exhibit as there would be no changes to the SR 520 mainline as it is today: the HOV lanes would remain on the outside of the corridor. Instead, traffic volumes could be managed at the 108th Avenue NE, Bellevue Way and 84th Avenue NE westbound on-ramps. For example, the 108th Avenue NE on-ramp could be HOV only during certain time periods.

What are the key findings for each option?

Option A

- Today's outside HOV lane provides approximately an 11-minute travel time savings for carpools and buses compared with general purpose traffic between 108th Avenue NE and Evergreen Point Road.
- Relocating the HOV lanes to the inside, as analyzed in Option A, would not result in any additional travel time savings for carpools or buses and could increase bus travel times by up to eight minutes during the peak periods.
- Relocating the HOV lanes to the inside would make it difficult to provide the same level of bus service at the Yarrow Point and Evergreen Point Freeway Transit stations. Buses would need to cross two general purpose lanes to access these shoulder stations. Nearly 800 daily transit riders would be affected.

Option B

- Relocating the HOV lanes to the inside for the entire length of the corridor, including through the SR 520/I-405 interchange, could save an additional one minute in travel time for carpools.
- Similar to Option A, bus travel times would likely increase by up to eight minutes west of I-405 during the peak periods.
- Because there is less congestion between 148th Avenue NE and NE 51st Street during the peak periods, buses and carpools would likely not experience as much delay when crossing the general purpose lanes to access the inside HOV lane. It would be more feasible to maintain the same level of bus service at the NE 40th and 51st Street freeway transit stations.

Option C

- Carpools would be able to reliably bypass congestion through the I-405 interchange; however, there would be no additional travel time savings because of the delay caused by having to change lanes to access the outside HOV lane near 108th Avenue NE.

Option D

- Reducing traffic volumes entering the freeway would improve HOV lane operations because there would be fewer general purpose vehicles crossing the HOV lane.
- Traffic patterns would change on the local streets and could result in more congestion on local streets and at other on-ramp locations.

Chapter 3: Accelerating Eastside improvements

Introduction

Improvements to SR 520 have been under consideration since 1997, when the Washington State Transportation Commission initiated the Trans-Lake Washington Study. In 2001, based on the Trans-Lake recommendations, a Notice of Intent was issued to prepare an environmental impact statement for the SR 520 Bridge Replacement and HOV Project, which covered the full length of SR 520 from I-5 in Seattle to SR 202 in Redmond. In 2003, the SR 520 Executive Committee changed the eastern project limit to 108th Avenue NE as a result of funding limitations imposed by Referendum 51.

In 2006, WSDOT published a draft environmental impact statement that evaluated No Build, 4-Lane, and 6-Lane alternatives for SR 520, as well as a number of design options to the 6-Lane Alternative. Based on findings in the draft, Gov. Gregoire identified the 6-Lane Alternative (also known as the “4+2” alternative) as the state’s preference for moving forward. The Legislature created a statutory requirement for this bridge configuration in Engrossed Substitute Senate House Bill 6099. In March 2008, Gov. Gregoire highlighted the importance of the SR 520 project to the region and state by announcing an accelerated project schedule. A new floating bridge is now slated to open in 2014, with the full corridor complete in 2016.

Since we began studying SR 520 improvements in 1997, much has changed. The initial purpose of the Trans-Lake Washington Project was to “improve mobility across and around Lake Washington.” Today, the SR 520 corridor faces a larger set of challenges:

- The need to prepare for potential catastrophic failure of the Evergreen Point Bridge in a windstorm – a need that becomes more urgent with each passing storm season.
- The need to respond to dramatic growth in jobs and housing on the Eastside, and to the demand for transit service that has accompanied this growth.
- The need to evaluate a new set of community-based design options that have arisen from the west side mediation process.
- The opportunity to partner with King County and the Puget Sound Regional Council to manage congestion on SR 520 in the near term through innovative use of transit, telecommuting, technology, and tolls.

To respond to this new set of challenges and opportunities, we have identified four distinct projects under a new SR 520 program. Each of these projects on its own provides substantial independent benefits to users of SR 520. The program approach provides WSDOT with an efficient way to plan and construct each project within a single team structure.

Why is an Eastside project needed now?

The Eastside Transit and HOV Project is one of the four projects in the SR 520 Program. Its purpose is to enhance travel time reliability, mobility, access, and safety for transit and carpools in the rapidly growing areas along the SR 520 corridor east of Lake Washington. Much of the need for this project is in response to the dramatic increase in economic growth on the Eastside in the eight years since the Notice of Intent for the bridge replacement project was issued.

This growth has substantially increased transit demand and spurred plans for service enhancements, but the existing Eastside infrastructure of SR 520 is inadequate to support either existing or future demand for transit. At the same time, transit agency planning is relying on SR 520 as a critical backbone to link east-west and north-south trips.

Key reasons that a separate project is needed now include:

- **To support current and planned growth on the Eastside.** The population of the three Eastside urban centers along SR 520 is expected to grow by over 45,000 people by 2030. Employment in the three cities (Bellevue, Redmond and Kirkland) is on an even faster growth curve, with a 40 percent increase in jobs projected between 2000 and 2022. Three major redevelopment projects in the works adjacent to SR 520 are slated to add up to 10,000 new households and 12.5 million square feet of office and retail space.
- **To support transit demand and planned service improvements.** In the last eight years, transit use on the Eastside has increased by 30 percent, and transit ridership on SR 520 has risen by almost 50 percent. Transit agencies throughout the region are either planning or implementing several programs that will increase the mode share of transit on the Eastside. These include King County Metro's Transit Now service expansion, transit and park and ride improvements funded under the Urban Partnership Agreement, and proposed future bus rapid transit service in the SR 520 corridor. Tolling proposed for SR 520 as part of the Urban Partnership Agreement is also expected to increase demand for transit by up to 35 percent starting in late 2009.
- **To facilitate transit reliability and safety.** The existing SR 520 Eastside HOV system is incomplete. Where HOV lanes exist, they are located on the outside of the roadway, requiring merging vehicles to weave through faster-moving HOV traffic. Between I-405 and the Evergreen Point transit stop, the HOV lane uses the old shoulder as a travel lane. In addition to creating congestion, these conditions have resulted in over 380 accidents during the last two years on westbound SR 520 between 124th Avenue NE and Evergreen Point. Buses are delayed up to 25 minutes in this congestion, affecting reliability throughout the transit system.

When can the accelerated improvements proceed?

In June 2008, we received concurrence from the Federal Highway Administration that the Eastside Transit and HOV Project meets the criteria for development of a new project as specified by Federal regulations (23 CFR 771.111(f)). This allows us to proceed with environmental review, design, and construction of the Eastside project independent of the Seattle and floating bridge portions of the corridor. We are planning to conduct environmental scoping in beginning in September 2008 and to issue an environmental assessment for the project in fall 2009, with a National Environmental Policy Act (NEPA) decision expected in December 2009. The environmental assessment will evaluate the project's effects on the natural and built environments.

