

# BUS RAPID TRANSIT FOR THE PUGET SOUND REGION

Current Status and Future Potential



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Provided by King County Councilmember Maggi Fimia (1994-2001)  
516 Third Ave, Room 1200 Seattle, WA 98104 December, 2001

Effective public transit on a regional scale provides fast and frequent, high-capacity intercity service that can compete with the private vehicle. For the past 30 years, local transit agencies in the Puget Sound region have been working cooperatively in that direction. We are not talking about Link light rail or Sounder commuter rail, even though rail systems (including monorail) are often mentioned as the region's only high-capacity transit alternatives.

Rather, since the early 1970s, regional transit agencies have been developing a high-capacity express bus system. This kind of transit system is called Bus Rapid Transit – BRT, for short.



Featuring express buses operating on HOV lanes and exclusive rights-of-way, and with enhancements such as bus priority at traffic signals and longer, more comfortable coaches,

BRT is shaping up to be the main transit mode in the Puget Sound region for intercity, intercounty, and even local trips, with or without rail transit. At the same time, Sound Transit's light rail plan is becoming a mostly local transit system for trips within City of Seattle.

The express bus services of King County Metro, Community Transit, and Pierce Transit, joined by Sound Transit's ST Express bus, have many of the attributes of BRT. With key right-of-way additions, these services could fully meet the definition and offer the benefits of BRT. The inter-city right-of-way, the regional HOV network, is two-thirds finished. With its completion, and the addition of HOV connectors from freeways to arterials and transit stations, and the construction of some exclusive transit lanes, buses would be able to move more quickly and reliably to serve large numbers of travelers on trips throughout the region.

### **BRT Advantages Defined**

Bus Rapid Transit combines the quality of rail transit and the flexibility of buses. It can operate on exclusive transitways, HOV lanes, expressways, or ordinary streets, and move from one kind of street to the next. A BRT system utilizes new technology to increase vehicle speed, including priority movement through intersections and rapid, convenient fare collection.

BRT also uses the newest and most customer-friendly vehicles. Buses are clean, quiet, and comfortable. The new Sound Transit express buses exemplify the new standard. They are air-conditioned and offer airliner-style, tilt-back seats and footrests, baggage racks, and individual reading lights. Low floors allow easier boarding and alighting. Future buses will use new, low-pollution power trains, such as diesel-electric hybrid.

BRT provides a better, faster, more flexible alternative to rail transit. Research into consumer attitudes demonstrates that rail has no inherent advantage over bus if riding comfort, speed, and schedule reliability are comparable. BRT accomplishes this with fewer waits for transfers.

High Occupancy Vehicle (HOV) lanes allow transit vehicles – as well as vanpools and carpools when there is ample space between buses – to bypass the congestion in general purpose lanes. Even when speed differences are modest, time savings are significant. For example, when buses in HOV lanes travel at 45 mph compared to cars at 25 mph in adjacent lanes, approximately one minute is saved for every mile of travel. Twenty miles yields twenty one minutes of savings.

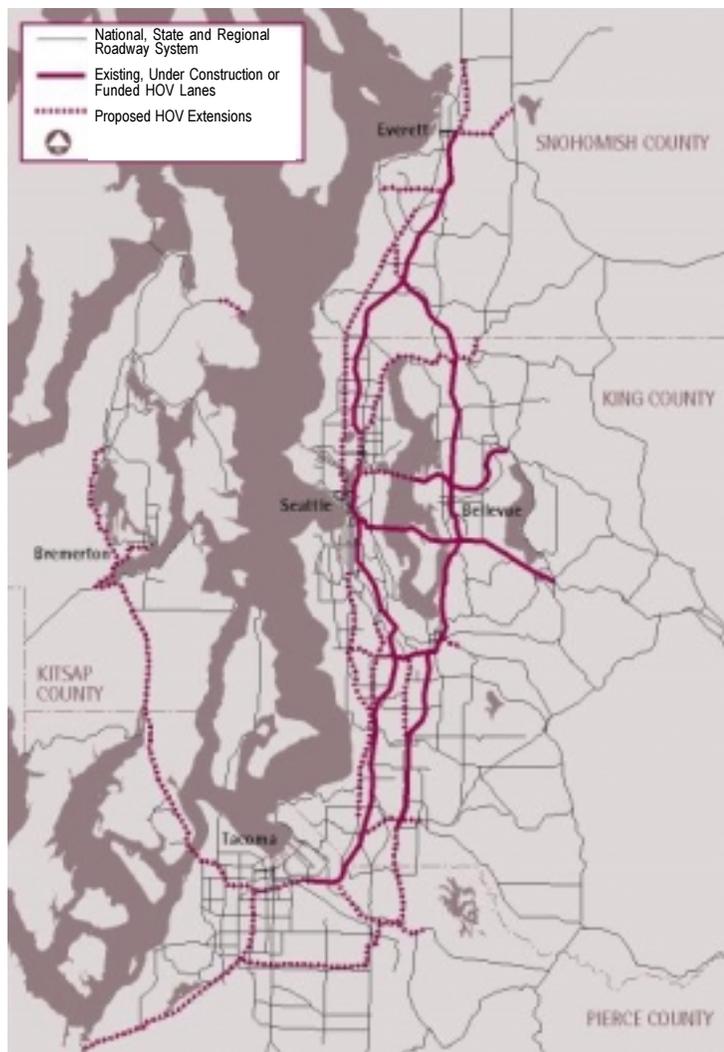
The United States General Accounting Office, the investigative arm of Congress, in September 2001 published a study of BRT and light rail transit. The report concludes that capital cost comparisons favor BRT while the lowest operating costs vary and depend on specifics. Ridership and operating speeds of BRT and light rail systems were found to be similar. According to the GAO, BRT systems operate more flexibly than light rail systems because they can respond to changes in employment and land use. Routes and capacity can be adjusted to new community patterns.

