Seattle Streetcar Network

South Jackson Street Corridor

Draft Report

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The City of Seattle Department of Transportation

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Chapter 1 Overview

1.1 Introduction

During the development of the Seattle Streetcar Network and Feasibility Analysis Report (June 2004), the extension of the waterfront streetcar line through the International District was identified as having many attributes contributing to a successful implementation of a streetcar line. Extending the existing waterfront streetcar line north to 23rd Avenue S. has the potential to provide a transportation connection through the dense, mixed-use communities along the corridor. The unique, historical identity of the neighborhood, combined with cultural destinations such as the Wing Luke Museum, attracts tourists as well as local residents. In addition to serving development at 23rd Avenue S. and S. Jackson Street, the line would provide access to the Pratt Fine Arts facility, the Langston Hughes Performing Arts Center, Washington Middle School, Douglas-Truth Library and other destinations. The route would also facilitate connections to the regional transit system at the International District and King Street Stations, as well as Colman Dock.

This corridor has the potential to function during the construction of the Alaskan Way Viaduct and Seawall Project, which is expected to begin in 2007. As part of that project, the existing waterfront streetcar tracks will be removed and service will be suspended along the waterfront. This analysis considers the potential alignment beginning in Pioneer Square at the Occidental Park Station (north of 1st Avenue S.) and S. Main Street and continuing along the existing tracks into the International District. This would require a new streetcar maintenance facility adjacent to or near the streetcar route.

Figure 1-1: (Portion of) Existing Waterfront Streetcar Route Map

Two phases are considered in this study:

- An initial operating segment could extend from Occidental Park/1st Avenue S. and S. Main Street to the existing terminus at 5th Avenue S. and S. Jackson Street and then form a couplet between S. King and S. Jackson Streets to either 8th or 10th Avenue S.
- A next phase could then extend service from the initial operating segment to 23rd Avenue S. along S. Jackson Street. It would also be possible to build from 5th to 23rd as one phase.

It is anticipated that streetcar service along the waterfront will be restored once the major construction for the viaduct and seawall replacement is completed along Alaskan Way.

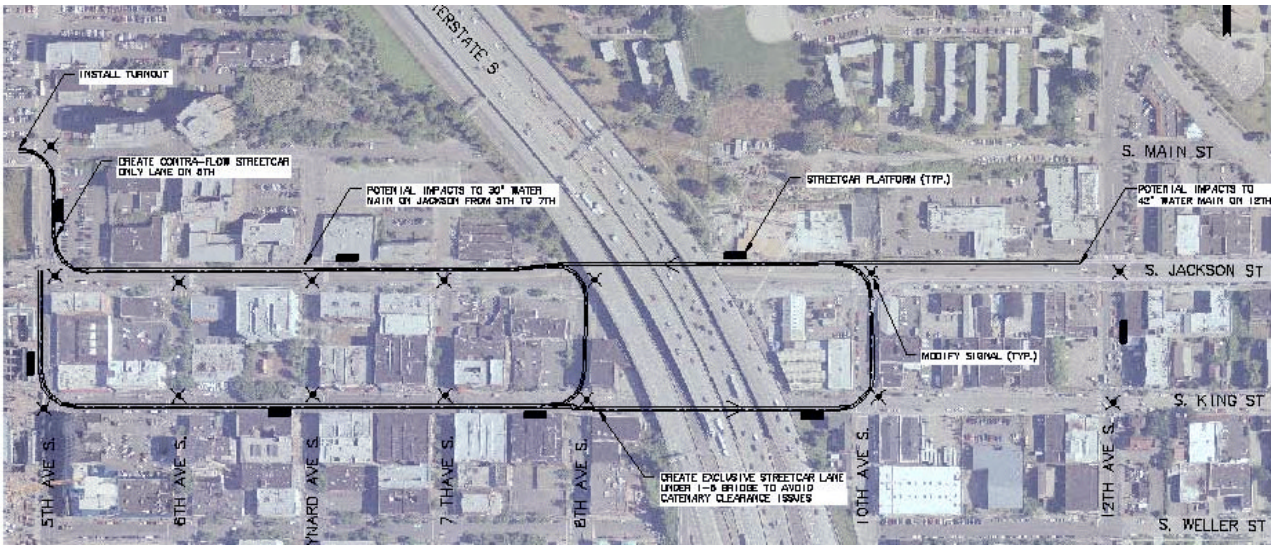

Figure 1-2: Initial Operating Segment with Jackson/ King Couplet, turning at 8th or 10th Avenues

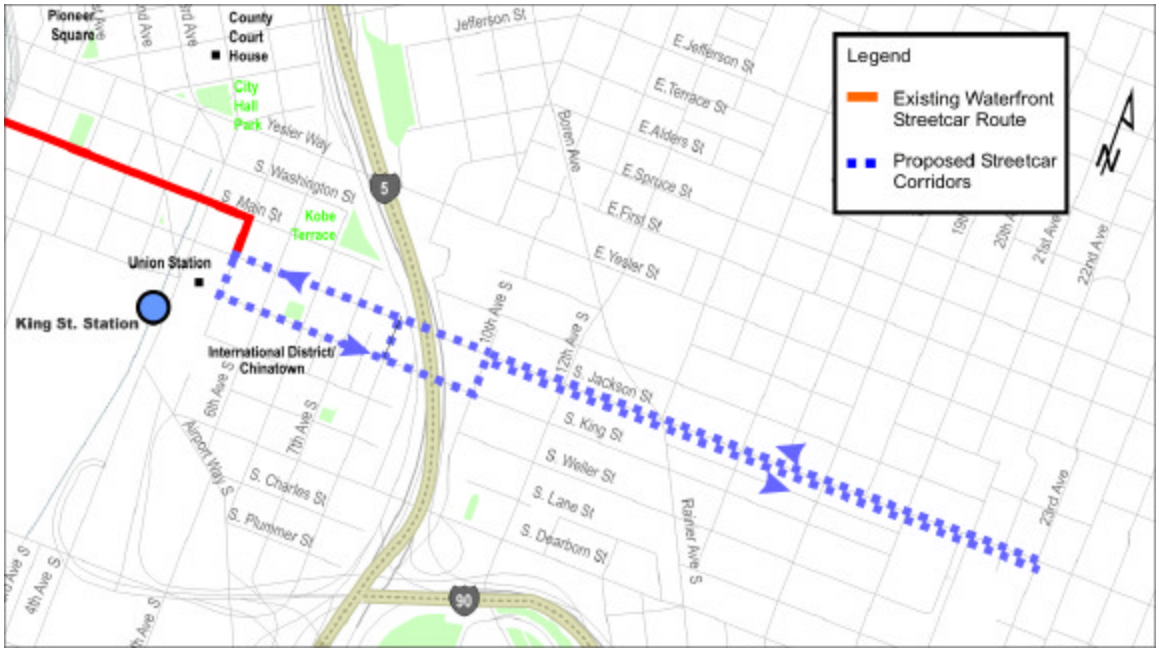

Figure 1-3: Streetcar Route Extension through the International District to 23rd Avenue

1.2 Alternatives Considered

During the course of the study, several alignments were considered. These include:

- A couplet on S. Jackson Street and S. King Street, transitioning to double track on S. Jackson Street at either 8th or 10th Avenue S., then continuing with both tracks on S. Jackson Street to 23rd Avenue S.
- Double-track on S. King Street, turning at either 8th or 10th Avenue S., then double-track on S. Jackson Street to 23rd Avenue S.
- Double-track S. Jackson Street to 23rd Avenue S.

Each alignment has advantages and disadvantages that must be considered in developing the optimum streetcar route. A summary of these elements is included in Table 1-1. Based on technical review and community input there appears to be more interest in developing the first option listed above. Although the S. Jackson Street – S. King Street loop is presented in more detail than the other alignments, this route has not been identified as the preferred alternative. Additional study of these other routes can be considered as the project progresses.

