Sound Transit Regional Transit Long-Range Plan
Draft Supplemental Environmental Impact Statement

APPENDIX N
East King County Subarea High Capacity Transit (HCT) Analysis: Approach to Assessing System-Level Alternatives

SOUND TRANSIT

HCT Planning

Sound Transit Long-Range Plan Update/Phase 2 Planning

East King County Subarea High Capacity Transit (HCT) Analysis: Approach to Assessing System-Level Alternatives

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Sound Transit

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FINAL

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1. Introduction

This report describes an approach for a system-level assessment of potential high capacity transit (HCT) alternatives for the East King County subarea of the Sound Transit district. Section 2 describes the purpose and need for investing in HCT on the Eastside and includes background information on HCT needs for both the Central Puget Sound region and the East King subarea. Section 3 identifies four conceptual alternatives that will be addressed in the assessment while Section 4 identifies the measures that will be used to evaluate these alternatives. Section 5 describes briefly the process for selecting an alternative to carry forward into project-level analysis.

Sound Transit (ST) is undertaking a system-level analysis for the purposes of defining, evaluating and comparing the most promising HCT system alternatives for the East King subarea, including the connection across the I-90 floating bridge to the Seattle central business district (CBD). The primary purpose of this work is to help screen and refine the HCT alternatives that will eventually be carried forward into a project-level review of HCT alternatives for addressing the mobility needs in the East King subarea.

Consistent with this system-level analysis, Sound Transit is updating its Long-Range Plan and will be developing a set of phase 2 project investments. To assist Sound Transit Board decisions in connection with these efforts, Sound Transit is preparing a plan-level (programmatic) Supplemental Environmental Impact Statement (SEIS) consistent with the State Environmental Policy Act. The SEIS will update the 1993 Environmental Impact Statement prepared by the Joint Regional Policy Committee for the Regional Transit System Plan. The SEIS will address new information and changed conditions since 1993, including analysis and decisions regarding the I-90 corridor.

East King County is a potential location for HCT development within the next phase of implementation of ST's Long-Range Plan. The I-90 corridor has been studied multiple times in the past with the primary conclusion that it is the most appropriate location for the future development of HCT to connect Seattle and the suburbs to the east of Lake Washington. The findings of these past studies are summarized in a recent technical report prepared by Sound Transit.[1] In the future, it is anticipated that a project-level environmental review of HCT improvements in the East King via I-90/Bellevue Corridor will be undertaken. This project-level review will follow the programmatic review of Long-Range Plan alternatives and options that is currently underway. The system-level assessment of potential HCT alternatives described in this report is consistent with the alternatives being evaluated in the Long-Range Plan and supplemental EIS.

As illustrated in Figure 1, the East King subarea encompasses the Seattle suburbs east of Lake Washington stretching from the Bothell/Woodinville area in the north to Renton in the south. The subarea encompasses approximately 188 square miles. In 2000, it had a population of 640,000 and employment of 480,000. Forecasts for the year 2030 indicate

[1] SOUND TRANSIT HCT PLANNING: Technical Report on Future High Capacity Transit Development Along the Seattle CBD to East King via I-90/Bellevue Corridor; Sound Transit; April 2004.

that the subarea will continue to see some of the fastest growth in the region, with population growing by approximately 40 percent and employment growing by approximately 50 percent.

The map also illustrates the location of the East King via I-90/Bellevue Corridor in relationship to the larger East King subarea. Existing land-use patterns, population and travel behavior support the development of a HCT system serving the corridor. Based on the analyses recently conducted by the Puget Sound Regional Council (PSRC) in its HCT Corridor Assessment Study[2], the connection between downtown Seattle and the Bellevue CBD warrants near-term implementation of HCT. These activity centers represent two of the most significant transit markets in the region and both are projected to grow considerably over the next 10-15 years. Seattle CBD is by far the largest employment and activity center in the region and it is a destination for trips from throughout East King

[2] *Central Puget Sound High Capacity Transit Corridor Assessment: Independent Technical Review Workbook* (Draft) March 2004.