### **BRT Experience**

Many cities around the world have highly developed BRT systems, including Houston, Pittsburgh, Ottawa, and Curitiba, Brazil. In Curitiba, double-articulated buses,

each carrying up to 270 passengers, transport more than 1.3 million people every day. Shorter BRT lines are currently operating in several western North American cities including Los Angeles, San Diego, and San Jose, California, and Vancouver, BC. With encouragement from the US Department of Transportation, new BRT projects are underway in San Jose and Eugene, Oregon.

The Federal Transit Administration (FTA), has been working with a consortium of seventeen communities around the country, to foster the development of BRT as a



Source: Puget Sound Regional Council

high quality service that will significantly reduce transit travel time, reduce congestion and improve air quality. The consortium is working to generate new bus procurements over the next two to four years.

### Puget Sound Regional HOV Network

BRT and HOV go hand in hand. Development of the Puget Sound HOV freeway lane network began in the early 1970s. As of January 2001, 191 of the 297 lane miles of the three-county “core” system had been completed and opened to traffic, and another 14 lane miles were under construction. Approximately one third of the system, 92 lane miles, remains to be funded and constructed, although some design work has been done. See map at left.

In addition to the lanes, the other key components of the HOV network are access ramps, freeway-to-freeway connectors, transit stations, and park & ride lots. A number of these enhancements have been made or are underway, while others are in planning.

To date, about \$1 billion (year 2000 dollars) has been invested in the HOV system. The Washington State Department of Transportation (WSDOT) estimates that an additional \$1.65 billion will be needed to complete the HOV core program, not including the cost of ramps and connectors needed to make it a seamless system.

Strategically located arterial HOV and bus-only lanes complement the regional facilities. Examples are the 4<sup>th</sup> Avenue bus lane in the Seattle CBD and the Pacific Street bus lane in the University District, both of which speed bus movement in congested corridors. Studies have identified numerous opportunities for additional arterial HOV improvements in the each of the region’s three counties. King County Metro, in its 2002-2007 Transit Development Plan, has proposed three arterial BRT routes as candidates for development.

**Transit on the HOV Lanes**

The regional HOV lane network is currently used by 75 King County Metro bus routes. These routes account for approximately 2,200 daily one-way bus trips and 68,000 daily riders. Additionally, all 24 Sound Transit Express bus routes use the HOV lanes, as well as 26 Community Transit routes that serve Seattle’s Downtown and University District.

In some cases buses use only short segments of the network. In other cases, regional express buses run for considerable distances on the HOV lanes. Along with vanpools and carpools, buses increase the carrying capacity of the HOV lane compared to the general purpose lane. For example, the southbound HOV lane on I-5 at a point just north of the Seattle city boundary at North 145<sup>th</sup> Street carries about 5,500 people per hour in the morning peak hour. Half of these commuters are carried in only 75 buses, the other half in carpools and vanpools. The HOV lane itself carries almost the same number of travelers as the three general-purpose lanes combined.

Even with gaps in the HOV network, ST Express buses offer scheduled service of 50 minutes from the Tacoma Dome to downtown Seattle, and 45 minutes from downtown Bellevue to Sea-Tac Airport.

