



SOUND TRANSIT
HCT Planning

Sound Transit 2
Compliance with HCT System Planning Requirements

Technical Memorandum
Options Assessment and Analysis Methods

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Sound Transit

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1. Introduction

1.1 *Historical Overview*

The development of high capacity transportation (HCT) systems within the central Puget Sound region has been guided over the years by federal and state legislation, as well as by state, regional and local plans and policies. The purpose of these overarching directives is to build an integrated HCT system that increases the people-carrying capacity of the region's most congested travel corridors, supports the region's growth management policies, ensures a vital economy and protects the region's environment.

Beginning in 1990, the Washington State Legislature began adopting legislation pertinent to the development of high capacity transportation systems to be deployed in the state's major urban areas. The primary references can be found under Revised Code of Washington (RCW) Chapter 81.104, also known as the High Capacity Transportation Systems Act. Under RCW 81.104.010, the purpose of the HCT legislation is defined as follows:

Increasing congestion on Washington's roadways calls for identification and implementation of high capacity transportation system alternatives. The legislature believes that local jurisdictions should coordinate and be responsible for high capacity transportation policy development, program planning, and implementation.

The Legislature defined a HCT system in RCW 81.104.015 (1) as:

“a system of public transportation services within an urbanized region operating principally on exclusive rights of way, and the supporting services and facilities necessary to implement such a system, including interim express services and high occupancy vehicle lanes, which taken as a whole, provides a substantially higher level of passenger capacity, speed, and service frequency than traditional public transportation systems operating principally in general purpose roadways.”

With the encouragement and authorization to designated local agencies to prepare plans for the development of high capacity transit systems, the Legislature also prescribed specific components of the planning process and requirements for how that planning process was to occur (RCW 81.104.100).

The intended result of the HCT planning process closely detailed in RCW 81.104.100 (2) in urbanized areas was to be a system plan to be submitted to the voters under RCW 81.104.100 (2) (d) and RCW 81.104.140. After a successful vote, a process for project planning was described in RCW 81.104.100 (3).

The Legislature did not provide precise direction in Chapter 81.104 RCW on how the planning process was to proceed after a voter-approved system plan transitioned into project development, and then into future system phases or plan updates to address new transportation challenges and opportunities. Thus, in implementing Sound Transit's obligations under Chapter 81.104 RCW, examination must include the agency's own enabling legislation in Chapter 81.112 RCW, which speaks both briefly and broadly to its powers in amending its system plan and to system phasing.

RCW 81.112.040 (2) requires a two-thirds board vote for “major decisions” including “system plan adoption and amendment” and “system phasing decisions.” RCW 81.112.080 (1) grants Sound Transit additional powers to “carry out the planning process set forth in RCW 81.104.100.” This constitutes a broad delegation of authority by the Legislature (enacted in 1992, two years after the HCT Act) to Sound Transit to devise appropriate plan amendment processes and subsequent system plan phases.

In applying this legislation, Sound Transit has concluded that the conservative approach is to generally prepare the same technical analysis for the second phase capital program - - Sound Transit 2 (ST2) - - as was prepared for *Sound Move* and to ensure that the ST2 plan complies with the system planning references in Chapters 81.104 and 81.112 RCW as explained below.

Table 1 provides a brief chronology of high capacity transportation planning and implementation in the central Puget Sound region since 1990.

Table 1: High Capacity Transit in the Central Puget Sound Region—Development Chronology

1990	<p>The Washington State Growth Management Act (Chapter 36.70A RCW) and High Capacity Transit (HCT) Act (Chapter 81.104 RCW) are approved, enabling the creation of a regional rapid transit system for the central Puget Sound region. The HCT Act calls for transit agencies to plan, build and operate an HCT system within the region's most heavily used travel corridors.</p> <p>The Puget Sound Regional Council (PSRC) adopted VISION 2020, the region's growth and transportation strategy. Transportation policy recommendations include references to the development of an HCT system.</p>
1991	The Joint Regional Policy Committee (JRPC) formed as a mandate of the HCT Act.
1992	The State Legislature enabled the formation of a Regional Transit Authority with the approval of RCW Chapter 81.112, which provided the legal basis for the Puget Sound region to create one local agency for planning and implementing an HCT system.
1993	<p>The JRPC's Environmental Impact Statement (EIS) was completed. The EIS evaluated options for improving regional mobility needs through 2020, including enhanced transportation system management (TSM) and transportation demand management (TDM), busways and rail alternatives. The Rail/TSM alternative in the EIS became the preferred alternative.</p> <p>The JRPC recommended that a Regional Transit Authority should serve King, Pierce and Snohomish Counties. The JRPC prepared and adopted a regional HCT system plan and transmitted that plan to the King, Pierce, and Snohomish county councils to consider whether to form a regional transit authority (RTA) to implement the plan.</p> <p>King, Pierce, and Snohomish Counties formed the Central Puget Sound Regional Transit Authority (RTA).</p>
1995	<p>Voters in King, Snohomish and Pierce counties rejected the RTA's \$6.7 billion plan (1995 dollars) to create a tri-county transportation system made up of commuter rail, light rail, express buses and bus facilities.</p> <p>The Puget Sound Regional Council (PSRC) adopted the 1995 Update to VISION 2020 and the Metropolitan Transportation Plan (MTP) in compliance with the requirements of the federal Intermodal Surface Transportation Efficiency Act (ISTEA), the Clean Air Act Amendments of 1990 and the state Growth Management Act. HCT remains a major component of the MTP.</p>
1996	<p>The revised <i>Sound Move</i> plan was approved by King, Snohomish and Pierce County voters with a price tag of \$3.9 billion (1995 dollars). This comprehensive regional transit plan contained nearly 100 separate but interrelated capital and service projects that included: high-occupancy vehicle system improvements, ST Express bus routes, Sounder commuter rail and Link light rail. <i>Sound Move</i> was the first implementation phase of a larger, long-range system.</p> <p>Concurrent with the adoption of <i>Sound Move</i>, the Sound Transit Board adopted the Regional Transit Long-Range Vision to keep the whole regional system in the public's eye. The Vision provided a general blueprint for reaching the region's long-term high capacity transit goals. The Vision addressed the opportunity for additional HCT investments, including rail extensions in future phases, and it identified possible additional HCT corridors and potential rail lines.</p>
2001	The PSRC adopted Destination 2030 as the functional transportation element of VISION 2020 , to serve as the region's MTP. Sound Transit's Long-Range Vision and the <i>Sound Move</i> plan are key components of the PSRC's MTP.
2004	A draft supplemental Environmental Impact Statement (SEIS) for an updated Long-Range Vision (now Plan) was released to update the 1993 EIS. The SEIS analyzed the environmental impacts of potential action alternatives in the context of new information and existing environmental conditions and provided plan-level environmental analysis to inform regional transit project decisions. This Draft SEIS analyzed a No Action alternative and the Long-Range Plan alternative (with options).
2005	<p>Sound Transit released the Final SEIS and unanimously adopted the updated Regional Transit Long-Range Plan. The 1996 Vision was updated to reflect extensive analysis of the region's future growth, and it details how a regional transit system might best accommodate that growth.</p> <p>Sound Transit engages in the Sound Transit 2 (ST2) system planning process.</p>
2007	Voters in the Sound Transit District reject Proposition 1, also known as the Roads & Transit plan. The plan would have added 50 miles of new light rail and made improvements to major roadways throughout the region. The measure is defeated 56 percent to 44 percent.
2008	Voters in the Sound Transit District approve Proposition 1, also known as the Mass Transit Expansion plan. The 15-year mass transit package increases express bus and commuter rail services and creates a 53-mile regional light rail system throughout the region. The measure is approved 57 percent to 43 percent.

1.2 Purpose and Intent of Technical Memorandum

This technical memorandum addresses state reporting requirements for the Central Puget Sound Regional Transit Authority, or Sound Transit. This memorandum addresses specifically how Sound Transit meets the requirements in RCW 81.104.100 (2), which reads in part as follows:

High capacity transportation system planning is the detailed evaluation of a range of high capacity system options, including: Do nothing, low capital, and ranges of higher capital facilities.

The RCW citation (2) (b & c) further goes on to state that:

Development of Options. Options to be studied shall be developed to ensure an appropriate range of technologies and service policies can be evaluated. A do-nothing option and a low capital option that maximizes the current system shall be developed. Several higher capital options that consider a range of capital expenditures for several candidate technologies shall be developed.

Analysis Methods. The local transit agency shall develop reports describing the analysis and assumptions for the estimation of capital costs, operating and maintenance costs, methods for travel forecasting, a financial plan and an evaluation methodology.

This technical memorandum describes how Sound Transit met these legislative requirements when the first long-range plan and the implementation of Phase I (*Sound Move*) were adopted in 1996. It also describes how the current system planning process leading up to the development of the ST2 plan, anticipated to go before voters in November 2007, will meet these requirements, as it has also included evaluation of do-nothing, low-cost and high-cost options continually throughout the planning process.

Detailed information on the analysis methods is documented in individual methodology reports prepared for each of the following:

- Capital Cost Estimates: *Sound Transit HCT Planning: Task 2.0 – Methodology Development and Documentation, Subtask 2.3 – Capital Cost Estimating Methodology Report, Final, March 2007;*
- Operations and Maintenance Cost Estimates: *Sound Transit HCT Planning: Task 2.0 – Methodology Development and Documentation, Subtask 2.6 – Operating and Maintenance Cost Methodologies, Final, February 2007;*
- Transit Ridership Forecasting: *Sound Transit HCT Planning: Task 2.0 – Methodology Development and Documentation, Subtask 2.4 – Transit Ridership Forecasting Technical Report, Final, February 2006;*
- Financial Plan: *Sound Transit 2, The Regional Transit System Plan, Appendix A: Detailed Description of Facilities and Estimated Costs, July 24, 2008; and*
- Project and System Evaluation: *Sound Transit HCT Planning: Task 2.0 – Methodology Development and Documentation, Subtask 2.1 – System and Project Evaluation Methodology, Final, February 2006.*

An additional technical memorandum has been prepared to summarize the public involvement and outreach process conducted for ST2.

2. Setting the Stage for HCT: Legislative Mandates and Initial Plan Development

2.1 Legal Overview

2.1.1 Goals and Context

In order to manage increased congestion on Washington's roadways, the state legislature mandated a planning process that regional planning and transit agencies must follow to develop high capacity transit system alternatives (RCW 81.104.010).

In recognition of the 1990 Growth Management Act, state law required that regional planning agencies "address the relationship between urban growth and an effective high capacity transportation system plan, and provide for cooperation between local jurisdictions and transit agencies" (RCW 81.104.080). The law also required that high capacity transit system analyses be included in regional transportation plan reviews. The investigation and implementation of such systems must then follow a process that includes a "detailed evaluation of a range of high capacity transportation system options" (RCW 81.104.100 (2) (b)). Such an appraisal must ensure that a range of technologies and service policies are assessed according to the following scenarios:

- **Do-Nothing** option;
- **Low Capital** option that maximizes the current system; and
- **Ranges of Higher Capital** options that consider a range of expenditures for several candidate technologies.

2.1.2 Conformance to Adopted Regional Transportation Plan

Sound Transit's high capacity transportation implementation program, which includes the system plan, project plans, and financing plan, is required to be in conformance with the region's adopted long-range transportation plan (RCW 81.104.040).

2.2 ESHB 2871, 2006 Washington Legislative Session

The 2006 Washington State Legislature amended state law to delay a public vote on Sound Transit expansion until the 2007 general election. ESHB 2871 directs Sound Transit and the Regional Transportation Investment District (RTID) to jointly approach voters in Snohomish, King and Pierce counties in 2007 with their system expansion and financing plans to expand transit and highways, respectively. In addition, the legislation specifies that neither proposal shall be considered approved unless both are approved by voters.

2.3 Vision 2020/Metropolitan Transportation Plan

2.3.1 Overview: A Regional Framework for Growth and Transportation ¹

In 1990, the Puget Sound Regional Council adopted VISION 2020, the region's first "integrated long-range growth and transportation strategy." VISION 2020 provided detailed planning and investment decisions that laid the groundwork for the Metropolitan Transportation Plan (MTP), which contained more explicit transportation components of VISION 2020 as required by the federal Intermodal Surface Transportation Efficiency Act (ISTEA).

VISION 2020 and the MTP promoted a multimodal, high capacity transportation system that shifted the emphasis from moving vehicles to supporting the movement of people and goods. The plan encouraged the creation of compact communities with employment and housing growth focused in urban centers. HCT was identified as an important component of economic and land use development needed to connect housing and jobs and to serve major activity centers. System plans adopted by Sound Transit are required to be in conformance with the MTP.

2.3.2 Providing for a Multi-Modal Transportation System: Elements Contained in Plan

VISION 2020 and the MTP made HCT planning integral to regional transportation planning efforts. Specific policy recommendations for HCT systems included increasing highway and HOV capacity and building transit centers and HCT services to connect regionwide urban areas as well as urban centers within the region's congested corridors.²

Establishing high capacity transit through these measures advanced the stated regional growth objectives to create greater mobility options by "optimizing and managing the use of transportation facilities and services, managing travel demand by addressing traffic congestion and environmental objectives, focusing transportation investments to support transit and pedestrian-oriented land use patterns, and expanding transportation capacity."³

More specifically, the HCT policy recommendations also suggested maximizing use of alternative transit modes; creating short transit trips to access regional transit stations; supporting concentrated urban corridors; and providing direct, frequent and convenient regional transit service between urban centers and access to urban areas that does not induce rural development.⁴

2.4 Joint Regional Policy Committee/Regional Transit Authority

2.4.1 Joint Regional Policy Committee Legislative Mandate

In 1990, the Joint Regional Policy Committee (JRPC) was formed as contemplated by the HCT Act. RCW 81.104.040 required transit agencies in counties containing one million or more residents (and bordering counties with 200,000 residents or more) to:

- Develop a joint regional policy committee to provide high capacity transportation planning and operating services through interlocal agreements;

- Create an implementation program that includes system, project and financing plans, and is in conformance with the regional transportation planning organization's regional transportation plan; and
- Present this plan to the boards of directors of the transit agencies within the service area or to the regional transit authority.

2.4.2 Overview of JRPC Activities ⁵

In 1993, the JRPC prepared and issued an EIS and a regional HCT system plan and transmitted these documents to the King, Pierce, and Snohomish county councils. The JRPC also recommended the formation of a regional transit authority (RTA) to implement the plan as provided under Chapter 81.112 RCW.

2.5 1993 Environmental Impact Statement

2.5.1 EIS Purpose and Need

Washington State's High Capacity Transit funding and planning legislation (RCW 81.104.100) mandated a planning process that included an evaluation of options for improving regional mobility needs through 2020, including enhanced transportation system management (TSM) and transportation demand management (TDM), busways and rail alternatives. The legislation also required the evaluation to include an investigation of the social, economic, and environmental impacts of the system location, as well as an analysis of the relationship between the high capacity transportation system plan and adopted land use plans (RCW 81.104.100 (2) (d) (viii & vii).

2.5.2 1993 EIS Summary and Scope

The HCT plan put forth by the JRPC developed three "build" alternatives and a no-build baseline. In accordance with the HCT legislation, these scenarios included a **Do-Nothing option (No-Build baseline)**, a **Low Capital option (TSM Alternative)** and **two High Capital options (Transitway/TSM and Rail/TSM Alternatives)**. As mentioned above, a programmatic State Environmental Policy Act (SEPA) EIS was prepared to evaluate each of the alternatives to the baseline scenario in terms of varying technology, route alignments, and areas served.

2.5.3 Alternatives Analysis

The **No-build baseline (Do-Nothing option)** limited the capital investments to budgeted programs or those necessary to maintain existing transit service levels. This scenario did not include the construction of new transit or operations facilities, but it included construction of new maintenance or operations facilities already budgeted. This scenario represented the least capital intensive alternative. Capital costs (all costs discussed in this section are in 1991 dollars) were estimated at \$1.2 billion and operating and maintenance costs were estimated at \$274 million per year.

All of the alternatives discussed below implemented either the concept of Transportation Systems Management (TSM) or low capital cost options to increase regional or community transit service to and between urban centers identified in VISION 2020.

- TSM Alternative (Low Capital option): An all-bus TSM Alternative emphasized lower-cost capital improvements to expand transit service and improve efficiency by completing the regional

HOV lane system and making significant investments in park-and-ride lots, transit centers, and expanded bus service. This alternative cost \$3.5 billion more than the No-Build Alternative.

- **Transitway/TSM (High Capital option):** This plan augmented and included the TSM investments with physically separated exclusive busways and transitways in the region's core. This plan allowed buses to travel to off-line stations, through local neighborhoods, minimize transfers between feeder and regional service, skip intermediate stops and share HOV facilities with general purpose vehicles. This alternative was intermediate in cost between the TSM and Rail/TSM Alternatives because of the smaller extent of the transitway and use of existing rights-of-way. This alternative cost \$4.3 billion more than the No-Build Alternative.
- **Rail/TSM Alternative (High Capital option):** This proposal augmented and included the TSM investments with an extensive regional rail system. The plan created an extensive rapid transit system and commuter rail line on top of most of the regional and local TSM improvements, including HOV projects. In contrast to the above-mentioned scenarios, this plan also proposed a significant expansion in park-and-ride facilities. This was the most capital intensive of all the alternatives with a cost \$10.3 billion above the No-Build Alternative budget.

The following table from the 1993 EIS summarizes the capital and operations and maintenance costs of the four scenarios.⁶

Table 2: Summary of System Alternatives Characteristics

Alternative	Capital Cost (billions of 1991 \$)	Operating and Maintenance Cost (millions of 1991 \$)	Daily Ridership (Year 2020)	Annual Ridership (year 2020) (millions)	Cost per Rider (1991 \$)	Cost per New Rider (1991 \$)
No-Build	\$1.2	\$274	388,500	109.4	3.67	N.A.
TSM	\$4.7	\$399	473,900	133.7	5.92	N.A.
Transitway/ TSM	\$5.5	\$406	480,000	135.4	6.36	11.39
Rail/TSM (includes Commuter Rail)	\$11.5	\$492	560,500	157.3	7.94	12.52

2.5.4 Transition of Implementing Agency for the EIS: JRPC to RTA and Sound Transit

The JRPC reviewed the 1993 EIS and adopted the Regional Transit Project System Plan. The Plan's central element was the Rail/TSM option that provided a rail system to connect the region's population and employment centers, including Seattle, Tacoma, Everett, and Bellevue, in addition to creating a Seattle-Tacoma commuter rail system. The JRPC also proposed significant funds for local bus service.

In 1993, the JRPC forwarded its Regional Transit System Plan to the Snohomish, King, and Pierce county councils for their consideration, and they recommended the formation of a regional transit authority. Later that year, the Central Puget Sound Regional Transit Authority was formed and this RTA supplanted the role of the JRPC, pursuant to Chapter 81.112 RCW. The JRPC's plan was then transmitted to this newly formed regional agency and the original committee (JRPC) ceased to exist. Several years after forming the RTA, the agency was renamed Sound Transit.⁷

2.5.5 Development of *Sound Move*: 1995-1996

In 1995, Sound Transit developed a plan to implement the first phase of a new regional rail and express bus network with an estimated cost of \$6.7 billion (in 1995 dollars). The Sound Transit Board conducted extensive outreach to assist in developing a plan to bring to the voters. The proposal included the following:

- All-day commuter rail between Lakewood-Tacoma-Seattle-Everett (and intermediate stops);
- A rail system stretching south from Lynnwood to Tacoma via Northgate, the University District, downtown Seattle, Rainier Valley, and SeaTac, plus an east-west line across I-90 to Mercer Island, Bellevue and Redmond/-Overlake;
- Following additional study, some form of HCT service would be implemented between Tukwila, Renton, Bellevue, and Kirkland; and
- Major investments in all-day, frequent ST Express Bus service linking employment centers along with supporting capital facilities.

This plan was placed on the ballot for voter approval in March 1995 and defeated by voters in King, Snohomish and Pierce counties. Following this defeat, the Sound Transit Board conducted another significant outreach effort to develop a new transit plan. The final product was the development of *Sound Move*, which represented a substantially downsized version of the original 1995 proposal.

2.6 1996 Regional Transit Long-Range Vision

2.6.1 Description ⁸

The Sound Transit Board adopted the Regional Transit Long-Range Vision in 1996 as the conceptual blueprint for reaching the central Puget Sound region's long-term HCT goals. The Long-Range Vision was adopted in conjunction with *Sound Move* in order to keep the whole regional system in the public's eye. The plan:

- Provided an overview of the HCT component of any state or regional long-range transportation plan;
- Detailed long-range goals, policies, and strategies to guide the long-term development of the regional transit system at each phase of implementation; and
- Looked at opportunities for making additional HCT investments, including rail extensions, in future phases.

The plan concentrated on a combination of light rail, commuter rail and express bus service as the means to provide HCT services to the service area.

