



**SOUND TRANSIT**

**HCT Planning**

**Sound Transit Long-Range Plan Update  
Issue Paper N.3: Seattle Streetcar Options**

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Sound Transit

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**FINAL**

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## Foreword

This issue paper is part of a series of reports designed to inform the Sound Transit Board in its decision-making on the Regional Transit Long-Range Plan update for the Sound Transit service area. Each issue paper provides information about a specific element or area of the Long-Range Plan and potential options. These reports focus on issues such as costs, ridership, engineering feasibility and operations.

The environmental impacts of the updated Long-Range Plan and Options, as well as potential mitigation measures, are examined in the Draft Supplemental EIS for the Regional Transit Long-Range Plan (December 2004). The Draft SEIS supplements the 1993 EIS prepared on the Regional Transit System Plan, and it generally updates that information and analysis through the year 2030. Public and agency comments on the 2004 Draft Supplemental EIS have been received and will be responded to in a final SEIS to be issued in June 2005.

The Sound Transit Board anticipates identifying a draft updated Long-Range Plan in the spring of 2005. There will be an opportunity for public review and comment on the draft Plan. The Board will adopt a final updated Long-Range Plan after public comments are received on the draft plan and the final SEIS is issued.

References in these reports to Sound Transit's existing Long-Range Plan are to the 1996 Regional Transit Long-Range Vision, which functions as the agency's Long-Range Plan. Discussion of the updated Long-Range Plan refers to the Plan being developed by Sound Transit over the coming months.

The following issue papers are being prepared:

### East Corridor

*E.1 – I-90 Corridor / East King County High Capacity Transit Analysis*

### North Corridor

*N.1 – BRT in SR 99 Corridor*

*N.2 – I-5 Corridor Northgate to Everett HCT Assessment*

*N.3 – Seattle Streetcar Options*

*N.4 – SR 522 Corridor HCT Assessment*

*N.5 – Convertibility of BRT to Light Rail*

### South Corridor

*S.1 – Tacoma Link Integration with Central Link*

*S.2 – Potential Rail Extensions to Frederickson and Orting*

*S.3 – HCT System Development Issues in the South Corridor*

*S.4 – Potential Tacoma Link Extension – West*

*S.5 – Rail between Burien and Renton*

*S.6 – Potential Tacoma Link Extension – East*

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# 1. Introduction and Summary

## 1.1 Purpose of this Paper

During scoping for the supplemental environmental impact statement (SEIS) to its Long-Range Plan update, Sound Transit was asked to evaluate several potential streetcar lines in Seattle. This issue paper responds to that request, using analysis already performed by the City of Seattle.

In February of 2004, the Seattle Department of Transportation (SDOT) began a study designed to respond to the City Council's request for information that would "support decision-making about a proposed new route in South Lake Union, and about proposed extensions of the Waterfront Streetcar." The report prepared for SDOT entitled "*Seattle Streetcar Network and Feasibility Analysis*," dated June 30, 2004, provided information about the South Lake Union streetcar route and potential Waterfront Streetcar extensions, and a look at what additional streetcar routes could be included in a future streetcar network. Of the various streetcar lines considered in the City of Seattle study, three were reviewed for this paper:

- South Lake Union to University District
- Waterfront Streetcar extension north to Interbay
- Waterfront Streetcar extension east to Central Area

This paper summarizes the detailed information presented in the SDOT report and addresses what role Sound Transit could play in helping develop a Seattle Streetcar network. It is intended to help Sound Transit consider whether and how such investments might support Sound Transit's implementation of a regional high capacity transit system. No additional cost estimates or ridership forecasts were prepared beyond those presented in the SDOT report. Full cost and ridership information for two potential streetcar segments of interest to Sound Transit – extending the Waterfront Streetcar further east than 12<sup>th</sup> Avenue S and extending a potential South Lake Union streetcar further north to the University District – is not provided in this paper because it was not included in the SDOT study.

## 1.2 Key Findings

- Streetcars are not high capacity transit. They operate in mixed traffic with no right-of-way priority, and are intended to serve local circulation needs, not regional service. However, streetcars might be an appropriate part of the Sound Transit system under its enabling legislation as "supporting services and facilities to implement such a (HCT) system."
- Only two of the three lines reviewed would directly connect to the regional HCT system: Westlake to South Lake Union and extending the Waterfront Streetcar to Central Area.
- The South Lake Union line has the greatest ridership potential with an estimated 4,100 daily riders once the neighborhood is "built out." The estimated capital

cost is approximately \$45 million and the estimated annual operating cost is approximately \$2.1 million. This line will also require construction of a new maintenance facility.