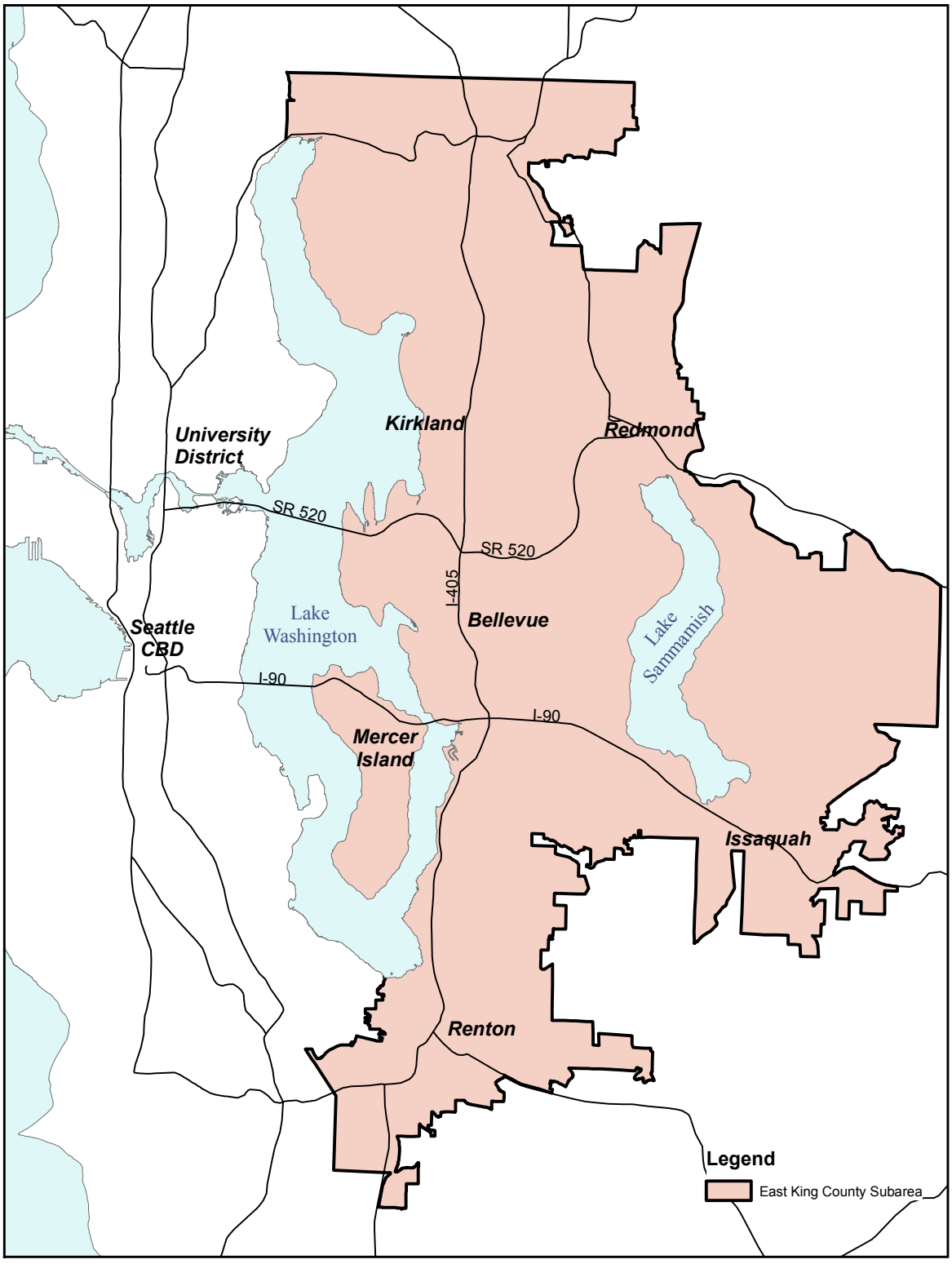

Figure 1. East King County Subarea

County. The Bellevue CBD is projected to contain a significant number of jobs and households at densities that could easily support HCT service in the near future.

The Trans-Lake Washington Study concluded that I-90 was the preferred choice for future HCT development between Seattle and the Eastside[3]. Although it evaluated potential HCT development along the SR 520 corridor, the Trans-Lake Washington Study noted that an HCT line in the I-90 corridor would more effectively serve transit ridership and could cost substantially less than one in the SR 520 corridor.

Because the I-90 corridor provides the most promising means of linking the East King subarea to Seattle, decisions regarding appropriate HCT technology choices are highly influenced by the systems-level performance of these alternatives in areas both east and west of the lake. As a result, a system-level assessment of technology choices will help screen the alternatives that will eventually be carried forward for further review at the corridor level.

2. Purpose and Need

The objective of regional transit is to effectively provide mobility for people throughout the region without requiring them to depend on the congested freeway network in single-occupant vehicles. Consistent with this objective, the purpose of HCT improvements in the East King subarea is to provide a high capacity transit alternative that effectively addresses the problems associated with automobile use in the subarea and the larger three-county region. HCT development in the subarea will also support measures by local jurisdictions that were enacted to manage growth and reduce automobile use to major employment and commercial centers. HCT improvements will provide more regional transportation capacity without requiring the amount of additional right of way or increased environmental impacts of adding comparable capacity on regional roadways.

An additional purpose of Sound Transit's future planning and project activities in the East King subarea is to set the stage for development and expansion of the regional HCT system. This expansion will address future population, employment, and transportation growth, which the region now anticipates. East King subarea improvements will effectively enhance mobility in a manner that is integrated and coordinated with the existing HCT system and with regional planning and decision-making.

Regional HCT Needs and Development

HCT, as part of an integrated transportation system, supports a long-standing strategy to focus growth in urban areas connected by high quality transportation. Vision 2020 defined this strategy in 1990, linking long-range land use and transportation plans throughout the urban Puget Sound region. Vision 2020 was updated in 1995 to meet State Growth Management Act requirements. Since this time, the region has repeatedly affirmed this strategy in adopted regional, county and city comprehensive plans. *Destination 2030*, the Metropolitan Transportation Plan for the Central Puget Sound

[3] *Trans-Lake Washington Project*: *Accommodating High Capacity Transit in the SR 520 Corridor*; prepared for the Washington State Department of Transportation, Office of Urban Mobility (August 23, 2002).

Region, indicated that long-range growth management and transportation goals depend heavily on providing more and better public transportation services.

Sound Transit is the designated provider of regional HCT infrastructure and services to meet public transportation and mobility needs in the Central Puget Sound region, as established by the State High Capacity Transportation Systems Act (Chapter 81.104 RCW). The transit district currently includes much of the urbanized portions of King, Pierce, and Snohomish Counties encompassing four of the state's largest population and employment centers: Seattle, Tacoma, Everett, and Bellevue.