2.6.2 Elements Contained in the Long-Range Vision ⁹

The 1996 Long-Range Vision concluded that combining commuter rail and light rail with an express bus system (the Rail/TSM concept) would create an HCT system that best reflected the region's growth patterns, policies, and travel needs by 2020. These modal investments would serve the purpose of the region's MTP by:

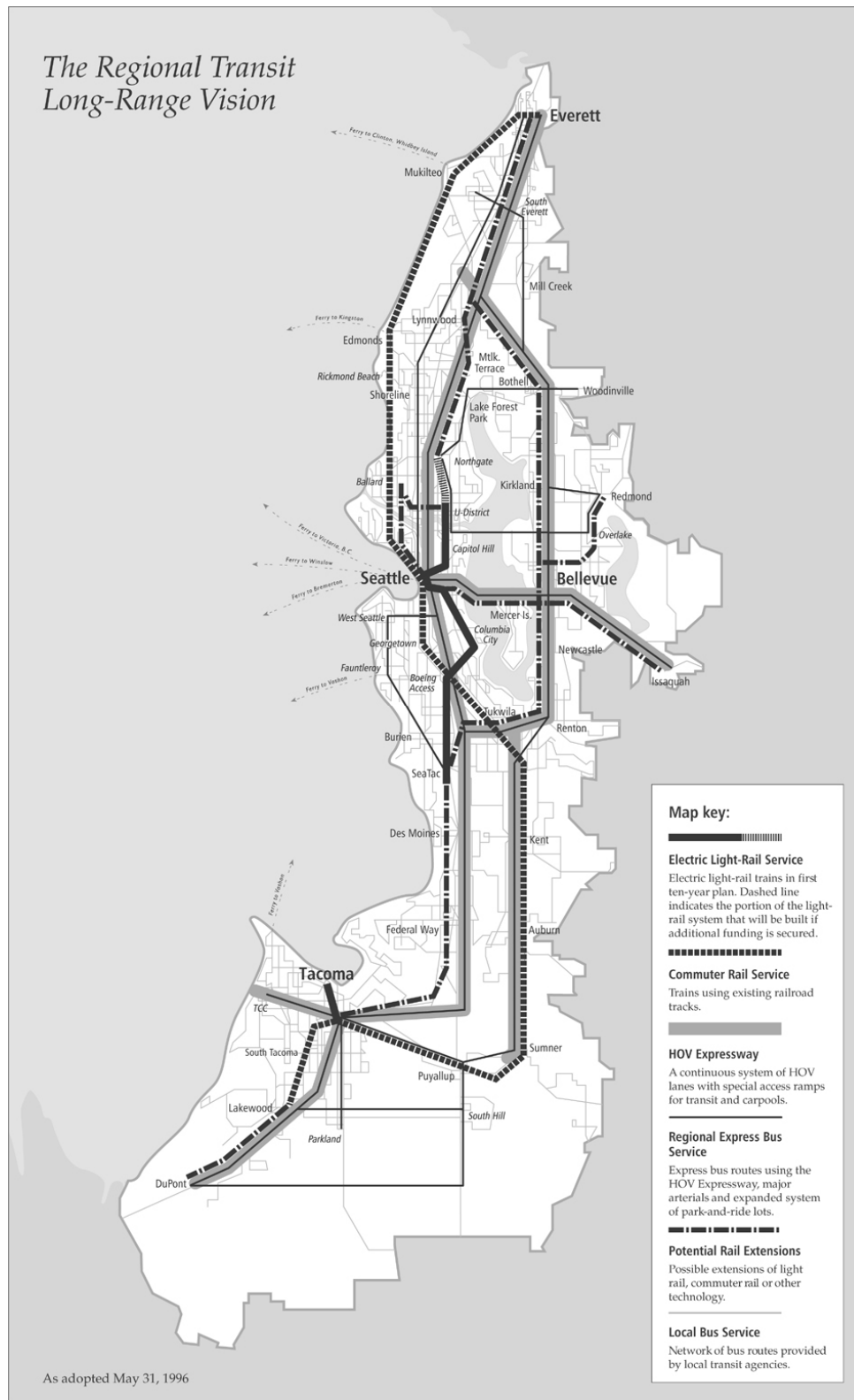
- Increasing the people-carrying capacity of the region's most congested travel corridors;
- Supporting the region's growth management policies;
- Contributing to a vital economy; and
- Protecting the region's environment.

Consistent with the Rail/TSM concept, which was chosen as the preferred alternative, the 1996 Long-Range Vision included both high and low-cost elements to meet the region's transportation needs. Possible additional HCT corridors were identified to be served by potential express bus services or rail lines, and included the following:

- University District to downtown Everett;
- Sea-Tac (S. 200th) to Fort Lewis/DuPont;
- I-405 between 164th S.W. (Swamp Creek) and Sea-Tac Airport;
- I-90 between downtown Seattle and Issaquah;
- Downtown Seattle to downtown Bellevue and downtown Redmond; and
- Downtown Seattle to Ballard to the University District.

Figure 1 displays a map of the 1996 Regional Transit Long-Range Vision.

Figure 1: 1996 Regional Transit Long-Range Vision



2.7 Sound Move

2.7.1 Description

The Sound Transit Board adopted *Sound Move*, the first implementation phase of the Long-Range Vision, in May 1996. Financing for the *Sound Move* plan was approved by King, Snohomish and Pierce county voters in the fall of 1996.¹⁰

2.7.2 Elements Contained in Sound Move

As the range of services described below indicate, the final plan relied on nearly 100 separate but interrelated capital and service projects that encompassed a range of high and low cost elements. The centerpiece of the plan combined rail and regional express bus networks. Those networks comprised a mix of light rail, commuter rail, and regional express bus services, supported by transit centers, access ramps, and park-and-ride lots.¹¹

The *Sound Move* plan's main elements, which are currently in various stages of construction, include the following:

- **ST Express Bus:** ST Express was allotted more than \$800 million for 20 new express bus routes, along with HOV access improvements and community connections projects. Community connections include bus stops, park-and-ride lots, transit centers, and multi-modal stations.¹²
- **Sounder Commuter Rail:** Sounder is being launched in three segments—Tacoma to Seattle, Everett to Seattle and Tacoma to Lakewood. The first two segments are operational, while the Tacoma to Lakewood portion is in the construction stage. Trains currently run a total of 82 miles through three counties. When the system is fully operational, trains will run every half-hour during peak commute hours – for a total of up to 18 one-way trips daily in the south corridor and eight one-way trips daily in the north corridor.¹³
- **LINK Light Rail:** Construction is under way on a 14-mile Central Link light rail line from downtown Seattle to Tukwila, with a subsequent 1.7 mile extension to Sea-Tac Airport. The trains will begin carrying passengers in 2009, stopping at 12 stations and running 4.4 miles on elevated tracks, 2.5 miles in tunnels and 7 miles at grade. Currently, work is also progressing on the development of the North Link project, which extends the Central Link light rail line from downtown Seattle north to Capitol Hill and the University District (also called University Link) and beyond to Northgate. Sound Transit and the Federal Transit Administration issued a Final SEIS for the North Link project on April 7, 2006. Also in April 2006, Sound Transit adopted a final North Link route, and the agency is now entering the final design phase for the University Link project between downtown Seattle and the University District. Tacoma Link went into operation in August 2003 and is a 1.6-mile line that runs from the Tacoma Dome Station at Freighthouse Square to the city's historic Theater District seven days a week.¹⁴

The *Sound Move* plan is shown in Figure 2.

2.7.3 Expert Review Panel Review of *Sound Move* Plan Methodologies

In 1989 an Expert Review Panel was appointed by the Governor, the Legislative Transportation Committee, and the Secretary of Transportation to provide technical oversight on HCT planning in the Puget Sound Region, pursuant to statute RCW 81.104.110. As defined by state legislation, the panel's role was as follows:

“To assure the appropriate system plan assumptions and to provide for review of system plan results, an expert review panel shall be appointed to provide independent technical review for development of any system plan which is to be funded in whole or in part by the imposition of any voter-approved local option funding sources enumerated in RCW 81.104.140.”

By the fall of 1996, the committee had held more than 25 one- and two-day meetings over a period of six-and-a-half years in which it reviewed the technical work prepared first by Metro, then by the JRPC and then the RTA (Sound Transit). It also reviewed supporting materials provided by the Puget Sound Regional Council and citizen-generated proposals.

The panels' 1995 final comments concluded that overall, the “RTA System Plan meets the requirements of state law.”¹⁵ In addressing the selection of alternatives, the panel found that “a reasonable range of alternatives was selected for study, and the adopted plan conforms to the state's definition of a high capacity system.”¹⁶

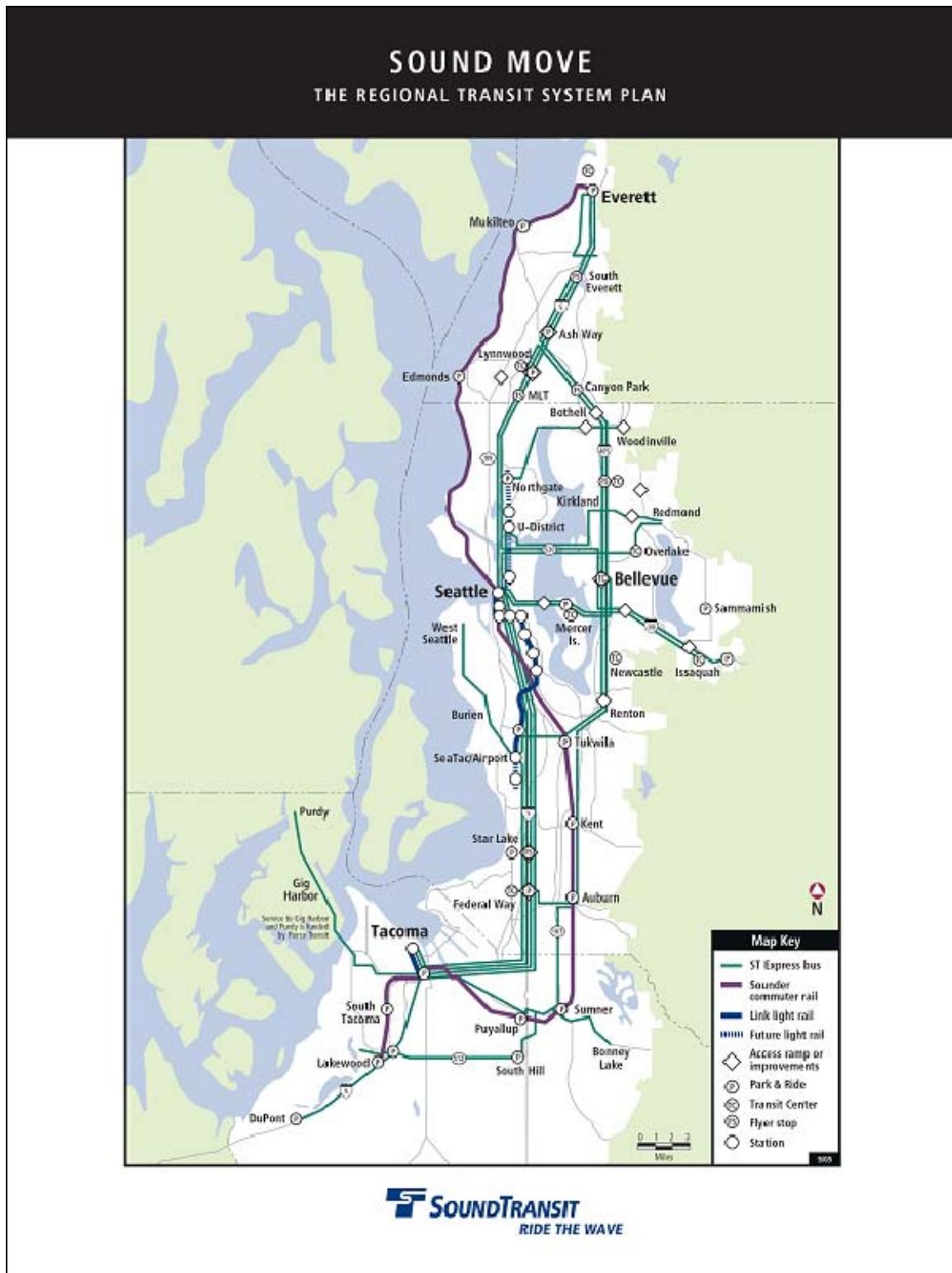
The last published letter by the panel in 1996 further supported this conclusion with its finding that the lower capital cost alternatives, including those evaluated by the project and others submitted by citizen groups, were not “credible stand-alone alternatives to a high capacity transit investment.”¹⁷

The Expert Review Panel's final 1996 letter is included in Appendix A.

2.7.4 *Sound Move* Conformance to the Metropolitan Transportation Plan

In 1996, the Puget Sound Regional Council (PSRC) found the *Sound Move* plan to be in conformance with the *1995 Metropolitan Transportation Plan*, as required by RCW 81.104.040.

Figure 2: 1996 *Sound Move* Plan Approved by Voters



3. Updating the Regional Transit Long-Range Plan

3.1 2005 SEIS and Alternatives Evaluation

3.1.1 Elements Contained in SEIS

The 2005 SEIS was prepared to address the potential environmental effects of the update to the 1996 Long-Range Vision. This document supplemented the original Regional Transit System Plan Final EIS, completed in 1993. The purpose and intent of the 2005 SEIS was not different from that of the 1993 EIS but simply considered planning efforts that had become regional in scope. Sound Transit updated its 1996 Long-Range Vision to align its planning efforts with updated local and regional plans. As with the earlier plan, the updated plan (the 2005 Regional Transit Long-Range Plan) identified projects and established priorities for the agency's future efforts to provide additional HCT service and transit facilities within Pierce, King, and Snohomish counties.

Sound Transit evaluated two primary alternatives for the SEIS that include the probable range of actions that could be taken for the update to the 1996 Regional Transit Long-Range Vision:¹⁸

- No Action Alternative, which involves no change from current management direction and assumes completion of *Sound Move*; and
- Regional Transit Long-Range Plan Alternative (Plan Alternative). This alternative is based primarily on the 1996 Long-Range Vision. The SEIS also evaluated a set of technology and corridor options that could be included individually or in various combinations to provide additions or modifications to the Plan Alternative, as detailed in the updated 2005 Long-Range Plan. The process used to develop and select the Plan Alternative for the SEIS built on the Rail/TSM Alternative analyzed in the original 1993 Final EIS, selected in the 1996 Long-Range Vision, and used to define *Sound Move*.

The SEIS alternatives focused on potential future system elements that reflected the 1993 Final EIS preferred alternative and the subsequent HCT system selection decision in 1996 of *Sound Move* and the Long-Range Plan. With the exception of a few options identified for the Plan Alternative, the SEIS does not repeat the 1993 Final EIS's analysis of the HCT system alternatives (i.e., TSM only and TSM/Transitway) that were not selected in 1996.¹⁹

The Final SEIS incorporated the comments of agencies and the public. Sound Transit invited federal, regional, state and local agencies and jurisdictions to submit scoping comments on preparation of the Final SEIS. Public scoping meetings were held on May 12, 13, 18, and 19, 2004, to solicit comments on the scope of the SEIS. An agency scoping meeting was also held in Seattle on May 19, and scoping was collected from a number of municipalities and transit agencies.²⁰

Appendix I of the 2005 SEIS provided a list of 500 to 600 possible HCT projects that were associated with the corridors identified in the SEIS for modeling and impact analysis.²¹

The projects in the 2005 SEIS appendix covered a range of low capital cost options (ST Express Bus and Streetcar projects) and high capital cost options (LINK Light Rail and Commuter Rail) options in each corridor. The range of options included in the 2005 SEIS is shown in Appendix B of this memorandum and is briefly described below:

- Systemwide elements: plans for King, Pierce and Snohomish counties included buses, core funded freeway HOV, downtown Seattle Transit Tunnel, maintenance bases, right-of-way preservation, TSM (including computer system enhancements, transit flow and safety, passenger shelters, miscellaneous projects, ADA shuttles, vehicles (commuter rail cabs, coaches and locomotives).
- Corridor elements: plans for the north, south and east corridors in King, Pierce and Snohomish counties include a wide range of projects by mode. Sounder commuter rail elements include rail stations and platforms and rail enhancements. LINK light rail elements include rail guideway and station and platforms. ST Express bus services had the widest range of elements from access and HOV improvements to transitway and arterial HOV projects. Additionally, these projects also include the construction of park-and-ride facilities, passenger and operating facilities and route deletion and service expansions.

The 2005 Long-Range Plan states that HCT services may be provided using a different array of transit modes for different locations to fit each corridor's unique needs. According to the text of the plan, "the final decisions about the best mix of technologies in future phases will be made based on performance of *Sound Move* investments, projected land use and transportation conditions, changing development trends, evolving technologies, functional requirements, environmental analysis, population and employment growth, and public input on future transportation priorities of the Sound Transit district's subareas."²²

3.2 Long-Range Plan Issue Papers

3.2.1 Description

The Long-Range Plan Issue Papers were drafted at the request of the Sound Transit Board and the public to provide further analysis to inform the Long-Range Plan update and ST2 decisions. The analyses will also potentially be used to help narrow the range of alternatives considered in subsequent project-level environmental documents.

The papers explored the range of options, from low-cost to high-cost, for extending service into the north, south and east corridors. The evaluation included in-depth technical analyses of light rail, regional express bus/BRT, and monorail technologies, focusing on comparative differences in system development, performance, and cost in selected corridors.²³

3.2.2 Alternatives Analysis

The following is a description of the options that were investigated as part of the alternatives analysis:

- North Corridor: No Action, LRT, HOV/BRT, Streetcar (within the city of Seattle), Monorail, Arterial BRT (BAT lanes), Express Bus;
- East Corridor: No Action, HOV/BRT, Busway/BRT, LRT, Monorail, Rail Convertible BRT, and Arterial BRT (BAT Lanes), Express Bus; and
- South Corridor: No Action, LRT, HOV/BRT, Commuter Rail and Diesel Multiple Unit (DMU), Express Bus.

The options investigated in these studies reflect a variety of capital cost options ranging from high to low:

- High-capital cost options: LRT, Monorail, Rail-Convertible BRT, Commuter Rail, DMU; and
- Low-capital cost options: No Action, HOV/BRT, Streetcar, Express Bus.

3.3 2005 Regional Transit Long-Range Plan

3.3.1 Description ²⁴

Sound Transit's 2005 Regional Transit Long-Range Plan (shown in Figure 3) provided a revised framework for the future development of the regional transit system. The Long-Range Plan identified proposed transit service technologies in major corridors throughout the region to guide future phases of voter-approved transit projects. Sound Transit then used the updated long-range plan as a blueprint for developing the next phase of investments – ST2.

The 2005 plan updates the original 1996 document to reflect new information about regional demographics and to show how the regional transit system might best accommodate projected growth. The 1996 Long-Range Vision was adopted when the Sound Transit Board adopted Sound Move – the first phase Regional Transit System Plan.

The 2005 Regional Transit Long-Range Plan notes that the long term goals of Sound Transit should include the following:²⁵

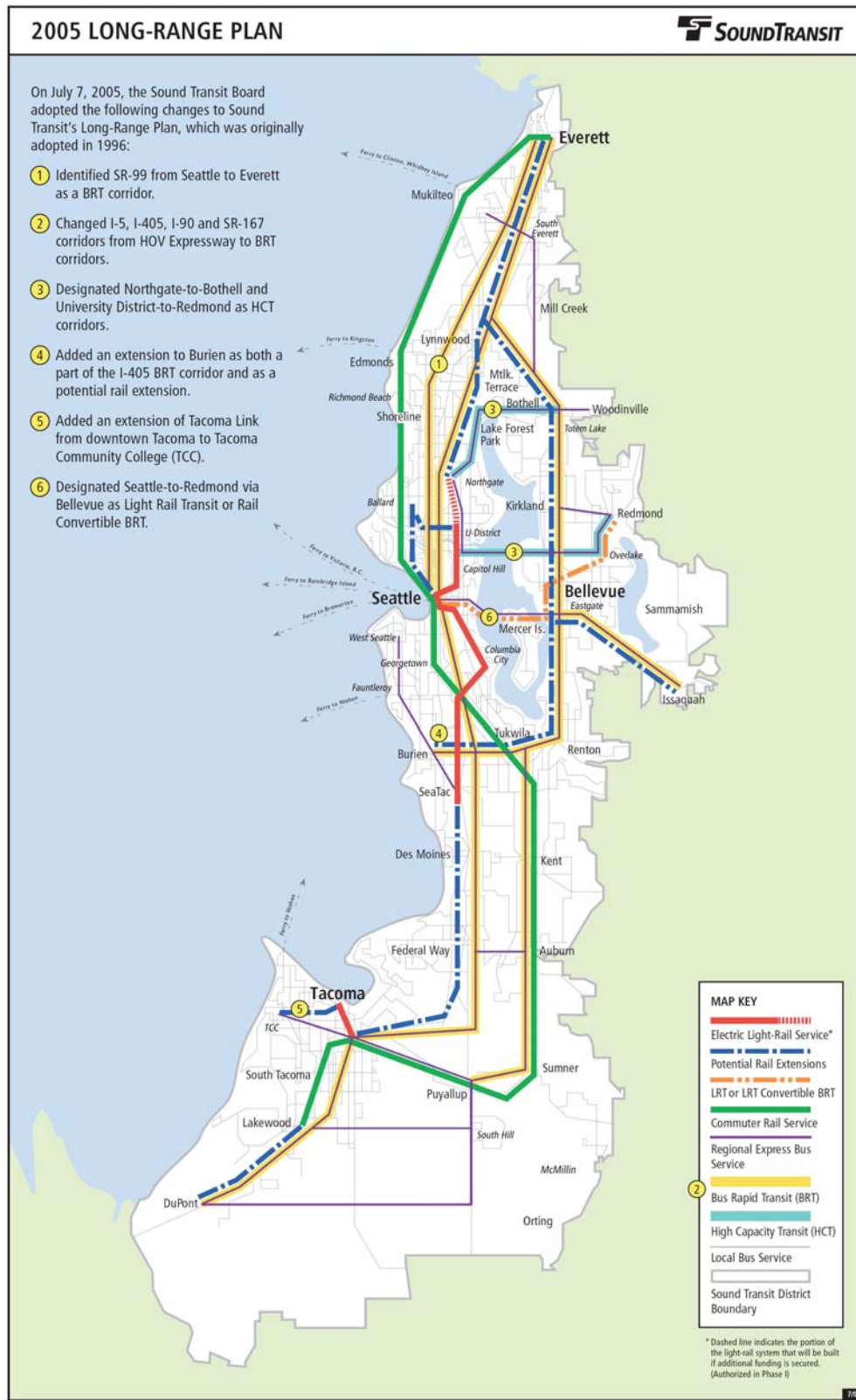
- Provide a public transportation system that helps ensure long-term mobility, connectivity, and convenience for the citizens of the Puget Sound region for generations to come;
- Preserve communities and open space;
- Contribute to the region's economic vitality;
- Preserve our environment; and
- Strengthen communities' use of the regional transit network.