- Extending the Waterfront Streetcar to 12<sup>th</sup>/Jackson from the International District could carry approximately 900 daily riders, with an estimated capital cost of approximately \$26 million and an estimated annual operating cost of approximately \$0.7 million.
- Extending further to 23<sup>rd</sup>/Jackson is estimated to cost an additional \$26 million in capital costs and an additional \$0.7 million in annual operating costs. Ridership for this extension has not been estimated.
- Double-tracking the existing Waterfront Streetcar could produce approximately 3,600 daily riders (an increase from approximately 1,400 today) after reconstruction of the Alaskan Way Viaduct.
- Extending that line north to Interbay could produce an additional 200-300 daily riders along the full line at a capital cost of approximately \$17 million and \$0.7 million in annual operating costs. The Port of Seattle has recently announced a proposal to make this extension.
- Timing and costs of either double-tracking or extending north from Broad Street are would be influenced by reconstruction of the Alaskan Way Viaduct.
- Whether or not Sound Transit becomes involved in streetcar implementation is a policy decision that must weight ST's mission to provide regional HCT service against the policy of providing "supporting facilities and services."

## **2. Background**

More than a dozen North American cities have streetcar systems that have either been expanded or begun operation in the past 15 years. In addition, at least twice as many other cities have new systems or new lines under active planning. The primary advantages of streetcars are the ability to add a visible rail system at a minimum capital investment and the ability to create a circulator that connects into a high capacity transit network without requiring additional extension or expansion of the more expensive high capacity mode. Streetcars are also popular because they are a good fit for densely developed, pedestrian-oriented, urban neighborhoods. The success of new systems such as that in Portland, Oregon further encourage the implementation of streetcars in this city.

As part of the SDOT study, other cities with streetcar systems in place were reviewed. From this research it was possible to derive common characteristics of streetcar lines and the conditions that contribute to successful streetcar implementation.

### 3. Streetcar Characteristics

Unlike light rail transit (LRT) or bus rapid transit (BRT), streetcars are not generally considered to be high capacity transit (HCT) due to their lower operating speeds and ridership capacity. Streetcar service typically operates in mixed traffic without priority over other traffic in high-density areas serving local neighborhood circulation needs. Service is frequent, generally between 10 and 15 minutes between cars. Stop spacing is relatively short, as opposed to high capacity transit where, to achieve maximum speeds, spacing is much greater. Streetcar service is designed for making neighborhood connections and connections to higher capacity services, rather than providing the high speed or high capacity service themselves. Average operating speed is consistent with other vehicles in the street as streetcars typically travel in the roadway with other vehicles, rather than on dedicated rights-of-way.

Other key streetcar characteristics include:

- Streetcars provide a visible and easy-to-understand routing, which attracts new users. In cities where bus lines have been converted to streetcars, ridership has increased by 15% (Toronto) and higher. In Memphis, 83% of streetcar riders do not otherwise use public transit, suggesting that streetcars could attract riders that similar bus services cannot.
- Streetcars attract both a visitor market and a local user market to transit. The Toronto Transit Commission estimates that 60% of streetcar riders are “choice” riders, that is, those who have a car, but choose to take the streetcar instead.
- In comparison to other fixed rail transit (e.g., light rail, monorail) streetcars cost less to construct.
- Streetcars often attract private funding. Private property owners have contributed to capital costs through various means, including the formation of a Local Improvement District (e.g., Seattle Waterfront Streetcar, Portland Streetcar), thus reducing the public’s share of the capital cost.
- Streetcars have contributed significantly to the economic development of their neighborhoods. Portland has seen more than \$1.3 billion in private investment since planning began for its initial line.

Based on these characteristics, research suggests that the following conditions contribute to maximizing the success of a streetcar line:

- A service area that includes a mix of uses or a variety of markets. While commuters are an important part of the market, tourists, visitors, residents and workers making trips to local destinations fill out the ridership during the non-commute times.
- Desire to accelerate and organize planned development.
- Property owners willing to contribute to the success of the streetcar.
- Demand is present for relatively short trips where vehicle speed is not a critical factor.