Following voter financing approval in 1996, Sound Transit has been implementing *Sound Move,* the first phase program of light rail, commuter rail and regional express bus facilities and services. *Sound Move* represents the initial step toward realizing the *Regional Transit Long-Range Vision* adopted in 1996 to guide future HCT system development decisions. The *Vision* described Sound Transit's approach to developing the future system over time in a series of subsequent implementation phases, and the *Vision* is currently being updated in the Long-Range Plan.

Sound Move has begun to address regional transportation mobility needs. The investments of *Sound Move* will continue to provide benefits in the years to come. However, *Sound Move* was intended to be the first phase of regional transit investment, with subsequent phases to follow to continue to address transportation problems being experienced by the region. The transportation problems facing the region still exist, and there is a continued need to address HCT planning and investment.

Many of the transportation problems identified as the reason for implementing *Sound Move* still exist; although *Sound Move* and the land use strategies now in place are helping the region better manage its population and employment growth. Ten years ago, congestion, slower and less predictable travel, and a lack of alternatives to driving alone were the key concerns. Today, *Sound Move* and the region's other investments in transportation are providing more competitive alternatives to driving alone. However, as the number of people and jobs grows in the coming decades, there will be greater demands for travel.

Finally, the needs of preserving the environment and quality of life are critical. The benefits of transit to the environment and for quality of life are central themes in the integrated growth management and transportation strategies of Vision 2020, Destination 2030 and Sound Transit's adopted *Vision* for regional transit. In all of these plans, preserving the environment and quality of life are reasons for making transit better able to compete with driving alone.

Eastside HCT Needs

An effective regional transit system is needed to address current and future transportation problems and to support the region's long-term strategy for managing growth. HCT improvements in the East King subarea are needed to support the region's adopted comprehensive plans, particularly the plans of those communities located along the study

corridor. *Destination 2030* calls for the region's high capacity transit to continue to develop and expand, in union with all forms of transportation - local transit, HOV lanes, ferries, airports, automobiles, freight traffic, bicycles, and pedestrians.

From 1990 to 2000, population in the region grew by nearly 20 percent, while the amount of travel in the region grew almost twice as fast. Many of the East King subarea's roads and freeways are already at capacity for many hours during the day. With more vehicles on the road, congestion and delay will be more severe. There will be slower and more unpredictable trips for people driving on the region's roads and freeways, and regional transit will be needed to provide a travel alternative. Between now and 2030, population growth is expected to be nearly 40%, with 50% growth in employment and miles traveled per vehicle. While this will be a more moderate rate of travel growth than in the past, in part because of the land use and transportation decisions of the last decade, transportation conditions will worsen.

3. Description of Alternatives

For the purposes of the East King subarea systems analysis, four alternatives have been developed for study, as follows:

- No Action,
- High Occupancy Vehicle Lane/Bus Rapid Transit (HOV/BRT), or
- Busway/Bus Rapid Transit (Busway/BRT), and
- Fixed Guideway Transit (Light rail transit or monorail).

These alternatives were developed to represent distinct choices for providing HCT in the East King subarea. Each alternative was developed to operate effectively as a system and to fairly represent the likely cost and operational characteristics. As a result of public and agency review, components of each alternative technology may be combined as options to address Eastside transportation needs. These alternatives are consistent with the alternatives that are being analyzed concurrently in Sound Transit's Long-Range Plan update and SEIS.

The three build alternatives are all designed to provide HCT service within the same generalized corridors on the Eastside, as follows:

- I-90 from downtown Seattle to Issaquah,
- SR 520 from downtown Seattle to Redmond, and
- I-405 from Renton to Bothell/Woodinville.

The No Action alternative forms the basis for all of the system-level build alternatives and was developed to take advantage of the HOV lane network and HOV direct access connections that will exist in the subarea by the 2030 design year. To this system the HOV/BRT alternative adds a number of additional key links and direct connections to improve bus operations. The Busway/BRT alternative adds a core busway component to the HOV/BRT alternative, while the Fixed Guideway alternative adds a core fixed guideway component. Both the Busway/BRT and Fixed Guideway alternatives were developed to mirror one another as much as possible with respect to the separation of

transit vehicles from other traffic. The build alternatives will include different improvements to I-90, SR 520, and I-405 to support the proposed technology being considered for each build alternative.

A summary of each of alternative is described below. As the assessment progresses, more detailed planning-level descriptions of facilities and conceptual engineering will be completed for each system alternative described below. The planning and conceptual engineering will serve as input to network definition for ridership forecasting and to the cost estimating activity.

No Action System Alternative

The No Action system alternative is defined as all projects included in Sound Transit's *Sound Move* Phase 1 plan. Figure 2 illustrates the No Action Alternative in the East King subarea.

The following elements are included in the No Action Alternative:

- Existing and planned ST Express service
- Direct access to Bellevue Transit Center.
- Direct access to Eastgate park-and-ride.
- Direct access and freeway station at Totem Lake on I-405.
- Direct access in Renton at North 8$^{th.}$
- Sunset interchange improvements.
- Canyon Park freeway station stop.
- SR 900 HOV lanes between I-90 and Issaquah P&R.
- Overlake Transit Center.
- Issaquah Transit Center/SR 900.
- Issaquah Highlands park-and-ride.
- Mercer Island park-and-ride.
- Newcastle Transit Center.
- Sammamish park-and-ride.
- Expansion of a number of existing park and ride facilities.
- "Nickel Package" improvements to I-405.
- I-90 two-way transit & HOV operations--Alternative R-8A improvements.