Preliminary design for the Eastside project is planned for completion in early 2009. The design may then either be completed by WSDOT for bidding by contractors, or may be advanced by a contractor as a "design-build" project. We have not yet determined which contracting method will be used. Regardless of construction method, the improvements are planned to be open to drivers by late 2013.

What is included in the Eastside Transit and HOV Project?

With concurrence from the Federal Highway Administration, we are moving forward with the SR 520 Eastside Transit and HOV Project. The project includes the following transportation components:

1. Completing the eastbound SR 520 HOV lane from Lake Washington to the existing eastbound HOV lane west of the I-405 interchange. This improvement will complete the currently discontinuous HOV network on the Eastside and improve travel time reliability for buses and carpools.
2. Relocating the HOV lanes from the outside lanes to the inside lanes from Lake Washington to SR 202. This change will enhance safety by eliminating the existing need for merging vehicles to weave across the faster-moving HOV lanes to reach the general purpose lanes.
3. Constructing HOV direct access ramps at 108th Avenue NE. This improvement will connect SR 520 with 108th Avenue NE, eliminating the need to connect to the South Kirkland Park and Ride via local streets and saving as much as 15 minutes.
4. Building inside transit stops at 92nd Avenue NE and Evergreen Point Road. These transit stops will support the inside HOV lanes, and access will be integrated with the proposed lids over the highway.

5. Adding a bike/pedestrian path between 108th Avenue NE and Evergreen Point Road. This will facilitate non-motorized use of SR 520, provide transit connections for bikes and pedestrians, and complement the existing non-motorized transportation network on the Eastside.
6. Improving interchanges at 84th Avenue NE, 92nd Avenue NE, Bellevue Way, and 108th Avenue NE to ease traffic congestion.

In addition, the project will include:

- Providing sound walls between 108th Avenue NE and Evergreen Point Road to reduce current and future high levels of highway noise.
- Constructing a stormwater system for areas where new impervious surface is added to improve water quality and reduce peak flows.
- Building lids at 84th Avenue NE and 92nd Avenue NE to reconnect communities divided by the original construction of SR 520 in the 1960s.
- Realigning Yarrow Creek and making culverts passable for fish. This will improve and enhance the habitat of this salmon-bearing stream.

How were the project boundaries selected?

The proposed project encompasses the entire Eastside portion of the SR 520 corridor, which is 8.5 miles in length. The corridor serves the urban centers of Bellevue, Kirkland, and Redmond and the rapidly growing areas of east King County.

Eastside employment is on track to grow from about 225,000 jobs in 2000 to about 317,000 jobs in 2022 – an increase of over 40 percent. This employment growth, coupled with proposals for large mixed-use developments and supportive transit policies in Bellevue and Redmond, makes the Eastside an urban center in its own right. As its communities strive for greater balance between jobs and housing, the Eastside requires a greater level of transit service. Increasing gas prices and worsening congestion are also adding to transit demand, which has grown by 30 percent on the Eastside and by 50 percent in the SR 520 corridor over the last eight years. The proposed termini support much-needed transit service enhancements by providing a continuous HOV link between SR 520's major Eastside transit hub at Evergreen Point and the eastern end of the corridor.

Another important factor is the planned improvements in transit service on the Eastside, which require additional infrastructure on SR 520 to function effectively. These proposals have all been planned and funded

within the last five years, reflecting changing regional conditions. King County Metro's Transit Now program will substantially improve service on SR 520 as well as many connecting Eastside routes. The Urban Partnership Agreement is slated to add 45 buses to SR 520 service and to fund improvements to the South Kirkland Park and Ride, which require direct access to SR 520 to achieve travel time benefits for transit vehicles. A legislatively mandated high-capacity transit plan for SR 520 designates the highway as a corridor for bus rapid transit. Coupled with proposed tolling – which will create a disincentive to driving alone – these recent regional actions create the need for additional improvements on the Eastside.

The text below describes the proposed east and west termini for the project and the reasons for these project boundaries.

West Terminus

The Evergreen Point freeway transit stop is the primary transfer point for people changing from local and regional north-south bus routes to the regional east-west service that operates on SR 520. In this sense, it is the transit equivalent of a highway interchange. Twenty-three bus routes, operated by both King County and Sound Transit, use this stop as a time and transfer point. (In comparison, 15 routes transfer at the Montlake transit stop on the west side of Lake Washington.) Buses that use the Evergreen Point stop serve the neighborhoods north and south of SR 520, neighboring cities, and destinations as distant as Totem Lake, Issaquah, and Renton. This makes it one of the key transit hubs of the Eastside, facilitating trips both across Lake Washington and to many points north, south, and east. For a project designed to enhance the operation of transit and HOVs, such a major regional linkage point is a logical terminus.

East Terminus

The SR 520/SR 202 interchange provides commuters from Redmond, the Sammamish Plateau, and east King County with access to SR 520 and is the easternmost interchange on the highway. The limited-access freeway terminates about a mile east of this interchange and connects with the local arterial network. The completed HOV system would link to ongoing improvements at the east end of the corridor to widen SR 520 and SR 202 and to add an HOV lane with SR 202.

Will these improvements bring benefits before the SR 520 corridor is completed?

The Eastside Transit and HOV Project provides independent benefit for the following reasons:

- The project would complete the Eastside transit and HOV system. The proposed transit improvements would create a complete and continuous Eastside transit and HOV system on SR 520. These improvements would also provide direct access ramps for transit vehicles traveling between SR 520 and the South Kirkland Park

and Ride at 108th Avenue NE. The project would provide the infrastructure and operational improvements to support planned population growth, economic expansion, and increases in transit service in the rapidly growing communities east of Lake Washington.

- The project would provide substantial travel time benefits to transit and carpools. Currently, buses and carpools on SR 520 experience substantial congestion-related delay during peak periods. Under free-flow conditions, the trip from the SR 202 interchange to Seattle takes about 36 minutes; during peak travel periods, the same trip takes over an hour. Much of this delay occurs in the Eastside portion of the corridor. Immediately upon completion of the Eastside Transit and HOV Project, transit vehicles would see their travel time reduced both eastbound and westbound between the Evergreen Point transit stop and SR 202, as compared to “no build” conditions. By 2030, these transit travel time savings are estimated at 15 minutes eastbound and 60 minutes westbound.
- The project would enhance public safety. As noted above, SR 520 experiences a large number of accidents in locations where the outside HOV lanes require drivers entering or exiting the highway to merge and weave. The project would result in safer and more efficient operation of SR 520 on the Eastside by 1) separating merge movements between buses and other vehicles at the 108th Avenue NE and 84th Avenue NE interchanges; 2) eliminating weaves caused by general purpose traffic needing to enter or exit via the outside HOV lanes; and 3) widening shoulders to current design standards.
- The project would support regional and local transit and land use plans and policies. Transit system and HOV improvements identified for this project are consistent with regional and local transit and multi-modal plans and policies, as well as policies geared specifically toward SR 520 that are identified in community comprehensive plans, bicycle and pedestrian plans, and the Urban Partnership Agreement. The project would also comply with ESHB 2878.