- Demand is present for connections to the high capacity network. Streetcars work well as a neighborhood collector to feed the larger network.
- Streetcar streets are not severely congested and limited competition for street space exists.
- Demand for high frequency service, but without the capacity demands that would support light rail transit.

## **4. Potential Streetcar Routes in Seattle**

The SDOT study evaluated the potential streetcar routes in the context of the major transportation projects currently being planned or constructed in the central area of Seattle from the SODO (South of Downtown) area, through Pioneer Square, the International District, Downtown, the Denny Triangle area, South Lake Union, the Eastlake community and the University District. Figure 1 illustrates the major transportation projects currently being planned or constructed.

In evaluating potential streetcar routes, the study began with the routes identified by the City Council as being of interest, then slightly broadened the scope to look at some additional routes that could contribute to a streetcar network. The study then conducted a more detailed analysis in order to provide information that would support decision making about the South Lake Union route or potential extensions of the Waterfront Streetcar. Some preliminary information about a potential extension of the South Lake Union route that would serve the University of Washington was also included. Figure 2 illustrates the streetcar routes originally identified as potential candidates. These potential candidate routes were then initially screened and resulted in five potential routes to be evaluated. Table 1 summarizes many of the issues associated with each of the five potential routes evaluated.

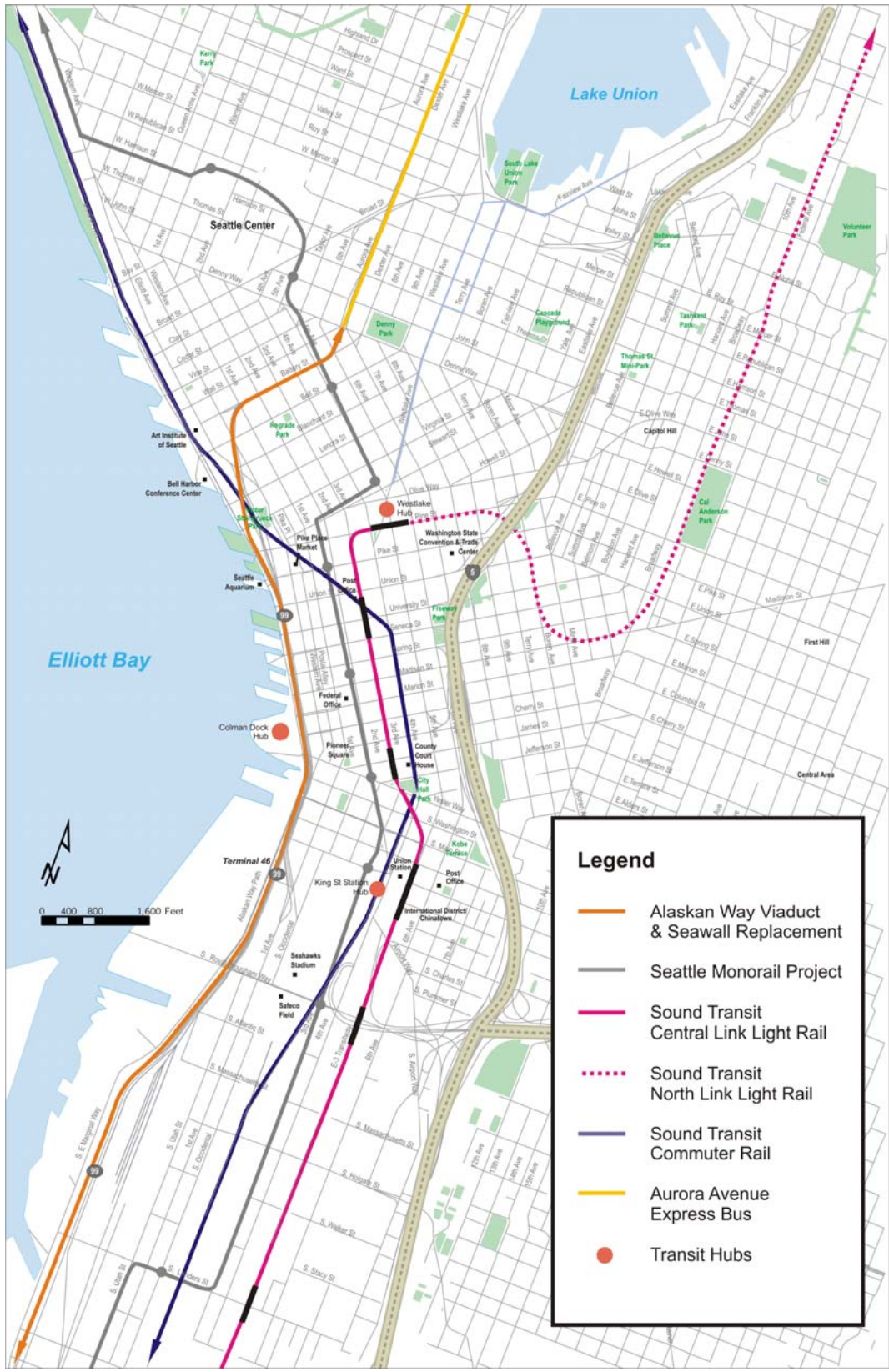


Figure 1. Planned and Funded Transportation Developments in Central Seattle

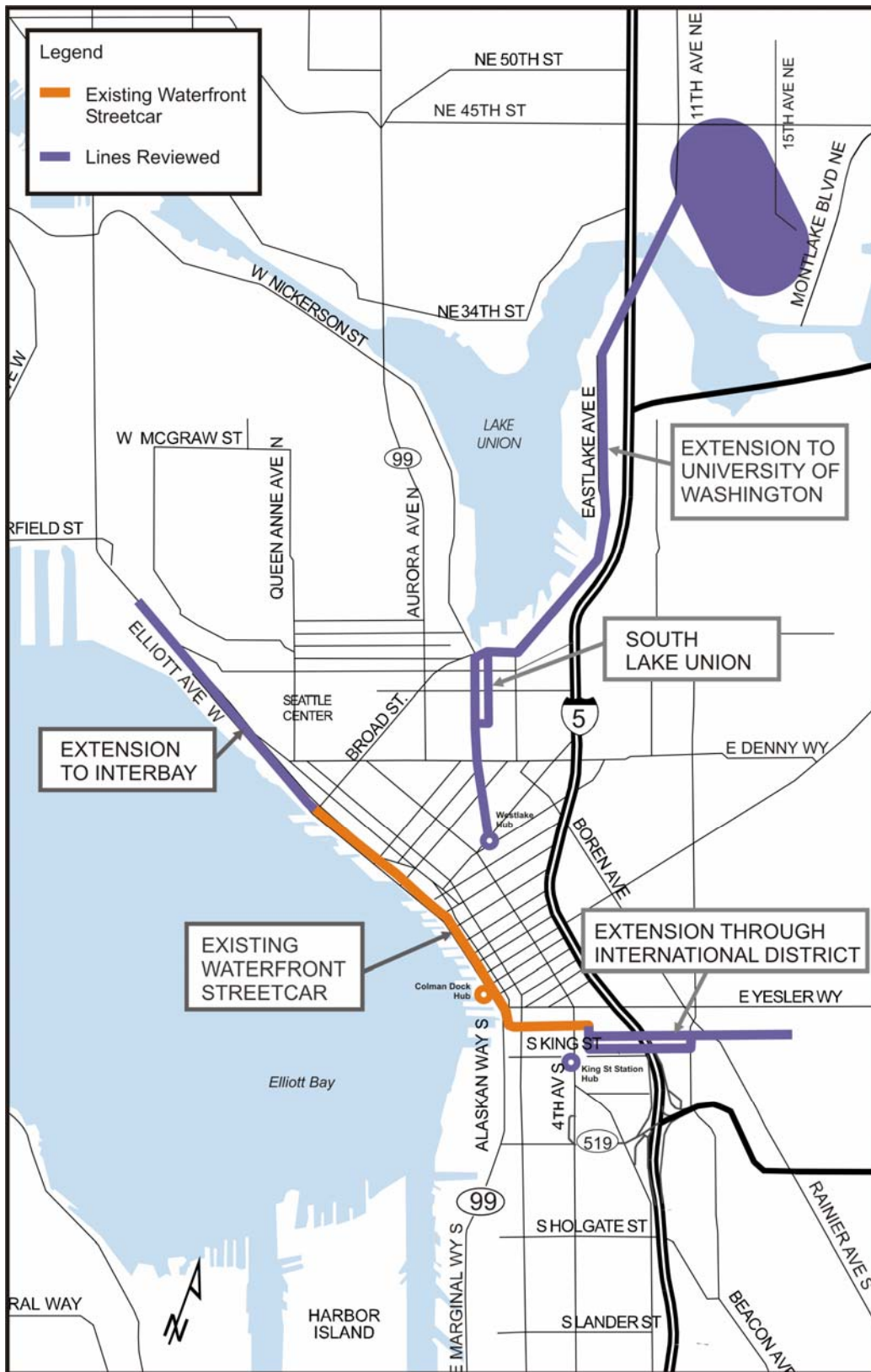


Figure 2. Streetcar System Options Reviewed by Sound Transit