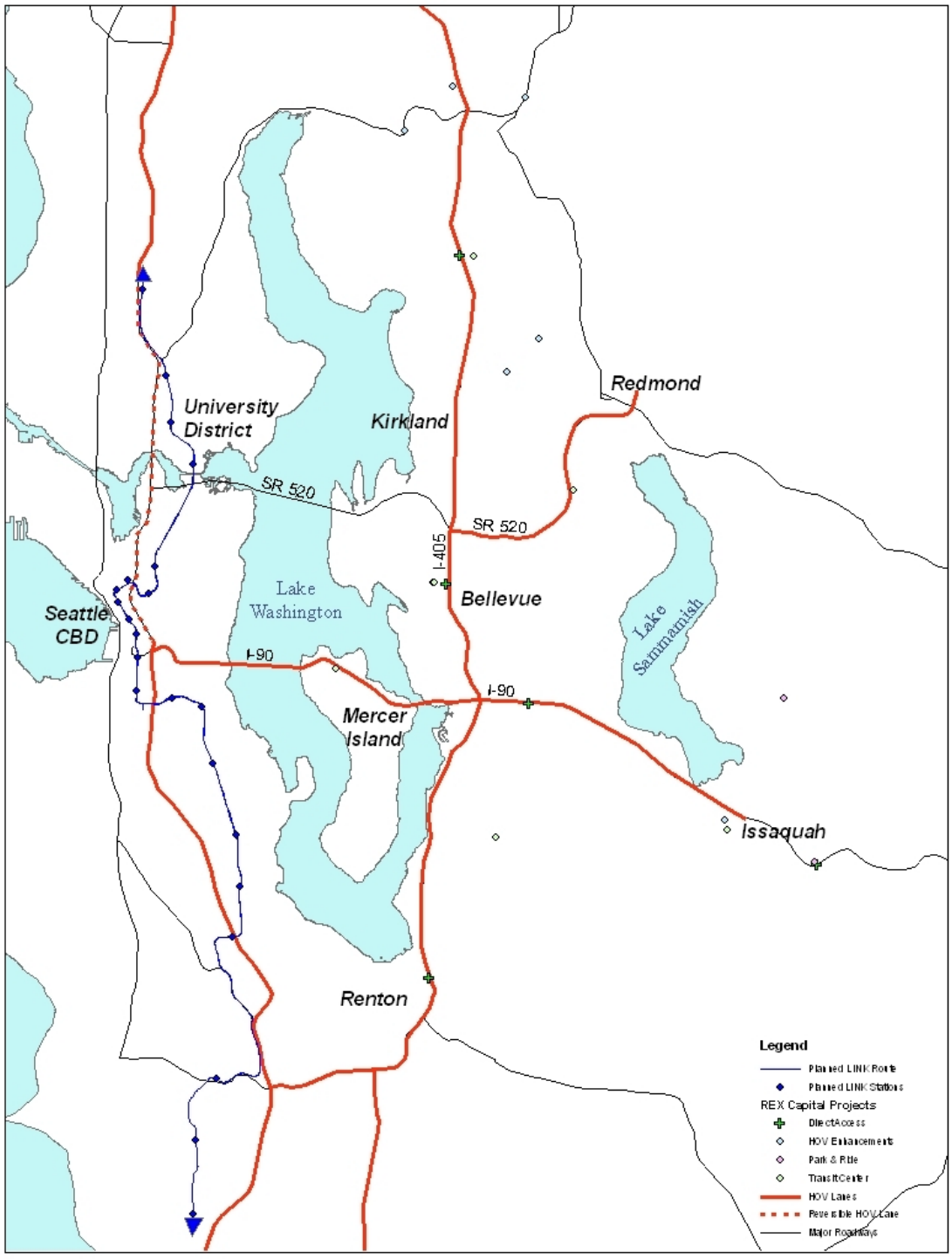

Figure 2. No Action Alternative

HOV/BRT System Alternative

The HOV/BRT system alternative would restructure existing transit service and add service to create a network of BRT routes in the primary Eastside HCT corridors, including connections across Lake Washington to Seattle in both the SR 520 and I-90

corridors. BRT service would operate on existing HOV lanes and share the facilities with 2+ HOVs. The majority of the system would not be in exclusive facilities (i.e., physically separated from general purpose vehicles and other HOVs). New facilities in this BRT alternative include the addition of a number of freeway-to-freeway bus only connections, and several direct access ramps. While this alternative will explore the possible development of a number of freeway-to-freeway bus only connections, only those that prove feasible without major reconstruction of the general purpose ramps will be pursued. Figure 3 illustrates the additional facilities to be considered as part of the development of this alternative.

Bus operations in Seattle will be in mixed traffic through the CBD. The primary roadways that will be included in the HOV/BRT system include: I-90, I-405, and SR-520.