Table 1-1: Alternatives Considered for ID Route Extension

ISSUES	Double-track King St (DTK)	Double-track Jackson (DTJ)	Jackson-King Couplet
	DTK to 8th or 10th; double-track on Jackson further east to 23nd.	**Continue DTJ to terminus at 23nd.**	**Couplet to 8th or 10th; double-track on Jackson further east to 23nd.**
Traffic			
Operations	Reduction in street capacity due to streetcar in both lanes of travel. Requires exclusive lanes under I-5 due to low overhead (OH) wire clearances. Eliminate all parking between 8th and 10th; auto access to parking under I-5 restricted. New signal required at Jackson and 8th or 10th and possibly other intersections.	Operational conflicts with bus movements particularly at bus stops. Competes with high east-west traffic volumes and reduces vehicular capacity and bus movement efficiency. Some loss of parking to accommodate street car bulb outs. Bus bulbs would need to be removed. New phase needed for 5th & Jackson signal.	More operational conflicts compared to double track on King but fewer conflicts than double track on Jackson. Some track placement issues on loop portion (8th/10th Ave) due to potential property acquisition required. Some loss of parking. Bus bulbs to be removed on Jackson.
Truck Deliveries	Must accommodate truck deliveries on King St.	NA	Must accommodate truck deliveries on King St.
Transit		High bus volumes in curb and center lanes. Perceived duplication of service with King County Metro bus system.	High bus volumes in curb and center lanes.
Operations	No conflict with Metro trolley bus. Less impact at Jackson and 5th with thru movement.	Turning movements to/from 5th very difficult	Turning movements to 5th very difficult.
Ridership	West of I-5, may be slightly higher than Jackson due to less competing bus service.	Competition with bus service. May have higher ridership potential east of I-5 than King St.	From 1st Ave & Main St. to 8th/10th: 93,000 to 110,000 annual boardings. Post AWV including reopening of waterfront streetcar line and extending to 23rd St.: 1.24M annual boardings.
Platforms	Need to modify existing high platforms for low floor operation of new vehicles.	Need to modify existing high platforms for low floor operation of new vehicles. Conflicts with bus stops must be investigated.	Need to modify existing high platforms for low floor operation of new vehicles. Conflicts with bus stops on Jackson must be investigated.
Conflicts with ETB	Minimum interface. Less impact at Jackson and 5th with thru movement.	Left turn onto Jackson and right turn onto 5th require significant interface with electric trolley bus operations and OH wires.	Right turn from Jackson to 5th requires interface with OH wires. Single track, single direction has moderate impacts on electric trolley bus operations.
Utilities	Increased detention requirements due to more extensive intersection pavement replacement/regrading. Lower impacts with 8" water main, however no clearance. 0.5' clearance over 12" sewer, north of 7th Ave.	Minimal detention requirements due to minimal pavement replacement/regrading. Major impacts to 30" water line with no clearance. Minimal clearance over 12" sewer, north of 7th Ave.	Along Jackson: Minimal detention requirements due to minimal pavement replacement/regrading. Major impacts to 30" water line, - 4.75' clear. Centered over 12" sewer North of 7th Ave. Along King: Increased detention requirements due to more extensive intersection pavement replacement/ regrading. Lower impacts with 8" water main -- close to 10'clear. Centered over 12" sewer north of 7th Avenue.
Track/Pavement	Grade-breaks at intersections; requires pavement replacement and regrading	No impact due to continuous grade.	Grade-breaks at intersections; requires pavement replacement and regrading
OCS	Vertical clearance limitations for OCS under I-5 require exclusive lanes.	Streetcar has single positive pole and negative return thru the rails. Interference with Metro electric trolley bus OH lines exacerbated at 5th. Vertical clearance more generous under I-5 than King.	Interference with Metro electric trolley bus OH lines. Exclusive lane required for OCS clearance under I-5 if extending line to 10th along King.
Environmental			
Historic Issues	Showcases park and historic architecture along King Street. Passes thru Pioneer Square and/or Chinatown Historic District.	Historic streetcar route -- Passes thru Pioneer Square and/or Chinatown Historic District.	Showcases park and historic architecture along King Street. Passes thru Pioneer Square and/or Chinatown Historic District.
Community Impacts	Encourages revitalization of King Street (the historic "main street" of the District). Would serve to unite King Street. Strong visual connection with King Street clock tower. Strong connections to multi-modal center.	Unites the District east and west of I-5. Highly visible and legible.	Encourages revitalization of King Street (the historic "main street" of the District). Would serve to unite King Street. Strong visual connection with King Street clock tower. Strong connections to multi-modal center.
Parking	Eliminate all parking between 8th and 10th; auto access to parking under I-5 restricted.	May eliminate parking both sides.	Jackson: May eliminate parking both sides. King: Maintain 2 lanes of parking until 8th Ave.
Schedule	Limited complexity. Must accommodate truck deliveries.	Very complex due to maintenance of auto and bus traffic (and OH wires).	Moderately complex due to maintenance of auto and bus traffic (and OH wires) on Jackson.

Chapter 2 Engineering Issues

2.1 Alignment

Operational Assumptions

During the reconstruction of the Alaskan Way Viaduct, the existing waterfront streetcar service will likely be temporarily shut down for several years. This report considers maintaining streetcar service by extending the waterfront route eastward during this period. Of the current waterfront line track, the portion of the route east of approximately the intersection of 1st Avenue S. and S. Main Street could remain in use. This study assumes that the ID extension would run from the existing Pioneer Square station at Occidental Park/1st Avenue S. and S. Main Street and continue as far east as 23rd Avenue S. All of the alignments that were considered would tie into the existing waterfront line along 5th Avenue S., and would serve the existing Occidental Park Station at 1st Avenue S. using the existing waterfront line track. It is assumed that the ID extension would use modern low-floor streetcar vehicles identical to those being proposed for the South Lake Union Streetcar.

The current waterfront streetcar system uses vintage vehicles that operate on a different voltage from most modern streetcar vehicles and use a different overhead catenary system (OCS) to supply power (refer to Section 2.6 OCS). The vintage vehicles also use higher platforms for boarding, rather than the 10-inch platforms used by modern streetcar vehicles. Combining the vintage vehicles on the same system as the modern streetcar vehicles may be possible, but has not been addressed in this report. This study assumes that modern streetcar vehicles will be running on the new route. Should there be the desire to use the vintage trolleys for special events or on weekends, for example, additional study will be required to run both the modern and vintage on the same route. Issues to be resolved include OCS and platform design.

Reconstruction of Existing Infrastructure

Use of modern low-floor streetcar vehicles along the existing waterfront streetcar route would require reconstruction of various system components. Platforms at Occidental Park and 5th Avenues S. stations would need to be reconstructed or extended to accommodate low-floor boarding. Traction power substations and overhead catenary wires may need to be reconfigured to accommodate a vehicle pantograph or dual pole collector system (refer to Section 2.6, OCS).

Couplet on S. Jackson Street and S. King Street

At 5th Avenue S. and S. Main Street, the eastbound (EB) track would diverge from the westbound (WB) track through a new turnout installed just west of the intersection. The EB track would continue on the west side of 5th Avenue S. (where the existing tracks are today) and the WB track would be located in an exclusive lane (no general purpose traffic) adjacent to the east curb along 5th Avenue S. A new traffic signal would need to be installed at the intersection of 5th Avenue and Main Street to allow WB streetcars to travel from the exclusive lane on 5th Avenue to the existing tracks on Main Street.

Eastbound Track – The EB track would turn at the intersection of 5th Avenue S. and S. King Street and head east along S. King Street. The track would be located in the travel lane adjacent to parking (on the south side of the street) until it reaches 8th Avenue S. At 8th Avenue S., the track would gradually transition over to an exclusive lane adjacent to the south curb and would head east to 10th Avenue S. (this would require the removal of all parking on the south side of S. King Street between 8th and 10th Avenue S). The exclusive lane is required due to the low overhead clearances at the I-5 bridges between 8th and 10th Avenue S. The overhead wires cannot be mounted high enough to allow general purpose traffic under them; therefore an exclusive lane must be created to keep general purpose traffic from the overhead wires. At 10th Avenue S., the track would turn north and would again run in the lane adjacent to parking (east side). A new signal would need to be added at the intersection of 10th Avenue S./S. King Street to accommodate the turn.

To continue to 23rd Avenue, the track would continue north on 10th Avenue S. and turn at S. Jackson Street. The track will head east on S. Jackson Street as far as 23rd Avenue S. and will be located in the travel lane adjacent to parking. Existing bicycle lanes on S. Jackson Street (between 12th and 23rd Avenues S.) will be impacted by the track location and may need to be moved to a parallel street (possibly S. King Street). Special track and bike transitions could be considered at platform locations. It may be desirable to transition from S. King Street to S. Jackson Street at 8th rather than 10th Avenue S. to avoid the impacts of an exclusive lane under I-5 from 8th to 10th Avenue S.