**Table 1. Summary of Potential Future Streetcar Corridors**

Corridor	South Lake Union from Westlake to Yale	South Lake Union from Yale to the UW	Chinatown/International District/ S. Jackson Street	Waterfront North to Interbay
Demand/ Market	20,000 new workers and 17,000 new residents anticipated by 2020 in South Lake Union. High demand for recreational and visitor travel to lakefront. Additional growth anticipated for Denny Triangle.	Connections between proposed South Lake Union Streetcar and UW. Connections between campus and research facilities, including biotech campus. Direct connection via streetcar from downtown.	High-density employment and housing in Chinatown/International District, especially west of 12 <sup>th</sup> Avenue S. Major tourist and recreational destination. Connections to regional transit and Amtrak.	W. Thomas Street pedestrian bridge opens new opportunities for waterfront travel. Amgen employs 2000. Potential new mixed-use neighborhood.
Land Uses	Newly developing area, with extensive housing and commercial expansion planned.	Recreational opportunities along lakefront. Employment & educational markets connecting SLU and UW.	Redevelopment potential as well as existing dense land uses. Highest density closest to International District Station.	Currently "single loaded" relatively industrial development with redevelopment or intensification potential.
Connections to Other Modes	Connections to major multi-modal hub at Westlake.	Creates single continuous alignment between Westlake hub and campus. Potential connections to Light Rail at UW.	Connections to major regional hub at International District Station.	Potential connection to the future monorail station at Blaine Street.
Dependencies	None	Requires basic South Lake Union Line to be in place.	None for short line operation. Maintenance facility site in Pioneer Square or Chinatown/International District needs to be identified.	Requires connections to operating Waterfront Streetcar line – need Alaskan Way Viaduct reconstruction completed. Also, any increase in service would require double-tracking the currently single-tracked Waterfront Streetcar line.