In addition to the facilities noted for the No-Build Alternative, the HOV/BRT Alternative will include the following:

- SR 520 six-lane Alternative with HOV lanes.
- I-405 BRT improvements.
- Minor arterial/lane improvements to expedite bus connections from Airport Way to downtown Seattle.
- Freeway-to-freeway bus only connections between all four quadrants of the I-90 /I-405 interchange.
- Freeway-to-freeway bus only connections between all four quadrants of the SR 520/I-405 interchange.
- Direct transit-only access to Kirkland at NE 85th Street
- Direct HOV access to South Kirkland park-and-ride, to and from the west on SR 520.
- Direct HOV access at Overlake Transit Center, to and from the west on SR 520.
- Direct HOV access to downtown Redmond/Redmond Town Center, to and from the west on SR 520.
- Direct HOV access to east Redmond, to and from the center HOV lanes on SR 520.
- Direct HOV access to Issaquah/SR 900, to and from the west on I-90
- In-line station on I-90 at Lakemont.
- In-line station on I-405 at Coal Creek/Newcastle.
- Implementation of a network of limited stop BRT routes that would mimic the three branches of rail service on the Eastside.
- Expansion of the Bellevue Transit Center as determined necessary to handle the volume of buses forecast for 2030.
- Operation of buses on downtown Seattle surface streets with little or no improvements.

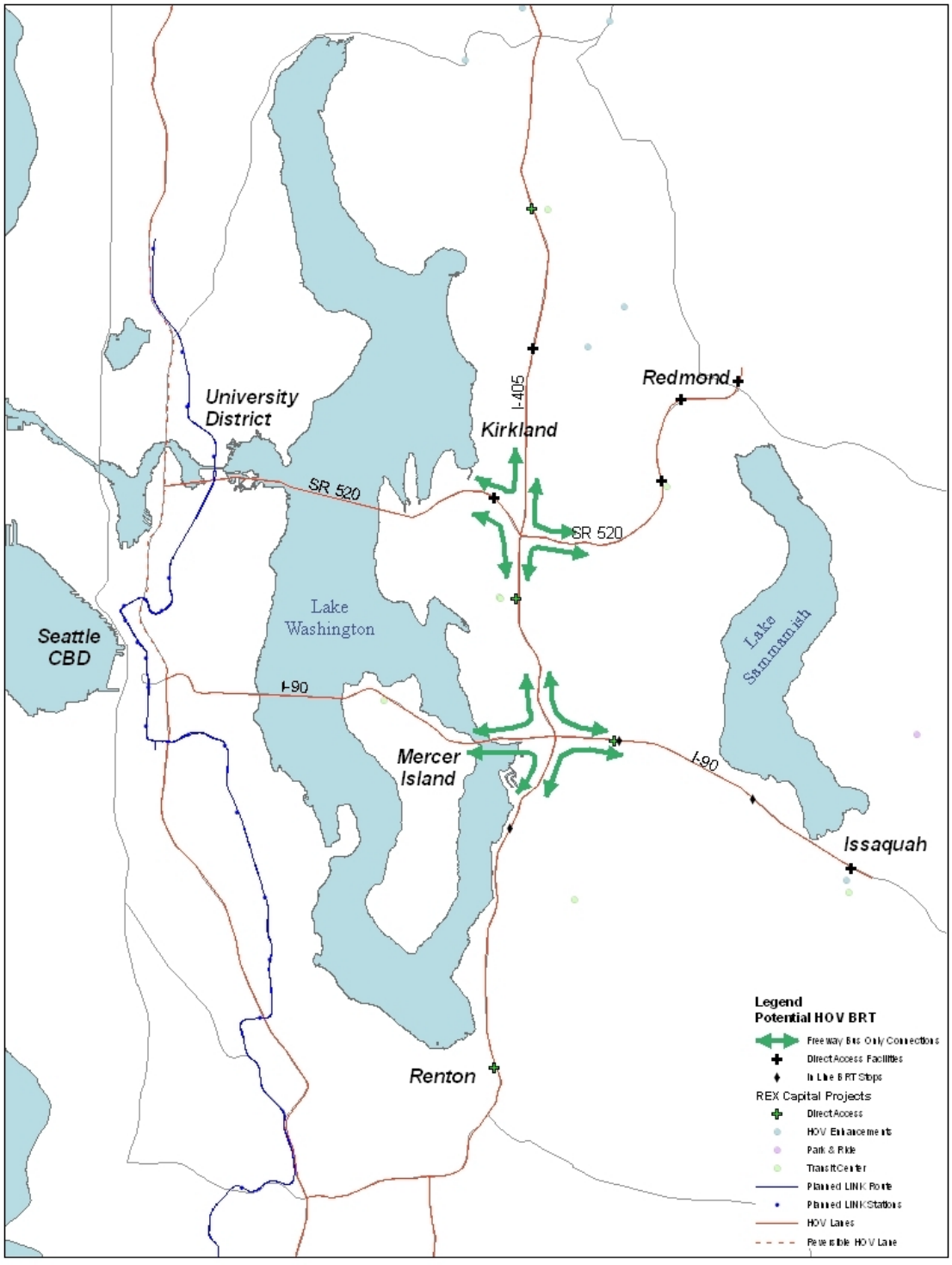

Figure3. HOV/Bus Rapid Transit Alternative

Busway/BRT System Alternative

The Busway/BRT system alternative would add a core exclusive busway network to the BRT system contained in the HOV/BRT alternative. This busway network would be developed based on three rights of way, as follows and illustrated in Figure 4:

- I-90 center roadway;
- The BNSF railroad right of way from approximately Coal Creek Parkway to Totem Lake, which roughly parallels I-405 and avoids the need to further widen and reconstruct the freeway beyond the work already planned by WSDOT; and
- New right of way that may be developed by the cities of Bellevue and Redmond between the BNSF right of way and the Overlake area parallel to Bel-Red Road, which avoids the need to further widen and reconstruct the SR-520 freeway beyond the work already planned.