The objectives of the plan are as follows:

- Keep the region moving;
- Offer cost-effective and efficient transportation solutions;
- Create a regional transit system that provides community, social, economic and environmental benefits;
- Develop equitable transportation solutions;
- Create a financially feasible system;
- Offer regional services that work well with other transportation services; and
- Work with local public transportation providers and the state Department of Transportation to coordinate services and develop a single-fare card.²⁶

Consistent with the 1996 Long-Range Vision, the 2005 Long-Range Plan recommends a mixture of rail and bus services reflecting continuation of the Rail/TSM Alternative examined in the 1993 EIS, 1996 Long-Range Vision and *Sound Move* plan. In addition to the expansion of Sounder commuter rail and Link light rail, ST Express bus and bus capital projects, Sound Transit is investigating further HCT expansion with rail-convertible bus rapid transit (BRT), and HOV/BRT technologies. Sound Transit will also develop gateways to local communities, at which pedestrian, bicycle and local bus access to the regional system is provided. Community connections include bus stops, park-and-ride lots, transit centers, and rail stations.²⁷

Figure 3: 2005 Long-Range Plan Update



4. ST2 Planning Process

4.1 Description

Sound Transit 2 (ST2) is being developed as the next stage of high capacity transit implementation for the central Puget Sound region. The plan will expand on Sound Transit's system of regional express buses, commuter rail, and light rail facilities and services in the tri-county area.

4.2 Candidate Project Identification

From an initial list of more than 500 ideas that were identified in the 2005 Final SEIS, local jurisdictions in the ST district prioritized 80+ candidate projects. These projects were presented to the ST Board at its December 8, 2005, meeting. At that meeting, the Board outlined the process and priorities to be used for the initial screening of ST2 projects.

The 80+ candidate projects were a mixture of high-capital LRT, rail-convertible BRT, and commuter rail options, and low-capital bus projects. Consistent with the Rail/TSM concept and pursuant to RCW 81.104, the 80+ projects included the following:

- High-capital options: light rail extensions in north and south corridors; fixed guideway connections (light rail or rail-convertible BRT) in East King County; and Sounder improvements (north and south corridors); and
- Low-capital options: ST Express bus (all subareas) – these projects include creation of arterial HOV lanes, direct access ramps, park-and-ride facilities, transit centers, transit signal priority projects, new/expanded bus routes and pedestrian bridges.

Refer to Appendix C for the list of candidate projects presented to the Board on December 8, 2005.

4.3 Narrowing of Candidate Projects

At its January 12, 2006, meeting, the Board approved Motion M2006-03, which identified eighteen (18) ST2 candidate projects that did not perform well under the Board's initial screening criteria and were therefore set aside from further consideration. These projects are listed in Table 3.

Table 3: ST2 Candidate Projects Set Aside on January 12, 2006

	PROJ. ID	PROJECT DESCRIPTION
NORTH CORRIDOR	N4	Link LRT – Lynnwood Park-&-Ride to Alderwood Mall along I-5 (Lynnwood)
	N9	Express Bus – HOV Access Ramps and Flyer Stops on I-5 at NE 185 th Street (Shoreline)
	N18	Express Bus – Parking Garage at Lake Forest Park Town Center (Lake Forest Park)
	N24	Sounder – New Station near Point Wells (Shoreline)

	N25	Sounder – New Station in Ballard (Seattle)
	N27	Express Bus – New Route to Provide Feeder Service to New Sounder Station at Broad Street (Seattle)
EAST CORRIDOR	E10	Enhanced Transit – ST funding of Metro Route 269 (East King County)
	E11	Enhanced Transit – ST funding of Metro Route 240 (East King County)
	E14	Express Bus – Direct Access Ramps on I-90 at SR 900 (Issaquah)
	E16	Express Bus – Flyer Stop and Pedestrian Bridge on I-405 (Bothell)
	E17	Express Bus – Flyer Stop on I-405 at NE 85 th Street (Kirkland)
	E18	Express Bus – BAT Lanes on SR 522 between I-405 and SR 527 (Bothell)
	E19	Express Bus – BAT Lanes on SR 522 (East King County)
	E21	Express Bus – Parking Garage and Transit Loading at Bothell Park and Ride (Bothell)
	E27	Express Bus – New Route between Bothell and Renton on I-405 (East King County)
SOUTH CORRIDOR	S4	Link LRT – New Station on Tacoma Link at Commerce Street (Tacoma)
	S8	Express Bus – Bus-only Access Ramps on I-5 at South Industrial Way and Airport Way/5 th Avenue South (Seattle)
	S14	Express Bus – Extension of Route 565 to Tacoma Dome Station during Peak Periods with Limited Stops

4.4 Remaining Candidate Projects

With the above listed projects set aside, the remaining 60+ candidate ST2 projects were a mixture of high-capital LRT, rail-convertible BRT, and commuter rail options, and low-capital bus projects. Consistent with the Rail/TSM concept and pursuant to RCW 81.104.100, the 60+ projects included the following:

- High-capital options: light rail extensions in north and south corridors; fixed guideway connections (light rail or rail-convertible BRT) in East King County; and Sounder improvements (north and south corridors); and
- Low-capital options: ST Express bus (all subareas) – these projects include creation of arterial business access/transit (BAT) lanes, direct access ramps and flyer stops, park-and-ride facilities, transit centers, transit signal priority projects, new/expanded bus routes, and pedestrian bridges.

The remaining 60+ candidate projects were eligible for inclusion in the draft sample investment scenarios, as discussed in the next section.

4.5 Development of Sample Investment Scenarios

As part of the process of developing a plan to submit to the voters, the Board requested that Sound Transit develop a range of sample scenarios to illustrate potential sets of projects that could be funded under various investment levels. The investment levels used for these sample investment scenarios reflect the amount of revenue generated by a zero to one-half of one percent incremental increase in the local sales tax rate within the Sound Transit district. Sound Transit currently collects a 0.4 percent (%) sales tax. The following sample scenarios were presented to the Board on June 8, 2006:

- The Do Nothing scenario assumed no increase in the sales tax rate for Sound Transit. This scenario represented the “Do-Nothing” option required by state law;
- The Bus/Sounder Emphasis (Low) scenario assumed a 0.1% incremental increase in the sales tax rate for Sound Transit. This scenario represented the “Low Capital” option (required by state law) that maximizes the current system;
- The Bus/Rail Emphasis (Medium) scenario assumed a 0.3% incremental increase in the sales tax rate for Sound Transit and included a mixture of high capital and low capital projects;
- The Fixed Guideway Emphasis (Medium-high) scenario assumed a 0.4% incremental increase in the sales tax rate for Sound Transit and included a mixture of high capital and low capital projects; and
- The Fixed Guideway Emphasis (High) scenario assumed a 0.5% incremental increase in the sales tax rate for Sound Transit (the maximum allowed under existing law) and included a mixture of high capital and low capital projects.

Figures 4 through 8 show the capital projects included in each sample investment scenario. As indicated on the accompanying project lists, each sample scenario (other than the Do Nothing scenario) also includes allocations for planning and engineering studies, various programmatic or system-wide activities, and funding for existing facilities and services.