The SDOT study also provided initial ridership estimates and vehicle fleet requirements for the routes evaluated. These estimates are summarized in Table 2 and Table 3. For comparative purposes, the range of potential daily ridership on the streetcar routes assessed in this paper are comparable on the low end to commuter rail to Frederickson and on the high end to light rail Northgate to UW Bothell.

**Table 2. Ridership Estimates**

Streetcar Line/Extension	Proposed Headway	Annual Revenue Hours <sup>1</sup>	Streetcar Ridership Potential (Daily) <sup>2</sup>
South Lake Union (initial operation)	15	10,950	1,100 – 1,300
South Lake Union (as area develops more densely)	10	16,425	3,600 – 4,100
South Lake Union to University District	TBD	TBD	TBD
Pre-Alaskan Way Viaduct Reconstruction Operations			
Current Waterfront Streetcar Line	20	12,679	1,400 <sup>3</sup>
Chinatown/International District to 12th Avenue S. (couplet using S. King and S. Jackson Streets) operating from Pioneer Sq. to ID alone during AWW construction.	15	5,475	300 – 400
12 <sup>th</sup> Avenue S. to 23 <sup>rd</sup> Avenue S.	TBD	TBD	TBD
Post-AWW Viaduct Reconstruction Operations			
New Waterfront Line - Double Tracked	10	21,900	3,300 – 3,600
Chinatown/International District to 12th Avenue (couplet using S. King and S. Jackson Streets)	10	5,475	800 – 900
Waterfront with extension to W. Thomas Street Includes double tracked Waterfront Streetcar line	10	27,375	3,500 – 3,800
Waterfront with extension to Interbay	20	32,375	3,600 – 3,800
South Lake Union to University District	TBD	TBD	TBD

<sup>1</sup>Based on 365 days of operation.

<sup>2</sup>The SDOT study presented potential annual ridership numbers. Those numbers have been converted to approximate daily ridership for comparative purposes.