The development of a busway network on these rights of way also avoids the need to develop exclusive bus connections in the I-405 interchanges with I-90 and SR-520. In addition to the facilities noted for the No Build Alternative, the Busway/BRT Alternative would include the following:

- Conversion of the I-90 center roadway to exclusive 2-way BRT operations from Airport Way in downtown Seattle to Bellevue Way.
- Construction of an exclusive 2-way BRT facility from the east end of the I-90 center roadway to connect with a rebuild BNSF bridge west of I-405 and continuing east to eventually tie back into the I-90 HOV lanes through the I-90/I-405 interchange.
- Construction of an exclusive 2-way BRT facility within the BNSF right-of-way from approximately Coal Creek Parkway to Totem Lake. Based the results of conceptual engineering studies this may include substantial grade separations, particularly in the area between I-90 and SR-520.
- Direct bus only connections from the ends of a BRT facility at Totem Lake to the I-405 HOV lanes to the north and near Coal Creek Parkway to the I-405 HOV lanes to the south.
- Direct 2-way bus only connection from the BNSF BRT facility to the downtown Bellevue Direct Access ramps at NE 6th, then continuing to the Bellevue Transit Center via an extension of or aerial connection to NE 6th.
- Direct 2-way bus only connections from the BNSF BRT facility to the South Kirkland Park and Ride, then continuing to/from the west on SR 520 via an HOV direct access connection at 108th NE.
- Extension of the 2-Way BRT facility from the BNSF right-of-way near NE 12th along a new right of way parallel to and north of Bel-Red Road to the vicinity of 148th Avenue NE, where the facility would connect through exclusive ramps into the center HOV lanes of SR 520 to/from Redmond.
- Direct HOV access to downtown Redmond/Redmond Town Center, to and from the west to the center HOV lanes on SR 520.
- Direct HOV access to East Redmond, to and from the center HOV lanes on SR 520 to East Redmond.
- Direct HOV access to Issaquah/SR 900, to and from the west on I-90.
- In-line station on I-405 near Houghton or NE 85th.
- In-line station on I-90 at Lakemont.
- In-line station on I-405 at Coal Creek/Newcastle.

- Bus intercept terminal and any necessary ramps/connections to the I-90 center roadway at International District or Royal Brougham Link Station.
- Expansion of the Bellevue Transit Center sufficient to accommodate forecast 2030 bus volumes.
- Implementation of a series of limited stop BRT routes that generally mimic the fixed guideway alternative (See below).
- A variation will also examine an exclusive busway along the same routes as the fixed guideway alternative.

