



## I-90/East King County High Capacity Transit Analysis Summary

### What's next?

This brochure summarizes the range of information that the people of the Puget Sound area and the Sound Transit Board of Directors will use to make decisions about how the regional transit system should be expanded to serve transit growth in the region. As you can see as you review this material, each approach brings with it both benefits and risks: ultimately, the decision will boil down to a choice about what makes the most sense for improving regional mobility for the long term and supporting the kind of livable communities citizens value so highly.

### Using this brochure

The information below is intended to provide some additional information to assist the reader in reviewing the material contained in this brochure.

### What was evaluated?

The Board requested an objective "apples to apples" comparison of different modes of bus, light rail, and monorail service throughout the Eastside. The analysis examined:

- Capital costs
- Operation/maintenance costs
- Ridership
- Traffic impacts
- Additional policy or technical issues

### What is high capacity transit (HCT)?

HCT is a system that:

- carries a large number of riders with more frequent and reliable service
- operates as independently of the freeway and roadway network as possible, avoiding areas with growing roadway congestion; and
- provides an attractive option to automobile travel.

### A note on cost figures contained in this document:

All estimated construction and operating costs are in 2005 dollars. Construction costs are conceptual only, for general comparative purposes. Operating/maintenance costs are represented as changes to the projected total operating and maintenance baseline costs for the Sound Transit district in 2030, which are estimated to be \$720 million.

### A note on bus volumes in downtown Seattle and Bellevue:

Downtown Bellevue bus volumes in 2030 are estimated to be 125 buses per peak hour (69 currently). Downtown Seattle bus volumes are estimated at 531 buses per peak hour (414 currently). Downtown bus volumes in this document are shown as changes to these baseline bus volumes.

### Get Involved

During May and June, 2005, Sound Transit will host public meetings on the I-90 study and the larger Long-Range Planning effort of which it is a part. In the fall of 2005, and on into 2006, Sound Transit's work to prepare for the future will continue. Look for more information on planning for the next round of investments in our regional mass transit system—and for how you can be involved—at Sound Transit's web site, [www.soundtransit.org](http://www.soundtransit.org). Or feel free to contact us any of the following ways:

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For printed materials in alternative formats,  
call (206) 689-4727 or (888) 713-6030 TTY.

### Introduction

In 1996, voters approved Sound Move, the first step in a regional transit system connecting King, Pierce and Snohomish Counties. That system included express buses, commuter and light rail trains, park-and-ride lots, and transit centers. Today, almost all of these projects are complete or under construction.

Recent studies have shown that by 2030, another 1.2 million people will live in the Puget Sound region and the average driver will spend an additional 70 hours each year sitting in her car. Rush "hour" will last most of the day. The Sound Transit Board of Directors has taken steps to prepare for that growth, laying the groundwork for the next steps toward expanding our regional transit system.

These next steps include updating the long-range plan for transit in the region as well as making decisions for the next round of investment in high capacity transit.

For East King County, that work is especially significant: analysis undertaken by the Puget Sound Regional Council shows that the eastside is the regional market most ripe for system expansion. As a result, the Board has asked for a thorough study of options for system expansion in East King County that would give them the ability to make "apples to apples" comparisons and arrive at decisions that both improve regional mobility and support the livable communities that the people of this region value so highly.

### The work to date

In March 2005, Sound Transit prepared an issue paper titled "I-90 Corridor/East King County High Capacity Transit Analysis." That issue paper evaluated different high capacity transit technologies to connect communities throughout East King County to the

developing regional transit system via the I-90 corridor. The system studied runs between Bellevue and Seattle with three branches extending to Kirkland, Redmond, and Issaquah.