Figure 4: Do-Nothing Sample Investment Scenario

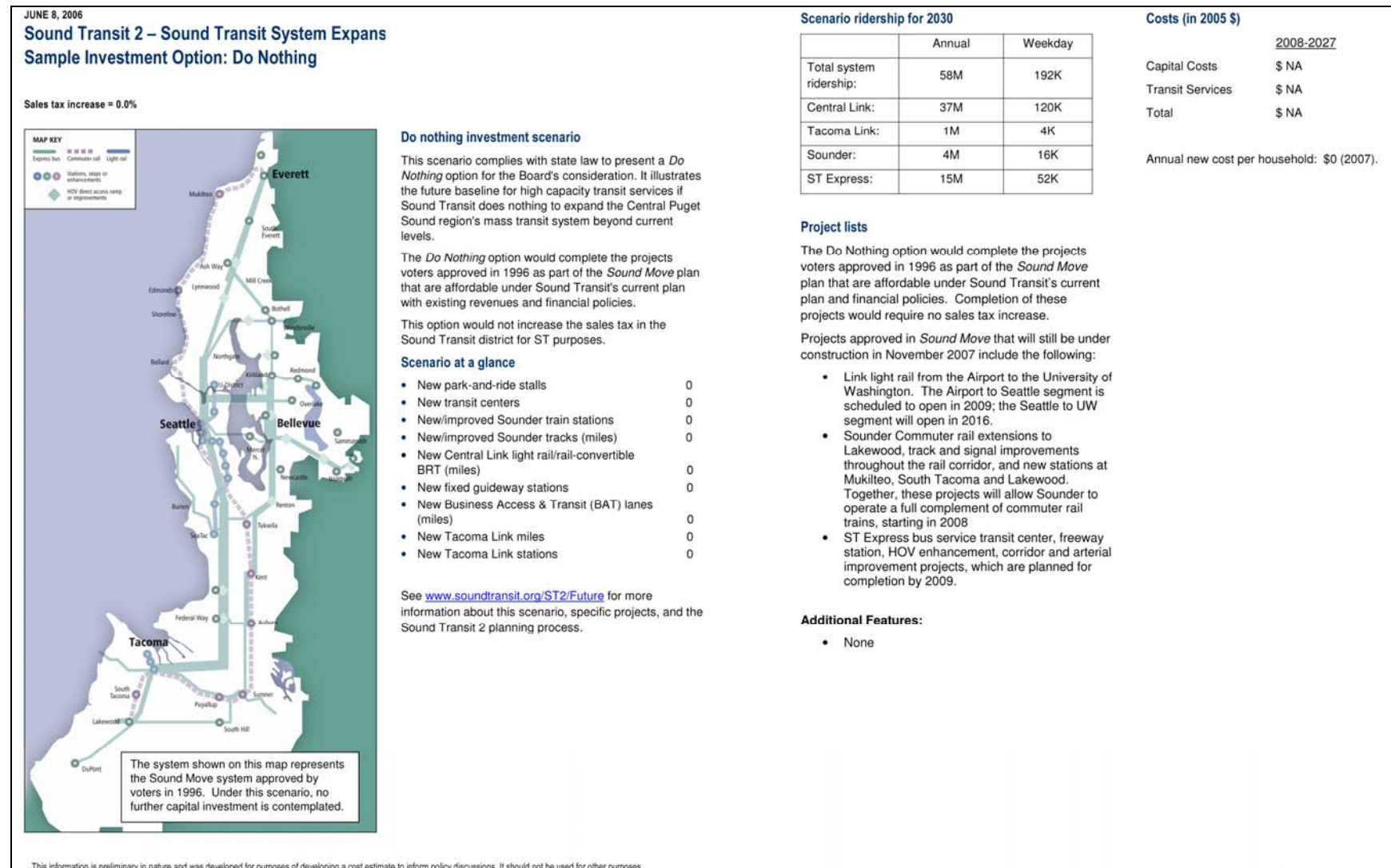


Figure 5: Bus/Sounder Emphasis (Low) Sample Investment Scenario

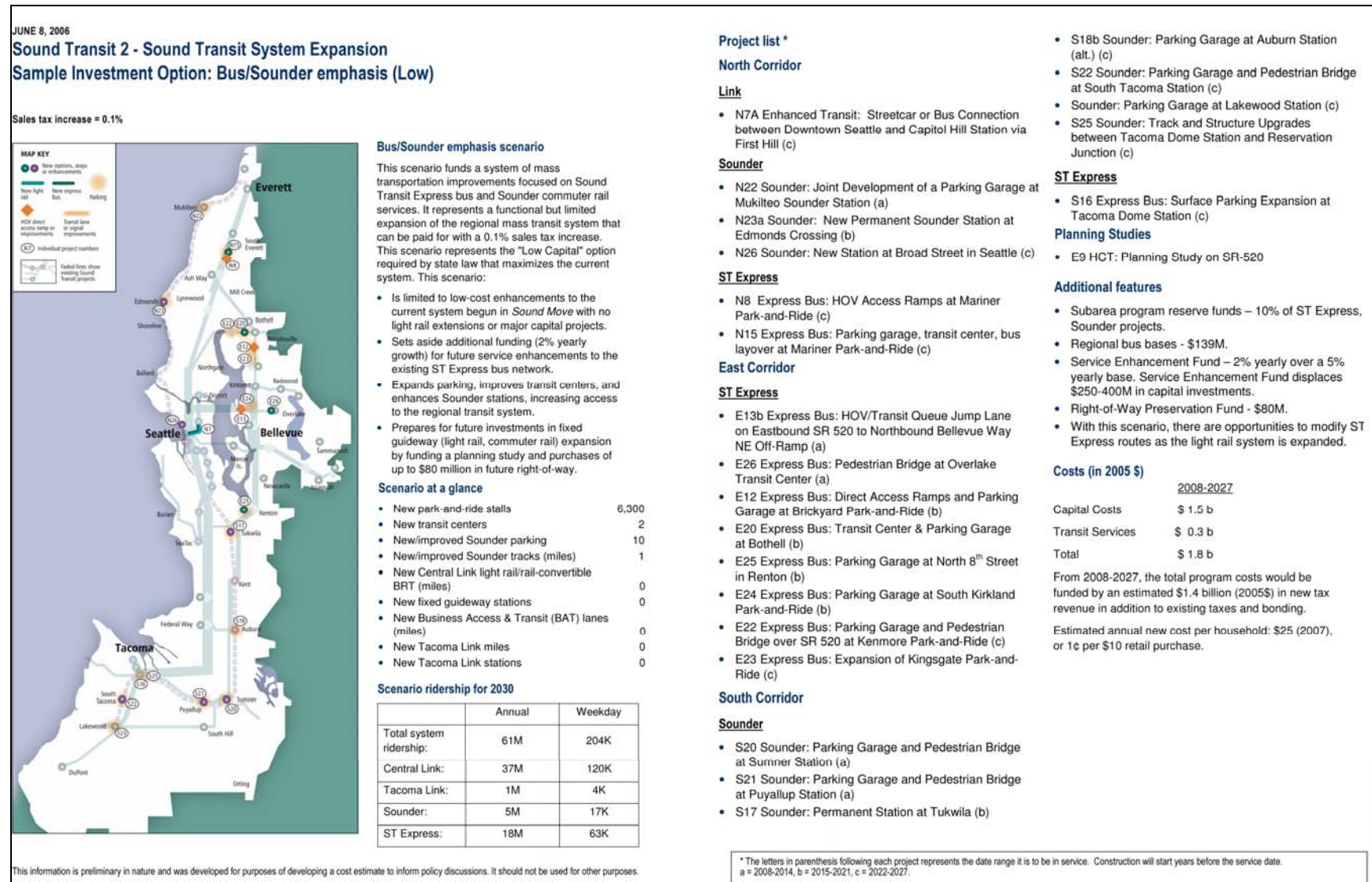


Figure 6: Bus/Rail Emphasis (Medium) Sample Investment Scenario

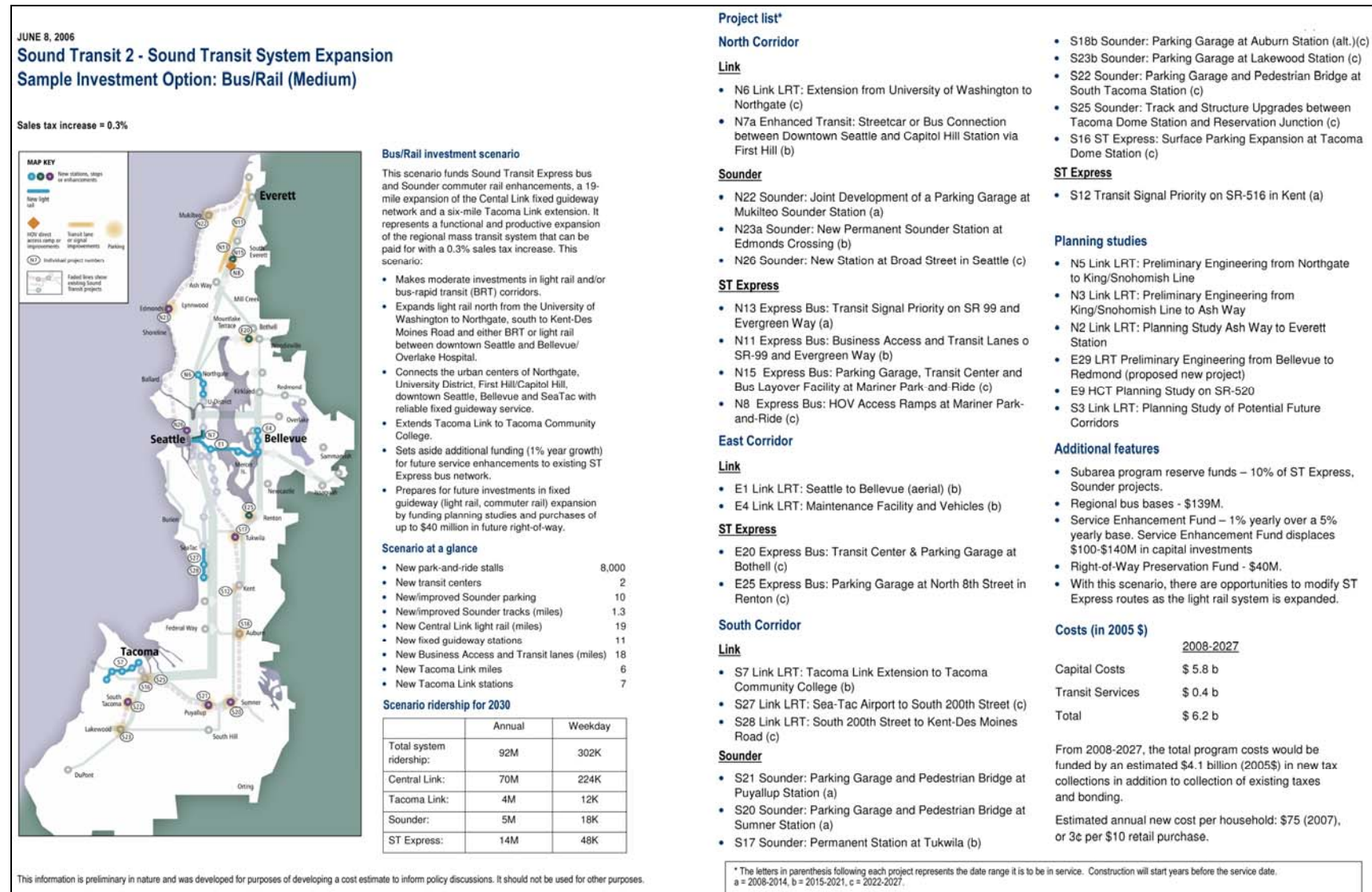


Figure 7: Fixed Guideway Emphasis (Medium-High) Sample Investment Scenario

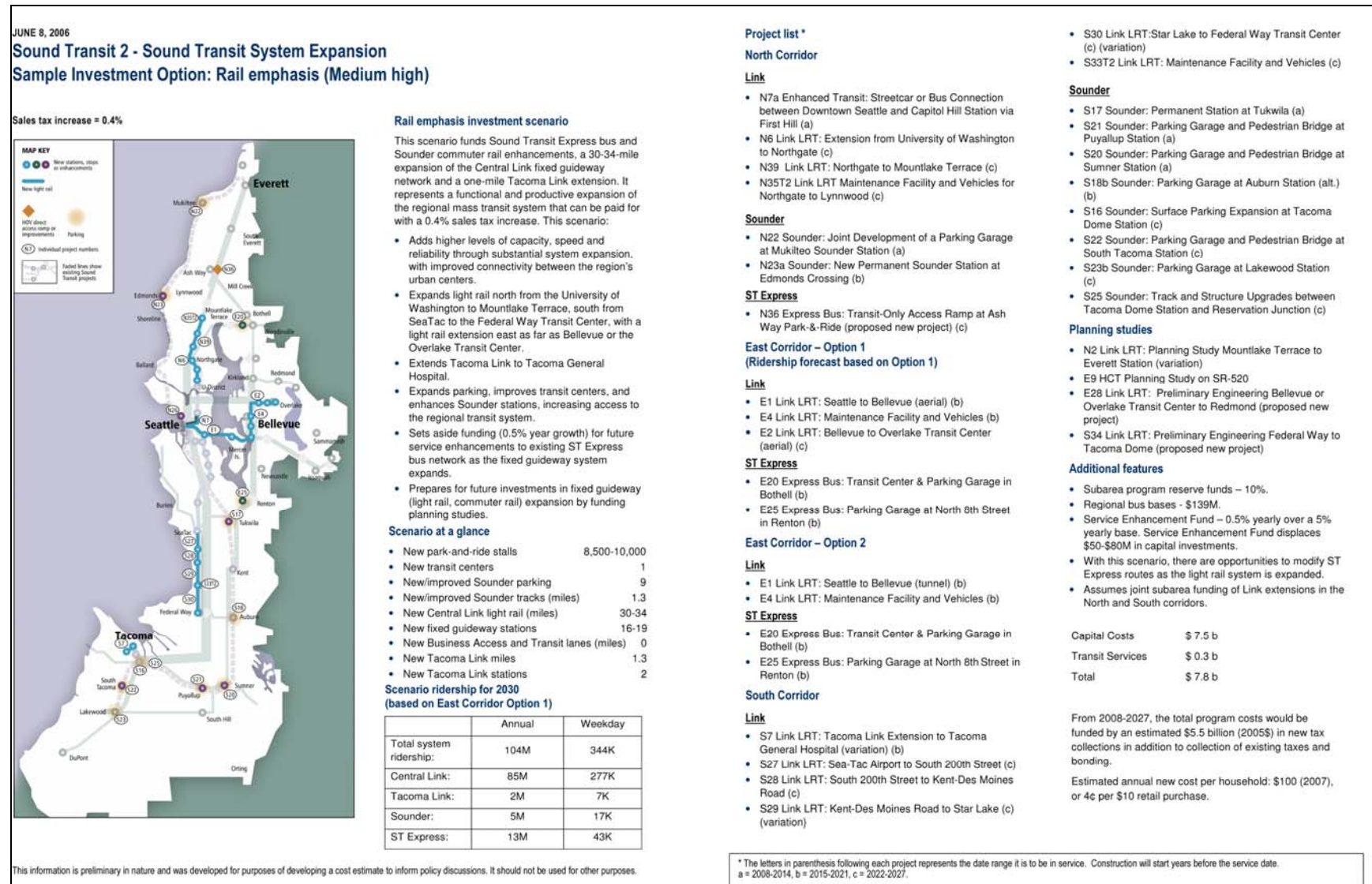
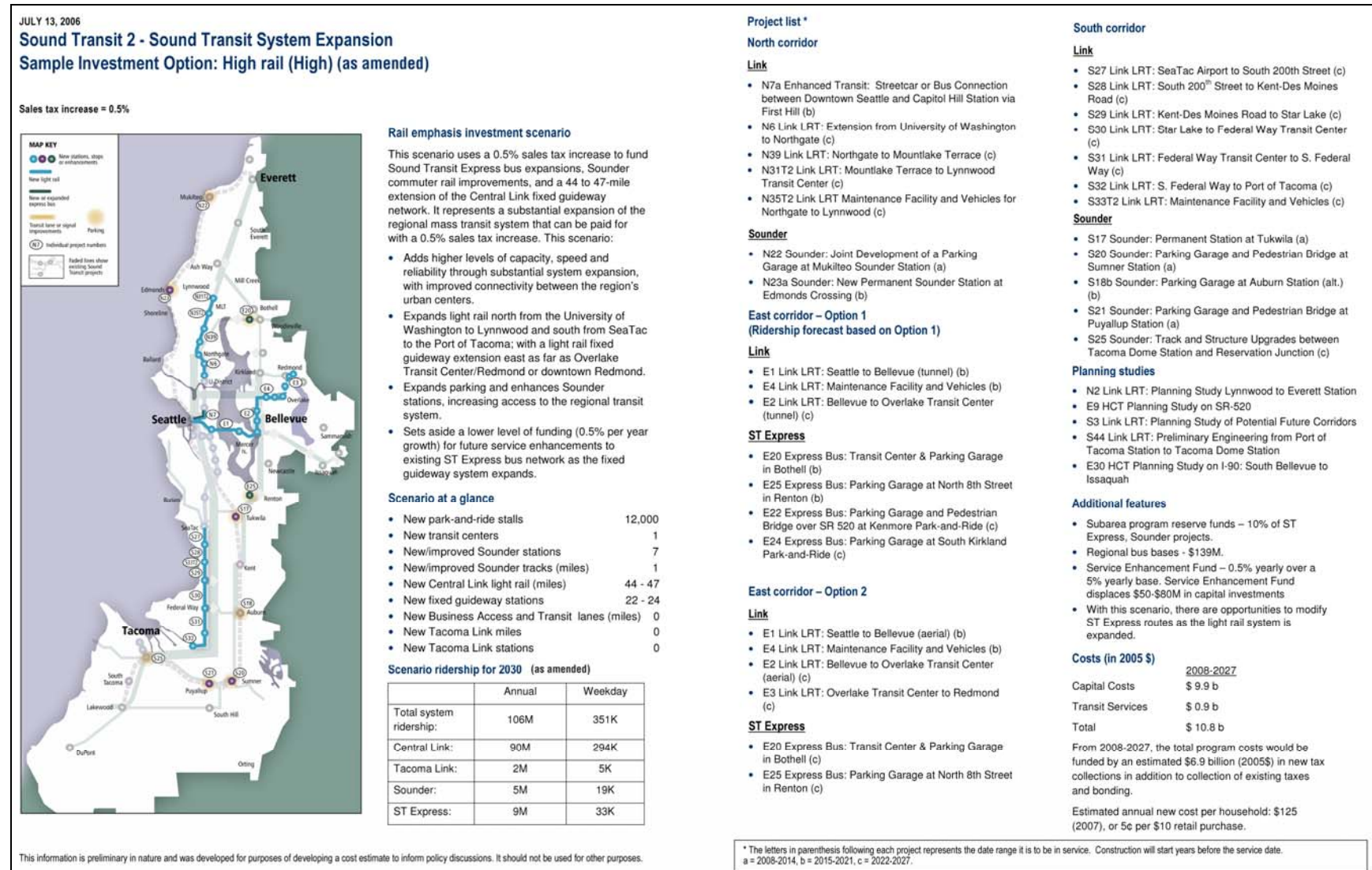


Figure 8: Fixed Guideway Emphasis (High) Sample Investment Scenario (as amended)



4.6 Do-Nothing and Low Capital Options Set Aside; 3 Sample Investment Options Issued for Public and Agency Review

With approval of Resolution R2006-15 on July, 13, 2006, the Sound Transit Board issued three sample investment options for public and agency review and comment. As part of that resolution, the Board also set aside two options from further consideration: the Do-Nothing option and the Bus/Sounder Emphasis (Low) option. The resolution also identified light rail as the preferred technology for the Seattle-Bellevue-Redmond via I-90 and Mercer Island corridor. In addition, the resolution directed that the 60+ ST2 candidate projects, which were retained as candidate projects as part of Motion No. M2006-03, remain eligible for further consideration.

At the Board's request, the Fixed Guideway Emphasis (High) option presented to the Board in June 2006 was replaced with a new option: Maximized Rail Extension (High). Instead of an extension of the Tacoma Link system west to Tacoma Community College that was included in the previous High option, the new High option provided for an extension of the Central/Airport Link system south to the Port of Tacoma area in Pierce County.

The three sample investment options issued by the Board for public and agency review were:

- The Bus/Rail Extension (Medium) option assumed a 0.3% incremental increase in the sales tax rate for Sound Transit and included a mixture of high capital and low capital projects;
- The Medium Rail Extension (Medium-high) option assumed a 0.4% incremental increase in the sales tax rate for Sound Transit and included a mixture of high capital and low capital projects; and
- The Maximized Rail Extension (High) option assumed a 0.5% incremental increase in the sales tax rate for Sound Transit (the maximum allowed under existing law) and included a mixture of high capital and low capital projects.

Figures 9 through 11 show the capital projects included in each sample investment option. As indicated on the accompanying project lists, each option also includes allocations for planning and engineering studies, various programmatic or system-wide activities, and funding for existing facilities and services.

Figure 9: Bus/Rail Extension (Medium) Sample Investment Option

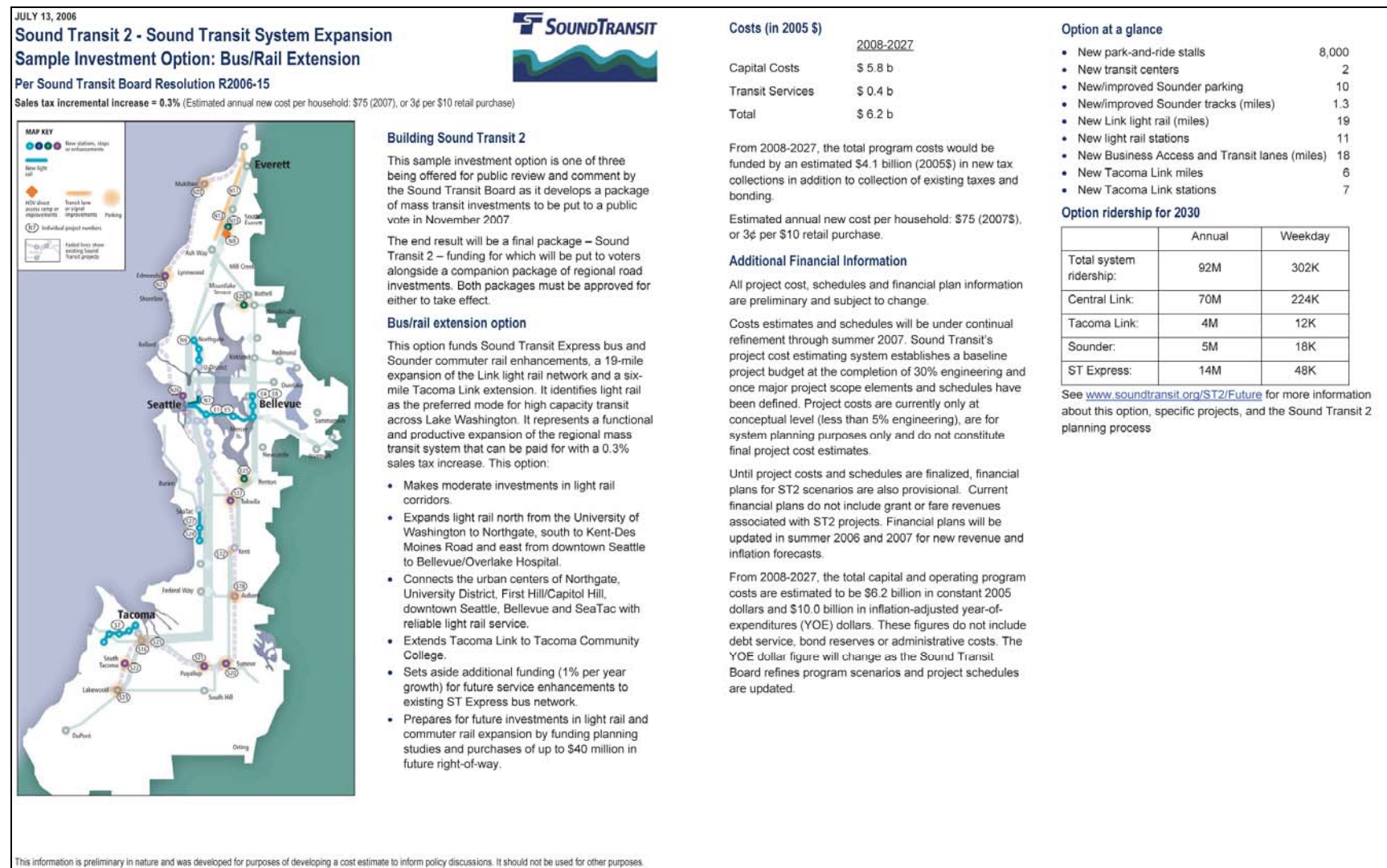


Figure 10: Medium Rail Extension (Medium-High) Sample Investment Option

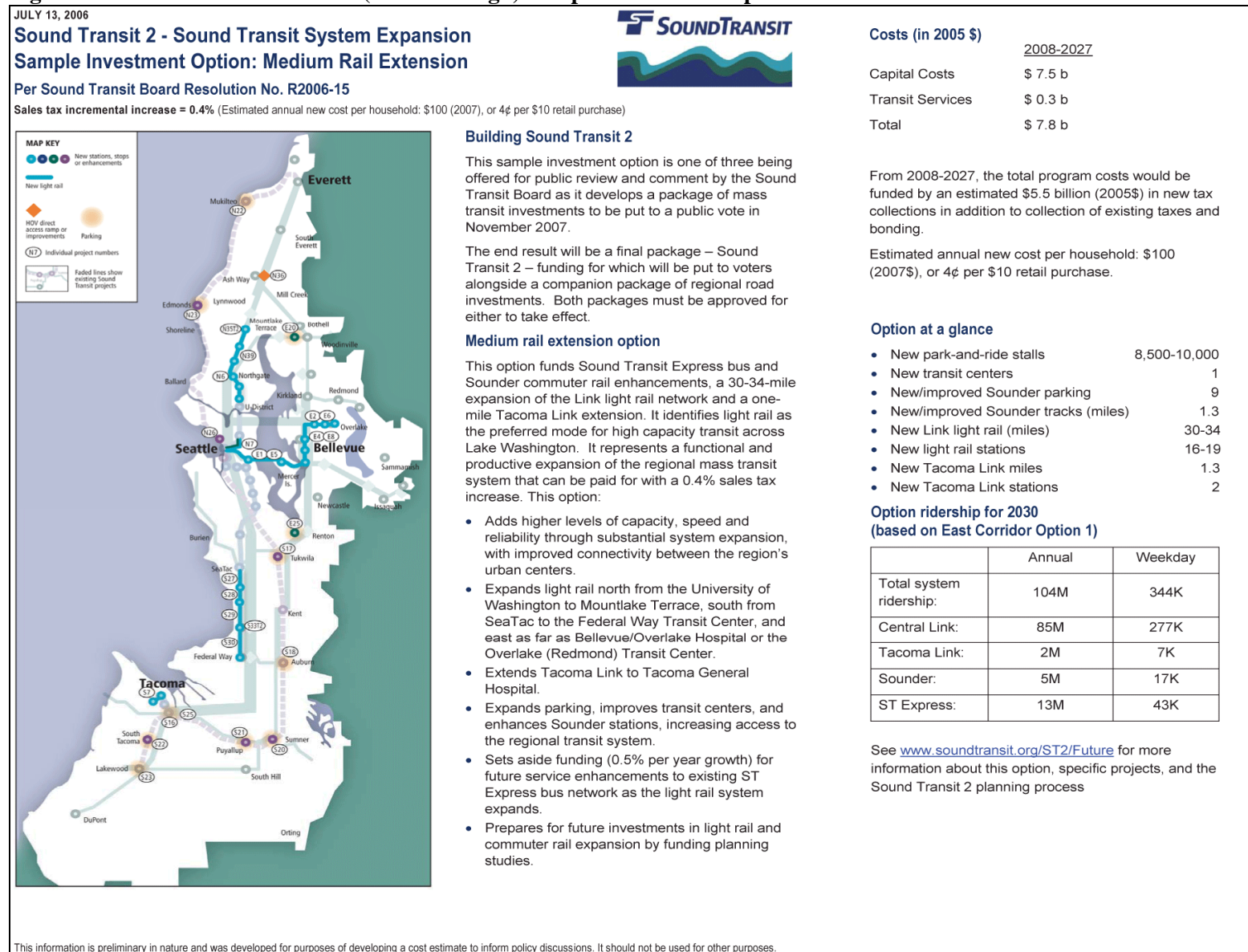
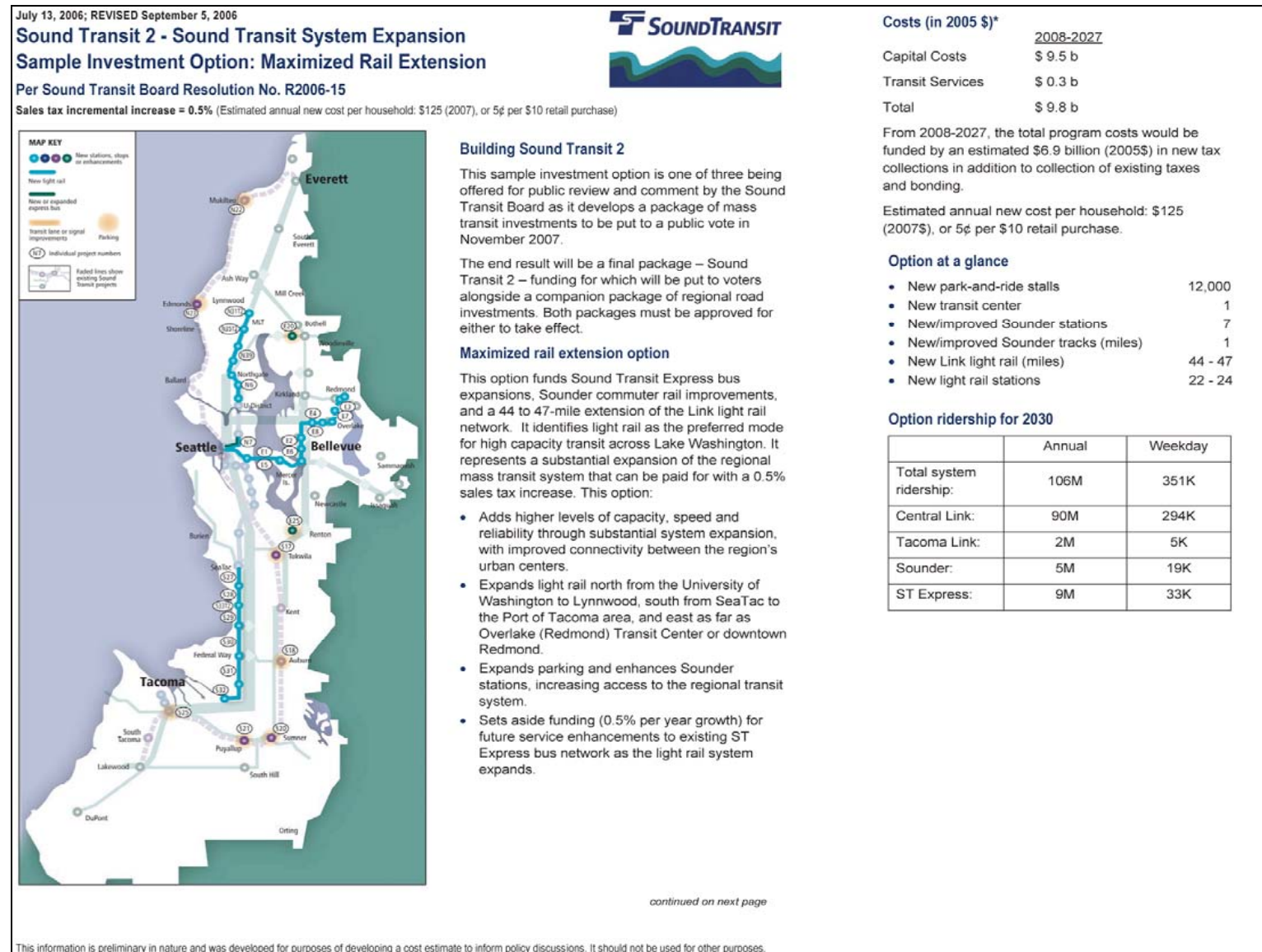


Figure 11: Maximized Rail Extension (High) Sample Investment Option



4.7 ST2 Draft Package

With approval of Resolution R2007-01 on January 11, 2007, the Sound Transit Board set aside from further consideration the “Bus/Rail Extension (Medium)” and “Medium Rail Extension (Medium-High)” investment scenarios. With this resolution, the Board also modified and renamed the “Maximized Rail Extension (High)” to provide light rail service to the Eastside, extend light rail in the north and south corridors and implement other core projects, and directed staff to further refine and evaluate this “Sound Transit 2 Draft Package” and distribute it for public and agency review.

Figure 12 shows the capital projects included in the ST2 Draft Package. As indicated on the project list (shown in Table 3), the draft package also includes allocations for planning and engineering studies, various programmatic or system-wide activities, and funding for existing facilities and services.