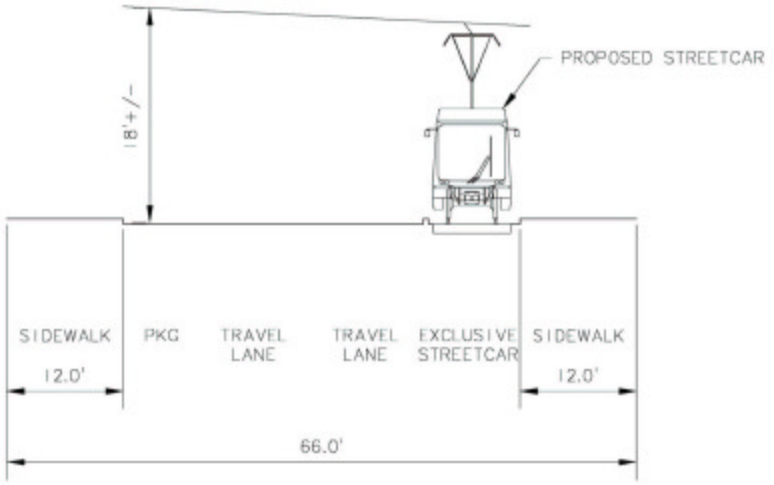

Figure 2-1: S. King Street Looking East

Westbound Track – The WB track would begin at 23rd Avenue S. and S. Jackson Street and continue to 5th Avenue S. The tracks would turn at the intersection of 5th Avenue S. and S. Jackson Street. The track would be located adjacent to the curb where there is no parking and would be located in the travel lane adjacent to parking everywhere else. It may be desirable to eliminate parking between 5th and 7th Avenues S. on S. Jackson Street so that the tracks can be shifted over to the curb to avoid impacting an existing 30" waterline (refer to Section 2.4 – Utility Impacts). Bicycle lane impacts may need to be addressed.

There are several Metro trolley bus lines that currently operate on S. Jackson Street and several cross streets. The overhead wires associated with these lines may be impacted by the streetcar alignment (refer to Section 2.6 OCS). If the streetcar is able to use the

existing wires, the impacts should be minimal. However, if the streetcar is unable to use the trolley bus wires there will be significant modifications needed to separate the trolley bus wires from the streetcar wires.

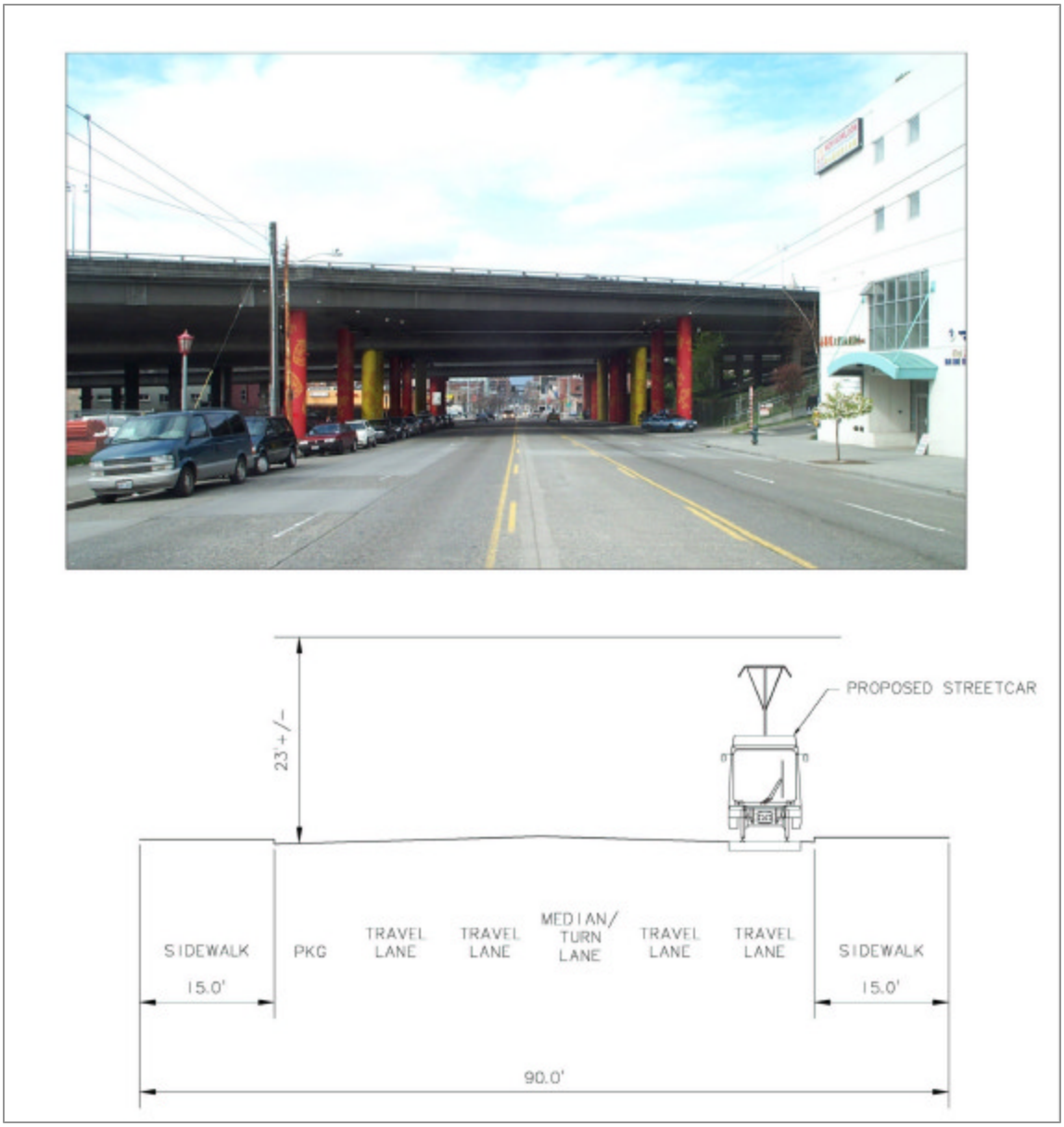

Figure 2-2: S. Jackson Street, looking west

Other Alternatives

In addition to the alignment described above, several other alignments were considered. All of the alternate alignments used S. King Street or S. Jackson Street to head east to 23rd Avenue S. The alternate alignments are discussed in the matrix included with this report.

2.2 Traffic

Arterial Capacity Impacts

The proposed streetcar route would operate within the existing rights-of-way on S. Jackson Street and S. King Street and along a short segment of 8th (or 10th) Avenue S. (one block). A potential alignment for this extension may consist of a single-track loop configuration between 5th Avenue S. and 8th/10th Avenue S. that utilizes S. King Street for the eastbound direction and S. Jackson Street for the westbound direction. East of 8th/10th Avenue S., double tracks on S. Jackson Street would serve both directions to 23rd Avenue S. For this extension, the on-street operational characteristics of the streetcar vehicles would generally be similar to those of traditional trolley buses with only modest to moderate operational impacts likely to arise for the various segments of the extension. The distinctions between streetcars and buses on the proposed extension, in terms of traffic operations, lie primarily in the types of stops required for streetcar vehicles and the need for exclusive streetcar signal phasing at certain intersection crossing points (to accommodate and protect complex streetcar intersection movements).

On S. Jackson Street, the streetcar tracks could be aligned along the outside travel lanes and stops would likely be curb-bulb platforms extending out from the curb into a parking lane such that the streetcar vehicles could stop in-lane to pick-up and drop off passengers. On S. King Street, a similar track arrangement could be used (along the single eastbound travel lane between 5th Avenue S. and 8th/10th Avenue S.) again to accommodate in-lane stops with curb bulb station platforms. Due to the alignment of the streetcar tracks on these roadways and the in-lane stop operations, some impacts to arterial capacity could be expected along with some added delays to mainline traffic.

The segment of 8th or10th Avenue S. where the tracks crossed from King to Jackson would also be affected to some degree due to the track alignment on the northbound travel lane (east side of the street). If a stop is placed between S. Jackson Street and S. King Street it would likely be in-lane, thereby reducing through capacity on 8th/10th Avenue S. to some degree.

The traffic analysis that would follow this study would include investigation of impacts to the circulation patterns, throughput capacity, and accessibility along 5th Avenue S., S. Jackson Street, S. King Street, and 8th or 10th Avenue S. The primary goal of this follow-up analysis would be to identify and highlight potential congestion areas, safety issues, and operational constraints in an effort to develop measures to address these issues, if required.