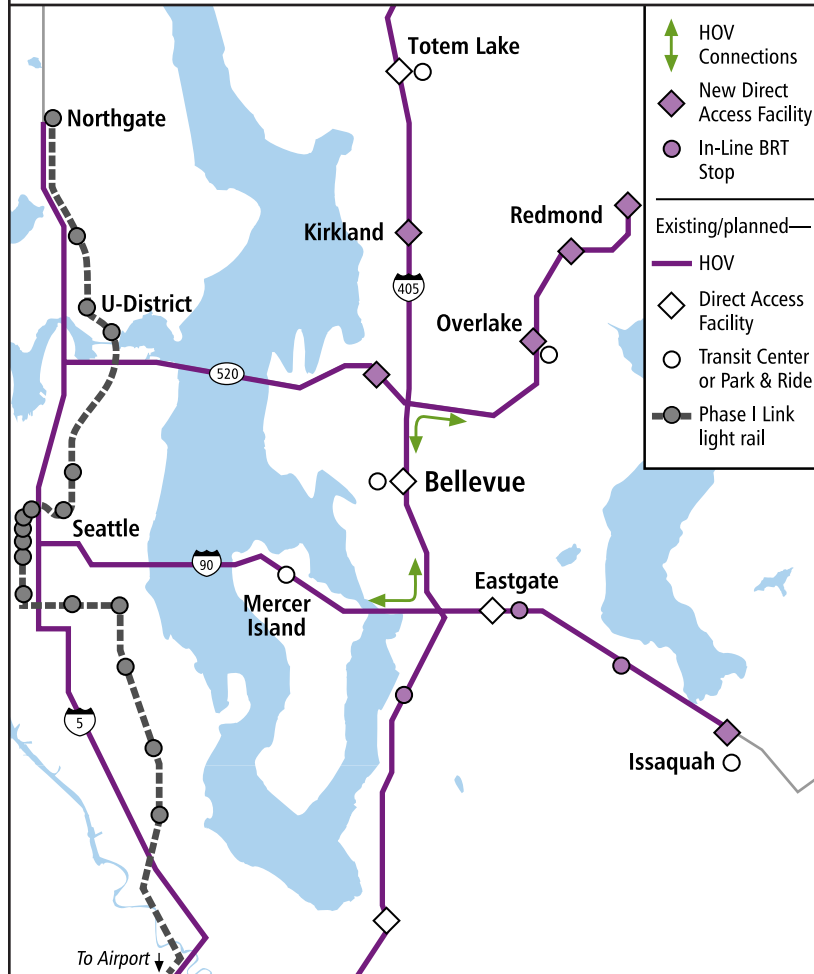
The Sound Transit Board reviewed this issue paper at a workshop held on March 31, 2005. After doing so, they directed staff to complete additional analysis of all transit technologies as well as a hybrid that combined the best features of the most promising modes—bus rapid transit and light rail. Sound Transit also met with the State Department of Transportation (WSDOT) to evaluate ways to reduce the significant capital cost of rebuilding freeway interchanges to provide HOV to HOV connections at I-405/I-90 and I-405/SR-520.

This paper summarizes the range of analysis that has been completed. A supplement to the I-90 Corridor/East King County HCT issue paper can be found on the Sound Transit website later in May, at <http://www.soundtransit.org/projects/longrange/issuepapers.asp>.



## HOV/BRT

Description: This option relies on the HOV lane system on the major freeways, augmented by direct access ramps and freeway-to-freeway connections that provide transit speed and reliability. It assumes on-street operations in both the Bellevue and Seattle downtowns.



### Key Facts

**I-90 Cross-lake Ridership (2030):**  
30,000 daily riders

#### Total Capital Costs:

Bus-only ramps: \$1.4–\$1.9 b  
HOV ramp construction costs plus interchange rebuild:\* \$2.5–\$3.5 b  
Additional cost to complete 5 remaining HOV connections is \$0.9–\$1.2 b

**Operating/Maintenance Costs:**  
+\$5.6m/yr (+0.8%)

#### Sample Travel Times (2030):

	HOV/BRT	No action
Seattle to Bellevue	36 min.	39
Bellevue to Redmond	29	45
Issaquah to Seattle	54	55
Kirkland to Bellevue	33	44
Mercer Is. to Bellevue	15	19

**Seattle street impacts:**  
+25 buses/hour (+4.7%)

**Bellevue street impacts:**  
+33 buses/hour (+26.4%)

### Key Findings

- Moderate improvement to travel times.
- Only scenario that continues Mercer Island SOV use of center lanes.
- Independent of BNSF right-of-way.
- Assumes surface street operations in Bellevue and Seattle.