Figure 12: ST2 Draft Package

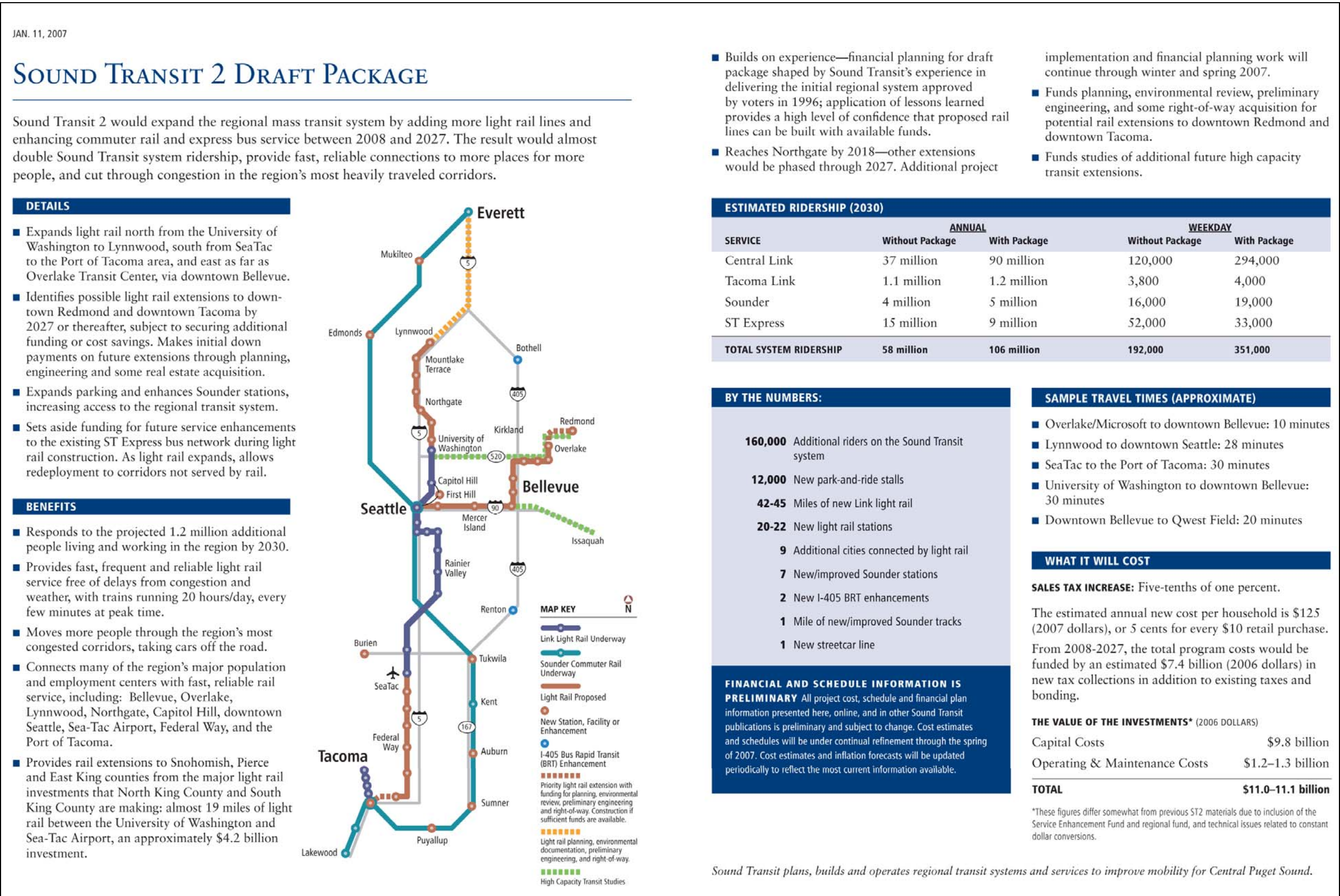


Table 4: ST2 Draft Package Projects by Corridor

	PROJECT ID	MODE	PROJECT DESCRIPTION
NORTH CORRIDOR	N2	Link	Planning Study, Lynnwood Transit Center – Everett Station
	N6	Link	University of Washington Station – Northgate (Seattle)
	N7a	Streetcar	Downtown Seattle – Capitol Hill via First Hill
	N22	Sounder	Joint Development of a Parking Garage at Mukilteo Station
	N23a	Sounder	New Permanent Station at Edmonds Crossing
	N28	Link	Northgate – Jackson Park
	N29	Link	Jackson Park – Shoreline
	N30	Link	Shoreline – Mountlake Terrace
	N31T2	Link	Mountlake Terrace – Lynnwood Transit Center (Terminal)
	N37	Link	Env. Review, PE, ROW Preservation: Lynnwood – Everett
EAST CORRIDOR	E1	Link	Seattle – Downtown Bellevue
	E2	Link	Downtown Bellevue – Overlake Transit Center
	E9	HCT	Planning Study on SR 520 in East King County
	E20	Express Bus	Transit Center and Parking Garage in Bothell
	E25b	Express Bus	N. 8 th Street Parking Garage in Renton
	E28	Link	PE and ROW Preservation: Overlake Transit Center – Redmond
	E30	HCT	Planning Study on I-90: South Bellevue – Issaquah
SOUTH CORRIDOR	S15b	Express Bus	Shared Funding for Parking Garage at Burien Transit Center
	S17	Sounder	Permanent Station at Tukwila
	S18b	Sounder	Parking Garage at Auburn Station (Alternative)
	S20	Sounder	Parking Garage and Pedestrian Bridge at Sumner Station
	S21	Sounder	Parking Garage and Pedestrian Bridge at Puyallup Station
	S25	Sounder	Track and Structure Upgrade: Tacoma Dome Station – Reservation Junction
	S27	Link	SeaTac Airport – S. 200 th Street
	S28	Link	S. 200 th Street – Kent-Des Moines Road via SR 99
	S29a	Link	Kent-Des Moines Road – S 272 nd Street via SR 99
	S30	Link	S 272 nd Street – Federal Way Transit Center via SR 99
	S40	Link	Federal Way Transit Center – S. 348 th Street via I-5
	S41T5	Link	S. 348 th Street – Port of Tacoma via I-5 (Terminal)
	S44	Link	PE and ROW Preservation: Port of Tacoma Station – Tacoma Dome Station
SYSTEM-WIDE	SYS-BUS	Express Bus	ST Express Maintenance and Operations Facilities and Fleet Expansion
	SYS-LRT	Link	Maintenance Bases, Vehicles, and Operations for ST2 Expansion

4.8 ST2 Plan

With approval of Resolution R2007-05 on May 24, 2007, the ST Board adopted the Sound Transit 2 Regional Transit System Plan for the Central Puget Sound Region (the ST2 Plan). As listed below, the Board approved the ST2 plan narrative, system map, and a set of related appendices as part of Resolution R2007-05:

- Making Connections, Sound Transit 2, The Regional Transit System Plan for Central Puget Sound (ST2 Plan narrative);
- System Map;
- Appendix A: Detailed Description of Facilities and Estimated Costs;
- Appendix B: Financial Policies;
- Appendix C: Benefits, Costs, Revenues, Capacity, and Reliability; and
- Appendix D: Social, Economic and Environmental Impacts; Performance Characteristics by Mode; and Integration with Regional Land Use.

The ST2 Plan system map is shown in Figure 2. The projects that were included in the ST2 Plan are identified in Table 5.

Figure 13: ST2 Plan

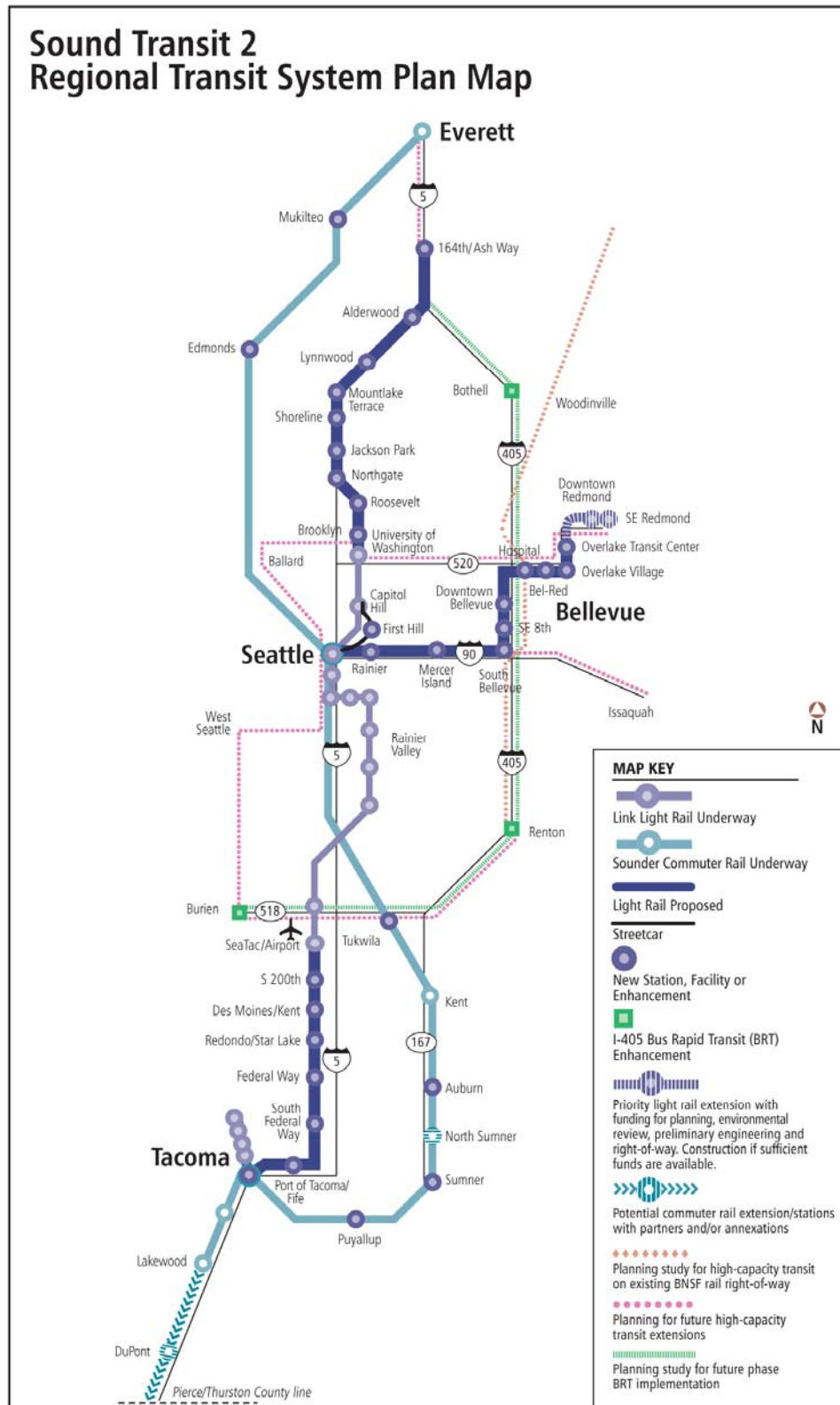


Table 5: ST2 Plan Projects by Corridor

	PROJECT ID	MODE	PROJECT DESCRIPTION
NORTH CORRIDOR	N2	Link	Planning Study: 164 th SW/Ash Way – Everett Station
	N6	Link	University of Washington Station – Northgate (Seattle)
	N7a	Streetcar	Downtown Seattle – Capitol Hill via First Hill (John Street)
	N7c	Streetcar	Extension to Aloha Street
	N22	Sounder	Joint Development of a Parking Garage at Mukilteo Station
	N23a	Sounder	New Permanent Station at Edmonds Crossing
	N28	Link	Northgate – Jackson Park
	N29	Link	Jackson Park – Shoreline
	N30	Link	Shoreline – Mountlake Terrace
	N31	Link	Mountlake Terrace – Lynnwood Transit Center
	N32	Link	Lynnwood Transit Center – Alderwood
	N33T3	Link	Alderwood – 164 th SW/Ash Way (Terminal)
	N44	Link	Planning Study: University District – Downtown Seattle via Ballard
	N45 & S50	Link	Planning Study: Burien – Downtown Seattle via West Seattle
	N46 & E32	HCT	Planning Study: BNSF Corridor from Renton to Snohomish
EAST CORRIDOR	E1	Link	Seattle – Downtown Bellevue
	E2T2	Link	Downtown Bellevue – Overlake Transit Center (Terminal)
	E9	HCT	Planning Study on SR 520 in East King County
	E20	Express Bus	Transit Center and Parking Garage in Bothell
	E25b	Express Bus	N. 8 th Street Parking Garage in Renton
	E28	Link	PE and ROW Preservation: Overlake Transit Center – Redmond
	E30	HCT	Planning Study on I-90: South Bellevue – Issaquah
	E31	Express Bus	I-405 BRT Planning Study from Lynnwood to Burien
	E32 & N46	HCT	Planning Study: BNSF Corridor from Renton to Snohomish
SOUTH CORRIDOR	S15b	Express Bus	Shared Funding for Parking Garage at Burien Transit Center
	S17	Sounder	Permanent Station at Tukwila
	S18b	Sounder	Parking Garage at Auburn Station (Alternative)
	S20	Sounder	Parking Garage and Pedestrian Bridge at Sumner Station
	S21	Sounder	Parking Garage and Pedestrian Bridge at Puyallup Station
	S25	Sounder	Track and Structure Upgrade: Tacoma Dome Station – Reservation Junction
	S27	Link	SeaTac Airport – S. 200 th Street
	S28	Link	S. 200 th Street – Des Moines/Kent via SR 99

	S29a	Link	Des Moines/Kent – Redondo/Star Lake via SR 99
	S30	Link	Redondo/Star Lake – Federal Way Transit Center via SR 99
	S40	Link	Federal Way Transit Center – South Federal Way via I-5
	S41	Link	South Federal Way – Port of Tacoma/Fife via I-5
	S42T6	Link	Port of Tacoma/Fife – Tacoma Dome Station via I-5 (Terminal)
	S50 & N45	Link	Planning Study: Burien – Downtown Seattle via West Seattle
	S51	Link	Planning Study: Burien – Renton
SYSTEM-WIDE	SYS-BUS	Express Bus	ST Express Maintenance and Operations Facilities and Fleet Expansion
	SYS-LRT	Link	Maintenance Bases, Vehicles, and Operations for ST2 Expansion

East Corridor project E28 identified above provided for planning, preliminary engineering, environmental review and strategic advance right-of-way acquisition on a “high-priority” extension from the Overlake Transit Center to downtown Redmond. In this ST2 Plan, the high-priority extension would have been built if sufficient additional funding and/or cost savings were identified as part of the ST2 program.

In addition to the Sounder commuter rail projects listed above, Sound Transit indicated it would consider adding a new (provisional) Sounder station and parking facility in the north Sumner area if substantial funding had been provided by another public agency and/or private entity. Sound Transit indicated it would also consider extending Sounder service south of Lakewood to a new station in DuPont and into Thurston County either through a funding agreement with a third party or through annexation of new areas into the Sound Transit district.

4.8.1 ST2 Plan Conformance to the Metropolitan Transportation Plan

The PSRC found that the ST2 Plan conformed to the current Metropolitan Transportation Plan (also known as *Destination 2030, 2007 Update*).

4.8.2 Rejection by Voters of 2007 Proposition 1 – The Roads & Transit Plan

The ST2 Plan was combined with a regional highway improvement plan (developed by the Regional Transportation Investment District) and placed before the region’s voters in November, 2007. The combined ballot measure was called Proposition 1, the Roads & Transit plan. Only voters in the Sound Transit district voted on the ST2 portion of the ballot measure. In November, 2007, voters rejected Proposition 1 56 percent to 44 percent.

4.9 Revised ST2 Plan – Approved by Voters November, 2008

Following the failure of Proposition 1 in November, 2007, Sound Transit conducted a system planning-level needs assessment, updated the ST2 Plan to respond to public input, and sent the updated ST2 Plan to the ballot in November, 2008. Voters approved the updated ST2 plan (Proposition 1, the Mass Transit Expansion plan) on November 4, 2008.

4.9.1 Needs Assessment

Shortly after the failure of Proposition 1 in November, 2007, Sound Transit conducted a needs assessment for an expanded HCT system in the region. This was a high-level assessment of the needs driving the extension of the existing high capacity transit system toward full build-out of ST's Regional Transit Long-Range Plan. The Needs Statement covered both regional and corridor-specific factors influencing the expansion of the system and laid out customer-focused and performance-based indicators of incremental achievement of regional transportation system goals and objectives.

On January 24, 2008, at the Sound Transit Board Meeting the draft Summary Needs Assessment was presented to the Board, and a final Summary Needs Assessment Technical Memorandum was published on January 31, 2008.

The needs assessment focused on the following performance measures:

Regional

- Mobility Improvements
- Environmental Considerations
- Economic Development Support
- Regional Plan Conformity

Corridor

- Serve existing and future travel patterns
- Support land-use and demographic distributions
- Improve travel time and reliability in congested corridors

The needs assessment concluded that current systems are approaching or are beyond capacity, and that there was a measurable need for addressing current and future transportation system demands. It also found that regional population and employment growth is significant, and maintaining economic vibrancy in a sustainable manner is important. Consequences of inaction could include deterioration in mobility, environmental quality, and economic opportunity for the region. Finally, it found that high capacity transit investment provides efficient, sustainable, and reliable transportation system expansion.

Because the needs assessment determined that there was a need for an expanded high capacity transit system, Sound Transit Board members and staff began considering modifications to the ST2 Plan as a step toward a potential ST2 ballot measure in 2008 or later.

4.9.2 12 and 20-Year 0.4 and 0.5 Percent Packages

In early 2008, Sound Transit developed new draft investment packages for the public to review. On April 24, 2008, the Sound Transit board approved a motion (M2008-45) authorizing distribution (for public and technical review and comment) of a draft package of options for expanding regional transit in the Sound Transit district. Sound Transit sought public review of two new options that Sound Transit could complete in 12 years, as well as the larger 20-year package that was part of the unsuccessful 2007 Roads & Transit measure, Proposition 1. The new 12-year options would each have cost 62 percent to 67 percent less than Proposition 1's total because the new measure would be transit-only and fund a smaller set of transit projects. A 20-year transit-only package would cost about one-third less than the 2007 Proposition 1 package.

All of the options included major expansions to the regional transit system, ranging from 18 to 50 miles of new Link light rail expanding to the north, and south to the east across Lake Washington, along with improvements to Sounder commuter rail and ST Express regional bus service and facilities.

One of the two new 12-year options would be funded by a sales tax increase of four-tenths of one percent (0.4 percent), while the second would be funded by a sales tax increase of five-tenths of one percent (0.5 percent). The 0.4 percent package would have funded an estimated \$9.0 billion (YOES) in new capital investments, while the 0.5 percent package would have funded an estimated \$10.3 billion (YOES) in new capital investments.

Figure 14 shows the projects included in the packages. The 0.4 percent package included a near doubling of the Link light rail system (18 miles) with ten new stations along extensions to Northgate, Bellevue and South 200th Street. Also included were up to 12 new daily trips in the Sounder south commuter rail corridor, 11 new/improved Sounder stations, a capital contribution toward a passenger rail partnership along the BNSF Woodinville Subdivision line, an increase in ST Express service hours of 10 to 15 percent in key corridors, 16 miles of new arterial transit lanes, and a new streetcar line serving the First Hill and Broadway communities in Seattle.

The 0.5 percent package included all the major features and components of the 0.4 percent package plus 4 additional Link light rail stations on extensions to Overlake Transit Center and Highline Community College, contributions toward up to 4 additional miles of new arterial transit lanes, and an extension of the First Hill Streetcar north to Aloha Street.

On June 26, 2008, the Sound Transit Board heard public input on these proposals to expand the region's mass transit system. Asked their preferences between the new 12-year options, 46 percent of respondents favored the 0.5 percent option, 24 percent favored the 0.4 percent option, and 24 percent did not like either.

The highest level of support was for the largest transit package option: a 20-year plan that could be funded by a sales tax increase of 0.5 percent, or about \$69 per year per adult. The 20-year option was favored by 43 percent of respondents, while 31 percent favored a 12-year plan, and 14 percent did not support either.

Respondents also expressed urgency around when to move forward with a new transit ballot measure: 76 percent favored a 2008 vote, 10 percent favored a 2010 vote, 3 percent favored voting after 2010 and 5 percent said never.

Also at the June 26, 2008 Board Meeting, several Board members expressed interest in development of a plan that could fall between the 12-year and 20-year plans and that would bring light rail service into Snohomish County in less than 20-years. Board Chair Nickels indicated that the Board would continue to make changes to the plan based on what was heard at that meeting.

Figure 14: ST2 12-Year Plans with 4/10 Percent and 5/10 Percent Funding Options



4.9.3 Adoption of Updated ST2 Plan (Mass Transit Expansion Plan)

At the July 10, 2008 Board Meeting, Chair Nickels said that based on Board discussion at the June 26, 2008 meeting, he directed staff to develop revisions to the plan that would address light rail extensions farther north and south. He noted that his request was in response to comments from jurisdictions and citizens. He offered a 15-year plan that would allow light rail to reach Federal Way and Lynnwood faster than the previous plan and would add more regional express bus service in the short term. He noted that it represented the second incremental step in a plan that ultimately builds light rail to Everett, Tacoma and Redmond.

At the next Board Meeting, on July 24, 2008, the ST Board approved Resolution R2008-10, thereby adopting the revised Sound Transit 2 Regional Transit System Plan for the Central Puget Sound Region (the ST2 Plan). At that meeting, the Board also approved Resolution R2008-11 to send the updated ST2 Plan to the November 2008 ballot.

As listed below, the Board approved the ST2 plan narrative, system map, and a set of related appendices as part of Resolution R2008-10:

- Exhibit A, Plan Document, Sound Transit 2 - A Mass Transit Guide The Regional Transit System Plan For Central Puget Sound (including system plan map);
- Appendix A: Detailed Description of Facilities and Estimated Costs;
- Appendix B: Financial Policies;
- Appendix C: Benefits, Costs, Revenues, Capacity, and Reliability; and
- Appendix D: Social, Economic and Environmental Impacts; Performance Characteristics by Mode; and Integration with Regional Land Use.

The ST2 Plan system map is shown in Figure 15. The projects included in the revised ST2 Plan are identified in Table 6.