Intersection Movements

As described previously, the operational characteristics of the streetcar vehicles would be similar to those of conventional trolley buses for many segments of the extension. The signalization requirements for the streetcar line would also be similar. Streetcar movements at key intersections along the route would generally be accommodated by the existing signal systems on Jackson Street and King Street with no significant modifications needed.

However, the streetcar movements at 5th Avenue S./S. Main Street and 5th Avenue S./S. King Street will require new protected signal phases to accommodate exclusive streetcar movements through these intersections. Potentially the most problematic movement, in terms of signal requirements, may be the proposed eastbound transition from the existing S. Main Street station platform terminus (on 5th Avenue S.) to S. King Street eastbound. This transition would require that the streetcar tracks cross through the intersection of 5th Avenue S./S. King Street (southbound to eastbound) and continue eastbound on S. King Street. To allow this movement to cross all traffic streams, a hold phase for conflicting movements would be needed to enable passage of streetcars by way of an exclusive green phase. In addition, a new signal and exclusive eastbound phasing would be needed at the intersection of S. King Street and 8th/10th Avenue S. to provide protected left turns for eastbound-to-northbound streetcar movements from S. King Street to 8th/10th Avenue S. (and on to S. Jackson Street eastbound). At the intersection of Jackson Street/10th Avenue, a new signal would be required to allow protected northbound-to-eastbound right turn streetcar movements. Exclusive phasing would not be needed at this new signal, however.

The specific need for exclusive signal phases, new signals, and the impacts of streetcar operations at critical "hot spot" intersections would be investigated in a subsequent traffic analysis.

Parking Impacts and Issues

Parking impacts on S. Jackson Street, S. King Street, and possibly 8th/10th Avenue S. would be based on the need to provide curb bulb station platforms where stops are located. For these three streets, some on-street parking may be lost based on the physical requirements for the various curb bulbs that extend out from the existing curb edge to meet the outside-lane streetcar tracks (to allow in-lane stops). At most four (4) parking spaces would be removed per streetcar stop. Some parking may also be removed along 5th Avenue S. south of the existing terminus station for extension of the contra-flow tracks.

Non-Motorized Access and Mobility

Impacts to pedestrian mobility at existing intersections along the various International District Extension corridors would generally be modest for the majority of track sections along the proposed route. Curbside station platforms (bulbs) on S. King Street and S. Jackson Street would preclude the need for pedestrians to cross to center platforms and the conventional operating characteristics of the vehicles (similar to buses) would not warrant extensive signage or non-motorized warning indicators. Also, the frequency of streetcar arrivals would likely be in the range of 10 to15 minutes ? therefore no significant vehicle-pedestrian conflicts would be expected due to headway issues.

Streetcar tracks can affect bicycle travel in two ways: one is when the cyclist needs to cross the streetcar tracks and the other is when the tracks are parallel to the cyclists direction of travel. Crossings of the streetcar tracks can be accommodated, and the ideal crossing angle is ninety degrees. Parallel travel can be accommodated where the streetcar

tracks are in the inner traffic lanes and cyclists can use the outer traffic lanes. Where there is only one lane of traffic in each direction with streetcar tracks in those lanes, cyclists need alternate routes.

Transit System Coordination

Due to the mixed operations for the streetcar extension in general purpose traffic, some bus/streetcar conflicts may occur that could potentially affect arterial capacity and/or transit movements. The majority of these conflicts would likely be concentrated along S. Jackson Street due to the number of bus routes to and through the International District via S. Jackson Street and the frequency of service in this area which can approach every 5 minutes during peak commute periods. The consolidation of streetcar and bus transit stops at single, combined locations could be pursued in an effort to minimize parking impacts and possibly minimize the potential redundancy of transit services.

Truck and Emergency Vehicle Access

Potential capacity reductions on S. Jackson Street when a streetcar vehicle is stopped to load/unload passengers or breaks down in-lane would not have severe repercussions with respect to emergency vehicle access and circulation. This is primarily due to the availability of two traffic lanes in either direction (as well a center turn lane) which allows same-direction or center-lane passing maneuvers. However, during heavy traffic periods, the single lane of through capacity during extended streetcar stops (for elderly or high volumes of riders) or breakdowns may add noticeable delays to emergency vehicle access. Due to the presence of on-street parking on S. King Street and the limited width for traffic movements (single lane eastbound and westbound), emergency access along this potential segment of the extension could be problematic during breakdown scenarios. Impacts to general purpose traffic and emergency vehicle access will be investigated in subsequent traffic analyses.

Stations and Urban Design Considerations

Stations/stops, in general, would be provided as side platform corner curb bulbs located within the parking lane at the far side of an intersection. Stations would be approximately 1000 feet apart (three to four blocks), with stops at intersections that provide: support to designated pedestrian routes and green streets; the optimum pedestrian access to existing public attractions and facilities and proposed new developments; and connectivity with other transit stops. Station locations would be determined in collaboration with community stakeholders and other public agencies.

Similar to the proposed South Lake Union streetcar plan, prototypical station components would include concrete corner curb bulbs or median platforms; rider information signs; trash receptacle; lighting; and shelter. Schedule and route information would be graphically displayed within or adjacent to the shelter. Real time displays would announce next arrivals. Solar panels would provide power.

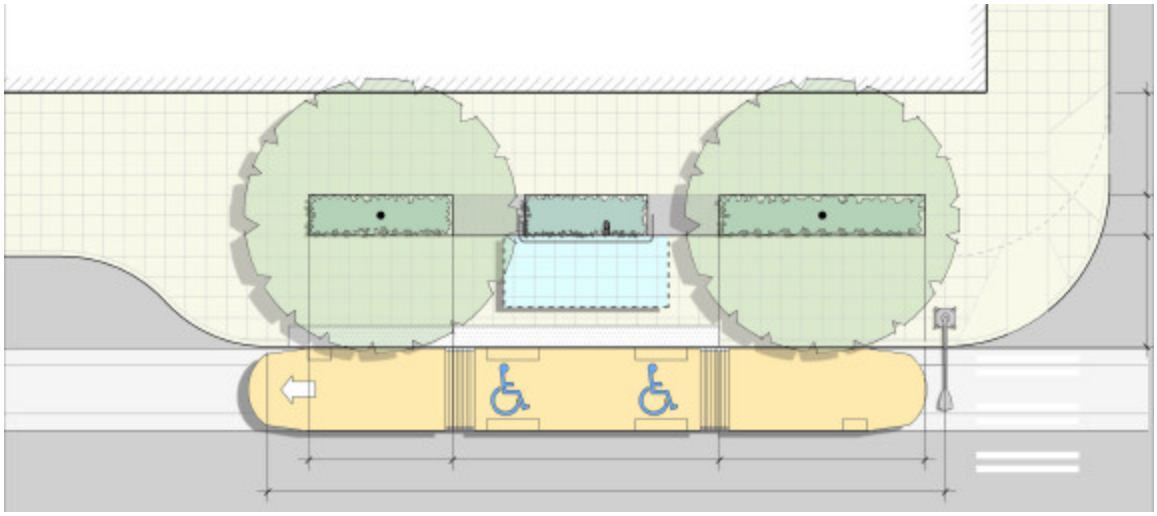

Figure 2-3: Plan view of Typical Streetcar Station along curb

Figure 2-4: Section of Typical Streetcar Station along curb

Historically a streetcar ran on S. Jackson Street. The route was established in 1887, connecting Pioneer Square to Leschi Park via Yesler Way and Jackson Street. The line linked the Elliott Bay steamers with the Lake Washington Ferries, creating an early intermodal transportation system. By 1941, the streetcar system was disbanded.

An alignment on S. Jackson Street and/or S. King Street will help unite the communitites to the east and west of the I-5 overpass. An alignment on S. King Street will also encourage the revitalization and unification of S. King Street, the historic "Main Street" of the International District. It will help showcase Hing Hay Park and the historic architecture along S. King Street as well as enhance the strong visual connection with the King Street Station clock tower and provide a direct physical connection to the transit tunnel and light rail.

2.3 Utility Impacts

The following utility information is from the City of Seattle SPU Water/Sewer GIS files, and Map Seattle Waterline and Sewer and Drainage Infrastructure Basemap Series (2005).