Are these changes compatible with other plans in the corridor?

The proposed improvements to the Eastside portion of SR 520 would not preclude any reasonably foreseeable improvements being considered for other portions of SR 520 or connecting transportation facilities. At the proposed west terminus, the HOV lanes would tie in near the transition span for the Evergreen Point Bridge. This configuration would be compatible with any of the bridge

replacement alternatives studied in the SR 520 Bridge Replacement and HOV Project draft EIS, including the No Build option. At the east end of the SR 520 corridor in Redmond, the proposed restriping of HOV lanes would be compatible with the current project to widen SR 520 and SR 202. The Eastside Transit and HOV Project also would not affect planned future improvements to I-405 in the area of the I-405/SR 520 interchange.

Chapter 4:

Analysis of near-term,
low-cost options for HOV relocation

Introduction

We identified four options for evaluating moving the HOV lane to the inside that met requirements of ESHB 2878. Since the current HOV lanes east of I-405 are on the outside of the corridor, we chose to evaluate improvements that extended beyond the 108th Avenue NE limit stated in the bill.

We developed a spreadsheet application to determine and evaluate the relative travel time differences between the existing lane configuration and the lane configurations associated with each of the proposed options. Based on previous analyses associated with the project and the team's familiarity with the corridor, we determined that ESHB 2878 addressed only one of two areas of concern for buses and carpools in the corridor.

One area of concern is the termination of the westbound HOV lane at Evergreen Point Road and the second concern is the termination of the westbound HOV lane near 124th Avenue NE, approaching the SR 520/I-405 interchange. We wanted to determine what, if any, travel time benefits might be provided if HOV lane improvements were provided east of 108th Avenue NE, through the SR 520/I-405 interchange, and throughout the east end of the SR 520 corridor to SR 202.

In addition to the qualitative evaluation of the different options, we also performed a high-level quantitative evaluation in order to provide a relative comparison of the effects of the improvements on travel times. In order to provide a conservative estimate, we used existing traffic volumes. While the legislation states that these improvements could occur under a pre-construction tolling scenario, we did not adjust the traffic volumes for trip diversions that might occur when a toll is added to the SR 520 corridor. This choice further ensures a conservative travel time estimate. Similarly, we also chose not to include the 45 new buses allocated to SR 520 under the Urban Partnership Agreement in the bus volumes used for the quantitative evaluation.

The options evaluated to improve traffic flow were:

Option A: Inside HOV lane between Evergreen Point Road and 108th Avenue NE

Purpose: This option was evaluated because it was specifically identified in ESHB 2878.

Option A is shown in Exhibit 4 on page 9: SR 520 lane diagram between Evergreen Point Road and 124th Avenue E. It moves the westbound outside HOV lane to the inside between 108th Avenue NE and Evergreen Point Road. East of I-405, the westbound and eastbound HOV lanes would remain outside lanes as they are today.

Option B: Inside HOV lane between Evergreen Point Road and SR 202

Purpose: This option was included to address westbound congestion through SR 520/I-405 interchange.

Option B is shown in Exhibit 5 on page 10: SR 520 lane diagram for Existing and Option B – Between 124th Avenue NE and SR 202. West of 108th Avenue NE, it is the same as Option A. East of 108th Avenue NE, Option B would move the westbound and eastbound HOV lanes to the inside, with the westbound HOV lane extending through the I-405 interchange.

Option C: Outside HOV lane between 108th Avenue NE and Evergreen Point Road/Inside HOV lane between SR 202 and 108th Avenue NE

Purpose: This option was included to allow buses and carpools to bypass the congestion in the SR 520/I-405 interchange area while maintaining service at 92nd Avenue NE and Evergreen Point Bridge Freeway stations.

The west end of Option C is not shown in an exhibit; the east end of Option C would be the same as Option B, which is shown in Exhibit 5 on page 10: SR 520 lane diagram for Existing and Option B – Between 124th Avenue NE and SR 202. West of 108th Avenue NE, the westbound SR 520 lane would remain the same as it is today: on the outside shoulder. East of 108th Avenue NE, the westbound and eastbound HOV lanes would be moved to the inside of the corridor.

Option D: Ramp management to improve traffic flow

Purpose: This option was added as an alternative to moving the HOV lane to the inside.

Option D is not shown in an exhibit as there would be no changes to the SR 520 mainline as it is today: the HOV lanes would remain on the outside of the corridor.

How were the options evaluated?

We developed a spreadsheet application to determine and evaluate the relative travel time differences between the existing lane configuration and the lane configurations associated with each of the proposed options.

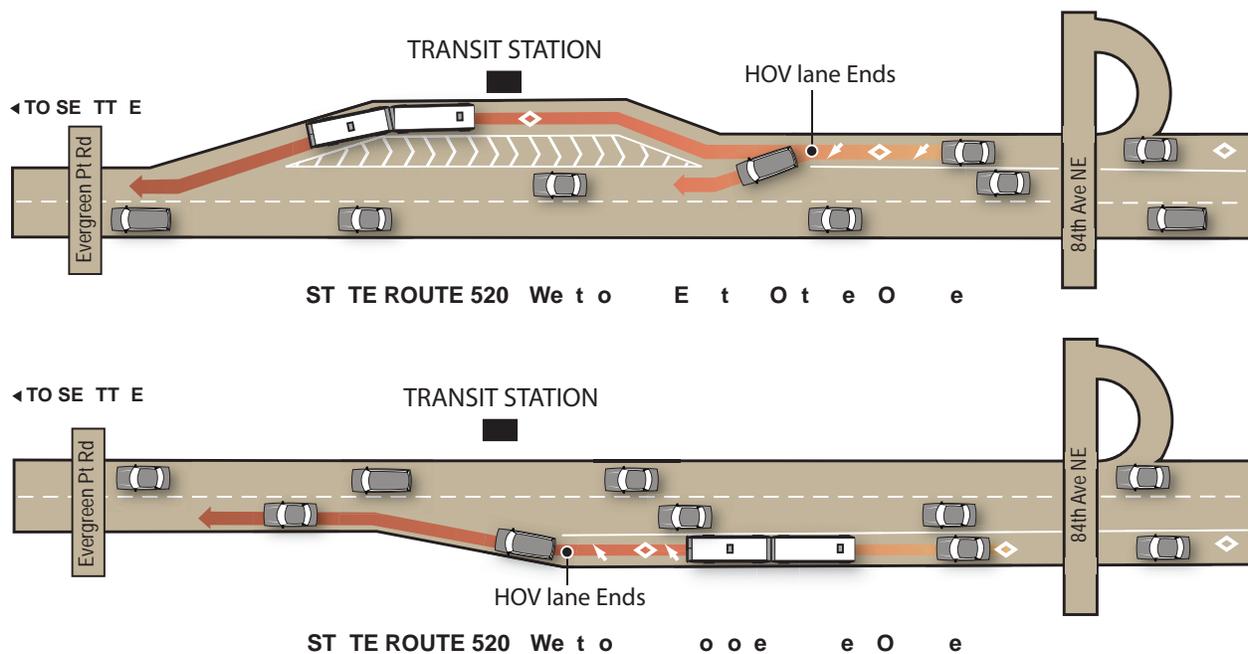
Existing speed and vehicle volume data were used to estimate travel times for the corridor by mode: general purpose, carpools and buses. Existing HOV occupancy data were used in the evaluation. We assumed no increases in transit ridership or HOV volumes/occupancy because of the temporary time span of these improvements. The evaluation also included geometric information, specifically the length

of the mainline segments between on- and off-ramps. Except for the speed data, all of the data inputs described above remained the same across the different options.