**BRT Role of Downtown Seattle Transit Tunnel**

A number of the Metro routes run through the Downtown Seattle Transit Tunnel, connected at its North end to I-5 HOV lanes and at its south end to both the I-5 and I-90 HOV lanes. The Tunnel is thus a major exclusive segment in the regional BRT system. A recent study for the King County Council concluded that the Tunnel should be retained for all-bus operation in order to be utilized effectively and efficiently. The Tunnel currently operates at about half of its bus capacity. More regional routes, including ST Express routes, could be

run through it, thus improving regional transit service by offering faster passage through the Seattle downtown.

**Impediments to Full Transit Utilization of HOV Lanes**

Use of the regional HOV lane network by buses is currently limited in several ways. Bus travel times become longer and schedule reliability is reduced where direct connections between the HOV lanes on intersecting freeways are not present. This causes buses to cross several traffic-filled general purpose lanes to enter or exit an HOV lane. Some buses have to leave the HOV lanes and use general purpose lanes or arterials that are typically congested during peak commuting hours. Some examples of these impediments:

- Buses starting in South Snohomish County and North Seattle and those coming from downtown Seattle cannot be directly routed east across the Evergreen Point Bridge because there is no connection from the I-5 express lanes to SR-520.
- Buses that serve some University District routes cannot exit (and enter) from the I-5 express lanes because direct ramps are lacking.

**BRT System Ownership and Management is Fragmented**

BRT System Component	Owner & Manager
HOV lanes	WSDOT (freeway) and local governments (arterials)
Bus vehicles	Four local transit agencies and Sound Transit
Transit stations	Transit agencies and local governments
Park & Ride lots	Transit agencies, local governments, WSDOT, and Sound Transit
HOV lane enforcement	Washington State Patrol

- A number of routes that leave the Seattle CBD for destinations South of the City use the E-3 busway, but there is no direct ramp connecting with the I-5 HOV lanes.

**Ownership and Management Issues**

Effective management of the BRT system requires extensive coordination and cooperation among a number of governmental agencies. Without it, divided ownership can result in weak advocacy for system completion and efficient operation.

**HOV Network Enhancements**

Washington State Department of Transportation in the mid 1990's undertook a comprehensive study

of the key enhancements needed to improve the continuity of and access to the core HOV lane network and, consequently, bus speed and schedule reliability. These enhancements include additional HOV lane miles, freeway-to-freeway connections, and access ramps. The study recommended a series of improvements based upon travel time saved in comparison to cost. Other studies and plans by the Regional Transit Project and King County Metro have confirmed these recommendations and made others. Most of them have been included in the Metropolitan Transportation Plan for the Puget Sound Region, adopted May 2001.

**Proposed but Unfunded HOV System Improvements in the I-5 and I-90 Corridors**

Project/Map Location Identifier (See Map, Pg. 6)	Description	Cost-Effectiveness Rating*	Estimated Cost (Millions - 2000 \$)
Busway Extension and Ramp (1)	E-3 busway extension with transit ramps connecting to I-5 HOV lanes near Spokane Street	4	\$48.7
Bus-only Lane (2)	Barrier-separated southbound contra flow transit lane on west side of I-5 express lanes from Ravenna Blvd. to Stewart Street	5**	\$58.8
HOV Lane Connector (3)	Reversible HOV ramp connecting I-5 express lanes to SR520	5	\$14.6
Bus Lane (4)	I-5 northbound bus-only lane on right shoulder of I-5 between Olive Way and SR520	n.a.	\$17.0
Bus Ramp (5)	Direct bus access ramp from I-5 express lanes to University District at NE 50th Street	5	\$7.2
Bus Ramp (7)	Direct bus access ramp to proposed southbound contra flow transit lane on Westside of I-5 express lanes, at NE 42nd Street	3	\$28.4
HOV Ramp (11)	Direct access to/from South at NE 145th Street	5	\$9.9
Trolley Ramp (9)	Direct access ramp at I-90/Corwin Place allowing trolleys to use DSTT via D-2 roadway	4	\$12.9
HOV Lane Connector	Freeway to freeway HOV lane connection at Southcenter, Southbound to Westbound, North west Quadrant	2	\$47.6
HOV Lane Connector	Freeway to freeway HOV lane connection at Southcenter, SE Quadrant	4	\$46.2

\* On a scale from least effective (1) to most effective (5).

\*\* Rated on travel time saving only.