The following assumptions are made regarding the potential impacts to the utilities along the proposed alignment:

- With track stray current mitigation of booted rail and bonded track slab reinforcing with test stations, it is assumed that water mains between 10 feet

measured as the clear distance between the pipe and the nearest rail, and 5 feet measured from the pipe centerline and the nearest track slab edge will not require relocation or replacement, but will require monitoring anodes per City of Seattle standards. Watermains within 5 feet measured from the pipe centerline and the nearest track slab edge to within the track slab footprint will be assumed to be relocated for maintenance access requirements. Electrical continuity verification will be required for water mains remaining in place within 10 feet of nearest rail. Should field tests show lack of sufficient continuity, bonding across existing joints or intentional disconnects may be required.

- Watermain, sewer, storm drain and all wet service crossings are assumed to be uncased. Upgrades of existing mains to allow for future expansion are not included in the cost estimate.
- Eccentric sewer and storm drain line manholes are allowed, but not offset manholes. This assumption carries forward with sewer and storm drain lines requiring relocation where manholes cannot be reconfigured to lie outside the track slab.
- Access to electrical vaults can be located inside the track slab footprint.
- Private utility mitigation will be determined by the private carrier, and mitigation performed by that utility's forces, at no cost to this project, and completed prior to any project in-street work.

Table 2-1: Utilities

Alignment	Cross Street	Sewer	Water	Sewer – Crossing	Water Main – Crossing	Notes	Utility Mitigation
S. Jackson St.	5th Ave. S.	-	30" approx. 12' north of centerline (1912)	See 5th Ave. S. Jackson St. to S. King St.	See 5th Ave. S. Jackson St. to S. King St.	12" & 16" steam log crosses at 5th/6th Ave. S. alley	Major
	6th Ave. S.	-	Same as previous (1910)	12" in centerline	12" approx. 12' east of center line (1918)	16" steam log 26' south of centerline from 6th & Maynard alley, east	Major
	Maynard Ave. S.	6" storm	Same as previous	8" in centerline	-	16" steam log 26' south of centerline from Maynard & 7th alley, west	Major
	7th Ave. S.	12" in centerline	Same as previous, 12" from 7th to 8th Ave. S. (1910) 12' north of centerline	10" and 18", and 12" diagonal to MH in centerline S. Jackson St.	30" (1910) and 12" (1963)	16" steam log crosses @ Maynard/7th alley 18" x 60" Electrical duct 20' north of centerline from Maynard/7th alley east past 7th	Moderate
	8th Ave. S.	Same as previous	12" (1910) 12' north of centerline	-	-		Moderate
	WSDOT ROW	Same as previous	Same as previous	-	-		Moderate
	10th Ave. S.	Same as previous	Same as previous	-	-		Moderate
5th Ave. S.	S. Jackson St.	12" 15' east of centerline	16" (1912) & 30" (1920) 12' east of centerline	-	30" NB lanes only (1912)		Water: Moderate Sewer: Minor
	S. King St.	12" 15' east of centerline	16" 12' east of centerline (1920)		-		Water: Moderate Sewer: Minor
S. King St.	5th Ave. S.	-	12" (?) 12' north of centerline	12"	16" (1912)		Moderate

Table 2-2 (continued): Utilities

Alignment	Cross Street	Sewer	Water	Sewer – Crossing	Water Main – Crossing	Notes	Utility Mitigation
	6th Ave. S.	-	Same as previous	Unknown size	-		Moderate
	Maynard Ave. S.	12" east to 7th	Same as previous	Same as previous	-		Moderate
	7th Ave. S.	12" in centerline	Same as previous	Same as previous	-		Moderate
	8th Ave. S.	Same as previous	Same as previous	12"	12"		Moderate
	WSDOT ROW	Same as previous	Same as previous	-	-		Moderate
	10th Ave. S.	Same as previous	Same as previous	-	-		Moderate
10th Ave. S.	S. King St.	-	-	Unknown size	12" (?) (1920)		Minor
	S. Jackson St.	-	-	12"	12" (1910)		Minor
S. Jackson St.	10th to 12th Ave. S.	12" in centerline	12" 12' north of centerline (1910)	-	12" (1910)		Moderate
	12th Ave. S.	Same as previous	12" 12' north of centerline (1891)	20", 12"	42" (1905), 12" (1912)		Moderate
	Rainier Ave. S.	Multiple parallel branching just west of Rainier, 8" in centerline, storm drain south of centerline to midpoint between Rainier & 16th	Unknown size (1891)	3 crossings just west of Rainier – storm and sewer	Unknown size (1905)		Major

Table 2-3 (continued): Utilities

Alignment	Cross Street	Sewer	Water	Sewer – Crossing	Water Main – Crossing	Notes	Utility Mitigation
	16th Ave. S.	Unknown size at centerline, storm drain north of centerline to 17th	Same as previous	Storm drain	Unknown size (1905) to the north		Moderate
	17th Ave. S.	Unknown size at centerline	Same as previous	-	-		Moderate
	18th Ave. S.	Unknown size at centerline, storm drain south of centerline to 19th	Unknown size (1997)	Storm drain	Unknown size (1923)		Moderate
	19th Ave. S.	Unknown size at centerline	Unknown size (1891)	-	-		Moderate
	20th Ave. S.	Same as previous	Unknown size (1976)	Storm drain	2 of unknown size (1903 and 1975)		Moderate
	21th Ave. S.	Same as previous	Unknown size (1891)	-	Unknown size to the south (1976)		Moderate
	22nd Ave. S.	Unknown size at centerline, storm drain north of centerline from approx. 21st to 23rd Ave. S.	Unknown size (1891)	Storm drain oblique @ approx. 21st	Unknown size (1903)		Sewer: Moderate Water: Moderate
	23rd Ave. S.	Unknown size at centerline, storm drain north of centerline	Unknown size	Unknown size at centerline	Unknown size (1909)		Sewer: Moderate Water: Moderate

2.4 Drainage

This area is entirely within the combined sewer system.

Detention is required in the combined sewer drainage basins and can most economically be provided by the use of piping within the existing road right-of-way. The extent of detention required will be determined by the removed and revised impervious areas for the rail track, stations, curb revisions, and maintenance facility if required. Utility conflicts will need to be identified and a suitable location determined for the detention pipe with the least impact to traffic during construction and disruption to existing utility operations. Control structures, cleanout manholes, and conveyance piping will be required. Pipe storage will be designed such that release rates do not exceed current City of Seattle standards. Detention pipe must be laid at or near 0.50% slope so it will be advantageous to find a relatively flat portion of roadway to minimize excavation.

2.5 Overhead Contact System (OCS)

In the near future, there will be four different types of electric traction vehicles in public service within the City of Seattle. These are:

- Waterfront Streetcar - 600V dc maximum, ungrounded negative by rail, 4/0 AWG conductor.
- Metro trolley bus - 672V dc nominal (400V to 700V), grounded overhead negative, 4/0 AWG conductor
- Sound Transit's LINK Light Rail - 1500V dc nominal
- SLU Streetcar, which will be similar to Portland/Tacoma Streetcar which operates at 750Vdc.

During final design of the South Lake Union Streetcar, it is expected that decisions will be made about the possibility for streetcars and buses to share overhead power.

Chapter 3 Environmental Issues

3.1 General Description

Environmental issues related to this route would be similar to those for the South Lake Union area, except there would be no shoreline or Endangered Species Act review. Cultural and historic issues would be similar, and there would be a review of potential environmental justice issues. Parts of the corridor are within an historic district.

Chapter 4 Neighborhood Plans and Outreach

In November 2004, SDOT contracted with Tarah and Associates Inc. to conduct a community involvement process in the Chinatown/International District and the Central Area to obtain feedback on the proposed extension of the waterfront streetcar along Jackson Street. The concept of the extension was articulated in the Neighborhood Plans of both Chinatown/International District and the Central Area in 1998. A feasibility study was conducted in summer of 2004. The community process represented another step towards the possible development of a streetcar on Jackson Street.

The purpose of the community outreach process was to:

- Inform and educate selected stakeholders in the Central Area regarding the proposed extension up to 23rd and Jackson.
- Solicit and document feedback from the stakeholders in the Chinatown/International District who were already engaged in the discussion regarding the streetcar extension.
- Introduce the concept of the LID as a possible source of funding.
- Listen to recommendations regarding the potential routing – pattern of stops, changes to the proposed routes, co-existence with current traffic on Jackson Street.
- Build lists of interested stakeholders who desire to be informed and involved.
- Determine the level of support for the proposed project.