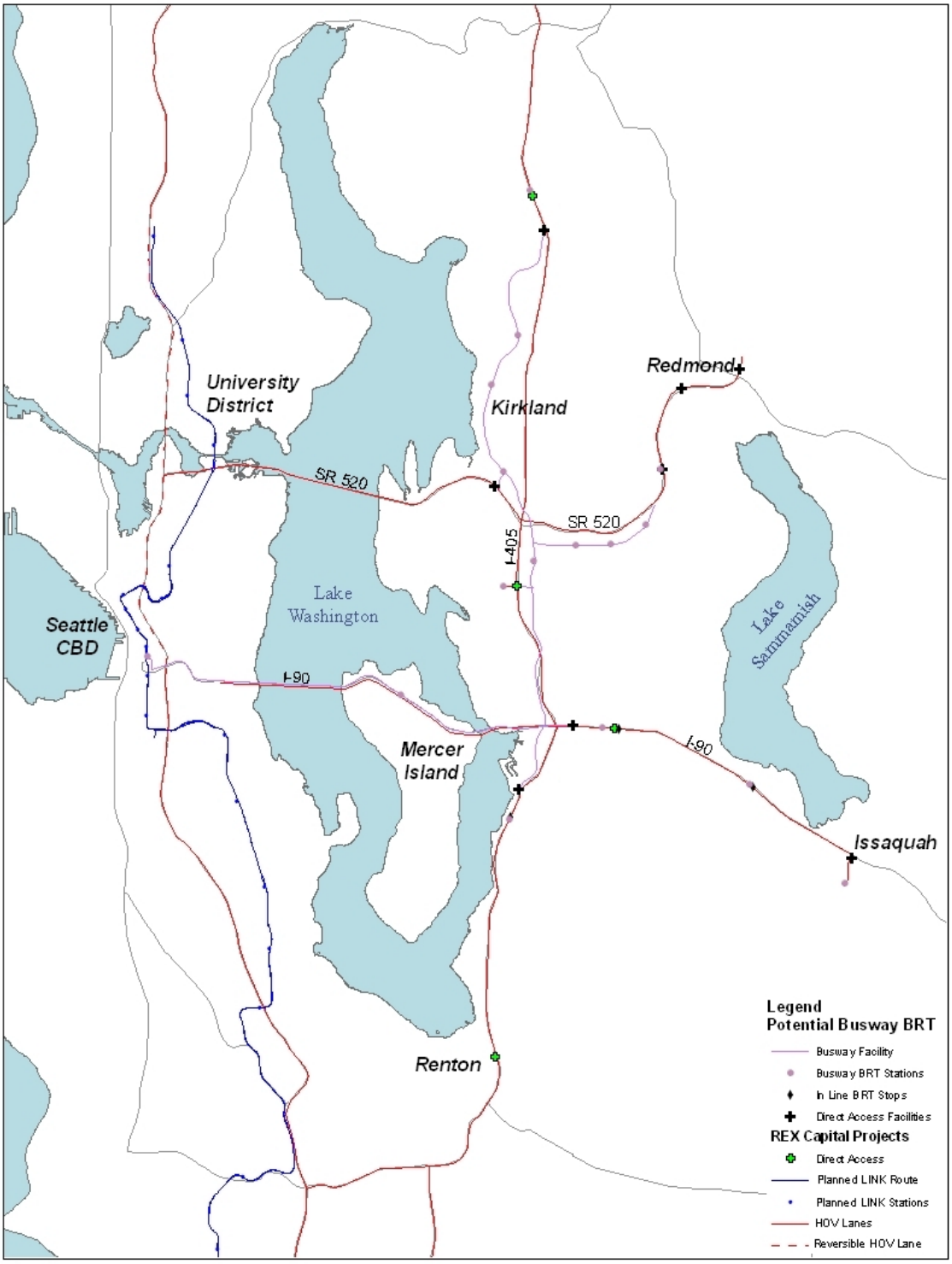

Figure 4. Busway/Bus Rapid Transit Alternative

Fixed Guideway Transit System Alternative

By the 2030 design year the region is assumed to have three types of fixed guideway HCT, as follows:

- Light Rail Transit (LRT) in the form of the Central Link running north/south from Northgate through downtown Seattle to South 200th Street, just beyond Seattle Tacoma International Airport;
- Monorail in the form of the Green Line running from Ballard to West Seattle; and
- Commuter Rail using existing rail trackage from Everett in Snohomish County to Lakewood in Pierce County.

Of the three, only LRT and monorail are options for the East King via I-90/Bellevue Corridor, given the lack of railroad right of way across Lake Washington. In addition, work to date has looked only at the feasibility of light rail technology on the I-90 floating bridge. When the I-90 bridge was designed and constructed, considerations were given to the eventual conversion of the center roadway to rail transit operations. Additional engineering analysis has been completed on the feasibility of light rail technology on the floating bridge, as part of the Trans-Lake Washington study. Since monorails require a very different guideway structure, it is currently not known whether this technology can be accommodated on the existing bridge. As a result, preliminary structural studies of the bridge are being undertaken to determine whether monorail technology can be accommodated. Depending on the conclusions of this work, either LRT or LRT and monorail networks will be considered for the East subarea Fixed Guideway system alternative.

Figure 5 illustrates the general fixed guideway network that will be explored. The fixed guideway system alternative would connect Downtown Seattle and Downtown Bellevue via I-90 and Bellevue Way/112th Avenue NE. This basic line would include three branches to three other regional centers: Kirkland, Redmond and Issaquah. The LRT would operate in its own right of way throughout the system through the use of dedicated at-grade right of way, aerial structures and tunnels.

In Downtown Seattle, an Eastside monorail system would terminate in the southern CBD area, near the International District Station of the Downtown Transit Tunnel. This would enable riders to transfer to vehicles operating in the tunnel or to the Green Line of the Monorail. The planned Green Line is not built to accommodate interlining with additional monorail routes. This south Seattle CBD route termination is assumed in the analysis.

In order to provide operations without a transfer, a second Downtown Seattle Monorail line would need to be built. This could be elevated or a tunnel alignment could be considered. The impacts of this option are not considered in the Eastside HCT analysis or the Draft Supplemental EIS for Sound Transit's Long-Range Plan, but it should be acknowledged that these impacts would occur as part of any additional downtown monorail alignment.

In Downtown Seattle, an Eastside light rail system would operate through the existing Downtown Seattle Transit Tunnel, providing a connection to light rail line serving the Seattle CBD and North Seattle without a transfer.