<sup>3</sup>Existing ridership.

**Table 3. Vehicle Fleet Requirements**

Streetcar Line/Extension	Proposed Headway	Peak Vehicles in Service <sup>1</sup>	Total Vehicle Requirement <sup>1</sup>
<i>SOUTH LAKE UNION (not including the extension to the University)</i>			
Westlake - South Lake Union	10	3	5
<i>WATERFRONT STREETCAR EXTENSIONS (Post-AWW reconstruction)</i>			
New Waterfront Line – Double-tracked	10	4	5
Chinatown/International District to 12 <sup>th</sup> Avenue S. (couplet using S. King and S. Jackson Streets)	10	1	2
Chinatown/International District to 23 <sup>rd</sup> Ave. S. (includes 5 <sup>th</sup> to 12 <sup>th</sup> Avenues S.)	10	2	3
Waterfront Extension to W. Thomas St	10	1	2
Waterfront Extension to Interbay (includes Broad to W. Thomas Streets)	20	1	2

<sup>1</sup>As estimated by the City of Seattle.

## 5. City of Seattle Priorities for Implementation

The SDOT study concluded that:

- The proposed streetcar line connecting the newly developing South Lake Union and Denny Triangle neighborhoods with the retail core and major transportation node at Westlake Center is the single most promising line for a new streetcar line in central Seattle. This line not only meets all criteria for a successful streetcar corridor, but it could be built without being dependent on, or interrupted by, any of the major construction projects anticipated in the Center City area.
- The extension of the existing Waterfront Streetcar from the Chinatown/International District Station along the S. Jackson Street corridor to 12th Avenue S. is another promising corridor for future streetcar service, which could be extended to 23rd Avenue S. The line would connect tourist and entertainment destinations along the waterfront, through Pioneer Square, into the busy Chinatown/International District and beyond. The route meets many of the criteria for success, but currently lacks the added incentive of a defined relationship with private property owners or other outside funding. In addition, timing may be affected by the Alaskan Way Viaduct and Seawall Replacement Project.
- In addition to extending the streetcar line to the east, future land use changes could justify an extension of the Waterfront Streetcar to the south and the north. The Port of Seattle recently announced a proposal to extend the Waterfront Streetcar north from its terminus at Broad Street to just south of Terminal 86, including relocation of the current maintenance barn.
- Another potential streetcar route that appears promising is to extend the proposed South Lake Union line north to serve the Eastlake neighborhood and destinations in the University district, including the University of Washington medical campus, and/or connecting to the regional transit system at NE 45th Street and Brooklyn Avenue NE. However, this route has not been further evaluated as it is dependant on the completion and successful implementation of the South Lake Union streetcar route.

## 6. Costs Associated with Streetcar Routes

Initial conceptual estimates for both capital costs and operating & maintenance costs were developed and included in the SDOT report.

Capital cost estimates developed were largely based on costs gathered from the Portland Streetcar projects recently constructed or currently in the planning or design phase. These costs were applied to the conditions that are believed to exist along the routes in Seattle and were escalated to mid-2004 dollars. They include total anticipated construction costs, agency soft costs (engineering, administration, etc.), and vehicles. Right-of-way is not included in the costs estimates as the streetcar is planned to be totally in the public right-of-way with the exception of land required for maintenance facilities. Right-of-way for the maintenance facilities was assumed to be on property currently owned by the City of Seattle.

Table 4 summarizes the conceptual capital costs for the routes evaluated.

**Table 4. Streetcar Route Estimated Capital Costs**

Streetcar Line/Extension	Estimated Capital Cost (mid 2004 \$) <sup>1</sup>
South Lake Union Westlake to Yale segment As Area Develops	\$45 million
South Lake Union to University District	TBD
Chinatown/International District/Jackson St. corridor 5 <sup>th</sup> Ave. to 12 <sup>th</sup> Avenue S. (couplet using S. King and S. Jackson Streets) Includes new Maintenance Facility	\$26 million
Chinatown/International District/Jackson St. corridor 12 <sup>th</sup> Ave S. to 23 <sup>rd</sup> Ave S.	\$21 million
Waterfront Streetcar Extension Broad St. to W Thomas St. Single track, post AWV construction, assumes maintenance facility relocated prior to this extension	\$8 million
Waterfront Streetcar Extension W. Thomas St. to Amgen campus Single track, post AWV construction, assumes maintenance facility relocated prior to this extension	\$9 million

<sup>1</sup>As estimated by the City of Seattle.