This report provides some background information to the project, describes the community process, reflects the comments and reactions of the stakeholders and describes the current, proposed and potential development in the communities that substantiate the implementation of the proposed streetcar and/or areas in which the presence of a streetcar may indeed catalyze further development. Segments of the Seattle Comprehensive Plan and the Neighborhood Plans are included to provide a context and a vision of the planned development of the communities in relation to the streetcar, especially in housing and transportation.

Description of Jackson Street Corridor

Jackson Street is the major arterial linking Pioneer Square and the Stadium Area, Chinatown, Japantown, Little Saigon – International District, Jackson Place and the Central District (west to east). Jackson Street also links two of Seattle's major bodies of water, Lake Washington and Puget Sound and provides access to the King Street Transit Hub.

Waterfront/Pioneer Square
The Waterfront Streetcar currently serves these two communities, which include residential, retail, office, and recreational uses.

Chinatown/Japantown/International District
This neighborhood is bounded Yesler Way to the north, South Charles Street to the south, Rainier Avenue South to the east and 4th Avenue South to the west. The Chinatown/International District are at the crossroads of many other neighborhoods – bordering Pioneer Square and the Commercial Core to the west, First Hill to the north, Central District to the east, Duwamish, Beacon Hill and North Rainier to the south.

Japantown
The intersection of Sixth Avenue and Main Street has been the historical center of the Japanese American community in Seattle. Uwajimaya's presence on Sixth Avenue and several Japanese small businesses including the Panama teahouse on Main Street reflects the continued importance of the two spines of this community.

Little Saigon
The area east of the I-5 freeway is called Little Saigon. Jackson Street and 12th Avenue are considered to be the hub - the two spines and the most important intersection for the Vietnamese community. In addition to the Vietnamese community, other ethnic centers and facilities are based in this area, such as three major Native American facilities and organizations, the Nissei Veterans Center and the Asian Resource Center. Much of the development in this neighborhood is oriented towards automobile accessibility instead of pedestrians. Consequently, strip-mall style buildings with parking in front have been built which starkly contrasts with Chinatown's friendly pedestrian development. The location and presence of the I-5 viaduct is a physical and psychological barrier between Little Saigon and the rest of the Chinatown/International District and Little Saigon seldom receives the benefits from the projects that are initiated in Chinatown and Japantown.

Central District
The Central District neighborhood plan identifies 4 nodes – Madison-Miller, 12th Avenue, 23rd & Jackson and 23rd & Union Streets. The two nodes that are relevant to the streetcar extension are 23rd & Jackson and 12th Avenue. The latter is known as the "Central Gateway" and lies at the confluence of Boren Avenue, Rainier Avenue, Jackson Street, Yesler Way, 12th to 14th Avenues and Dearborn Street. Because the "Central Gateway" serves as a meeting point for four urban villages (12th Avenue, First Hill, the International District and Jackson & 23rd) as well as for the immediate neighborhoods such as Jackson Place, Squire Park, Spruce Park. Yesler Terrace and Little Saigon, it will be an important segment with respect to the streetcar, flow of traffic and the physical identity and character of each of these communities.

The proposed streetcar will terminate at the 23rd and Jackson. This area has experienced tremendous growth and development in the last three years and is a very commercial intersection anchored by large businesses such as Safeco, Starbucks, Walgreen's, Bank of America, Washington Mutual Bank, Red Apple Grocery Store, and Hollywood Video. About one block east of the intersection, a church and other small businesses line both sides of Jackson Street. The construction of the Welch Plaza has provided an additional

162 units of housing in the last two years at the proposed site of the end of the line of the streetcar.

A new senior citizen residence, the Cannon House, is located about ½ block from the intersection and Catholic Community Services, which served approximately 12,000 clients in 2004, is also nearby.

City of Seattle Comprehensive Plan
The City's 2005 update of the Comprehensive Plan identifies the following 2024 growth targets for neighborhoods in the project area:

Neighborhood	New Households	New Jobs
12th Avenue	700	700
Chinatown/ID	1,000	2,000
23rd and Jackson	650	N/A

Neighborhood Planning
Chinatown/International District (from the Approval and Adoption Matrix)

- Develop zoning for market rate development and diversify housing to include more moderate income as well as family housing units to meet the housing growth targets in the City of Seattle Comprehensive Plan.
- More financing for mixed use projects
- Work with Seatran to find solutions for congested area at 12th Avenue (Central Gateway)
- Develop a circular route within the neighborhood which will facilitate movement of residents.
- Increase services on routes 7, 14 and 36.

Central Area (from the Approval and Adoption Matrix)

- Rezoning to allow for increase commercial use in the future consistent with adjacent use to the south of 23rd & Yesler
- Rezoning to increase residential density on the block between 22nd & 23rd, Yesler Way to Main Street.
- Develop gateways into the Central Area at 23rd & Jackson and MLK Way & 23rd Avenue at the I-90 lid.
- Continue adding convenience retail, restaurants, services and office space.
- Encourage increased housing density in and around the commercial area.
- Develop the African American Heritage Museum.

23rd & Jackson node

- Create Central Area streets that hum with activity, shopping, walking and alternate transportation modes to link people with employment and employment centers.
- Build a new Central Area image for the city and for the community.

- Strengthen this economic node and plan for the necessary street improvements, land use and zoning amendments and desired community amenities to ensure that 23rd and Jackson remains the Central Area's shopping focal point and a true "urban village".

The public involvement process consisted of three parts:

Stakeholder interviews
Stakeholders were selected based on the following criteria:

- Key individuals who would be most able to obtain involvement of others.
- Business owners, opinion leaders, community organization/council leaders, professionals and volunteers.
- Representatives from different population groups in the area.
- Representatives of those involved in the implementation of the Neighborhood Plan and in the economic development of the businesses in the communities.

Community Open House
An open house was held at that Senior Citizen Center on King and 30th Avenue on February 22nd, 2005 and consisted of general and technical information in the form of display boards, a slide presentation and an open interactive discussion period. Notices of the meeting were went to addresses in the project area, and invitations were sent to community councils and other community groups. Approximately 34 people attended.

Feedback Forms
Copies of a feedback form were available at the open house and were later sent electronically to some individuals who could not attend the forum and wanted to share their opinions.

Findings
Overall, there is very strong support for the streetcar in all communities along the Jackson Corridor. Of considerable importance to the small businesses is the transport and movement of tourists and visitors from the waterfront up into the communities and the associated inherent economic benefits. The residents in the Central Area appreciate the ability to move easily up and down the corridor to the other communities and the ease of access to the waterfront. Many commented on the differences in perception and experience in riding the bus and the streetcar. They see the strong possibility that tourists will be attracted to the streetcar although they are not currently using the buses. The waterfront area and the Pike Place Market are experiencing cultural tourism. The strong cultural history, heritage and images of the individual communities present a rich offering of experiences and interests to the tourists.

Stakeholders stressed the importance of the implementation of the streetcar considering the fact that these communities will not benefit directly from the current plans for a major transportation system such as Sound Transit.

The advantage and value of the streetcar to the 23rd and Jackson node are recognized. In the light of Neighborhood Planning, it is important to recognize the other nodes under development in the Central Area and to plan for long term development of the streetcar to serve those areas. Suggestions for future streetcar routes included:

- A turn on 12th Avenue to Seattle University.
- A turn on 23rd Avenue to the African American Heritage Museum.
- An extension and turnaround to 31st or 32nd and Jackson, which is a historic residential district.

Community Comments and Concerns:

- The funding proposal through a LID was a source of concern, but not vehemently opposed. Some small businesses owners in the Central Area stated that they understand the need to contribute to an asset that will benefit their businesses. Most of the businesses along the Jackson Street corridor are small businesses and in the case of the Chinatown/International District, an LID assessment would be in addition to the current CID BIA tax. There was more willingness to pay an assessment after the streetcar is implemented and they are generating additional revenue, rather than paying first.
- The Central Area stakeholders are concerned that this is another proposed project that may not be implemented and that time will be spent "talking and planning."
- Another concern is that the increase in the housing density along Jackson Street is happening without an economic development component to build local businesses to serve the increasing number of residents. There is interest in keeping the dollars in the community and creating jobs for local residents.
- Develop strategies to support small African American businesses that have remained in the community to enable them to take advantage of the increased opportunities emerging from the streetcar. The few African American businesses in the Central Area are not supported by the new residents to the community.
- Increase efforts to develop more African American businesses in light of the changing demographics of the Central Area.
- Who will operate the streetcar? Concern with the current condition of the buses and Metro's commitment and ability to maintain the streetcar and preserve its appeal.
- Increased parking in the Central Area for those who will take the streetcar from 23rd and Jackson to the sporting facilities. The tendency may be to leave their vehicles in that business node.
- Congestion during construction and impact on current street parking.
- Location of the terminus
- Increasing congestion on Jackson Street and overall impact of the addition of a streetcar.
- The current practice of parking large trucks by Franz bakery on Jackson Street and in the vacated Wonder Bread properties. The trucks will have

to be moved when development of the Wonder Bread properties begin this year. Also the turning radius of the trucks and the presence of the streetcar on Jackson Street.