### Risks

- Most reliant on WSDOT to manage HOV system to provide fast and reliable transit travel time.
- Subject to possible legislative decisions to allow single-occupant vehicle (SOV) use of HOV system.

- Implementation is dependent upon WSDOT's ability to reconstruct freeway interchanges in a manner that permits freeway widening before HOV connections are built.
- Raises significant policy and financial question of whether WSDOT and/or ST should fund construction of freeway interchange modifications and HOV connections.

\*HOV Freeway to Freeway Interchange Connections: The costs shown represent the total costs for interchange rebuilds and freeway to freeway HOV connections. How the costs may be paid, whether by WSDOT or ST is dependent on which agency has funds and when funds become available. In addition, the number of freeway to freeway connections has been reduced to the two most critical connections—the northwest quadrant of I-405/I-90 and the southeast quadrant of I-405/SR-520. This has resulted in reduced costs compared to the earlier study.

## Fixed guideway: Rail-convertible BRT

Description: Exclusive busway on I-90 from Seattle to Bellevue with three branch lines to Redmond, Kirkland and Issaquah. Built to LRT standards for later conversion to LRT.



### Key Facts

**I-90 Cross-lake Ridership (2030):**  
36,000 daily riders

#### Total Capital Costs:

With tunnel: \$3.7–\$5.0 b  
With aerial: \$3.3–\$4.5 b

**Operating/Maintenance Costs:**  
–\$17.2m/year (–2.4%)

#### Sample Travel Times (2030):

	Rail Convertible BRT	No action
Seattle to Bellevue	32 min.	39
Bellevue to Redmond	25	45
Issaquah to Seattle	48	55
Kirkland to Bellevue	32	44
Mercer Is. to Bellevue	14	19

**Seattle street impacts:**  
–94 buses/hr (–17.7%)

**Bellevue street impacts:**  
–16 buses/hr (–12.8%)

### Key Findings

- Moderate improvement in travel times.
- Increased reliability with exclusive right-of-way.
- Highest cost element, Bellevue CBD tunnel could cost less if aerial alignment used.
- Unlike Busway BRT, does not transition to freeway HOV system in outlying areas. Capital costs approach LRT costs.
- Either transfer station in Seattle CBD required until conversion to LRT, or significant impacts to Seattle surface streets from additional bus volumes.

### Risks

- I-90 traffic impacts: Implementation of this scenario would convert the I-90 center lanes to two-way for HCT. This would increase the people moving capacity

of the center roadway. It will result in travel times of about 9-13 minutes between the East Channel Bridge on Mercer Island and Rainier Avenue South in Seattle for general purpose traffic, which is similar to current conditions. In addition, an HOV lane will be in operation in both directions on the outer roadways.

- Costs do not include conversion—conversion costs unclear since specifics of conversion not determined. Cost drivers could include: phasing of construction to maintain some bus service; possible changes to design standards or environmental regulation; or mitigation for street impacts if/when buses are displaced.
- Later conversion to LRT must accommodate continued bus operations during conversion period.
- No known conversions to LRT exist—Downtown Seattle tunnel comes closest.
- No exact threshold for conversion.

## Fixed guideway: Monorail

Description: Monorail extending from a transfer station in Seattle to Bellevue, with three branch lines to Redmond, Kirkland and Issaquah.