**Sound Transit 2
Regional Transit System Plan Map**

Legend

- Link light rail**
 - Extension: New service and station
 - Planning, environmental, design, and potential right-of-way purchase
 - Existing service
- Sounder commuter rail**
 - New/improved service or station
 - Provisional station subject to funding availability
 - Existing service
- ST Express regional bus**
 - New/improved service
 - New Bus Rapid Transit (BRT) service or station
 - Existing service
- Other supporting investments**
 - Regional transit partnership contribution
 - First Hill Link Connector

Adopted July 24, 2008

Table 6: Updated ST2 Plan Projects by Corridor

	PROJECT ID	MODE	PROJECT DESCRIPTION
NORTH CORRIDOR	N06	Link	Extension from University of Washington to Northgate
	N07a	Streetcar	First Hill Link Connector: IDS to Capitol Hill (John St.) via First Hill
	N22	Sounder	Mukilteo Station Access
	N23a	Sounder	New Permanent Station at Edmonds
	N39	Link	Extension from Northgate to Lynnwood TC (Terminal)
EAST CORRIDOR	E01	Link	Extension from Downtown Seattle to Bellevue CBD
	E02	Link	Extension from Downtown Bellevue to Overlake Transit Center
	E20b	Express Bus	Contribution to Bothell Parking Garage/Transit Center
	E28b	Link	LRT Preliminary Engineering/Engineering Overlake Transit Center to Downtown Redmond
	E32b	Sounder	Contribution to Partnership for Eastside BNSF Passenger Rail
SOUTH CORRIDOR	S27	Link	Extension from SeaTac Airport to South 200th Street
	S28	Link	Extension from South 200th to Kent-Des Moines Road via SR 99
	S29A	Link	Extension from Kent/Des Moines - S 272nd via SR 99
	S7b	Link	Tacoma Link Extension Contribution
	S131	Link	Right-of-Way Preservation: South Federal Way to Tacoma Dome
	S132	Link	Environmental & PE: Kent-Des Moines Rd to Tacoma Dome
	S24	Sounder	Lakewood-Seattle Expanded Sounder Service
	S16	Sounder	Tacoma Dome Station Access
	S17	Sounder	Permanent Station at Tukwila
	S109	Sounder	Kent Station Access
	S18b	Sounder	Auburn Station Access
	S20	Sounder	Sumner Station Access
	S21	Sounder	Puyallup Station Access

	S22	Souder	South Tacoma Access
	S23b	Souder	Lakewood Station Access
	S110	Souder	8-Car Platform Extensions
	S25	Souder	Track and Structure Upgrades between Tacoma Dome Station and Reservation Junction
	S15b	Express Bus	Shared Funding for Parking Garage at Burien Transit Center
SYSTEM-WIDE	SYS-LRT	Link	Maintenance Bases, Vehicles and Operations for ST2 Expansion
	SYS-BUS	Express Bus	ST Express Maintenance and Operations Facilities and Fleet Expansion
	SYS-RAIL	Souder	Souder Yard and Shops Facility
	SYS-PLANNING	Link	Planning for the Future: Planning Studies

Source: Sound Transit Website Accessed 11/11/2008 (<http://www.future.soundtransit.org/projects.aspx>)

5. Capital Cost Methodology

This section summarizes the methodology used for developing capital cost estimates, which is documented in detail in the report: *Sound Transit 2: Task 2.0 – Methodology Development and Documentation, Subtask 2.3 – Capital Cost Estimating Methodology Report, Final, March 2007*.

The purpose of the cost estimation phase of ST2 is to identify the estimated capital and operations and maintenance costs of selected projects. This enables Sound Transit (ST) to develop an adequate funding scenario for the project/program implementation. This summary documents the approach to capital cost estimation. The capital costing methodology presented in this document acknowledges the varying degrees of design that will be available for ST2 projects and takes advantages of ST's experience building similar facilities. The ST2 planning and cost estimating processes both focus the most resources and analyses on the largest projects with the greatest potential to impact the overall cost of the ST2 Plan and, therefore, the greatest risk to successful delivery of the ST program.

The primary goal of the ST2 capital cost estimating process is to generate realistic cost estimates for which ST can deliver the projects, as defined, during the ST2 implementation period.

The general approach for the ST2 capital cost estimating methodology consists of five steps:

- Define the project scopes;
- Identify unit costs;
- Estimate quantities;
- Calculate the costs; and
- Validate the cost estimates against ST's actual cost experience during *Sound Move*.

5.1 Levels of Costing

While there are a variety of project types (park-and ride lots, light rail lines, commuter rail extensions, etc.) for the purposes of costing, the projects are grouped by the level of planning and engineering completed at the time of the cost estimates.

Level 1 – Projects with Completed Preliminary (30%) Engineering

As part of *Sound Move*, Sound Transit has completed preliminary engineering on the North Link LRT segments as far north as Northgate. The cost estimate prepared by ST as part of the preliminary engineering efforts was reviewed to ensure assumptions and features included in the design were still consistent with the desired project definition. Costs were escalated to be consistent with the base year for all other ST2 projects.

Level 2 – Major Fixed Guideway HCT Projects (stand-alone segments or extensions to the current *Sound Move* Plan)

Project definitions for large-scale (typically light rail or rail-convertible bus rapid transit) corridor projects were prepared as part of the Long-Range Plan update. The definition of these projects has been refined based on additional planning and conceptual engineering. Plans, critical profiles and typical sections were prepared for a representative alignment and key facilities. An engineering report documenting design assumptions and facility features was prepared. Cost estimates were developed based on standard FTA cost categories.

Level 3 – Smaller Scale Discrete Projects

All of the smaller scale projects (e.g., park-and-ride lots, Sounder service extensions, ST Express route enhancements) have undergone planning investigations resulting in project definitions sufficient for developing cost estimates. Cost estimates were based on unit costs from detailed bid data derived from *Sound Move* projects and other local experience. Updated right-of-way cost estimates for each Core project were based on a parcel-by-parcel estimate of real estate acquisition, relocation and administration costs.

5.2 General Approach to Estimating Capital Costs

This section documents the general capital cost estimating approach that was applied to Level 2 and 3 projects, as described above.

1. Define Projects

- Define and document features and assumptions for each project;
- Standardize project definitions for like project types to avoid omission of standard or recurring costs;
- Review project definition with ST Corridor Teams, Technical Advisory Committees, jurisdictions, and ST2 Work Teams; and
- Exert version control on project definition and update cost estimates when project definitions change.

2. Generate Unit Costs

- Compile unit cost information based on ST experience with similar facilities;

- Use other local unit cost data for facilities for which ST has no prior experience (e.g., bus rapid transit); and
- Cross-check unit costs against other projects throughout the U.S.

3. Estimate Quantities

- Use typical drawings, where practical; and
- Calculate areas from site plans.

4. Calculate Costs

- Develop cost estimates based on project definitions and unit costs.

5. Validate Cost Estimates

- Review project definition and costs through ST Work Team review; and
- Compare against like projects that have been constructed or for which engineer's estimates have been prepared.

5.3 Capital Cost Escalation

Because the ST2 planning process occurred over multiple years, it was necessary to escalate project capital costs to the current base year. For the updated ST2 Plan (Proposition 1, Mass Transit Expansion Plan), all capital cost estimates were escalated to a 2007 base year. The methodology and assumptions for capital cost escalation are described in the report: *Sound Transit 2: Task 2.0 – Methodology Development and Documentation, Subtask 2.3 – Capital Cost Escalation Methodology (2006 – 2007), Final, March 2008*.

6. Operations and Maintenance Cost Methodology

This section summarizes the methodology used to estimate operations and maintenance costs for the ST2 projects. Several types of sensitivity and reasonableness tests were conducted on the O&M cost model. The models, assumptions, results, and other information are documented in the report: *Sound Transit 2: Operations and Maintenance Cost Methodologies, Final, February 2007*.

6.1 ST Express

The O&M cost model for Sound Transit's ST Express bus system was calibrated using Sound Transit's 2005 budget for ST Express bus service. Using these calibration assumptions as a baseline, the model was used to estimate the annual O&M cost for future service scenarios for ST Express.

Sound Transit currently contracts with three local transit agencies for operation of the ST Express service: King County Metro (KCM), Community Transit (CT), and Pierce Transit (PT). While these arrangements are expected to continue in the near term, contracting some service to private companies could be an option in future years. Each of the current contracts is based on a negotiated unit cost per service hour. The cost of this "purchased transportation" constitutes the vast majority of the budget. Additional costs are incurred directly by Sound Transit for a variety of support functions.

Since the service contracts are based on service hours, the key variables for the ST Express O&M model are the service hours for each provider:

- *Service Hours – KCM:* The annual service hours operated by King County Metro;
- *Service Hours – CT:* The annual service hours operated by Community Transit;
- *Service Hours – PT:* The annual service hours operated by Pierce Transit; and
- *Service Hours – Other:* The annual service hours that may be operated by private contractors in future scenarios.

In each case, the estimated hours include hours that are reserved for additional bus service (schedule maintenance) during the course of the year.

6.2 Central Link Light Rail

The O&M cost model for Sound Transit’s Central Link light rail system approved in *Sound Move* was used to estimate costs for extensions to the initial system. Those extensions are being studied as part of the ST2 planning process.

The model has been calibrated for the initial segment of the Central Link system. The 14-mile line will run from Westlake Station in downtown Seattle to the Tukwila International Boulevard Station, and it includes 12 stations. The initial operating plan calls for two-car trains running every six minutes during peak periods and every 10 minutes offpeak. The initial fleet will have 31 cars, including five spares.

Sound Transit intends to contract with KCM for operation of the Central Link system. The calibration process used the budget proposed by King County Metro in 2005 for the initial system. Additional cost items are based on information provided by Sound Transit staff. Using these calibration assumptions as a baseline, the model can be used to estimate the annual O&M cost of any future light rail alternative. As the budget for initial operations is refined by KCM and Sound Transit, the model can be updated and recalibrated to reflect the latest cost estimates for the initial segment. The Central Link O&M model requires the following input statistics:

- *Peak Cars:* The maximum number of light-rail vehicles operating simultaneously in scheduled service;
- *Annual Revenue Car-Miles:* Total miles operated by all rail cars in scheduled service, excluding deadhead mileage;
- *Annual Revenue Train-Hours:* Total hours operated by all trains in revenue service, excluding report and deadhead time;
- *Subway, Elevated, At-Grade Stations:* The number of each type of passenger station in the light rail system;
- *Directional Route Miles:* The miles of revenue track, excluding yard and tail track (e.g., one mile of double track equals two directional route miles);
- *Maintenance Facilities:* The number of light rail maintenance and storage yards; and
- *Joint Operation in DSTT* (Downtown Seattle Transit Tunnel): Yes or no.

6.3 Tacoma and Everett Light Rail

The O&M cost model for the downtown Tacoma light rail system is calibrated with Sound Transit's 2005 budget and operating statistics. The model was used to estimate costs for system extensions being studied as part of the ST2 planning process.

The Tacoma Link cost model was modified to estimate costs for light rail system alternatives under study for downtown Everett. The Everett system would be similar in scale to Tacoma Link, so the cost experience for Everett should be closer to Tacoma Link than to Central Link.

The Tacoma Link O&M model requires the following input statistics:

- *Peak Cars:* The maximum number of light rail vehicles operating simultaneously in scheduled service;
- *Annual Revenue Car-Miles:* Total miles operated by all rail cars in scheduled service, excluding deadhead mileage;
- *Annual Revenue Train-Hours:* Total hours operated by all trains in revenue service, excluding report and deadhead time;
- *Stations:* The number of passenger stations in the light rail system;
- *Directional Route Miles:* The miles of revenue track, excluding yard and tail track (e.g., one mile of double track equals two directional route miles); and
- *Maintenance Facilities:* The number of light rail maintenance and storage yards.

6.4 Rail Convertible Bus Rapid Transit

This section describes the O&M cost model for a proposed rail-convertible bus rapid transit (BRT) system that was considered as part of the ST2 planning process.

One of the alternatives that was studied for the East Corridor was a BRT system that could be converted to light rail in the future. The line and stations would be built in a manner that would facilitate future conversion to light rail. In addition, the BRT operation would be patterned after rail service, with BRT buses operating only on the proposed busway. In the initial system that was proposed, the busway would run from a terminal station in Redmond to a terminal station near the Central Link International District Station in downtown Seattle.

Sound Transit currently contracts with KCM for operation of the ST Express service in the East Corridor. Sound Transit also intends to contract with KCM for operation and maintenance of the Central Link light rail system.

If BRT (including a rail convertible form) were to be implemented in the East Corridor, it was assumed that KCM would operate the BRT service, which would replace some current ST Express routes. It was also assumed that Sound Transit would contract with KCM for maintenance of the BRT facilities.

The O&M cost model for rail-convertible BRT was developed by combining elements from two other cost models that were developed as part of the ST2 project, ST Express and Central Link, described previously.

The key variables for the BRT cost model are as follows:

- *BRT Service Hours*: The annual platform bus hours operated by KCM;
- *Subway, Elevated, At-Grade Stations*: The number of each type of passenger station in the BRT system;
- *Route Miles*: The miles of two-lane busway; and
- *Yard*: The number of maintenance bases devoted to BRT vehicles.

6.5 Sounder Commuter Rail

This section describes the O&M cost model for Sounder commuter rail extensions that were considered as part of the ST2 planning process.

Service levels on Sounder commuter rail that are planned and funded through *Sound Move* are for 18 daily trains in the South Corridor between Lakewood and Seattle and 8 daily trains in the North Corridor between Everett and Seattle. Extension of the South Corridor line from Tacoma Dome Station to Lakewood is currently under construction.

The Sound Transit budget details expected Sounder operating costs for full service in 2012, the first year of full service to Lakewood. The operations cost per vehicle hour, as defined in the agency's budget, was used for the potential ST2 extension of Sounder south to DuPont.

7. Transit Ridership Forecasting Methodology

This section summarizes the methodology used for transit ridership forecasting for ST2. The methodology is documented in detail in the report: *Sound Transit HCT Planning: Task 2.0 – Methodology Development and Documentation, Subtask 2.4 – Transit Ridership Forecasting Technical Report, Final, February 2006*.

7.1 History of Transit Forecasting at Sound Transit

The history of transit forecasting analysis at Sound Transit began at Seattle Metro (now King County Metro) in 1986. Work by Brand and Benham, of Charles River Associates, led to Metro's consideration of "a quick-responsive incremental travel demand forecasting method"²⁸ based on the concept of staged forecasting analysis. Subsequently, in 1986, Metro installed "the logit mode-choice equations for pivot-point analysis"²⁹ (as described by Ben-Akiva and Atherton³⁰; Koppelman³¹; Nickesen, Meyburg and Turrnquist³²; and many others) on EMME/2 software. In 1988, Metro staff highlighted the relationship between Metro's transit forecasting methods and the Puget Sound Council of Governments' (PSCOG) regional model.³³

Sound Transit and the Regional Transit Project (RTP) then further developed the forecasting analysis procedures in the early 1990s, prior to the November 1996 voter approval of *Sound Move: The Ten-Year Regional Transit Plan*. An Expert Review Panel (ERP), formed in 1990 under the auspices of the Legislative Transportation Committee, the Secretary of Transportation, and the Governor, oversaw development of the first generation of the Sound Transit incremental model. This model is described in the November 1993 *Travel Forecasting Methodology Report*, published by the Regional Transit Project.

The Sound Transit model was updated in the late 1990s in support of the Central Link Light Rail Transit Project Environmental Impact Statement (EIS) evaluation as well as the North Link Light Rail Transit Project Supplemental Environmental Impact Statement (SEIS). The underlying Sound Transit model procedures used to perform transit ridership forecasting analysis in support of the North Link Light Rail Projects were documented in the *Transit Ridership Forecasting Technical Report*, issued in November 2003 by Sound Transit.

7.2 Sound Transit Incremental Planning Model

The Sound Transit incremental model has been updated to a new base year (2004). Development of the base year transit trip tables involved a rigorous analysis of actual ridership volumes along each transit route, as well as a realistic simulation of observed transit service characteristics for both peak and off-peak periods. External changes in demographics, highway travel time, and costs are distinctly incorporated into the process in phases prior to estimating the impacts of incremental changes in transit service. The Sound Transit model relies on the Puget Sound Regional Council (PSRC) regional model for data on external changes.

In the first stage of ridership forecasting analysis, only changes in PSRC model trip distribution results or demographics are considered. In the second stage, other external changes such as highway travel time (congestion), costs (including parking costs), transit fares, and household income are taken into consideration.

The first two stages of ridership forecasting analysis result in a forecast of zone-to-zone transit trips within the RTA district boundaries absent any changes in the transit system. In the third and final stage, incremental changes in the transit level-of-service (i.e., access, wait, and ride travel times) are considered. Finally, transit trips are assigned to the future year transit network.

Like all travel forecasting models, the Sound Transit model has some limitations. Because it uses average daily ridership, it is unable to assess the effects of special events such as sports games or major festivals. Furthermore, the ST model is not well-suited for analyzing structural changes in regional land use beyond those already included in PSRC demographic forecasts, or to forecasting in outlying areas of the three-county region where there is minimal existing transit service. Finally, the model does not explicitly take into account differences in safety, comfort or user-friendliness of bus versus rail transit service.

7.3 Summary Comparisons of the ST and PSRC Models

The ST and PSRC modeling procedures are closely inter-related and highly complementary. The ST model uses measures of regional change in travel demand and highway congestion derived from the PSRC model. Summary comparisons of the PSRC and ST modeling procedures are highlighted below:

- The PSRC model is a four-county synthetic modeling system comprising land-use, trip generation, trip distribution, modal split, and assignment models. It also includes several feedback loops based on intra-regional accessibility;
- The ST model is a three-county, three-stage, fully incremental system purposely designed for detailed corridor-level transit planning and transit patronage forecasting;
- The PSRC's regional population and employment forecasts are used to predict travel demand growth;
- ST uses the PSRC's time and cost coefficients for its mode choice model; and

- ST uses PSRC information for all non-transit input to the incremental transit ridership model.

7.4 Important Considerations

This section identifies five important areas of consideration in travel forecasting methods. Most of these considerations and constraints were taken from the FTA guidelines on transit project planning³⁴. The considerations described below simply reemphasize the use of best professional practice:

- Careful standards for validation;
- Consistent application of policy assumptions across alternatives;
- Use of identical land use plans and overall travel demand patterns across alternatives;
- Generic attributes of modes; and
- Analysis of service levels and travel forecasts for reasonableness.

All of these considerations were taken into account in ST's travel forecasting methods.

8. Financial Plan

This section briefly summarizes the financial plan for the updated ST2 Plan, which is described in more detail in one of the Plan appendices approved by Resolution R2008-10, namely *Appendix A: Detailed Description of Facilities and Estimated Costs, July 24, 2008*. This appendix identifies the estimated costs for the projects included in the updated ST2 Plan. The appendix also describes the sources and uses of revenue for the updated ST2 Plan.

8.1 Methodology for Financial Plan – Sources & Uses Summary for ST2

Sound Transit maintains an integrated long-range financial model that includes two elements:

1. On-going *Sound Move* projects and services funded by tax revenues approved by voters in 1996; and
2. ST2 projects and services funded by tax revenues that are not yet approved by voters.

In order to derive a Sources and Uses statement for just the ST2 component of the financial plan, the financial model was first run with only the *Sound Move* projects, services and funding (i.e., no ST2 programs or funding). The model was then run with all of the *Sound Move* and ST2 projects, services and funding included. The Sources and Uses table for “ST2 only” that is included in the ST2 Plan Appendix A document was obtained by subtracting the results of the first model from the second. This technique produces an approximate summary of the Sources and Uses for just the ST2 Plan.

9. Candidate Project and System Evaluation

This section summarizes the candidate project and system evaluation methodology for ST2. This methodology is documented in the report: *Sound Transit HCT Planning: Task 2.0 – Methodology Development and Documentation, Subtask 2.1 – System and Project Evaluation Methodology, Final, February 2006.*

9.1 Summary of Overall Evaluation and Screening Process

The grouping and evaluation of projects to be included in ST2 has occurred within the context of Sound Transit's overall Long-Range Plan. During the development and adoption of the agency's Long-Range Plan (including the 2005 update), Sound Transit made a number of strategic decisions regarding topics such as the addition of new corridors, technology choices for critical corridors, and the role of supporting facilities and projects. These decisions shape the number and types of projects that were carried forward into the ST2 evaluation process. During ST2, this initial list of projects was narrowed down to a set of new and enhanced existing facilities and services that meet the overall principles, goals and objectives of the agency.

The ST2 evaluation methodology serves the following purposes:

- Provides structure to the overall evaluation process;
- Establishes the method for evaluating projects and comparing different groups of projects;
- Develops a systematic process for organizing information regarding potential benefits, impacts and costs;
- Provides decision makers with a procedure for identifying key differences among alternative packages; and
- Ensures consistency in the evaluation of alternative packages.

9.2 Goals and Objectives for Long-Range Plan and Resulting ST2 Projects

The goals and objectives for both the Long-Range Plan and ST2 projects are listed below. These goals and objectives provide a policy basis for the project and system evaluation. The Plan and ST2 planning process must:

- Provide citizens with strongly supported, improved and expanded alternatives to automobile and traffic congestion;
- Enhance system developed in *Sound Move*;
- Continue complementary investment in *Sound Move*;
- Link the region's designated urban centers;
- Operate service principally in exclusive rights-of-way;
- Implement HCT in high density corridors;

- Focus investment within the RTA district;
- Encourage and support future development inside urban growth boundaries;
- Balance regional, corridor and subarea needs;
- Respect subarea equity policies;
- Return benefits in balance with subarea population, employment and needs;
- Provide regional (not local) facilities and services;
- Protect and enhance the natural environment in the central Puget Sound region;
- Preserve transit right-of-way;
- Influence future land use toward Transit Oriented Development (TOD);
- Avoid competitive, duplicative services;
- Involve the public and key stakeholders in decision making; and
- Favor cities and counties with supportive land use plans.

9.3 Phased Process of Candidate Project and System Evaluation

Following the update of the Long-Range Plan in July 2005, ST began working with local jurisdictions to identify specific projects and services to evaluate for ST2. In October 2005, the ST Board identified a list of 81 candidate projects for further study. As ST began developing the projects' scopes and other information required for the evaluation process, it also began detailing a two-part evaluation framework, described below.