- Others shared the fact that they will not ride the bus but will definitely ride the streetcar.
- Plan the distance of the stops of the streetcar to encourage more pedestrian traffic to facilitate the "showcasing" the businesses in the community and to increase the speed of the streetcar.
- The communities along the Jackson Street corridor exist as separate communities currently. The proposed idea of the streetcar had already advanced the development of a planning group that had begun to look at the corridor as a whole and involved representatives from all the relevant communities. Comprehensive planning along the corridor can only serve to benefit all the communities.
- Offers a more convenient speedy transportation option for those who attend meetings downtown or for errands/shopping.
- Direct access to the Chinatown/International District and Pioneer Square areas including all major sporting activities. It will relieve traffic congestion in those neighborhoods.
- Increased business due to the ease of movement within the corridor communities themselves.
- Enhance economic development in the development of structures, parks, cultural destinations as a result of the increased movement of tourists into the area.
- Integrate fares on the streetcar with other modes of transportation to create a user-friendly transit network.
- Look at the opportunity cost of not allowing the community to prosper as it could with the implementation of the streetcar.
- What will the tourists come up here to see?
- How many hours a day will it run?
- Forget the tourism. Neighborhoods will get to know each other, and know the business owners.
- It creates more pedestrian traffic.

Results from Feedback Forms

When asked how they will use the streetcar, 15 respondents provided the following information:

Commuting 38%
Errands 46%
Shopping in the adjacent neighborhoods 54%
Sightseeing with family/friends 62%
Other ___cultural events_____ 8%

New Developments

The Central Area

"The Central Area is experiencing the most growth since my family started the business here" (Don Gai of Gai's now Franz Bakery)

In the last three years, there is a boom in mixed use construction and residential construction in the area at and around the 23rd & Jackson area. Within the last seven years, over 500 units of housing have been added, including:

23rd & Jackson -	162 units (Welch Plaza)
24th & Jackson	40 units
29th & Jackson	45 units
Hiawatha Place	100 units
23rd & Judkins	20 units
Homesight	60 units
Main Street Condos	57 units

Proposed development in the next two years of the WonderBread properties will yield an additional 330 units:

- Between 17th &16th Avenues on Jackson - 45 units with10,000 to 15,000 sq. ft of retail commercial space (CADA)
- Between 18th & 17th Avenues on Jackson - residential mixed use with 210 to 240 units (Fairfield)
- Between 20th &19th Pratt Fine Arts - New Facilities
- Suzuki properties (privately owned) - 45 units

Cultural and Historical Development

Chinatown/International District

The district is considered the economic and cultural hub for several Asian ethnic groups. It is important that the cultural and historical character be preserved and built upon as a way to strengthen community identity. The identity of this community will only strengthen the history of cultural areas within the neighborhood is honored through sensitive streetscapes, public areas and open space design elements. The three neighborhoods Chinatown, Japantown and Little Saigon encompass a rich history of events and commercial activities. Currently, the area is working on improving Hing Hay Park and in marking the entries to the King Street spine at 5th and 8th avenues with traditional Chinese gates.

Japantown

As documented by historians including the University of Washington's Gail Dubrow, historic Japanese districts are disappearing nationally. However Dr. Dubrow argued that Seattle's Japantown is the most intact Japanese American district in the United States especially considering that exceptional buildings like the Nippon Kan Theater, the NP Hotel, the old Japanese Language School and the

Panama Teahouse and Hotel with the intact original Japanese bathhouses. The Danny Woo International District Community Gardens is a vibrant presence in the neighborhood. In addition Japantown has Kobe Terrace Park and two designated Green Streets providing the opportunity to developing Japantown as a very unique part of Seattle.

Little Saigon
Basic improvements are being planned – replacing street trees, creating an identity through the use of simple banners and public art symbolic of Southeast Asian American cultures.

The Central Area
The Pratt Fine Arts Center is in the schematic design phase. The design shows a building that is open to Jackson Street with large windows and viewing areas where artists can be seen from the street – glass blowing, sculpture, painting etc. The building will also house an art gallery facing west and a conference area.

In addition to the development of residential and business areas, the local community councils are actively engaged in redesign and development of the parks in the area and other public art spaces. The community is also eager and very interested in showcasing its cultural history which is closely connected to the Chinatown/International District.

The Waterfront Streetcar has been cited in the urban design process as an important component in enhancing Jackson Street and developing better connections of the Little Saigon/International District neighborhood with Jackson Place and/or First Hill, as well as connecting Little Saigon with Chinatown and Japantown. The image of Jackson as a grand boulevard could easily be strengthened and serve as a gateway for the whole community with the addition of more street trees, public art and banners that feature all of the cultures present in the District.

Chapter 5 Ridership and Operating Costs

5.1 Ridership

Ridership for the South Jackson Street Corridor was estimated as part of the June, 2004 Seattle Streetcar Network and Feasibility Analysis (page 48). The method used for estimating ridership on this line is commonly called "pivot point" analysis. It can be thought of as a system of "weighted averages" using the results obtained in other cities, weighted by local conditions. This is the method used for estimating ridership throughout the South Lake Union Streetcar study, and has been documented previously.

The basic approach includes beginning with the productivity (passenger per revenue hour) for a group of peer cities. Productivity is used rather than overall ridership to eliminate differences based strictly on the length of the line or the number of revenue hours of service provided. We then introduce a series of adjustment factors, for fares, the mix and intensity of development, the availability of a tourist market, etc. These factors were selected based on engineering judgment and experience in a number of transit studies.

The factors are applied to each peer system and the resulting productivity rates are averaged across all peers. From this average, we apply a range, resulting in a high and low productivity projection for the entire line. Multiplying the high and low productivity projection by the number of hours provided results in a range of ridership for both short term and long term ridership.

This technique is very similar to what an appraiser might do if you were going to sell your house. Starting with comparable sales in the neighborhood, the appraiser will add and subtract value based on the specific conditions of your house – for example, one house might have a deck, or a covered garage or a bigger lot than others in the group. Making adjustments, and then comparing the result back to the group as a "reality check" is a simple and accurate technique that is confirmed by the market place.

In our case, the final reality check was to compare the ridership estimate back to the individual peers, as well as to regional modeling data and to Metro ridership on similar bus lines.

Table 4-1: System Productivity

System	Productivity (Passengers per Revenue Hour)*
Tampa	25
South Jackson Street Corridor	**45 to 50**
Tacoma	49
San Francisco	68
South Lake Union (At Build Out)	65 to 75
New Orleans	81
Portland	91
Toronto	99

* A revenue hour is defined as one vehicle in operation for one hour. Multiple vehicles are typically in operation at any given time.

Based on the estimated productivity, a stand-alone line from 1st and Main to 12th and Jackson would serve 93,000 to 110,000 passenger per year (20 passengers per revenue hour). Once the Viaduct project is complete, with double streetcar tracks on the waterfront, a line to 12th and Jackson would serve 250,000 to 270,000 riders per year and a line to 23rd and Jackson would serve 219,000 to 246,000 additional passengers each year.

5.2 Modern versus Vintage Streetcar Vehicles

The costing and operating data provided in this section assume that the streetcar line would be operated with modern equipment. A number of systems, including Portland, mix vintage streetcars with modern streetcars on limited days or for special occasions. The current vintage fleet could be used on the new line, either alone or in combination with modern cars. However, there are a number of factors that should be considered when implementing vintage streetcar service:

- Vintage streetcars are typically boarded via stairs and therefore are not readily accessible for persons in wheelchairs or those that have difficulty stepping up into the car. To improve access and to meet the requirements of the American's with Disabilities Act, high level platforms or wayside lifts must be located at stops. Given the configurations of the streets in corridor, it may be difficult to locate wayside platforms without reducing street width at least at some locations.
- If a mix of high and low floor streetcar vehicles is in use, there can be confusion about where to stand and wait for the streetcar. When both types of vehicles are operating, there may be some delay and added confusion if passengers must change boarding locations depending on which vehicle is arriving.
- Given the difference in door and car configurations, vintage cars generally board more slowly at stops, and therefore have slower overall travel times. When combining vintage and modern streetcars, it is especially important to be sure that

the vintage cars don't fall behind schedule and create bunching on the line. With 15-minute headways, this should not be a significant problem. However, with more frequent service, delays due to vintage cars could create bunching problems on the line.