By holding the data described above constant and changing the HOV lane speeds to reflect their relocation to the inside of the corridor, we were able to determine the relative differences in travel times between the different options, except for Option D. Option D was only qualitatively evaluated as there was no change to the mainline lane configurations. The operational considerations and evaluation results for each option are discussed below.

Option A: Inside HOV lane between Evergreen Point Road and 108th Avenue NE

Under Option A, we assumed that the inside HOV lane would begin and end in approximately the same locations that it does now: beginning near 108th Avenue NE and terminating near 84th Avenue NE. See Exhibit 9: Westbound HOV lane terminations. Terminating the HOV lane in this way would likely affect traffic flow in the general purpose lanes as it does today. However, the lane merge could be improved. This possible improvement is discussed more in the general purpose traffic section below.



Note: traffic would merge into the general purpose lanes but the merge could happen over a longer and safer length of roadway to facilitate a safe operation

Exhibit 9

West of I-405

Traffic operations - buses

Buses would likely be able to travel at higher speeds because they would no longer be operating on a converted, substandard shoulder. This configuration would also reduce the number of higher speed conflicts at the ramp merge since general purpose vehicles would no longer be merging across the HOV lane.

Moving the HOV lane to the inside in this segment would affect bus service along the corridor.

- **I-405 to SR 520 buses**

For buses coming from east of the I-405 interchange, an inside HOV lane would allow them to bypass the weaving activity associated with traffic entering from I-405 and exiting to 108th Avenue NE. However, buses coming from I-405 would have to make three lane changes across the general purpose lanes to access the inside HOV lane. These lane changes would degrade general purpose lane operations throughout the peak period and would add travel time for buses. However, I-405/SR 520 westbound bus service is highest during the morning peak period, which is less congested than the afternoon peak period. Therefore, these buses would likely have minimal delays related to congestion when accessing the inside HOV lanes. These lane changes would degrade general purpose lane operations throughout the peak period.

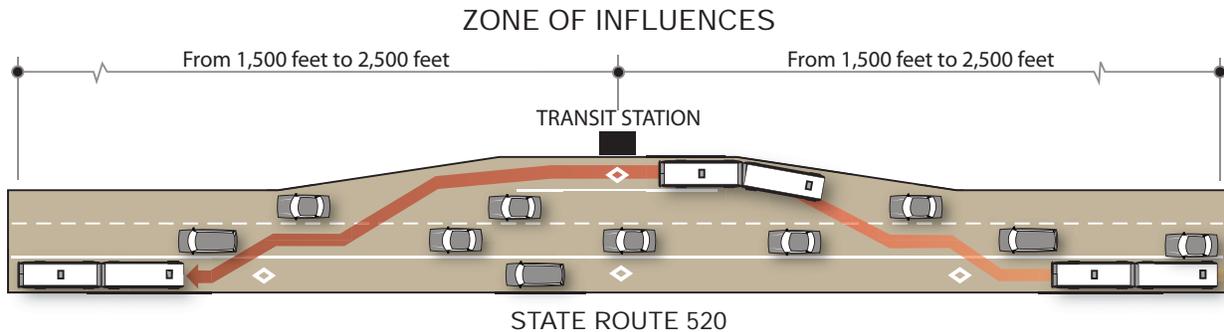
- **South Kirkland Park and Ride buses**

Buses leaving the South Kirkland Park and Ride lot and entering from the 108th Avenue NE westbound on-ramp would face similar conditions and make two lane changes to access the inside HOV lanes. Metro route 255 provides frequent all-day service with a bus approximately every 10 minutes during the peak periods and every 30 minutes during the mid-day. These lane changes would degrade general purpose lane operations throughout the peak period and it would add travel time for buses during stop-and-go congested conditions.

- **Evergreen Point Road and 92nd Avenue NE freeway stations**

Under near-term, low-cost enhancements, the freeway stations would remain on the outside shoulders, requiring buses to again make two lane changes across the general purpose lanes to serve the freeway stations and they would have to do this four different times – approaching and departing the 92nd Avenue NE and Evergreen Point freeway stations. These lane changes could increase bus travel times between 108th Avenue NE and Evergreen Point Road by up to eight minutes, which would outweigh any benefit provided by moving the HOV lanes to the inside, especially when considered in person hours. For example, an average articulated bus carries 65 people, so an increase of eight minutes results in nearly a nine-hour increase in person travel time for every bus that is delayed. See Exhibit 12 for existing

and Option A travel times on page 46. This weaving activity would also affect traffic operations in the general purpose lanes, which is discussed in the general purpose section below. See Exhibit 12: Typical freeway station with inside HOV lane.



Note: it 0 to 0 uses er our t e enera ur ose anes wou d e ad erse a e ted near e er inute due to uses wea in a ross t e enera ur ose anes to a ess t e transit stations is wou d resu t in ost roadwa a a it a on t e orridor and in reased on estion

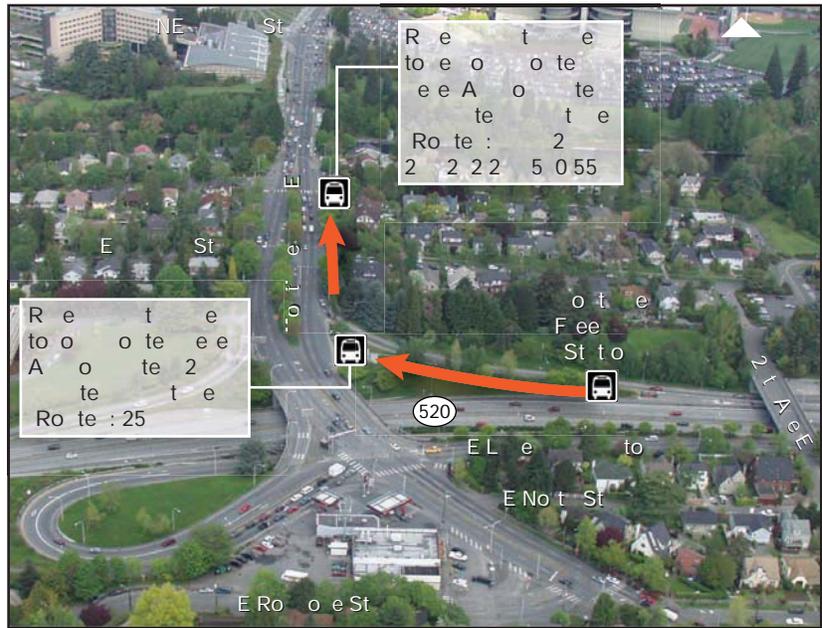
Exhibit 10

Additionally, when freeway transit stations are less than two miles apart, drivers are often instructed not to make lane changes, but to remain in the outside general purpose lane between the two stations. Therefore, during the peak periods, buses would be traveling in the congested general purpose lanes, which would be a substantial degradation in service over today's conditions with the outside HOV lane. When these lanes are congested, traveling between the 92nd Avenue NE and Evergreen Point freeway transit stations could take up to 14 minutes, which is longer than the 11 minutes it could take to travel between the inside HOV lane and the outside freeway transit stations. Either way, bus travel times would increase substantially over today's average bus travel time of approximately four minutes between 108th Avenue NE and Evergreen Point Road.