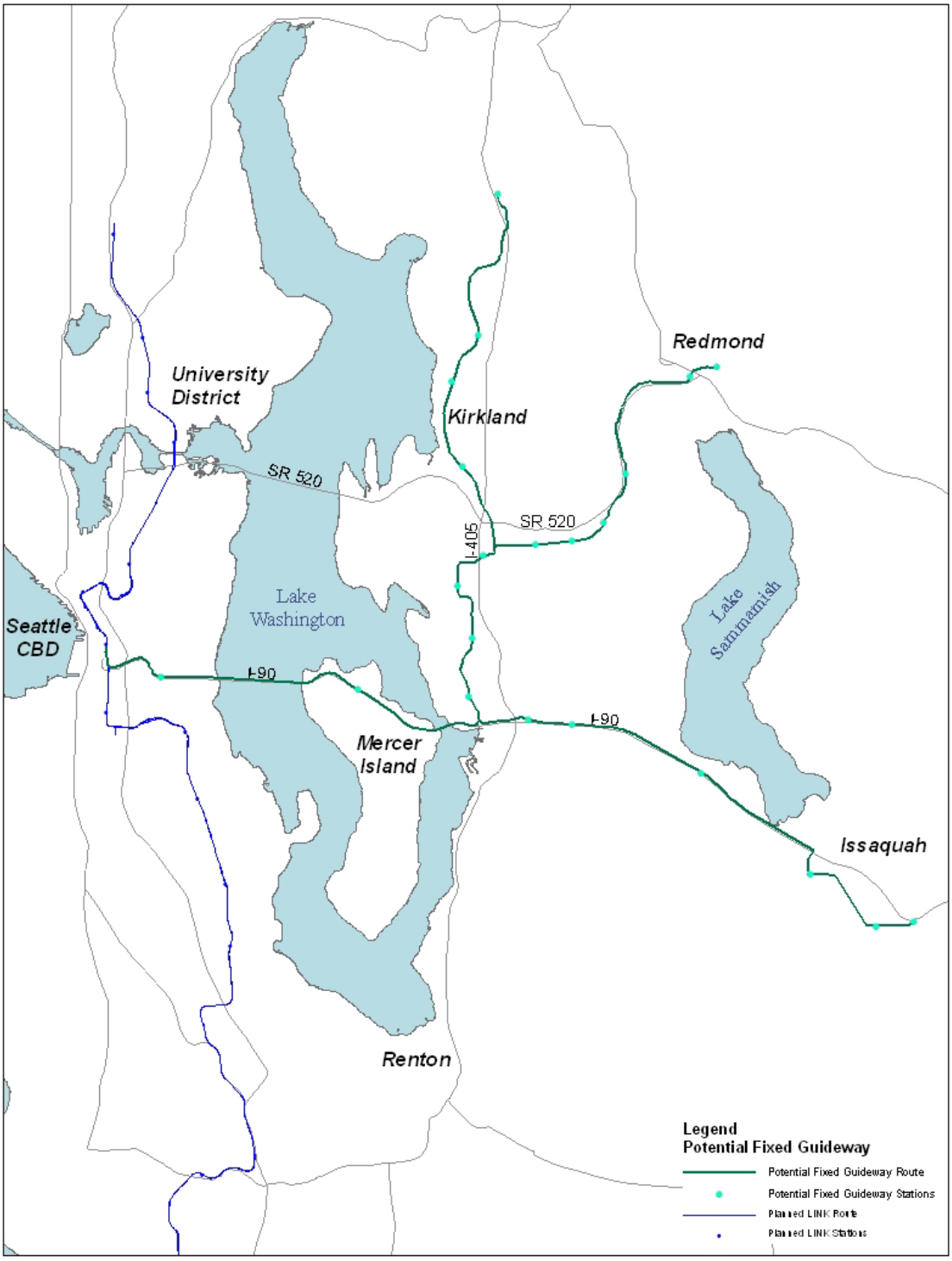

Figure 5. Fixed Guideway Alternative

4. Evaluation Criteria

The following evaluation criteria will be used in this system-level analysis of alternatives. The results from the evaluation will serve as the basis for a mode choice decision (no

action, HOV/BRT, Busway/BRT, fixed guideway (monorail or light rail), or some combination for this corridor.

Costs

Order of magnitude cost estimates will be developed based on conceptual level engineering for the facilities required for each alternative. Some costs will be taken from recently completed studies of the facilities while other cost estimates will be based on gross level unit costs based on recent local experience. Operating costs will be based on current Sound Transit experience. All costs will be expressed in current year dollars.

Financial Complexity

Financing for many of the improvements included in the alternatives are the responsibility of agencies other than Sound Transit. In developing *Sound Move*, for example, completion of the freeway HOV lane system and the freeway-to-freeway ramps were the responsibility of WSDOT, while the funding of direct access ramps were a shared responsibility of Sound Transit and WSDOT. A criterion that assesses the complexity of project financing would be used to evaluate the alternatives.

Transportation Performance

Ridership

Ridership will be generated using the Sound Transit ridership forecasting model. Separate networks will be defined for each system alternative.

Speed, Reliability, Redundancy and Access

Speed and reliability will be addressed quantitatively and qualitatively depending on the particular system alternative and location. While an in-depth traffic operations study will not be done at this stage, certain areas may be addressed quantitatively. Redundancy in the provision of parallel and independent facilities to congested freeways will also be assessed. Finally, access is a critical component of the system. Rider access to the alternative systems will be noted, in terms of walking, park and ride and transfers.

Integration with Planned and Committed Regional HCT infrastructure

A qualitative discussion of the ability to integrate with existing, committed and planned regional HCT facilities will be provided.

Capacity for Growth beyond Forecast Year

Capacities for the different transit technologies will be discussed in relation to 2030 forecasts and beyond.

Circulation Feasibility

Traffic circulation in the Seattle and Bellevue CBDs will be discussed qualitatively for each system alternative.

Impacts

Environmental Impacts

Sound Transit's draft SEIS on the Long-Range Plan includes in its impact analysis the system-level alternatives described here. In addition, the analysis of the environmental impacts of the system-level alternatives will include any potential fatal flaws or major environmental constraints that impact the conceptual engineering.

Impacts to Major Regional Centers (Seattle CBD, Bellevue CBD, Redmond, etc.)

Impacts to regional centers will be addressed qualitatively.

Ability to Influence Growth and Development

The ability of LRT, monorail and BRT technologies to influence growth, land use and development patterns will be discussed with reference to experience in other parts of the country with LRT, monorail and BRT systems.

5. Selection of an Alternative to Be Pursued for Project-Level Analysis

The above noted alternatives for analysis are meant to illustrate the differing futures and options of high capacity transit available for the East King subarea. These alternatives are intended to stimulate discussion and ideas for possible future systems and scenarios. It is possible that various elements from each of the alternatives (HOV/BRT, Busway/BRT, and Fixed Guideway) may be combined for further project-level analysis.

In Spring 2005, it is anticipated that the Sound Transit Board will select the alternative to be pursued for project-level analysis as part of its adoption of the Long-Range Plan, based on technical and environmental analysis and public and agency input.