### Key Facts

**I-90 Cross-lake Ridership (2030):**

31,000 daily riders

**Total Capital Costs:**

\$5.0–\$6.8 b

**Operating/Maintenance Costs:**

+\$21.5m/yr (+3%)

**Sample Travel**

**Times (2030):**

	Monorail	No action
Seattle to Bellevue	26 min.	39
Bellevue to Redmond	23	45
Issaquah to Seattle	47	55
Kirkland to Bellevue	32	44
Mercer Is. to Bellevue	12	19

Seattle to Bellevue

Bellevue to Redmond

Issaquah to Seattle

Kirkland to Bellevue

Mercer Is. to Bellevue

**Seattle street impacts:**

–92 buses/hr (–17.3%)

**Bellevue street impacts:**

–16 buses/hr (–12.8%)

### Key Findings

- Significant improvements in travel time.
- Increased reliability with exclusive right-of-way.
- Requires transfer station in Seattle CBD.
- Some segments have high capital/operations costs and modest ridership.

### Risks

- I-90 traffic impacts: Implementation of this scenario would convert the I-90 center lanes to two-way for HCT. This would increase the people moving capacity of the center roadway. It will result in travel times of about 9-13 minutes between the East Channel Bridge on Mercer Island and Rainier Avenue South in

Seattle for general purpose traffic, which is similar to current conditions. In addition, an HOV lane will be in operation in both directions on the outer roadways.

- Must operate at-grade on a lightweight steel beam across I-90 bridge (untested technology); elevated monorail on floating bridge is infeasible.
- Hitachi vehicles do not fit within Mt. Baker tunnel and other constrained areas; Bombardier vehicle can fit, with reconstruction of some structures, including excavation within Mt. Baker tunnel.

## Fixed Guideway: Light Rail (LRT)

Description: Light rail system connected to Central Link from Seattle to Bellevue with three branch lines to Redmond, Kirkland, and Issaquah.



### Key Facts

**I-90 Cross-lake Ridership (2030):**

48,000 daily riders

**Total Capital Costs:**

With Bellevue CBD tunnel: \$4.6–\$6.2 b

With Bellevue CBD aerial: \$4.2–\$5.7 b

**Operating/Maintenance Costs:**

+\$29.0 m/year (+2.7%)

**Sample Travel**

**Times (2030):**

	LRT	No action
Seattle to Bellevue	23 min.	39
Bellevue to Redmond	23	45
Issaquah to Seattle	44	55
Kirkland to Bellevue	32	44
Mercer Is. to Bellevue	12	19

Seattle to Bellevue

Bellevue to Redmond

Issaquah to Seattle

Kirkland to Bellevue

Mercer Is. to Bellevue

**Seattle street impacts:**

–95 buses/hr (–17.9%)

**Bellevue street impacts:**

–18 buses/hr (–14.4%)

### Key Findings

- Significant improvement in travel times.
- Increased reliability with exclusive right-of-way.
- Integrated with Central Link with direct service through downtown Seattle tunnel—no transfer station required.
- Highest ridership on I-90 bridge and between downtown Bellevue and downtown Seattle.
- Highest cost element, Bellevue CBD tunnel could cost less if aerial alignment used.
- Some segments have high capital/operations costs and modest ridership.
- LRT operation on I-90 bridge feasible; operational design analyses being undertaken.

### Risks

- I-90 traffic impacts: Implementation of this scenario would convert the I-90 center lanes to two-way for HCT. This would increase the people moving capacity of the center roadway. It will result in travel times of about 9-13 minutes between the East Channel Bridge on Mercer Island and Rainier Avenue South in Seattle for general purpose traffic, which is similar to current conditions. In addition, an HOV lane will be in operation in both directions on the outer roadways.
- Analysis assumes a rebuilt SR 520 with HOV lanes. If this does not occur, transit ridership on I-90 will increase. Light rail on I-90 provides greatest capacity to address this.

## Light Rail/HOV Hybrid

Description: Light rail, extending from Seattle to Bellevue and to Overlake or Redmond, with HOV/BRT in the segments from Bellevue to Totem Lake and from South Bellevue to Issaquah.