One option is to restructure the transit service at these stops so that not all routes would stop at the freeway transit stations, which would give bus riders less options than today for crossing the lake. Route restructuring can take up to two years to complete, at which time the Eastside Transit and HOV Project would already be under construction

Another option is to close the freeway stations. With the freeway transit stations closed, buses would experience travel time benefits similar to those for carpools. At the 92nd Avenue NE freeway station, most of the 140 daily riders using that stop come from the surrounding neighborhood (as opposed to transfers) and they would need to find an alternate route. They could use either the South Kirkland or Evergreen Point Road Park and Ride lots to access bus service on SR 520, which would increase their travel time.

At the Evergreen Point freeway station, most of the 640 daily riders using that stop are transferring between buses and those riders would either need to make that transfer at the Montlake freeway station, board their bus from another location, or find an alternate route. If riders transferred at the Montlake freeway station, riders transferring to downtown Seattle routes would likely not experience any additional delay from transferring at the Montlake freeway station. However, riders transferring to University District routes would experience some additional delay as they would need to walk from the Montlake freeway station to Montlake Boulevard to catch a connecting bus. See Exhibit 11: Accommodating University District transfer at Montlake freeway station.



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Exhibit 11

Depending on their destination, some riders may be able to catch a local bus at the stop just south of the Montlake Boulevard/ SR 520 westbound off-ramp intersection, which would add approximately two minutes of walking time. The routes serving this stop operate all day and arrive frequently so additional wait time would likely be fewer than 15 minutes. Some riders may need to continue walking north to the bus stop just south of the Montlake Boulevard/Shelby Street intersection, which would add approximately four minutes of walking time. Because a number of the buses serving this stop operate during the peak periods only, buses arrive less frequently so riders could experience additional wait times of approximately 30 minutes.

Traffic operations - carpools

Moving the HOV lane to the inside at this location would provide the most benefit for carpools (up to one minute) as they would no longer be delayed by general purpose on-ramp traffic crossing the HOV lane to access the general purpose lanes.

Traffic operations - general purpose traffic

In the highly congested area west of I-405, moving the HOV lanes to the inside would not result in any traffic flow improvements for general purpose vehicles. Buses changing lanes across the general purpose lanes to access the ramps and freeway transit stations might negatively affect general purpose traffic flow over today's conditions. Because buses accelerate more slowly than passenger cars, a single bus can have the same operational effect as multiple passenger cars. This effect would be greatest during the shoulder periods and could result in increasing the peak periods when merging of slower traveling buses will trigger unstable traffic flow at lower volumes of general purpose traffic. Additionally, during off-peak periods, speed differences between buses and general purpose vehicles may be a safety concern.

Design considerations

Our engineering evaluation focused primarily on geometric design issues that would be related to the potential shifting of the HOV lanes to the inside. In the westbound direction, shifting the HOV lane to the center is feasible from a geometric perspective with two concerns:

- With the shift to the inside lane, many changes to the highway signage would be required. Much of the signage for the inside HOV lane should be mounted either adjacent to the HOV lane or above it. The median is 4 feet wide with 2 feet occupied by a concrete barrier, leaving 1-foot inside shoulders for the westbound and eastbound inside lanes. If HOV signage were to be placed in the median with such narrow shoulders, the likelihood of a vehicle striking the edge of the sign is very high. This would create a safety and maintenance issue. This could be resolved by mounting the signs on a sign bridge or on existing bridges that cross over SR 520. Mounting signs on bridges would have to be evaluated on a case-by-case basis to determine if the bridge has the strength to carry the load and if there would be sufficient clearance between the sign and the roadway below.
- The existing outside HOV lane is not designed to carry large volumes of traffic, which would introduce safety and roadway maintenance issues.

The existing lanes in the westbound direction are very narrow. The original lane configuration was for two 12-foot lanes and an 8-foot shoulder. Today, in the same space there are three lanes (11-feet wide in each lane). The inside general purpose lane averages slightly less than 11 feet and the outside general purpose lane averages just over 11 feet. The inside shoulder between the east shore of Lake Washington and 108th Avenue NE ranges between 1.1 and 3.3 feet.

The state design manual states the design guidelines for an HOV lane are a minimum width of 12 feet with a minimum shoulder width of 10 feet. Currently, the SR 520 HOV lane between the east shore of Lake Washington and 108th Avenue NE ranges between 11.2 and 12.6 feet wide with the outside shoulder width ranging between 1 and 5 feet.

Safety considerations

If the freeway transit stations were to remain open, buses would be required to merge across two general purpose lanes, increasing the opportunity for accidents. During the peak periods when the general purpose lanes are operating under stop-and-go conditions, there would be a greater speed differential between the vehicles traveling in the general purpose and HOV lanes, which would increase the severity of accidents when they occur.

If HOV signage were to be placed in the median with such narrow shoulders, the likelihood of a vehicle striking the edge of the sign is very high. This would create a safety issue.

Through the SR 520/I-405 interchange

Traffic operations - buses and carpools

Under Option A, there would be no change compared to today's lane configuration through the SR 520/I-405 interchange: an inside HOV lane would not be added. Today, the outside HOV lane designation ends just east of 124th Avenue NE and opens to general purpose traffic to provide access to the I-405 ramps. Some buses merge to the inside general purpose lane to bypass congestion that originates from congestion on I-405, affecting the SR 520/I-405 interchange ramps and the outside lanes on the SR 520 mainline. With the inside HOV lane starting between 108th Avenue NE and the I-405 interchange, buses may receive some benefit by being able to enter directly into the inside HOV lane instead of having to weave back to an outside HOV lane.

Traffic operations - general purpose traffic

With no change to the SR 520/I-405 interchange, general purpose vehicles would experience the same operational challenges they do today. The conflicts between entering and exiting traffic between SR 520 and I-405 would remain and when combined with I-405 congestion, traffic flow in the outside lanes would be affected. Some benefit of the inside HOV lane downstream may be observed at the interchange as through traffic might be encouraged toward the inside lane in anticipation of the inside HOV lane. This could balance the traffic volumes across lanes through the interchange area.

East of 124th Avenue NE

Traffic operations - buses and carpools

Under Option A, the HOV lanes (both westbound and eastbound) would remain on the outside of the corridor as they are today. Westbound buses and carpools would need to change lanes between

east of 124th Avenue NE and the start of the inside HOV lane near 108th Avenue NE. However, many buses already move to the inside lane to bypass congestion through the SR 520/I-405 interchange.