The table above and map below indicate proposed but unfunded HOV system improvements that are located within the I-5 Corridor or I-90 west of Mercer Island. Most are either access ramps or freeway-to-freeway connectors. The total cost for these improvements, based on the last available estimates, is about \$300 million. In addition to these unfunded HOV improvements, Sound Transit is funding the construction of many

others in the region outside of Seattle. There are also unfunded HOV proposals in the I-405 Corridor Program now under study by Washington DOT. The proposals include enhanced HOV lanes providing more separation from the adjacent general purpose lanes, and hence enhanced safety.

**BRT and Sound Transit**

State legislation authorizing the establishment of Sound Transit specified that the development of high capacity transit begins with express buses operating on HOV lanes. In addition to planning and implementing light rail and commuter rail service, the 1996 Sound Move Plan includes express bus service and HOV connection improvements of the type listed in the table.

Back in 1996, Sound Transit described its future ST Express bus service as a form of BRT:

*Regional express bus lines would provide all-day, frequent, two-way service to centers including Bellevue, Kirkland, Redmond, Issaquah, Mercer Island, Woodinville, Bothell, Lynnwood, Mountlake Terrace, Everett, Shoreline, West Seattle, Renton, Burien, Tukwila, Sea-Tac, Federal Way, Kent, Auburn, and Tacoma. Many routes would use a new HOV Expressway, combining over 100 miles of continuous, state-funded HOV lanes and RTA-funded HOV ramps, so transit may travel in separated rights-of-way on congested freeways.*

ST Express has largely implemented this BRT service, but in traveling to downtown Seattle the buses are slowed by the HOV coverage gaps described in the table and on the map below. The unfunded gaps reflect the decision of Sound Transit to focus its resources exclusively on rail transit infrastructure in King County west of Lake Washington. The high cost of Link light rail and the Sounder commuter rail programs have caused the Sound Transit leadership to plan no HOV improvements in the I-5 corridor under the 1996 Sound Move transit plan. At the same time, Sound Transit is funding HOV and BRT enhancements in East King, Snohomish, and Pierce Counties.

Sound Transit in recent statements has demonstrated interest in the opportunities of implementing more BRT for future phases of regional high-capacity transit, beyond the first phase emphasis on rail construction. This interest is reflected in the updated long-term Metropolitan Transportation Plan adopted by the Puget Sound Regional Council in May 2001.

But what about the present? Could Sound Transit’s light rail resources be better utilized? The answer is YES.

Immediate redirection of Sound Transit capital funds away from future rail construction and into the HOV enhancement projects listed in the table could deliver benefits to transit riders much more quickly and less expensively than light rail under current plans. These



Source: RideFree Express

projects could be funded by Sound Transit and its partner agencies utilizing presently authorized local revenue sources, state funds, and federal funds.

The HOV lane and access ramp projects listed would enhance access and improve express bus transit service, and are consistent with Sound Transit's existing legislative authority. Better transit then comes sooner and more widely.

With respect to Federal funding, the existing \$500 million Full Funding Grant Agreement for Link light rail could potentially be reprogrammed to support development of additional exclusive BRT rights-of-way, for example, across the Ship Canal. A BRT system that substitutes for light rail in a nearly identical north-south corridor would likely be favorably considered under Federal funding guidelines.

"Bus Rapid Transit: Everything Old is New Again." *American City & County Magazine*, June 2001.

"Bus Rapid Transit Grows Up Into a New Mode." *Metro Magazine*, January 2001.

### **Actions Needed to Gain Full Benefits of BRT**

1. Complete the HOV lane network
2. Improve HOV network connectivity and access
3. Resolve the divided ownership of HOV network components
4. Seek federal funding assistance

### **Further Reading**

*Bus Rapid Transit Shows Promise.* United States General Accounting Office Report to Congress, GAO-01-984, September 2001.

Bus Rapid Transit. On-line resource for US Federal Transit Administration's BRT programs, <http://www.fts.dot.gov/brt/>

Bus Rapid Transit Central. On-line resource for information about BRT systems world-wide, <http://www.busrapidtransit.net/>

"Light Rail or Buses in The Downtown Seattle Transit Tunnel: Assesment of Benefits to King County Metro and Regional Public Transportation." Integrated Transport Research Final Report to King County Council Transportation Committee, November 2001.

*Washington State Freeway HOV Program: Status, Performance, Questions & Answers.* Washington State Department of Transportation, January 2001.

"In Pittsburgh, Ottawa, and Elsewhere Bus Rapid Transit is Redefining Perceptions of Bus Travel." *Mass Transit Magazine*, March 2001.