### Key Facts

#### I-90 Cross-lake Ridership (2030):

42,000 daily riders (rail to Overlake)  
44,000 daily riders (rail to Redmond)

#### Total Capital Costs:

Bellevue CBD tunnel:  
\$2.7 - \$3.7b (to Overlake)  
\$3.2 - \$4.4b (to Redmond)  
Bellevue CBD aerial:  
\$2.3 - \$3.2b (to Overlake)  
\$2.8 - \$3.9b (to Redmond)

#### Operating/Maintenance Costs:

+\$12.3m/yr (+1.7%) (Rail to Overlake)  
+\$17.3m/yr (+2.4%) (Rail to Redmond)

#### Sample Travel

Times (2030):	RAIL/HOV	No action
Seattle to Bellevue	26 min.	39
Bellevue to Redmond	23-28	45
Issaquah to Seattle	55	55
Kirkland to Bellevue	32	44
Mercer Is. to Bellevue	14	19

#### Seattle street impacts:

-46 buses/hr (-8.7%)

#### Bellevue street impacts:

-14 buses/hr (-11.2%)

### Key Findings

- I-90 light rail would be integrated with Central Link with direct service through the downtown Seattle tunnel—would not require transfer station.
- Extending light rail to Redmond adds about 2,000 riders to the rail system while drawing about 1,000 from the Kirkland-Bellevue bus line.
- Highest cost element, tunnel in Bellevue CBD, could be reduced if aerial.
- Does not require BNSF right-of-way.

### Risks

- I-90 traffic impacts: Implementation of this scenario would convert the I-90 center lanes to two-way for HCT. This would increase the people moving capacity of the center roadway. It will result in travel times of about 9-13 minutes between the East Channel Bridge on Mercer Island and Rainier Avenue South in Seattle for general purpose traffic, which is similar to current conditions. In addition, an HOV lane will be in operation in both directions on the outer roadways.
- Analysis assumes a rebuilt SR 520 with HOV lanes. If this does not occur, transit ridership on I-90 would increase. Light rail on I-90 provides greatest capacity to address this.

## Busway/BRT

Description: Exclusive busway in the core of the Eastside, which transitions to the freeway HOV system at Totem Lake in the north, Overlake in the northeast, Eastgate in the east, and Newport Hills in the south.



### Key Facts

#### I-90 Cross-lake Ridership (2030):

With transfer station: 29,000 daily riders  
With street operations: 30,000 daily riders

#### Total Capital Costs:

W/transfer station: \$3.1-\$4.2 b  
W/street operations: \$3.1-\$4.2 b

#### Operating/Maintenance Costs:

W/transfer station: -\$5.5 m/year (-0.8%)  
W/street operations: +\$6.3 m/year (+0.9%)

#### Sample Travel

Times (2030):	Busway/BRT	No action
Seattle to Bellevue	32-35 min.	39
Bellevue to Redmond	29	45
Issaquah to Seattle	48-51	55
Kirkland to Bellevue	32	44
Mercer Is. to Bellevue	14	19

#### Seattle street impacts:

W/transfer station: -73 buses/hr (-13.7%)  
W/street operations: +25 buses/hr (+4.7%)

#### Bellevue street impacts:

+29 buses/hour (+23.2%)

### Key Findings

- Moderate improvement in travel times.
- Increased reliability with exclusive right-of-way.
- Adds east leg to NE 6th Street/I-405 interchange to allow buses to serve downtown Bellevue.
- Eastside regional bus facility underneath Bellevue Transit Center.
- Either transfer station in Seattle CBD required, or impacts to Seattle surface streets from additional bus volumes.

### Risks

- I-90 traffic impacts: Implementation of this scenario would convert the I-90 center lanes to two-way for HCT. This would increase the people moving capacity of the center roadway. It will result in travel times of about 9-13 minutes between the East Channel Bridge on Mercer Island and Rainier Avenue South in Seattle for general purpose traffic, which is similar to current conditions. In addition, an HOV lane will be in operation in both directions on the outer roadways.
- Most reliant on acquisition of the BNSF right-of-way.
- Requires rebuilding of Wilburton trestle.