Traffic operations - general purpose traffic

Under Option A, the existing general purpose traffic conditions would be similar to today. Where the outside HOV lanes open to general purpose traffic in advance of the I-405 interchange, carpools traveling through would likely begin to merge into the general purpose lanes and move left in anticipation of the inside HOV lane at 108th Avenue NE. This may moderately extend the queues exiting to I-405, but the conflicting volumes would remain the same as existing conditions. The HOV lane changes at the end of this segment would not substantially affect delays for general purpose traffic.

As shown in Exhibit 12, today's outside HOV lane provides an 11-minute travel time savings for carpools compared with general purpose vehicles. The results of the evaluation showed that relocating the HOV lane to the inside would likely not result in any noticeable travel time savings for carpools between 108th Avenue and Evergreen Point Bridge when the freeway transit stations are closed. However, buses serving the outside transit freeway stations would experience a substantial increase in travel time when the freeway stations are open.

Option A Key Findings

Under Option A, carpools would save one minute in travel time between 108th Avenue NE and Evergreen Point Road. Moving the HOV lane to the inside would eliminate the existing need for general purpose vehicles to merge across the HOV lane, which would increase safety. Carpools would still be affected by delays through the SR 520/I-405 interchange and the HOV lane termination near 84th Avenue NE. Buses would likely not receive any travel time benefits because of the need to continue serving the outside freeway transit stations at Evergreen Point Road and 92nd Avenue NE. If buses continued to serve these freeway stations, they could be delayed up to eight additional minutes over today's travel times between 108th Avenue NE and Evergreen Point Road. Buses would also still be affected by delays through the SR 520/I-405 interchange, delays associated with on- and off-ramp activity across the general purpose lanes, and the merge associated with the HOV lane termination near 84th Avenue NE.

In order to continue serving the outside shoulder freeway transit stations, buses could incur up to approximately eight additional minutes of travel time as a result of weaving across two general purpose lanes both approaching and departing from the station. These lane changes would affect both safety and traffic flow in the general purpose lanes as buses travel more slowly and have slower response times. The effects would be greatest during the shoulder periods when traffic volumes are building but have not quite slowed to stop-and-go conditions because any speed differences between vehicles affects more vehicles.

As discussed under Option A, with the freeway transit stations closed, buses would experience travel times similar to those for carpools.

Exhibit 12: Option A Vehicle Travel Time Comparison (in minutes)

| Option | Westbound SR 520 | | | | | | | |
|--|------------------|-----------------------------|--|-----|------------------------------------|-----|------------------------------------|-----------------------------|
| | Corridor Total | | W Lake Sammamish Pkwy to 124th Avenue NE | | 124th Avenue NE to 108th Avenue NE | | 108th Avenue NE to Evergreen Point | |
| | General Purpose | HOV | General Purpose | HOV | General Purpose | HOV | General Purpose | HOV |
| Existing | 22 | 11 | 6 | 6 | 2 | 1 | 14 | 4 |
| Option A Freeway Station open | 22 | 10 (carpools) 19 (buses) | 6 | 6 | 2 | 1 | 14 | 3 (carpools) 12 (buses)* |
| Option A Freeway Station closed | 22 | 10 | 6 | 6 | 2 | 1 | 14 | 3 |

**This travel time increase over existing would likely be limited to peak periods when general purpose traffic congestion is stop and go.*

Option B: Inside HOV lane between Evergreen Point Road and SR 202

West of I-405

Under Option B, the westbound HOV lane would be on the inside, as it is under Option A. Therefore, it would have the same effect on buses, carpools and general purpose traffic as described above.

Through the SR 520/I-405 interchange

Buses and carpools

Under Option B, the inside HOV lane would continue from 108th Avenue NE through the I-405 interchange, which would allow buses and carpools to reliably bypass the congestion associated with high general purpose traffic volumes and weaving activity associated with the I-405 ramps. Nearly half of the westbound traffic on SR 520 between 124th Avenue NE and I-405 is destined for the I-405 corridor. The travel time savings would be the greatest for westbound buses and carpools during the afternoon peak period, which is when the westbound lanes are congested as far east as 140th or 148th Avenue NE.

Traffic operations – general purpose traffic

With continuous HOV lanes through the interchange, the inside lane would be for carpools and buses only, which would increase general purpose volumes in the outside lanes and potentially increase the conflicts with traffic exiting and entering from I-405. General purpose traffic is likely to experience moderately increased delay under this configuration, but it would be an extension of the congestion that is already occurring west of I-405.

Safety considerations

The merge area associated with the eastbound SR 520 on-ramp from I-405 southbound has been designated a high accident location during the last three review periods: 2002, 2004, and 2006. Moving the HOV lane to the inside in this location would introduce higher levels of traffic in the outside merge lane. This would create a higher level of crossing traffic movements that could result in an increased number of accidents.

By continuing the inside HOV lane through the I-405 interchange, more general purpose traffic would be using the two outside lanes on the SR 520 mainline. With more volume in the outermost lane, there will be increased opportunity for conflicts between through traffic and I-405 traffic.

Design considerations

There are no substantial geometric concerns with shifting the HOV lane to the inside in the westbound direction through the SR 520/I-405 interchange.

The short merge area on eastbound SR 520 at the I-405 southbound to eastbound SR 520 ramp offers inadequate views and deficient acceleration distance for merging into the existing mainline.

East of 124th Avenue NE

Traffic operations – buses

Under Option B, the westbound HOV lane would be moved to the inside of the SR 520 corridor between near 124th Avenue NE and West Lake Sammamish Parkway. This would provide a one-minute travel time benefit for buses as they would be able to bypass the congestion approaching the SR 520/I-405 interchange. However, the one minute in travel time savings provided by an inside HOV lane may be offset by the time lost weaving between the inside HOV lanes and the outside transit freeway stations located at NE 40th and NE 51st Street. At the same time, these freeway stations are both served off of the collector-distributor system between the NE 40th and NE 51st interchanges, which means that buses would only have to exit and enter the SR 520 mainline once. Also, SR 520 is generally not as congested between the 148th Avenue NE and 40th/51st Street interchanges, meaning that the travel time effects of weaving between the inside HOV lane and the freeway transit stations may be negligible.

Buses traveling eastbound would need to exit the HOV lane near the 148th Avenue NE interchange to access the off-ramp to the NE 51st Street/NE 40th Street collector-distributor and freeway transit stops. These eastbound buses would rejoin the SR 520 corridor near the West Lake Sammamish Parkway off-ramp where some would exit the corridor. The buses destined for Union Hill Road would need to cross over congested traffic to enter the HOV lane and bypass the congestion.