5.2 Assumptions: ID Streetcar Extension Operating Plan

The following table summarizes the assumptions that were made about the ID Streetcar extension to estimate likely operating costs.

Table 5-1: Operating Plan Assumptions

Relation to Waterfront Line	The ID line is designed to be able to operate as a "stand alone" line during the shutdown of the waterfront streetcar. Costs and operating plan presented in this document assume modern streetcar vehicles with low floor technology and one operator assigned per car.
Alignment	Several alignments are possible. Cost estimates were produced for two alternatives that have significantly different lengths: one would be an initial operating segment and the second would extend to 23rd Ave. S. Both alternatives have a western terminus at 1st Ave. S. and S. Main Street, and use existing track on S. Main Street and 5th Ave. S. Beyond S. Main Street and 5th Ave. S: the first alternative would make a single-track loop, traveling east on S. King St., crossing to S. Jackson St. on 10th Ave. S., and returning to 5th Ave. S. on S. Jackson St. The round trip length from 1st Ave. S. / S. Main St. to 10th Ave. S. and back would be 1.3 miles. The second alternative would travel in a single track south from the existing terminus at S. Jackson St. along 5th Ave. S., turn east on S. King St., turn north on either 8th or 10th Ave. S., proceed eastward along S. Jackson St. to 23rd Ave. S. A second return track would head west to 5th Ave. S. along S. Jackson St. where it would meet existing alignment. The round trip length from 1st Ave. S. / S. Main St. to 23rd Ave. S. and back would be 2.6 miles.
Vehicles and Infrastructure	Modern, one-operator streetcars vehicles will be used. To expedite and ease boarding and alighting, there will be proof of payment fare collection, low floor boarding, and wide doors.
Initial Operating Plan Parameters	For the initial operating plan, there will be 15-minute headways and a consistent 15 hour service span 7-days a week.
Average speed	Costing assumes that a 9 mph operating speed can be maintained, including all stops and delays. Lower speeds may result in higher costs and vehicle requirements, while higher speeds may result in lower costs and lower vehicle requirements.
Maintenance facility	No costs for deadheading have been included. It is assumed that there will be a new maintenance facility located in close proximity to the line.

5.3 Estimated Annual Operating Cost for Two ID Streetcar Alignments

Layover and Recovery

Transit vehicles need scheduled layover and recovery time at the ends of a line so that the vehicle can return to schedule and the operator can have a break. A typical transit agency standard for layover requires a minimum of 5 minutes of layover for each trip plus approximately 10% of running time for recovery. The following table summarizes the run time, required layover (the minimum necessary), and expected layover (how much will be expected at first) for each alignment.

Expected layovers often exceed the minimum layover because schedules often cannot be made to be as efficient as possible, and some extra recovery can help maintain schedules and buffer against adding more vehicles as congestion erodes travel speeds.

Table 5-2: International District Extension Initial Layovers

	Alignment A: 10th Avenue S.	Alignment B: 23rd Avenue S.
Roundtrip travel time (without layover)	9 min	17 min
Minimum layover required	6 min	7 min
Expected layover	6 min	13 min

Annual Revenue Service Hours, Miles, and Peak Vehicles

This analysis assumes that for a streetcar extension, operator productivities, line management, supervision, and fare collection will be consistent with the analysis for the operating plan for the initial South Lake Union streetcar segment.

Table 5-3: International District Initial Operating Parameters

	Alignment A: 10th Avenue S.	Alignment B: 23rd Avenue S.
Frequency (weekday and weekend)	15 min	15 min
Span	15 hour	15 hour
Roundtrip travel time (without layover)	9 min	17 min
Expected layover	6 min	13 min
Peak vehicles to provide service	1	2
Number vehicles required (including spares)	3	4
Number annual revenue hours	5,475	10,950
Number of annual revenue miles	28,470	56,940

The cost model and inputs used for the South Lake Union streetcar line were used to calculate the operating cost for the ID alignment options.

Table 5-4: Initial Operating Cost Model – Key Elements in 2004 dollars

Cost Item	Major Cost Elements	Unit Cost
Vehicle Operations	Streetcar operators Other salaries including supervision and fare inspection	$62.09 per revenue hour
Material and Services	Materials and Supplies Power Parts including lubricants and consumables	$1.42 per revenue mile
Vehicle and Non Vehicle Maintenance	Maintenance Labor (fully burdened) Other salaries and support contracts	$119,901 per peak vehicle
Non-Vehicle Maintenance	Maintenance of trackway and stations	$98,881 per track mile
General Administration	Allocates costs for system overhead as well as line level overhead to the streetcar system. Costs may be lower if the route is operated directly by Metro than if full allocation is required for contract.	Escalate sum of above factors by 10.4%

Annual Operating Cost of Jackson Street Corridor

The cost for the initial operating segment (S. Jackson Street / S. King Street loop turning at 10th Avenue S.) is approximately $700,000 per year, and the full route to 23rd Avenue S. is approximately $1.4 million per year. Costs are in 2004 dollars.

Table 5-5: Annual Operating Cost Estimates for Initial Operating Plan

	Alignment A: 10th Avenue S.	Alignment B: 23rd Avenue S.
Annual revenue hours	5,475	10,950
Annual revenue miles	28,470	56,940
Cost of revenue hours	$340,000	$680,000
Cost of revenue miles	$40,000	$81,000
Annual costs associated with peak vehicles	$120,000	$240,000
Annual costs associated with track miles	$129,000	$257,000
Administrative overhead	$65,000	$131,000
Total Annual Operating Cost	$694,000	$1,389,000

Chapter 6 Capital Costs

6.1 General Description

The costs presented below are based on the unit prices developed for the South Lake Union Streetcar Preliminary Engineering effort. The costs include upgrading facilities for the modern streetcar vehicles from 1st Avenue S. along the existing alignment to S. Jackson Street and 5th Avenue S. (modifying existing high platforms to platforms for low floor vehicles, etc.). From S. Jackson Street and 5th Avenue S. the costs include new track and facilities for an alignment that includes the S. Jackson Street / S. King Street couplet to 10th Avenue S. and a double track extension from 10th to 23rd Avenue S. A new OCS system, separate from the Metro trolley bus wires, is included.

Based on this preliminary level of study, the capital costs in 2005 dollars for this extension are expected to be in the $60M range.

COST CATEGORY	UNIT PRICE	QUANTITY	TOTAL PRICE
Trackwork - Track Slab Installation	$380.00	14100	$5,358,000
Trackwork - Turnout/Track Crossing Installation	$125,000.00	4	$500,000
Main Street Trolley Modifications	$200.00	2500	$500,000
Catenary Poles and Overhead Wire	$210.00	14100	$2,961,000
Traffic Signals - New (or Full Replacement)	$150,000.00	8	$1,200,000
Traffic Signals - Modified	$60,000.00	9	$540,000
Civil/Roadway	$150.00	14100	$2,115,000
Utilities - Major Conflicts	$700.00	1600	$1,120,000
Utilities - Moderate Conflicts	$450.00	2000	$900,000
Utilities - Minor Conflicts	$250.00	2500	$625,000
Drainage Allowance	$100.00	14100	$1,410,000
Platforms	$60,000.00	19	$1,140,000
Substations	$550,000.00	5	$2,750,000
Maintenance Facility	$3,000,000.00	1	$3,000,000
Construction Soft Costs	15.00%		$3,617,850
Sales Tax	8.80%		$976,337
SUB-TOTAL CONSTRUCTION COST			**$28,713,187**
Design and Construction Contingency Cost	30.00%		$8,613,956
TOTAL ANTICIPATED CONSTRUCTION COST			**$37,327,143**
Engineering and Administration Cost	28.00%		$10,451,600
Vehicles (includes sales tax)	$3,050,000.00	4	$12,200,000
Right-of-Way	Not Incl.	Not Incl.	Not Incl.
TOTAL PROJECT COST			**$59,978,743**

Table 6-1: Capital Costs in 2005 Dollars