Round 1: Sound Transit evaluated 81 candidate projects as part of the ST2 development process between December 2005 and January 2006. Project evaluation was completed using the following nine criteria, although the ST Board focused its evaluation efforts on those criteria shown in bold type:

- 1. Average Weekday Ridership;**
- 2. Capital Cost;**
- 3. Annual Operating Cost;**
4. Travel Time and Reliability;
- 5. Connectivity, Mobility and System Integration;**
6. Land Use and Development;
7. Customer Experience;

8. Risk Avoidance; and

9. Public and Agency Support.

The results of Round 1 project evaluation are documented in the report: *Sound Transit HCT Planning: Summary of ST2 Round 1 Project Evaluation, Final, January 2006*. Following its evaluation, the Board set aside 18 projects from further consideration in January 2006, leaving 63 candidate projects for continued ST2 planning.

Round 2: This phase of analysis focused on completing system-level ridership forecasting, the creation of several alternative ST2 systems (at varying levels of cost), and analysis of the resulting financial scenarios. Analysis of the system-level performance was focused on the following nine criteria:

1. Average Weekday Ridership;
2. Capital Cost;
3. Annual Operating Cost;
4. Travel Time and Reliability;
5. Connectivity, Mobility and System Integration;
6. Land Use and Development;
7. Customer Experience;
8. Risk Avoidance; and
9. Environmental Benefits.

The results of Round 2 project evaluation are documented in the report: *Sound Transit HCT Planning: Summary of ST2 Preliminary System-Level Evaluation: Round 2, Draft, July 2006*. ST2 project- and system-level evaluation continued until adoption of the updated ST2 Plan in July, 2008.

10. Conclusions

As this document has illustrated, Sound Transit has explicitly considered and evaluated Do-Nothing, Low Capital and High Capital options in the development of its regional high capacity transit plan. This document has also described the analysis methods, assumptions and reports for the estimation of capital costs, operating and maintenance costs, methods for travel forecasting, a financial plan and an evaluation methodology. Sound Transit therefore meets the provisions as detailed in RCW 81.104.100 and the plan amendment requirements in RCW 81.112.030, .040 and .080 (1).

Based on the 1993 EIS, 1996 regional transit long-range vision, and the *Sound Move* plan, Sound Transit identified an integrated high capacity transit system that features light rail transit, commuter rail, HOV facilities and regional express bus capital facilities. Sound Transit has now largely completed project planning for, and has built or is building most of, the first phase projects identified in *Sound Move*.

The *Sound Move* services provide travelers in the central Puget Sound region with an integrated network of transit options for regional trips. The 2004 Draft and Final SEIS and the 2005 update to the regional transit long-range vision and adoption of the Regional Transit Long-Range Plan continue this policy of planning and development of a mix of high capacity transportation options to help the region meet future growth and demand.

Implementation of the voter-approved Mass Transit Expansion (ST2) Plan over the next 15 years will expand regional HCT services that conform to and support the region's adopted growth and transportation goals and objectives.

Appendices

Appendix A: Expert Review Panel – Documentation of 1996 Long-Range Vision and Sound Move Plan Review

October 14, 1996

The Honorable Mike Lowry
Governor of the State of Washington
Olympia, WA 98504

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Puget Sound Regional Council
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Mr. Bob Drewel, Chair
Regional Transit Authority
3000 Rockefeller Avenue, MS 407
Everett, WA 98201

Dear Madam and Sirs:

This is the tenth formal letter prepared by the Expert Review Panel appointed in 1989 by the Governor, the Legislative Transportation Committee, and the Secretary of Transportation to provide technical oversight to high capacity transit planning in the Puget Sound Region. Over the last six-and-a-half years we have held over twenty-five one- and two-day meetings and half-day committee meetings to review the technical work prepared first by Metro, then by the Joint Regional Policy Committee (JRPC), and finally by the Regional Transit Authority (RTA). We have also reviewed the supporting modeling work prepared by the Puget Sound Regional Council (PSRC), as well as citizen-generated light-rail transit proposals and least-cost planning analyses. Our role is defined in RCW 81.104.110:

"To assure appropriate system plan assumptions and to provide for review of system plan results, an expert review panel shall be appointed to provide independent technical review for development of any system plan which is to be funded in whole or in part by the imposition of any voter-approved local option funding sources enumerated in RCW 81.104.140."

SUMMARY OF FINDINGS

We find the technical work underlying the Regional Transit Authority's Ten-Year Plan, "Sound Move", provides a reasonable basis for the region's elected officials and voters to decide whether they wish to fund the transit investments detailed in the plan.

- The ridership forecasts and capital cost estimates are reasonable and prudent, though taken as a whole they may present a picture that understates the long-term regional ridership potential of the proposed investments.
- The estimates for federal funding are realistic given today's constrained financial environment, and are much lower than other cities have received in the past and are currently projecting to receive in the future for comparable projects.

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Scott Rutherford, Acting Chair
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Michael Meyer
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- The contingencies are adequate for this type of project to respond to most unforeseen circumstances.
- The equity structure of the plan adequately assures individual subareas that their share of expenditures will be balanced with their contributions to revenue over the life of the plan.

At our most recent meeting, held on July 17, 1996, we focused our review on "The Ten-Year Regional Transit System Plan" and its appendices, particularly "Appendix C: Benefits, system use and transportation impacts of Sound Move." This letter comments on that review. It also summarizes our earlier comments on the supporting work and the System Plan.

TRANSIT AS A COMPONENT OF THE METROPOLITAN TRANSPORTATION PLAN

The proposed Sound Move plan for the Regional Transit Authority must be evaluated within the framework of the region's total transportation system and growth management plans. The Metropolitan Transportation Plan (MTP), adopted in 1995, commits the region to a 20-year program of capital and operating investments totaling \$58.3 billion for all roads, highways, transit and ferries. Of these identified needs, the PSRC assumed only \$36.9 billion could be met through current-law revenues; shortfalls are anticipated in every program except ferries. The proposed RTA investment, \$3.9 billion in Phase 1, must be placed in the context of the other transportation investments anticipated in the MTP. The benefits analysis prepared by the RTA as a stand-alone document, highlighting the proposed transit investment and its costs and benefits, must be compared to the proposed twenty-year investments of \$11.6 billion for highways, (of which \$5.7 billion is unidentified revenues), \$14.9 billion in county roads and city streets, \$3.8 billion in ferries, and additional investments in freight and non-motorized improvements.

We note that public expenditures for transportation represent a minor share of the region's total transportation expenditures. A recent report from the PSRC, "The Costs of Transportation", documents \$21 billion in surface transportation expenditures for 1995 in the four-county central Puget Sound region. Of this, private expenditures on auto ownership and use, not including license fees and gas taxes, are over \$13 billion. Thus, the proposed local revenue package for the RTA investment represents 1% of the region's annual transportation expenditures. Currently public and private expenditures on transit represent approximately 2.6% of the region's total and transit carries approximately 3.1% of the region's trips. An analysis of relative benefits should occur in this context.

LAND USE AND ACHIEVING VISION 2020

Vision 2020 is the adopted land use plan for the four-county central Puget Sound region, consistent with the State's Growth Management Act (GMA). Without the mobility alternative offered by the transit investment Vision 2020 cannot be achieved without continuing pressure on the urban growth boundary. This places the current growth management efforts at risk. Furthermore, while the JRPC and RTA have been developing a high capacity transit plan, the counties and cities have adopted land use plans in compliance with GMA. All these plans assume implementation of the RTA and are dependent on the high capacity transit investment to realize their goals.

The most significant land use impacts of the proposed transit investment will not be felt within the ten year scope of this plan, nor even within the twenty-five year scope of Vision 2020. Most of the development that will exist in the region twenty years from

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now is already on the ground today. However, looking beyond 2020, the region can, if it wishes, use a combination of policies and investments to significantly alter the shape of development that would otherwise occur without such policies and investments. The ability of high capacity transit to carry very high numbers of people to and from the region's major urban centers during the most congested hours will allow the region to develop in ways not otherwise achievable.

The housing and employment needs of an additional million people offer opportunities to realize Vision 2020. High capacity transit connections between major centers will be critical to achieving the future land use vision and maintaining the urban growth boundary, thereby protecting agricultural and rural land from development.

MAJOR BENEFITS

The projected benefits of Sound Move are quantified in Table 8 of Appendix C to the Ten-Year Plan, with additional but unquantified benefits listed in Table 8b. While we are not proposing specific measures to quantify the benefits in Table 8b, we find many of them can be quantified and we urge the RTA to complete the additional analyses necessary to do so. We highlight five of the measures as critically important benefits that are likely to accrue from the proposed investment package.

- New people-moving capacity in the region's most congested corridors.
 - It is likely that new or improved road links will be built in various locations throughout the region but it is not reasonable to expect that any major additions to road capacity could be sited or built in the region's most congested corridors. The Texas Transportation Institute has repeatedly found this region to have among the worst congestion in the United States. While it is true that riders who leave their cars for transit may open up spaces on the roads that will be filled by other drivers, without major additional capacity in highly congested corridors, the region simply cannot continue to grow without adverse environmental and social consequences. While high capacity transit does not eliminate congestion, it provides a fast and reliable alternative to those who choose to use it.
- Integrating the four-operator, multi-county transit fare system and other measures to integrate the region's entire transit network into one, easily navigated system.
 - The RTA's Sound Move plan allocates significant resources to developing and supporting the links that will allow potential passengers to travel on transit from one end of the region to the other, able to find their way, paying a single fare, and making critical connections between the services of the various operators.
- Aid to the region's employers in achieving the Commute Trip Reduction Act goals.
 - The State's Commute Trip Reduction Act requires the region's major employers to reduce single-occupant-auto peak hour commute trips by 35% by 1999. The additional transit capacity provided by the RTA, particularly in peak commute corridors, will be helpful to employers in achieving these goals.
- Increased connections between and to/from regional economic centers.

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- The region's economic centers are physically well-connected now by the freeway network, although the average travel speed on the network during the ever-lengthening peak periods is expected to decline from today's 26 mph to 18-20 mph in 2020. The RTA's rail and express bus investments will provide a reliable alternative to our highly congested roadways which will preserve these interregional connections.
- Improving transit as a travel option for both "choice" and "dependent" riders .
 - While there are nearly as many cars as people in the region, there is still a significant percentage of households with no car at all, and a significant percentage of individuals with cars who would prefer not to be dependent on driving for all their mobility needs. The RTA investments, linked with the local transit service provided throughout the region, will offer many more transportation choices to the region's citizens.

Along with the direct benefits to system users which are only partially quantified in the form of travel time and parking cost savings, these additional benefits would significantly add to the other benefits listed on both Tables 8 and 8b.

BENEFIT ANALYSIS

In addition to highlighting the above benefits, we have the following comments on the other measures in Table 8 and the cost per rider calculations shown in Table 19.

- Auto operating costs

The auto operating cost benefit is the reduction in personal costs of operating an automobile for those attracted from cars to transit. In response to criticism of an earlier calculation, the RTA has adjusted this figure downward from 40¢ per mile to 15¢ per mile to represent the marginal costs of a single auto trip rather than the auto owner's fully allocated costs. The adjustment is inappropriate, and this benefit should be recalculated to include both operating and ownership costs. The standard methodology in use throughout the country and approved by the Federal Transit Administration uses the auto owner's fully allocated cost when calculating savings from reduced auto use. A 1996 study by AAA uses a per mile cost of 42.6¢; a study prepared by Jack Faucett Associates for the Federal Highway Administration calculated peak auto operating costs at 38.6¢ per mile and off-peak costs at 36.5¢, in 1991 dollars. Using the same assumptions for mileage and a more appropriate per mile cost of at least 40¢ would yield an annual benefit ranging from \$40 million to \$61 million.

- Construction related employment

The \$64-96 million annual benefit from construction related employment is calculated using only the additional federal dollars attracted to the region by the RTA. This is an appropriate calculation and assumes there is no additional benefit from local dollars moved to this project from other potential local uses.

- Cost per rider and TSM

Table 19 shows an operating and maintenance cost per additional passenger trip of \$2.40 and a cost per additional boarding of \$1.45. Neither of these numbers is calculated using the federal cost-per-new-rider method. The cost-per-new-

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rider calculation requires a comparison to a TSM (Transportation System Management) alternative, that is a lower cost, non-fixed facility alternative, often called the "best bus" alternative.

During the JRPC planning phase, an extensive TSM alternative was developed and the Panel commented at that time that the TSM alternative was much more extensive than any comparable alternative prepared anywhere in the country.

In developing the initial Phase I Plan submitted to the voters in 1995, the RTA did not choose to revisit or redesign the TSM alternative, but rather took as a starting point for its analysis the JRPC decision to implement a rail system. The RTA work focused on issues of technology, grade-separation and alignment choices for that rail system. Phase I of the RTA system is based on a different time horizon, 2010 versus 2020. Consequently, the ridership projections developed by the RTA were substantially different from those developed for the JRPC. Hence, the comparison with the former TSM alternative was no longer valid.

The RTA then prepared a "baseline" alternative and after considerable review, the Panel felt comfortable that this baseline was, in fact, a suitable TSM alternative. It relied on substantial new investment not now available and so is clearly different from a "do-nothing" or "no-build" alternative. Finally, in shrinking the 16-year Phase I Plan to the new Ten-Year Sound Move Plan, the RTA pivoted off the former ridership forecasts to develop estimates for the different combination of services now proposed. A completely new TSM was not developed as a basis of comparison, rather the new Plan was compared to the TSM previously studied.

The Panel believes this approach adequately meets the requirements of the State Law.

SYSTEM USE

One of the key reasons for the establishment of an expert panel oversight for high capacity transit planning was the concern raised by national studies about the overstatement of benefits, primarily ridership, and the understatement of costs, primarily construction costs, for new light rail starts. Since its inception, the Panel has spent hundreds of hours reviewing Metro's, the JRPC's and now the RTA's ridership modeling methods and procedures. This Panel was instrumental in asking for a forecasting methodology that resulted in very conservative ridership forecasts. Furthermore, federally mandated forecasting methods require that the land use patterns assumed for both rail and non-rail alternatives must be the same, so while rail offers the opportunity to shape land use, this effect is not reflected in the forecasts. Consequently, we later became concerned that these conservative methods might lead to two unintended results:

- First, that the proposed rail element might be under-built and that the service would be full almost from opening day, without adequate capacity to meet future growth in demand; and
- Second, that the stated ridership projections were so conservative the RTA would understate the potential benefit of the proposed investments and so fail to present decision makers and the public with appropriate information on which to base their decisions.

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We are comfortable at this time that the proposed electric rail line from the University District to SeaTac has been adequately sized and will be able to serve the likely ridership demand in that corridor over the next decades and that it will continue to function adequately if extended north and/or south in the future. We remain concerned that the forecasts may understate the long-term ridership benefits of the proposed system. Overall, however, the Panel finds the ridership forecasts prudent and reasonable.

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CAPITAL COSTS

The primary reviewer of the capital costs was a Panel member with experience in major capital projects here and around the country, including the BART system in the San Francisco Bay Area and the Downtown Seattle Transit Tunnel. In looking at the RTA's estimates he evaluated labor hours and rates item-by-item and engaged in considerable back and forth discussion with the project team. Other Panel members with experience in transit capital projects have also reviewed the estimates based on their experiences around the country.

The commuter rail capital costs may overstate the actual costs that would be incurred. The capital costs include all the track and signal improvements necessary to operate commuter rail in the Everett-Lakewood corridor without any consideration of the overlapping improvements which may be constructed to serve the Eugene-to-Vancouver B.C. intercity rail corridor, or other improvements to serve the freight railroads or the region's ports. In the earlier analysis it was assumed that at least some of the capital costs now assumed by the RTA would be covered by WSDOT. While accounting for all the track and signal improvements in the commuter rail analysis is a conservative and prudent approach, it may double count some expenditures and the RTA's actual costs may be significantly lower.

Overall, the Panel has concluded that the capital cost estimates for each of the alternatives are reasonable and that the project could realistically be built within the projected budget. The contingencies represent reasonable allowances to cover both potential unknowns and design refinements.

TUNNELING

The RTA's proposed north light rail line includes an extensive tunnel between downtown Seattle and the University District. The feasibility of, the need for and the costs of the tunnel have been extensively reviewed by the Panel.

- Feasibility: Additional geotechnical and engineering analysis is needed to verify the preliminary conclusions that the tunnel can be built. However, several large-scale tunnels have been completed in Seattle including Metro sewer tunnels, the downtown bus tunnel, and a decades-old tunnel running under the Ship Canal along a similar alignment to the one proposed in this plan.
- Need: The proposed tunnel is necessary if the highest-ridership transit destinations in the state, downtown Seattle, First and Capitol Hills, and the University District are to be connected by light rail. The topography of the area precludes other alternatives. More riders currently use transit to Seattle Central Community College than to all of downtown Bellevue. The University of Washington's U-Pass program currently accounts for 10% of Metro's total ridership. First and Capitol Hill have over 45,000 jobs. Failure to serve these areas with their very high residential and employment densities and their proven transit markets would significantly reduce the ability of the RTA to meet the region's high capacity transit needs.
- Costs: The downtown-University District tunnel is estimated to cost \$865 million, including trains. Other alignments between downtown and the N.E. 45th and I-5 have been estimated at approximately \$700 million. The construction of a people mover between I-5 and the University of Washington campus has been estimated at approximately \$250 million. The tunnel as it is now proposed is not only the most cost-effective element in the Plan, it is among the most cost-effective unbuilt transit

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links in the country and will likely compete very favorably for federal funding. The Panel concluded that the construction cost estimate for the tunnel was conservative and adequate to cover much higher costs than we would expect to be incurred based on the experience of other tunnel projects in Seattle.

SUBAREAS AND EQUITY

State law requires the RTA System Plan to include an equity element that identifies revenues and phasing by corridor and county and the degree to which revenues generated in a county will benefit the residents of that county (RCW 81.21.030). The RTA's Ten-Year System Plan takes a new approach to the issue of subarea equity, starting with a division of the region into five subareas: Pierce County, Snohomish County, and North, South and East King County. For each subarea, the plan identifies revenues and investments. It goes further, in the financial policies, with guarantees that over the life of the plan no subarea will subsidize investments or operations in another subarea. The creation of subarea "firewalls" represents an unusual degree of financial protection for groups of taxpayers, well beyond those usually associated with government operations.

While this subarea structure increases the complexity of plan design and implementation, it is satisfactory to meet the requirements of state law.

COMMUTER RAIL

Washington State Law also includes unique requirements for the operation of commuter rail. The law establishes tests of costs per passenger mile for commuter rail compared to comparable bus, entrained bus, trolley or personal rapid transit systems (RCW 81.104.120). As noted in our February 1995 letter the Panel found that some of these modes are not reasonable alternatives for the commuter rail alignments proposed in the system plan and, appropriately, not all were tested.

An August 12, 1996 RTA staff report shows considerable overlap in the cost per passenger mile numbers for commuter rail and express bus alternatives. With this range of overlap, it appears the cost effectiveness of the alternatives are comparable. Determination of the relative position of the bus and rail alternatives vis-a-vis the cost-per-passenger-mile test defined in the state law is highly dependent on decisions regarding which services meet the law's definition of comparable. In actual practice, bus or rail service would each be designed to build on their different strengths, not forced into configurations comparable to each other. A final decision between the two should more appropriately compare different service patterns and configurations, with each mode designed to operate in a configuration appropriate to that mode. Other factors such as land use development opportunities and access to intermodal connectors also need to be factored into the analysis.

We recommend that a final choice between alternatives should be made as part of the project planning process, and that the north and south corridors be evaluated separately. The legislature might consider reviewing the statutory requirements for commuter rail and substituting the federally mandated Major Investment Study process, consistent with the requirements for all other plan elements.

We find the analysis to date meets the requirements of the state law.

FEDERAL FUNDING

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The RTA's Plan assumes federal funds will contribute approximately 18% of the Plan's revenues. This is a conservative assumption and is much lower than other cities have received or are projecting to receive in the future. Both Portland and Sacramento are currently planning extensions of their light rail systems and using federal funding assumptions of 50%.

The current earmark of \$300 million which Seattle Metro was awarded in the 1991 Intermodal Surface Transportation Efficiency Act for the "Phase 1 (Transit) System" will expire without a federal funding commitment due to lack of local commitment to a project. Early next year Congress will be earmarking federal funds for major transportation projects across the U.S. for the next five-year authorization. This will be the last opportunity that the Puget Sound region will have to secure federal participation in major transit and highway improvements until 2002. If local funding is approved before the end of the year, the region's proposed project could be expected to compete favorably for funds, based on the high cost-effectiveness numbers of the core rail line.

OTHER ISSUES REQUIRED UNDER THE LAW

Washington State law requires that the system plan submitted to the voters address a number of issues (RCW 81.104.140). Below is a list of issues from the RCW (in italics), followed by our findings regarding how the Plan meets the requirements:

- (i) *Identification of level and types of high capacity transportation services to be provided;*

Identified on pages 10-25, Ten-Year Regional Transit System Plan.

- (ii) *A plan of high occupancy vehicle lanes to be constructed;*

No HOV lanes will be constructed by the RTA. The RTA will fund access ramps to the HOV lanes that will be built by WSDOT; they are identified on pages 20-23 of the Ten-Year Regional Transit System Plan. The access ramps will only be built to completed HOV lanes.

- (iii) *Identification of route alignments and station locations with sufficient specificity to permit calculation of costs, ridership, and system impacts;*

The route alignments and station locations for both electric rail and commuter rail are identical to portions of the alignments studied during the JRPC planning process. During that process the analysis of costs, ridership and system impacts was thorough and met the requirements of state and federal law. Detailed descriptions are presented in Appendix A to the Ten-Year Regional Transit System Plan.