Traffic operations – carpools

Moving the HOV lanes to the inside east of 124th Avenue NE would provide some travel time benefit to carpools as they would also be able to bypass the congestion approaching the SR 520/I-405 interchange. This benefit would be greatest for those carpools traveling the length of the corridor as drivers would need to make two to three lane changes between ramps and the inside HOV lane

Traffic operations - general purpose traffic

Moving the HOV lanes to the inside east of 124th Avenue NE would not affect general purpose traffic operations. The east end of the corridor – especially between 124th Avenue NE and NE 40th Street – generally has better traffic flow and is less congested than it is west of I-405. Therefore, weaving activity between the inside HOV lanes of the freeway transit stations is expected to have a negligible effect on general purpose traffic operations.

Safety considerations

If the freeway transit stations were to remain open, buses would be required to merge across two general purpose lanes, increasing the opportunity for accidents. Similarly, carpools would also have to merge across two general purpose lanes to enter and exit the SR 520 corridor.

During the peak periods when the general purpose lanes are operating under stop-and-go conditions, there would be a greater speed difference between the vehicles traveling in the general purpose and HOV lanes, which would increase the severity of accidents when they occur.

Design considerations

There are no substantial safety concerns or geometric constraints with shifting the HOV lanes to the center between 124th Avenue NE and West Lake Sammamish Parkway. We recommend terminating the eastbound HOV lane at the existing location, just west of the NW 60th Street undercrossing. The westbound HOV lane should start west of West Lake Sammamish Parkway.

The SR 520 to West Lake Sammamish Parkway to State Route 202 project will widen SR 520 from two to four lanes by adding a merge lane and a carpool lane in both directions. Construction on this project will likely begin in late 2008 and finish in mid-2011. We recommend not making changes to the HOV lanes east of West Lake Sammamish Parkway until after construction is complete. The final roadway configuration will accommodate inside HOV lanes.

Option B Key Findings

Like Option A, bus travel time would increase from four to 12 minutes if the 92nd Avenue NE and Evergreen Point freeway stations remain open. Because there is minimal congestion between the 148th Avenue NE and 40th/51st Street interchanges, buses serving

the NE 40th and NE 51st Street freeway stations are not likely to incur the same increase in travel times they would serving the 92nd Avenue NE and Evergreen Point Road freeway stations. Travel times would be similar to what they are today.

Exhibit 13. Option B Vehicle Travel Time Comparison (in minutes)

| Option | Westbound SR 520 | | | | | | | |
|--|------------------|-----------------------------|--|-----|------------------------------------|-----|------------------------------------|-----------------------------|
| | Corridor Total | | W Lake Sammamish Pkwy to 124th Avenue NE | | 124th Avenue NE to 108th Avenue NE | | 108th Avenue NE to Evergreen Point | |
| | General Purpose | HOV | General Purpose | HOV | General Purpose | HOV | General Purpose | HOV |
| Existing | 22 | 11 | 6 | 6 | 2 | 1 | 14 | 4 |
| Option B Freeway Station open | 22 | 10 (carpools) 19 (buses) | 6 | 6 | 2 | 1 | 14 | 3 (carpools) 12 (buses)* |
| Option B Freeway Station closed | 22 | 9 | 6 | 6 | 2 | 1 | 14 | 3 |

**This travel time increase over existing would likely be limited to peak periods when general purpose traffic congestion is stop and go.*

Option C: Outside HOV lane between 108th Avenue NE and Evergreen Point Road/Inside HOV lane between SR 202 and 108th Avenue NE

This option was included in this evaluation because of safety concerns related to shifting general purpose traffic volumes to the outside shoulder lane on SR 520 west of I-405. As mentioned, the outside shoulder lane was not designed to carry a full lane of traffic volumes, which is why it currently has a three or more occupancy requirement. This option was also included in the evaluation to try and balance the operational requirements for transit in the corridor. With Option C, I-405 buses would not have to weave across three lanes of traffic to access the inside HOV lane and SR 520 buses would be able to continue serving the freeway stations at 92nd Avenue NE and Evergreen Point. At the same time, SR 520 buses and carpools could receive some benefits from having the HOV lane on the inside of the corridor between West Lake Sammamish Parkway and 124th Avenue NE.

West of I-405

Traffic operations – buses, carpools and general purpose traffic

Under Option C, the westbound HOV lane would remain where it is today in the outside shoulder lane between 108th Avenue NE and Evergreen Point. Operations would remain the same as they are today with the outside HOV lane providing an 11-minute travel time savings for buses and carpools compared to general purpose vehicle travel time.

Through the SR 520/I-405 interchange

Traffic operations - buses and carpools

Under Option C, the westbound HOV lane would continue through the I-405 interchange, ending just west of the I-405 exit ramp. With the HOV lane located on the inside through the interchange, westbound buses and carpools would be better positioned to bypass the weaving activity and congestion that occurs through the interchange. Once through the interchange, buses and carpools would need to make three lane changes to access the outside HOV lane that would begin near 108th Avenue NE, which is what many of the buses and carpools do today as they travel in the inside general purpose lane through the interchange. Under Option C, there would also be no change to the eastbound HOV lane; it would not begin until east of the interchange near 124th Avenue NE.

Traffic operations - general purpose traffic

Option C would be the same as Option B through the SR 520/I-405 interchange. The inside lane would be for HOV traffic only, which would increase general purpose volumes in the outside lanes and potentially increase the conflicts with traffic exiting and entering from I-405. General purpose traffic is likely to experience moderately increased delay under this configuration, but it would be an extension of the congestion that is already occurring west of I-405.

East of 124th Avenue NE

Traffic operations - buses and carpools

East of I-405, the HOV lanes (both eastbound and westbound) would be moved to the inside of the corridor, which would provide a one-minute travel time savings for buses and carpools. This savings would be a result of being able to bypass the congestion approaching the SR 520/I-405 interchange, which can often extend as far east as 140th or 148th Avenue NE.

Westbound, the inside HOV lane would begin as it does today near West Lake Sammamish Parkway and extend to near 108th Avenue NE. While buses and carpools would receive some travel time benefit from not being delayed by general purpose traffic weaving across the HOV lane, this benefit could be negated by the time required to weave across the general purpose lanes to the inside HOV lane. Buses would also have the additional delay of making these same lane changes to serve the transit flyer stations located on the NE 51st and NE 40th Street interchange ramps. However, as discussed under Option A, this effect would likely be negligible because this segment of SR 520 is typically not as congested as the west and east ends of the corridor.

Traffic operations - general purpose traffic

East of I-405, the general purpose lanes would operate the same as under Option B. Some delay may be expected due to the HOV traffic weaving across the general purpose lanes.

Option C Key Findings

As shown in Exhibit 14, the results of the quantitative evaluation show that relocating the HOV lane to the inside between 108th Avenue NE and West Lake Sammamish Parkway could result in approximately one minute of travel time savings for HOV vehicles as a result of being able to bypass congestion associated with the SR 520/I-405 interchange.