Operating and maintenance costs estimates were developed by SDOT by applying an average, all-inclusive, operating cost of \$127.50 per revenue hour, based on current King County Metro streetcar and bus operating costs. Table 5 summarizes the O&M costs for the routes evaluated.

**Table 5. Revenue Hour Requirements and O&M Costs**

Streetcar Line/Extension	Proposed Headway	Weekday Revenue Hours	Annual Revenue Hours <sup>1</sup>	Annual Operating Cost <sup>2</sup>
<i>SOUTH LAKE UNION (not including the extension to the UW)</i>				
Westlake - South Lake Union	10	45.00	16,425	\$2.1 M
<i>WATERFRONT STREETCAR AND EXTENSIONS (Post AWW Reconstruction)</i>				
New Waterfront Line – Double-tracked	10	60.00	21,900	\$2.8 M
Chinatown/International District to 12 <sup>th</sup> Avenue S. (couplet using S. King and S. Jackson Streets)	10	15.00	5,475	\$0.7 M
Chinatown/International District to 23 <sup>rd</sup> Ave S. (includes 5 <sup>th</sup> to 12 <sup>th</sup> Avenues S.)	10	30.00	10,950	\$1.4 M
Waterfront Streetcar Extension to W. Thomas St.	10	15.00	5,475	\$0.7 M
Waterfront Streetcar Extension to Interbay (includes Broad to W. Thomas Streets)	20	15.00	5,475	\$0.7 M

<sup>1</sup>Based on 365 days of operation.

<sup>2</sup>As estimated by the City of Seattle.

Note: For purpose of estimation it is assumed that all vehicles go in and out of service at the same time. Actual revenue hour requirements would vary slightly based on final schedule development.

## 7. Sound Transit's Role in a Streetcar Network

Sound Transit's mission is to provide high capacity transit services, defined by RCW 81.104.015 as:

“High capacity transportation system’ means 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 as 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.”

As stated previously, streetcar systems are not considered high capacity transit. However, they do provide local transit service and can connect these local services to regional HCT systems and might be considered “supporting services and facilities necessary to implement such a system.” Examples of how streetcars in Seattle might connect with and support the regional high capacity transit system include:

- The southern terminus of the South Lake Union streetcar route is within a short walking distance to the existing Central Link LRT's Westlake Station (currently part of the downtown Seattle transit tunnel) and the proposed monorail Green Line station in the vicinity of 5th Avenue and Stewart St.
- The extension of the South Lake Union route to the University of Washington could connect to or be within a short walking distance of either of the two planned Link LRT stations in the University District.
- The end of the current Waterfront Streetcar line at 5th Avenue and S. Jackson St, which is the beginning of the extension through the International District and Jackson St. corridor, is a short walk to Central Link LRT's International District Station.
- An extension of the Waterfront Streetcar north of Broad St. could extend beyond the current Amgen complex and the planned North Bay development to a potential future Monorail Green Line station in the vicinity of Blaine St.

Whether or not Sound Transit participates in providing streetcars is essentially a policy decision that must be made by Sound Transit in the context of the high capacity transit facilities and services it is charged to provide. As noted in this paper, many streetcar projects around the country have been implemented as public-private partnerships involving adjacent property owners, local governments and transit agencies. A similar approach might be considered here, whereby Sound Transit investment in streetcars along with host cities and private property owners could extend the reach of the high capacity transit network. The type (capital v. operating), amount and duration of funding (one-time v. on-going) that Sound Transit might contribute would need to be developed for each specific project depending on the level of partnering support from other participants.

Other criteria that Sound Transit might consider when deciding which, if any, streetcar investments it might make could include, but are not limited to:

- Does it operate with any exclusivity from or priority over other traffic (e.g. separated lane, protected median, traffic signal pre-emption, etc.)?
- Does it connect to the regional HCT system?
- Does it have the potential to add significant new riders to the regional system?
- Does it serve a previously identified regional corridor?
- Does it provide a connection from regional HCT service to PSRC-designated urban centers?
- Can it be converted in the future to be compatible with the regional HCT system (e.g., Tacoma Link is designed to connect to Central Link and handle larger, multi-unit trains)