- (iv) *Performance characteristics of technologies in the system plan;*

Detailed on pages D-4 & D-5 of Appendix D to the Ten-Year Regional Transit System Plan.

- (v) *Patronage forecasts;*

Detailed in Appendix C of the Ten-Year Regional Transit System Plan. The patronage forecasts prepared for the System Plan and contained in the Final Environmental Impact Statement also meet this requirement.

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- (vi) *A financing plan describing: Phasing of investments; capital and operating costs and expected revenues; cost-effectiveness represented by a total cost per system rider and new rider estimate; estimated ridership and the cost of service for each individual high capacity line; and identification of the operating revenue to operating expense ratio. The financing plan shall specifically differentiate the proposed use of funds between high capacity transportation facilities and services, and high occupancy vehicle facilities;*

Detailed in Appendices A, B, C and D of the Ten-Year Regional Transit System Plan.

- (vii) *Description of the relationship between the high capacity transportation system plan and adopted land use plans;*

Detailed in Appendix D of the Ten-Year Regional Transit System Plan.

- (viii) *An assessment of social, economic, and environmental impacts; and*

The Environmental Impact Statement prepared in 1993 for the System Plan fulfills this requirement. Project level environmental analyses and checklists will be prepared for appropriate system elements during project planning.

- (ix) *Mobility characteristics of the system presented, including but not limited to: Qualitative description of system/service philosophy and impacts; qualitative system reliability; travel time and number of transfers between selected residential, employment, and activity centers; and system and activity center mode splits. (RCW 84.104.100.2(d))*

Detailed in Appendix C of the Ten-Year Regional Transit System Plan.

In meeting the requirements of the State law the planning process has also followed the Federal Transit Administration's guidelines and successfully met its requirements.

CONGESTION

Although not specifically required to do so under state law, the Panel wishes to comment on the issue of high capacity transit investments and roadway congestion. The Puget Sound Regional Council projects that the region's 1996 population of 3.0 million will grow to 4.1 million people by 2020. (In the time our Panel has been working the region's population has grown by 400,000 people.) With this growth, regardless of new capital investments in transportation, highways or transit, congestion will worsen. If the region is serious about reducing the increase in congestion, it will need to implement a comprehensive program of mobility improvements and single-occupant-auto disincentives. The RTA investment, if implemented as planned, will provide new, reliable, peak carrying capacity in the region's most congested corridors.

LOWER COST ALTERNATIVES

Over the course of our work, the Panel reviewed a number of lower cost alternatives, including those evaluated by the project, and others submitted by citizen groups. We did not find any of these to be credible stand-alone alternatives to a high capacity transit investment. Much of the region's transit needs can continue to be met by buses and the proposed HOV improvements in this plan will enhance bus speed and reliability

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in suburban corridors. In the most-traveled and most congested central corridor in the region, however, only rail provides the capacity, speed and reliability to meet growing demand.

Often missing from this debate is the effectiveness of transportation system management (TSM) and transportation demand management (TDM) programs that have been in place for years. Without these programs the capacity of the region's transportation network would not be nearly what it is today. From traditional traffic improvement measures such as one-way streets, reversible lanes, left turn lanes, loop detectors and signal interconnects, to newer efforts such as HOV facilities, ramp metering, priority carpool parking, and employer subsidies for transit passes, TSM and TDM measures have significantly increased the region's transportation capacity.

Whether there are other alternatives the region ought to consider depends largely on the definition of the problem. If the problem is defined as congestion, transportation pricing could, potentially, solve the problem. The broad implications of pricing have not yet been fully evaluated but a sense of the political acceptability was gained through the State's Public Private Initiative program proposals; negative public reaction to the pricing elements of those proposals eliminated almost all of them from further consideration. If the region's decision makers felt that pricing options were viable there is little doubt that this could become an effective approach to reducing the region's congestion although major work would have to be done to determine what the economic and social costs would be.

It has also been proposed to solve congestion by "filling the empty seats" in the cars now on the region's roads through real time ridematching using high technology. The average auto occupancy for all trips in the region is 1.44, and for peak hour trips it is approximately 1.1. Assuming only 4 seats per vehicle, overall person miles traveled could grow 270% if every seat was filled on every trip, an increase far above the need projected in any current studies of demand to the year 2020. Nationally and regionally, however, ridesharing is declining as a percentage of work trips despite many programs to support it.

Quite simply, we have already done and continue to do the "easy" things and are benefiting from the additional capacity they give us.

FUTURE ANALYSIS AND DECISIONS

We would like to emphasize that we find the analysis completed to date, first by Metro, then by the Joint Regional Policy Committee, and finally by the RTA, represents possibly the most extensive analysis ever taken of an expanded public transit investment prior to presenting the issue to the public for their approval. It does not represent, however, the final level of planning, engineering and construction that must be completed before capital projects are undertaken and new service is implemented. Nor should it.

If approved by the voters in November, the System Plan will be implemented through a process of project planning and preliminary engineering, including project level environmental analysis, determination of modes, final alignments for both rail and bus service, siting of stations, access ramps and other capital improvements, and the preparation of detailed operating plans and programs.

We find the Ten-Year System Plan is appropriately flexible to allow final project-level decisions to be made after the completion of more detailed analysis, design work, and involvement of local communities throughout the region.

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SUMMARY

The Puget Sound region has developed a proposal for a high capacity system that is based on reasonable assumptions, adequate analysis and well-accepted planning methods. The plan is a reasonable approach to the transportation needs and growth management goals of the region.

- The ridership forecasts are conservative and reasonable and do not overstate the ridership potential of the system.
- The capital cost estimates are also reasonable and prudent and provide adequate contingencies to cover design refinements and unforeseen circumstances.
- The financing plan demonstrates adequate revenues to build and operate the proposed system. The revenue forecasts and assumptions regarding government funding are reasonable and prudent.

Finally, we would like to note that every other west coast city that has built a rail system in recent decades is building and/or planning expansions to their system. This is true in San Diego, Los Angeles, Long Beach, Sacramento, the San Francisco Bay Area, Portland and Vancouver. The ultimate test of high capacity transit, public acceptance and willingness to provide continued support for rail, has been met in every city.

This volunteer panel was first appointed in November, 1989, and we expect that with this final review our work is done. We hope that our commitment of time and attention to this project has proved useful to the region and the state. We also hope that our work helps to create an assurance that the high capacity transit planning this region has been engaged in for so long has been conducted in a way that gives decision makers at all levels confidence that they can rely upon the results of the technical work to make well-informed decisions about future transportation investments in this region, and that the debate on these investments can take place over matters of policy and direction, not on the technical detail of the underlying analysis.

Sincerely,

Scott Rutherford, Acting Chair
Expert Review Panel

Attachments: Panel membership
Reports reviewed

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PUGET SOUND REGION HIGH CAPACITY TRANSIT EXPERT REVIEW PANEL

o Panel Membership

The Puget Sound Region's Expert Review Panel provided technical review of the Joint Regional Policy Committee's High Capacity Transit Plan and the Regional Transit Authority's Phase 1 Project planning, consistent with its role as defined by RCW 81.104.111. Its members and the disciplines they represent are:

Name	Association	Discipline
Maud Smith Daudon	Port of Seattle	Finance
David Hodge	University of Washington	Geography
George List	Rensselaer Polytechnic Institute	Rail Operations
Michael Meyer	Georgia Institute of Technology	Modeling/Planning
Gerrit Moore	Washington Environmental Council	Environment
Scott Rutherford	University of Washington	Engineering/Planning
Doug Wentworth	Sacramento RTD	Rail/HOV Planning/Finance

o Panel Member Biographies

Maud Smith Daudon is director of finance for the Port of Seattle. Prior to joining the Port she was vice president with Shearson Lehman Hutton, Inc. providing investment banking and financial services to state and local governments. She was responsible for Shearson's coverage of all port, airport, highway, toll road and mass transit authorities in the western United States. She also worked as a consultant in the management services division of Arthur Young and Co. and as downtown project manager for the City of Corvallis.

David Hodge is professor of Geography at the University of Washington. He teaches urban geography and quantitative methods and is also associated with the Urban Transportation Program in Civil Engineering and with the Center for Demography and Human Ecology. His current research emphasizes the restructuring of American metropolitan areas, particularly how demographic and employment changes are altering the nature of residential and work location choice and the implications for urban transportation and women in the labor force. He just completed a one year appointment with the National Science Foundation directing their Geography and Regional Science Program.

George List is a professor of civil and environmental engineering at Rensselaer Polytechnic Institute in Troy, New York. He holds a Ph.D. from the University of Pennsylvania. His main area of interest lies in the analysis of flows through networks, train flows through train networks being one example. He focuses on the capacity and operation planning of such networks and their real-time control. He has worked on commuter rail and light rail projects for GO Transit in Ontario, the Long Island Railroad, SEPTA, New Jersey Transit and many other systems. He is currently

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researching control strategies that facilitate the movement of transit vehicles through congested street networks.

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Michael Meyer is the Dean of the School of Civil and Environmental Engineering at the Georgia Institute of Technology. He has served as chair of the Transportation Research Board's Committee on Multi-Modal Planning. From 1983-88 he was director of the Bureau of Transportation Planning and Development of the Commonwealth of Massachusetts. In this capacity he was responsible for transportation planning, traffic engineering, project development and research for the state highway agency. From 1978-83, Dr. Meyer was a professor in the Civil Engineering Department at M.I.T. Dr. Meyer holds a Ph.D. in Civil Engineering from M.I.T. and is a registered engineer.

Gerrit Moore serves on the Board of Directors of the Washington Environmental Council. He has been active in land use/growth management issues during the past decade including the adoption of the King County Comprehensive Plan. He has also worked on water quality issues including tankers on Puget Sound. He has served as an appointed member of the Metro Council and recently retired from Boeing where he was an engineer involved in systems modeling.

Scott Rutherford is an associate professor of Civil Engineering at the University of Washington. He teaches classes in transportation planning, transportation engineering and transit planning. Until recently he served as director of the Washington State Transportation Center (TRAC). Prior to joining the UW faculty he worked eight years with several transportation consulting firms, specializing in travel demand forecasting and alternatives analysis. In this capacity he was involved in the development of forecasts for major high capacity transit investments in the United States.

Doug Wentworth was appointed director of finance for Sacramento Regional Transit District in January 1991. Prior to that he was the director of planning analysis and research for Houston METRO. That agency has recently completed an alternatives analysis for a rail/bus system and Doug represented the agency before a panel similar to this expert review panel. He also worked in cost forecasting and route performance evaluation. Prior to joining Houston METRO, Doug worked as director of management information and analysis for Tri-Met during the period that MAX was being developed. He has also worked as a consultant for four years.

The Expert Panel also included **Edward L. McLean**, who passed away in 1995. Ed retired from Morrison-Knudsen after twenty-five years as a civil engineer and construction manager on major projects. His experience included estimating, planning, engineering, and construction management. Ed was involved in rail installation on the BART system and prepared portions of the cost estimates on the Downtown Seattle Transit Project. After retirement from Morrison-Knudsen, Ed worked as an independent consultant.

Other former members include:

Aubrey Davis, who chaired the panel from 1989 to 1995. During his tenure on the panel Aubrey was president emeritus of Group Health Cooperative of Puget Sound, and served as chair of the State of Washington Transportation Commission.

John Basic, who was engineering manager, Electronics Business Development, Aerospace & Electronics Division for the Boeing Company's Defense and Space Group. John has been involved in a wide range of transportation technology projects from the design of the Morgantown PRT Vehicle System to projects in Europe and Japan.

Tom Matoff, who was formerly the general manager of the Sacramento Regional Transit District. Tom left the panel when he was appointed to be executive director of the Regional Transit Authority, a position he held for two years.

Puget Sound Region High Capacity Transit Expert Review Panel

Appendix B: Range of Options Listed in 2005 SEIS

8.3.1 System Plans

King County

- Buses
- Buses
- Core Funded Freeway HOV
- Downtown Seattle Transit Tunnel
- Maintenance Bases (Redmond, Kent/Des Moines, King County).
- Right of Way Preservation
- Systemwide Elements (TSM; Computer System Enhancements; Transit Flow and Safety; Passenger Shelters; Miscellaneous Projects; ADA Shuttles; Vehicles, commuter Rail cabs, coaches, and locomotives).

Pierce County

- Systemwide Elements (TSM; Passenger Shelters; Transit Flow and Safety; Computer System Enhancements; ADA Shuttle Vehicles; Bus Fleet; Vehicles; Commuter Rail Cabs, Coaches and Locomotives; Sounder Service 2-way, All day; Vehicles, Diesel Multiple Unit Trains).
- Maintenance Bases

Snohomish County

- Systemwide Elements (TSM; Miscellaneous Projects; Passenger Shelters, Transit Flow and Safety; computer Systems/Enhancements; ADA Shuttle Vehicles; Vehicles, Commuter Rail cabs, coaches and locomotives).
- Maintenance Bases
- Buses

North Corridor

ST Express Bus

- Access Improvements
- Arterial HOV
- Core Freeway HOV
- HOV Access
- Operating Facility
- Park-and-Ride
- Passenger Facility
- Priority Treatment
- Route Deletion or Service Expansion
- Service
- Transitway-HOV
- Vision 2020 Freeway HOV

Link Light Rail

- Rail, Guideway
- Rail, Stations and Platforms

Sounder Commuter Rail

- Rail, Stations and Platforms
- Rail, Enhancement
- Rail, Expansion
- New Line of Business
- Streetcar, Guideway
- Streetcar, Stations and Platforms

East Corridor

ST Express Bus

- Access Improvements
- Bus Route Improvements
- Arterial HOV
- Core Freeway HOV
- HOV Access
- Operating Facility
- Park-and-Ride
- Passenger Facility
- Route Deletion or Service Expansion
- Service
- Transit Center
- Transitway HOV

Link Light Rail

- Rail, Guideway
- Rail, Stations and Platforms

Sounder Commuter Rail

- Rail, Stations and Platforms
- Rail, Enhancement

South Corridor

ST Express Bus

- Access Improvements
- Arterial HOV
- Park-and-Ride
- Passenger Facility
- Service Improvements
- Vision 2020 Freeway

Link Light Rail

- Rail, Guideway
- Rail, Stations and Platforms

Sounder Commuter Rail

- Rail, Stations and Platforms
- Rail, Guideway

Appendix C: ST2 Candidate Project List, 12/8/2005

North Corridor

- N1 Link LRT: Everett Station to Everett Community College
- N2 Link LRT: Planning Study from Ash Way to Everett Station (Snohomish County)
Link LRT: Preliminary Engineering from King/Snohomish County Line to Ash Way (Snohomish County)
- N3
- N4 Link LRT: Lynnwood Park&Ride to Alderwood Mall along I-5 (Lynnwood)
Link LRT: Preliminary Engineering from Northgate to King/Snohomish County Line (N. King County)
- N5
- N6 Link LRT: Extension from University of Washington Station to Northgate (Seattle)
Enhanced Transit: Connection between Downtown Seattle and Capitol Hill Station via First Hill (Seattle)
- N7
- N8 Express Bus: HOV Access Ramps at Mariner Park-&-Ride (Snohomish County)
- N9 Express Bus: HOV Access Ramps and Flyer Stops on I-5 at NE 185th Street (Shoreline)
- N10 Express Bus: BAT Lanes on SR 522 (Lake Forest Park)
- N11 Express Bus: BAT Lanes on SR 99 and Evergreen Way (Snohomish County)
- N12 Express Bus: BAT Lanes on SR 99 (N. King County)
- N13 Express Bus: Transit Signal Priority on SR 99 and Evergreen Way (Snohomish County)
- N14 Express Bus: New Route between Everett and Bellevue via SR 527
Express Bus: Parking Garage, Transit Center and Bus Layover Facility at Mariner Park-&-Ride (Snohomish County)
- N15
- N16 Express Bus: Parking Garage at Ash Way Park-&-Ride (Snohomish County)
- N17 Express Bus: Parking Garage at Lynnwood Transit Center
- N18 Express Bus: Parking Garage at Lake Forest Park Town Center (Lake Forest Park)
- N19 Express Bus: Parking Garage at Canyon Park Park-&-Ride (Bothell)
- N20 Express Bus: Surface Park-&-Ride along SR 527 (Mill Creek)
- N21 Sounder: Parking Garage and Bus Layover Facility at Everett Station
- N22 Sounder: Joint Development of a Parking Garage at Mukilteo Station
- N23 Sounder: New Permanent Station at Edmonds Crossing (Edmonds)
- N24 Sounder: New Station near Point Wells (Shoreline)
- N25 Sounder: New Station in Ballard (Seattle)
- N26 Sounder: New Station at Broad Street (Seattle)
- N27 Express Bus: New Route to Provide Feeder Service to New Sounder Station at Broad Street

East Corridor

- E1 HCT-LRT: Seattle to Downtown Bellevue
- E2 HCT-LRT: Downtown Bellevue to Overlake Transit Center
- E3 HCT-LRT: Overlake Transit Center to Redmond
- E4 HCT-LRT: Maintenance Facility and Vehicles
- E5 HCT-RCBRT: Seattle to Downtown Bellevue
- E6 HCT-RCBRT: Downtown Bellevue to Overlake Transit Center
- E7 HCT-RCBRT: Overlake Transit Center to Redmond
- E8 HCT-RCBRT: Maintenance Facility and Vehicles
- E9 HCT: Planning Study on SR 520 (E. King County)
- E10 Enhanced Transit: ST Funding of Metro Route 269 (E. King County)
- E11 Enhanced Transit: ST Funding of Metro Route 240 (E. King County)
- E12 Express Bus: Direct Access Ramps and Parking Garage at Brickyard Park-&-Ride (E. King County)
- E13 Express Bus: Direct Access Ramps on SR 520 at 108th Ave. NE (E. King County)
- E14 Express Bus: Direct Access Ramps on I-90 at SR 900 (Issaquah)
- E15 Express Bus: Direct Access Ramps on I-405 at N 8th Street (Renton)
- E16 Express Bus: Flyer Stop and Pedestrian Bridge on I-405 (Bothell)
- E17 Express Bus: Flyer Stop on I-405 at NE 85th Street (Kirkland)
- E18 Express Bus: BAT Lanes on SR 522 between I-405 and SR 527 (Bothell)
- E19 Express Bus: BAT Lanes on SR 522 (E. King County)
- E20 Express Bus: Transit Center and Parking Garage (Bothell)
- E21 Express Bus: Parking Garage and Transit Loading at Bothell Park-&-Ride (Bothell)
- E22 Express Bus: Parking Garage and Pedestrian Bridge over SR 522 at Kenmore Park-&-Ride (Kenmore)
- E23 Express Bus: Expansion of Kingsgate Park-&-Ride (Kirkland)
- E24 Express Bus: Parking Garage at South Kirkland Park-&-Ride (Kirkland)
- E25 Express Bus: Parking Garage and Extension of N. 8th Street (Renton)
- E26 Express Bus: Pedestrian Bridge at Overlake Transit Center (Redmond)
- E27 Express Bus: New Route between Bothell and Renton on I-405 (E. King County)

South Corridor

- S1 Link LRT: Extension from South 200th Street to Kent-Des Moines Road (S. King County)
- S2 Link-LRT: Kent-Des Moines Road to Tacoma Dome Station
- S3 Link LRT: Planning Study of Potential Future Corridors (S. King County)
- S4 Link LRT: New Station on Tacoma Link on Commerce Street (Tacoma)
- S5 Link LRT: Conversion of Tacoma Link to Central Link Technology
- S6 Link LRT: Extension of Tacoma Link to Tacoma Community College with Central Link Technology
- S7 Link LRT: Extension of Tacoma Link to Tacoma Community College with Tacoma Link Technology
- S8 Express Bus: Bus-Only Access Ramps on I-5 at South Industrial Way and Airport Way/5th Avenue South (Seattle)
- S9 Express Bus: HOV Access Ramps on SR 167 at Smith Street (Kent)
- S10 Express Bus: BAT Lanes and Transit Signal Priority on SR 161, New Meridian/South Hill Park-&-Ride and New Bus Route Serving the Sounder South Corridor
- S11 Express Bus: New Bus Route Serving all Sounder Stations between Tacoma Dome and King Street during Off-Peak Periods
- S12 Express Bus: Transit Signal Priority on SR 516 (Kent)
- S13 Express Bus: Transit Signal Priority, Left Turn Lane and Route 560 Modification to Improve Access to Sounder Tukwila Station
- S14 Express Bus: Extension of Route 565 to Tacoma Dome Station during Peak Periods with Limited Stops
- S15 Express Bus: Parking Garage at Burien Transit Center
- S16 Express Bus: Surface Parking Expansion at Tacoma Dome Station
- S17 Sounder: Permanent Station at Tukwila
- S18 Sounder: Parking Garage at Auburn Station
- S19 Sounder: New Station in North Sumner
- S20 Sounder: Parking Garage and Pedestrian Bridge at Sumner Station
- S21 Sounder: Parking Garage and Pedestrian Bridge at Puyallup Station
- S22 Sounder: Parking Garage and Pedestrian Bridge at South Tacoma Station
- S23 Sounder: Parking Garage at Lakewood Station
- S24 Sounder : Expanded Service Levels during Peak, Off-Peak and Weekend Periods, and Related Track & Signal Improvements between Lakewood and Seattle
- S25 Sounder: Track and Structure Upgrades between Tacoma Dome Station to Reservation Junction
- S26 Sounder: Extension of Service to DuPont, Upgrade of Track & Signals between Lakewood and Dupont and a New Station at Dupont
- S27 Link LRT: Extension from SeaTac Airport to South 200th Street

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