Exhibit 14. Option C Vehicle Travel Time Comparison (in minutes)

| Option | Westbound SR 520 | | | | | | | |
|-----------------|------------------|-----|--|-----|------------------------------------|-----|------------------------------------|-----|
| | Corridor Total | | W Lake Sammamish Pkwy to 124th Avenue NE | | 124th Avenue NE to 108th Avenue NE | | 108th Avenue NE to Evergreen Point | |
| | General Purpose | HOV | General Purpose | HOV | General Purpose | HOV | General Purpose | HOV |
| Existing | 22 | 11 | 6 | 6 | 2 | 1 | 14 | 4 |
| Option C | 22 | 10 | 6 | 5 | 2 | 1 | 14 | 4 |

Option D: Ramp Management

West of I-405

Traffic operations - buses and carpools

Under Option D, the HOV lanes throughout the corridor would remain as they are today. Instead, the ramps west of I-405 would be managed in order to improve traffic flow in both the outside HOV lane and the general purpose lanes. With the 108th Avenue NE and Bellevue Way interchange on-ramps so closely spaced, there are many vehicles weaving across the outside HOV lane within a short distance.

There are three potential ramp management strategies:

- One ramp management strategy would be to restrict the 108th Avenue NE westbound on-ramp to HOV lane traffic only during the peak periods. This would decrease both the weaving activity in this lane and the entering volumes at this location.
- Another ramp management strategy would be to close the northbound Bellevue Way westbound on-ramp to all traffic and reroute traffic to the 108th Avenue NE on-ramp.
- A third ramp management strategy would be to restrict the 84th Avenue NE on-ramp to HOV-only during the peak periods to reduce the weaving activity and entering volumes at this location. This would benefit not only HOV lane operations but also general purpose lane operations.

Traffic operations - general purpose traffic

Ramp management would improve traffic flow on the freeway during the beginning and end of the peak periods. More restrictive ramp-metering can shorten the peak by reducing the amount of merging ramp traffic conflicting with the general purpose traffic. However, operations

on local roads may be affected by traffic queuing from the freeway on-ramp. This effect can be controlled with back-of-queue detectors on the freeway ramps. These detectors loosen the ramp-metering restrictions when a queue is detected.

The benefit of ramp management is limited during times of high congestion. In over-saturated conditions, or when the traffic demand is greater than the road capacity, the travel conditions become stop and go. In these conditions, the delay of mainline general purpose traffic due to merging vehicles is relatively much less substantial. This type of condition is common during the morning and afternoon peak periods on SR 520 west of I-405.

Under Option D, no changes are proposed for ramp operations or mainline lane configurations east of 108th Avenue NE. They would be the same as they are today.

Summary of findings

Relocating the HOV lane to the inside between 108th Avenue NE and Evergreen Point Road as described in ESHB 2878 would provide a one-minute travel time savings for carpools only, likely increase bus travel times by approximately eight minutes, and trade one set of safety improvements (eliminating general purpose vehicles weaving across the HOV lane) for another set of safety concerns (buses weaving across general purpose lanes). The increase in bus travel times would affect approximately 1,400 daily riders traveling westbound from the 92nd Avenue NE and Evergreen Point freeway stations. Any changes to bus service at these freeway transit stations could take up to two years to implement and would likely reduce transit service options for some or all of these riders.

If the 92nd Avenue NE and Evergreen Point Road westbound freeway transit stations were closed, the riders making transfers at these stations could make their transfers at the Montlake freeway station, but they would incur additional delays due to walking time between the different transit facilities. Riders that use these stations from the surrounding neighborhoods would have to find alternate routes, such as using the South Kirkland Park and Ride, which would likely increase their overall transit trip travel times. Options B and C did not offer any substantial improvements to the challenges associated with Option A.

Recommendation

None of the options evaluated provided the traffic flow improvements intended by the legislation. Without supporting infrastructure like inside median HOV lanes and direct access HOV ramps, relocating the HOV lane to the inside through restriping the corridor would not provide desired improvements and would negatively affect bus service and operations. The negative effect on bus service could also decrease general purpose traffic flow compared to today's conditions if they were to continue to serve the outside freeway transit stations at 92nd Avenue NE and Evergreen Point Road.

We recommend that the SR 520 HOV lanes continue to operate in the outside lanes of the corridor in the near term.

Exhibit 15. Vehicle Travel Time Summary by Option (in minutes)

| Option | Westbound SR 520 | | | | | | | |
|------------------------|------------------|------------------------------|--|-----|------------------------------------|-----|------------------------------------|-----------------------------|
| | Corridor Total | | W Lake Sammamish Pkwy to 124th Avenue NE | | 124th Avenue NE to 108th Avenue NE | | 108th Avenue NE to Evergreen Point | |
| | General Purpose | HOV | General Purpose | HOV | General Purpose | HOV | General Purpose | HOV |
| Existing | 22 | 11 | 6 | 6 | 2 | 1 | 14 | 4 |
| Option A | | | | | | | | |
| Freeway Station open | 22 | 10 (carpools) 19 (buses)* | 6 | 6 | 2 | 1 | 14 | 3 (carpools) 12 (buses)* |
| Freeway Station closed | 22 | 10 | 6 | 6 | 2 | 1 | 14 | 3 |
| Option B | | | | | | | | |
| Freeway Station open | 22 | 9 (carpools) 19 (buses)* | 6 | 5 | 2 | 1 | 14 | 3 (carpools) 12 (buses)* |
| Freeway Station closed | 22 | 9 | 6 | 5 | 2 | 1 | 14 | 3 |
| Option C | 22 | 10 | 6 | 5 | 2 | 1 | 14 | 4 |

**This travel time increase over existing would likely be limited to peak periods when general purpose traffic congestion is stop and go.*



**Washington State
Department of Transportation**

Urban Corridors Office



DRAFT

October 22, 2008

SR 520 Eastside Transit and HOV Project
Attn: Bill Blaylock
600 Stewart Street, Suite 520
Seattle, WA 98101

Dear Mr. Blaylock:

Thank you for the opportunity to comment on the scoping of the environmental assessment for the Eastside Transit and HOV project. We are pleased that the schedule for improvements to SR 520 on the Eastside is being accelerated.

We recognize most of the elements in the project as being those that were identified previously for the Eastside in the larger SR 520 Bridge Replacement and HOV project. These are the elements which Eastside Mayors worked on during the summer of 2007 and on which Council was briefed last fall. These include direct HOV access at 108th Avenue NE, construction of facilities for cyclists and pedestrians and, in the Points communities, short lids over SR 520.

While we are in general agreement with scope of the project and what's planned for the Environmental Assessment, we have two areas of concern. First, the extension of bicycle facilities beyond Points Drive is an important and valuable change to previous plans. However, bicycle facilities need to be extended to connect with the existing SR 520 trail. This is in keeping with the concept that we agreed to in 2007. If such an extension is not completed now, where in the SR 520 program will it be completed? It is very important that this link not get left out of the overall program.

Second, we want to make sure that the Environmental Assessment carefully considers how stormwater will be managed. It is important that local agencies not be expected to maintain new facilities and that only appropriate discharges to Lake Washington be proposed and that they be analyzed in detail.

It's exciting for us to see long awaited improvements to the SR 520 corridor coming closer to reality. Thank you once again for the opportunity to comment on this project.

Sincerely,

Kirkland City Council

By: James L. Lauinger, Mayor